UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

A dissertation submitted to the Faculty of Health Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Pharmacy

Chigomezyo J Kawonga

1629583

Supervisors:

Rubina Shaikh

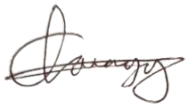
Stephanie Leigh

Zelna Booth

24 June 2025

Declaration

I, Chigomezyo Kawonga, declare that this dissertation is my own, unaided work and has not been submitted before for any degree or examination at any other University. All sources that I have used or quoted here have been indicated and acknowledged by complete references. This dissertation is being submitted for the Degree of Master of Pharmacy at the University of the Witwatersrand, Johannesburg,

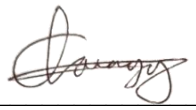


24/06/2025

Chigomezyo Kawonga — Date

Ethics declaration

I, Chigomezyo Kawonga, declare that I am registered with the University of the Witwatersrand for the degree in Master of Pharmacy and have read the University's current research ethics guidelines. I accept responsibility for the conduct of the procedures in accordance with the Human Research Ethics Committee (HREC). I have obtained ethical approval from HREC (Appendix 1, M210809)



24/06/2025

Chigomezyo Kawonga

Date

Dedication

This thesis is dedicated to all those living with vision loss. It is my sincere hope that the research conducted in this study will bring about vital positive change in the pharmaceutical healthcare services offered to all visually impaired or blind individuals in South Africa, and beyond.

Acknowledgments

I would like to express my most profound gratitude to my supervisors Ms. Rubina Sheikh, Ms Zelna Booth, and Dr Stephanie Leigh for their support throughout. Their critical insights, and academic mentorship have been invaluable. Without them, I would not have been able to learn so much and achieve even more.

My sincerest appreciation to the Department of Pharmacy and Pharmacology at the University of the Witwatersrand for affording me the opportunity to study and learn amongst some of the best and finest South Africa has to offer.

I would also like to thank the South African Pharmacy Council for their permission and assistance in reaching out to pharmacists in the country. I am grateful to Clicks, and Netcare hospitals for their permission and assistance in conducting research amongst their pharmacies.

I am truly indebted to BlindSA for their assistance in the recruitment process of visually impaired and blind participants in this study. Their help has been vital in bringing to the forefront the issues and challenges amongst visually impaired and blind individuals in South Africa.

Words cannot describe the immense appreciation I have to my wife for being a source of unceasing love and support especially during the most trying days of this research. A heartfelt thank you to all my family for being a source of constant encouragement and motivation.

Table of Contents

List of Figures

List of Tables

List of Equations

List of Abbreviations

Abbreviation	Meaning
AFB	American Federation of the Blind
AI	Artificial Intelligence
aOR	Adjusted Odds Ratio
ASCP	American Society of Community Pharmacists
CNN	Convolutional Neural Networks
cOR	Crude Odds Ratio
CRPD	Convention on the Rights of Persons with Disability
DALYs	Daily Adjusted Life Years
DCDDG	Directorate of Chronic Diseases, Disabilities and Geriatrics
DWCPD	Department of Women, Children and Persons with Disability
EOA	Electronic Orientation Aids
ETA	Electronic Travel Aids
EU	European Union
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GPS	Global Positioning System
HIV	Human immune deficiency virus
IAPB	International Agency for the Prevention of Blindness
ICD	International Classification of Disease
IEF	International Eye Foundation
IMF	International Monetary Fund
MM	Medication Management
NFC	Near Field Communication
NGO	Non-Governmental Organisation
NGPB	National Guideline on the Prevention of Blindness
OPC	Opération pour la Prevention de la Cécité
PLD	Position Locator Devices
QR	Quick Response
RFID	Radio Frequency Identification
SA	South Africa
SANCB	South African National Council of the Blind

Abbreviation	Meaning
SAPC	South African Pharmacy Council
SOP	Standard Operating Procedures
SVM	Support Vector Machine
UDHR	Universal Declaration of Human Rights
UN	United Nations
US	United States
VIB	Visual Impaired/Blind
WHO	World Health Organisation
WPA	World Programme of Action Concerning Disabled Persons

Abstract

Vision loss amongst individuals who are visually impaired, or blind (VIB) has a huge impact on their experiences at pharmacies and the quality of healthcare they receive. Visual impairment/blindness adds new complexities to health seeking and health management behaviours. Pharmacists play a key role in fulfilling the health needs of VIB patients. The experiences and challenges VIB patients face from a pharmaceutical healthcare perspective are unique and worth understanding. Despite this, within the South African context, research exploring the experiences, challenges and current state of pharmacy healthcare toward VIB individuals is limited.

Aim: The aim of the study was to explore the challenges experiences and current practices implemented by pharmacists in meeting the pharmacy healthcare needs of VIB individuals in South Africa.

Method: This study utilised a convergent parallel mixed method approach that enabled the collection of quantitative and qualitative data simultaneously. A three-phased approach was applied, with phase 1 surveying pharmacists in South Africa; phase 2 interviewing 12 VIB individuals and 12 pharmacists; and phase 3 consisting of the integration of phases 1 and 2, where the quantitative and qualitative data was consolidated to help provide insights on the research questions. Questionnaires were developed and distributed online using REDcap® to pharmacists. Survey data was analysed using descriptive statistics and presented in the form of frequencies, means, figures and graphs. Pearson chi-squared tests and binary regression analysis tests were utilised in analysis. All interviews were conducted via telephone or online. An interview guide was developed. Interviews were conducted until data saturation was achieved. Qualitative interview data was analysed using the thematic analysis approach by Braun and Clarke, which identified and generated themes from the data.

Results: The knowledge, attitude, and practice survey revealed that the pharmacist participants largely had poor knowledge levels, positive attitude levels and moderate practices relating to the care and treatment of VIB patients. No statistically significant association was observed between pharmacist participant demographics and knowledge, attitude and practice outcomes using the chi-square test. Binary logistic regression analysis revealed statistically significant association between hospital pharmacists and knowledge outcomes (aOR = 0.30;95% CI: 0.11

-0.84). Regarding years of experience and knowledge outcomes, pharmacists with less than 5 years work experience had a statistically significant aOR value of 0.11 (95% CI: 0.02 – 0.59). A significant association was observed between participant qualifications and practice outcomes. Master's degree holders had an aOR of 0.42 (95% CI: 0.18 – 0.98).

Qualitative data highlighted issues of poor counselling practices and techniques in treating VIB patients. Pharmacists were observed and reported to possess poor knowledge levels of the VIB condition and those affected by it. The VIB participants reported the need for better pharmacist training and awareness on visual impairment and blindness. Techniques used by VIB participants in medication identification included, using braille, tactile markings, and different sized containers. The use of mobile phones and mobile assistive applications were common amongst VIB participants. Barriers to seeking pharmacy healthcare services included the absence of blind-friendly and accessibility features in pharmacies, and the lack of poor service delivery due to a lack of pharmacy policy and guidelines on the treatment and care of VIB patients.

Conclusion: This study revealed the current state of pharmacy healthcare regarding the care and treatment of VIB patients in South Africa. The pharmacy healthcare needs of VIB patients are at present not sufficiently and appropriately being met. There is insufficient knowledge, and awareness of the VIB condition amongst pharmacists, which requires appropriate pharmacist training to amend. This study shed light on the medication management techniques and processes VIB patients implement. Observed VIB patient challenges highlighted the need for policy changes directed at the improvement of pharmacy facilities and standards of pharmaceutical healthcare for VIB individuals in South Africa.

Keywords: Visual impairment, Blindness, Pharmacists, Medication management techniques, South Africa, Pharmaceutical Healthcare, Visual aid devices, Barriers to pharmacy, Disability, Pharmacy practice, Awareness, Training, Education.

Chapter 1: Introduction

1.1 Background

Disability creates limitations that have a profound effect on the lived experiences of those affected (WHO, 2001). Individuals with disabilities face various challenges, particularly in relation to healthcare. Obstacles to accessing and receiving equitable healthcare are numerous, complex and multifaceted (Tracy and McDonald, 2015).

Amongst the various disability groups, the visually disabled present with unique challenges. The inability to see has a considerable impact in the way one interacts with the world around them. It affects mobility, one's ability to perform daily tasks, and it reduces the ability to fulfil key physical and social functions (West, Rubin and Broman, 2002; Nesemann *et al.*, 2022).

Advances in science and technology in the medical field have provided solutions to many health problems that have afflicted humanity, including visual impairment (Rorsch, 2014). Despite the advances, solutions are still required to address the daily needs and challenges of visually impaired individuals (Taylor, 2017).

The World Health Organisation (WHO) has estimated that in 2021, 2.2 billion individuals globally suffer from visual impairment or blindness (WHO, 2021b). This figure includes individuals who suffer from both mild and severe forms of visual impairment. Visual acuity is the measure of how well one can see and recognise small details. Africa contributes a fifth of the world's total vision loss population (Budenz *et al.*, 2012). Data on vision impairment prevalence in South Africa from the 2011 census, indicated that there were 4,085,888 individuals who suffered from mild to moderate visual impairment and, 739,079 individuals who suffered from severe visual impairment (StatsSA, 2011).

The latest International Classification of Disease (ICD) defines mild visual impairment as having a visual acuity score of 6/18, less than 6/18. 6/60. Blindness is any score worse than 3/60 (WHO, 2023)

Vision is integral to daily functioning and quality of life. Vision arises as part of the integration and processing of sensory information from the ophthalmic, neural, and motor systems of the body (Land, 2009). These systems function by coordinating eye movements to focus on a stimulus, and transmitting that information to the brain where it is interpreted and understood (Addo *et al.*, 2021). These systems enable the human body to make intentional motor actions

and movements such as locating items, moving the body, and understanding the bodies position in space (Romano da silva, *et al*., 2014)

The loss of vision has been shown decrease quality of life (Khorrami-Nejad, *et al*., 2016), and increase emotional and mental stress (Addo *et al.*, 2021) for VIB individuals. Without sight, simple tasks such as reading, walking, driving, and playing sports turn into complex tasks (Brown*, et al*., 2014). Furthermore, a VIB individual is not able to execute various self-care and healthcare tasks that are required for good health management such as, grooming, reading medicine packages, and administering medication (Teutsch, *et al*., 2016). This is of concern where continuous maintenance of a particular pharmacotherapy regimen is required. Ultimately, visual impairment and blindness cause individuals to be at an elevated risk of experiencing therapeutic drug related problems as compared to normal sighted individuals. Such drug related problems often arise from the misidentification of medicine. Examples of therapeutic drug related problems include missing doses, taking the wrong dosage or medication, or taking medication at the wrong time (Wong, *et al*., 2020).

Alumkainzi et al. concluded that current methods of medication dispensing do not meet the healthcare needs of the visually impaired (Almukainzi *et al.*, 2020). Normal sighted individuals can read medication prescriptions, medicine labels and special warning labels, unlike VIB persons have been shown to faces challenges with self-medication management (Latham, et al., 2011).

Considering this, special label guidelines have been presented by organizations and regulatory bodies to improve patient safety (Almukainzi *et al.*, 2020). In the US, the American Foundation for the Blind (AFB) recommended the use of visible, and legible print on prescriptions and medicine labels by recommending font styles and sizes (American Foundation for the Blind, 2008). In the EU, similar guidelines were provided by the European commission for enterprise and industry (EU, 2009). In contrast, no organizations or regulatory bodies have produced guidelines, recommendations or legislations regarding labelling specifications for VIB persons in South Africa (Van den Berg, 2023).

Various practices and techniques have been adopted by VIB persons and pharmacists to improve the medication management of VIB patients. Such techniques include using different packaging shapes and sizes; using smell to differentiate between medicines; adding different tactile markings on medication packages; using pillboxes; and the use of technological assistive devices to provide information relating to the medication in audio format (Smith and Bailey,

2014; Easley, Kuber and Ozok, 2017).

The Braille system has been used as a mode of communication for VIB individuals for nearly 200 years. Braille is a tactile reading system that uses arrangements and patterns of 6 embossed points that represent letters and numbers (Almukainzi *et al.*, 2020). Various challenges regarding the use of braille within pharmaceutical healthcare exist. Firstly, printing health information material in the form of pamphlets, package information leaflets, and Braille label stickers can be complicated and quite expensive (American Foundation of the Blind, 2021). Secondly, braille printouts are often bulkier and larger making it relatively difficult to produce braille package information leaflets small enough to be packaged into medication packages (Wong, et al., 2020). Thirdly, there is an evident decrease in the number of visually impaired individuals who can read braille indicating that braille may not be a sufficient assistive aid for all VIB individuals (Massof, 2009; Forcelini & Garcia, 2018).

Considering the drawbacks of traditional visual impairment assistive devices and techniques, further research is necessary to identify effective assistive devices. Examples of such devices include PenFriend™ (Royal National Institute of the Blind, 2019), and ScripTalk® (Envision America, 2020). Camera based mobile applications such as VizWiz (Bigham, et al., 2010), and Be My Eyes (Avila, et al., 2016) enables VIB users to identify objects with the help of sighted volunteers from around the world. Though positive outcomes have been noted, concerns relating to patient privacy, autonomy, and confidentiality have been described in research, and the effectiveness of these solutions needs to be researched further (Ahmed *et al.*, 2015).

Healthcare professionals are tasked with providing quality care to all patients, including VIB patients. By researching and evaluating current pharmaceutical healthcare practices, the current standard of healthcare provided to VIB patients can be determined and the recommendations for improvement made. For example, the American Foundation of the Blind conducted research into healthcare practices relating to the labelling of medication for visually impaired individuals. This research was used to create guidelines that promoted change, resulting in an improvement of healthcare standards for the visually impaired community (American Foundation for the Blind, 2008).

In South Africa, the Good Pharmacy Practice manual published by the South African Pharmacy Council (SAPC), provides steps, recommendations, and guidelines for general pharmaceutical healthcare practice. Despite this, available guidance on practice relating to VIB patient care is lacking (SAPC, 2019). No guidelines as detailed or similar to those discussed above are

available in South Africa (Lourens and Zeyen, 2024).

Thus, this study sought to determine existing pharmaceutical healthcare practices relating to VIB patients within the South African pharmacy healthcare sector from the pharmacist and VIB patient perspectives. Such research has the potential to be used to inform healthcare policy makers in creating policies, guidelines, and standards that could improve healthcare delivery to VIB individuals.

1.2 Rationale for the study

In South Africa, research pertaining to VIB individuals and pharmaceutical healthcare practices that are implemented to assist such patients is limited. Furthermore, standardized guidelines to address the pharmaceutical care needs of the VIB patients specifically are absent. To develop such guidelines, it is imperative to understand the current knowledge, attitude, and practices amongst pharmacists practising in South Africa pertaining to the pharmaceutical care of VIB patients. Complementary to this, it is essential to understand the pharmaceutical care needs of VIB patients. Understanding their perspectives, challenges and experiences with pharmacy healthcare, provides insights into optimal pharmacotherapeutic management of VIB patients.

The lack of research relating to VIB patients and pharmacy healthcare presents an opportunity to explore the current state of necessary pharmacy health services required. Findings from this study have provided recommendations for better pharmacist practices. Similarly, exploring the challenges, and experiences of VIB patients has provided feedback from the patients relating to best practices for pharmaceutical care.

1.3 Aims and Objectives

The aim of this study was to explore the challenges, experiences, and current practices amongst pharmacists in South Africa in meeting the pharmacy healthcare needs of the VIB patient. The above aim was achieved through the following objectives:

1. To explore the knowledge, attitude, and perceptions of pharmacists on the various strategies employed in dispensing for visually impaired patients by using questionnaires (Phase 1).
2. To explore the current practices and challenges amongst pharmacists in providing pharmacy healthcare services to VIB patients utilising interviews (Phase 2).
3. To explore the current practices implemented by VIB individuals in addressing their

medical management needs via interviews (Phase 2).

4. Consolidation and integration of qualitative and quantitative data results (Phase 3)

The above aim and objectives were accomplished by using a mixed methods study design utilising surveys for the quantitative data collection (phase 1) and interviews for the qualitative data collection (phase 2). The mixed method approach enabled the collection of both types of data such that when analysed together provide greater insights into the data (phase 3).

1.4 Synopsis of Dissertation

Chapter one of this dissertation consists of a brief background to visual impairment and blindness. This section provides introductory statistics and pertinent information relating to visual impairment, along with the rationale, aim and objectives of the study.

Chapter two provides an in-depth literature review on visual impairment. This section defines and discusses various health, social and economic aspects of visual impairment, with an analysis of currently available scientific research on the topic. This chapter highlights some of the key healthcare policies for visually impaired individuals. This narrative looks at the current challenges experienced by both visual impaired individuals and pharmacists when it comes to seeking or providing pharmaceutical healthcare.

Chapter three provides information relating to the research methodology of the study. The study design, study procedure, sampling techniques, and methods of data analysis are stated and described within this section.

Chapter four, **five**, and **six** present the results of this dissertation. Chapter four presents the results from the survey of the study disseminated to South African pharmacists. Chapters five and six present the findings from the interviews amongst the pharmacist and VIB participants respectively. Quantitative data was presented using graphs, tables and frequency charts. Qualitative data was organised into themes and subthemes which are presented utilising quotes and tables.

Chapter seven contains the discussion of results for this dissertation. The chapter provides an in-depth exploration of results obtained and a concise discussion on the findings of this study and their implications.

Chapter eight provides the conclusion of the dissertation in which future recommendations, and an evaluation on the dissertations' strengths and limitations are presented.

Chapter 2: Literature Review

This literature review explored research relating to visual impairment and blindness with the aim of understanding the advances, challenges and policies relating to the pharmaceutical healthcare of visually impaired individuals. This review will provide an overview of visual impairment/blindness health research at a global level and will congruently compare those findings with research on visual impairment within the South African context.

2.1 Introduction

Visual impairment transcends all aspects of an individual's life. It affects a person's health, lifestyle, and economic output. Vision has a significant impact on how one interacts with the world around them. With the advancements made in science and technology, much progress has been made in improving our understanding of visual impairment and blindness. Advances in the medical field have made it possible for new and innovative surgeries and treatments to be discovered and implemented (Rorsch, 2014). New technologies have made it possible for VIB individuals to lead more fruitful and meaning lives (Pal *et al.*, 2017).

2.2 Visual impairment

2.2.1 History, Definition and Classification

The definition of visual impairment has changed over time. In 1948, the World Health Organisation (WHO) formed a committee that defined it as either functional disability, or the more quantifiable, visual acuity (Leat, Legge and Bullimore, 1999). Visual impairment as a functional disability is defined as one that is "economically blind". In other words, the affected individual was considered visually impaired or blind to the extent that they are not able to work in any industry or vocation. Later on, visual impairment and blindness was defined in terms of visual acuity and defined VIB individuals as persons with a visual acuity score poorer than 20/200 (WHO, 1951). Thereafter, many countries began defining visual impairment and blindness according to nationally customised classifications, terminologies and understanding of visual impairment. In 1975, the WHO introduced a standardised definition of visual impairment that was included in the ICD-9. It defined visual impairment as best corrected visual acuity in the better eye with five various categories defining varying degrees of visual impairment (WHO, 1975). The WHO further made improvements to the definition in 2006 which was included in a revised version of the ICD 10 (WHO, 2006). The amended definition recommended various changes to the existing definition. This included measuring visual acuity

with both eyes open. “Low vision” was replaced with category 1 and 2. Visual acuity less than 20/400 was placed under category 3. These revisions were necessary because they allowed for the inclusion of a significant part of the population with visual impairment due to uncorrected refractive errors to be considered. Prior to this, there was an underestimation of the global visual impairment figures. These revisions brought about the current international definition of visual impairment (Vashist *et al.*, 2017).

Visual impairment and blindness are terms that describes a range of visual states, ranging from low visual impairment to complete blindness. The current international definition of visual impairment that has been adopted by the WHO, which can be found in the latest International Classification of Disease (ICD) (WHO, 2021b), defines mild/low visual impairment as having a visual acuity score of 6/18. Moderate visual impairment is defined as having a score less than 6/18. Severe visual impairment is a score less than 6/60. Blindness is any score worse than 3/60 (Table 2.1).

Table 2.1: Visual impairment classification according to ICD 10 definition (WHO, 2021).

Category	**Presenting visual acuity distance**	
	Worse than	**Equal to or better than**
Mild or no visual impairment		6/18
Moderate visual impairment	6/18	6/60
Severe visual impairment	6/60	3/60
Blindness	3/60	1/60
Blindness	1/60	Light perception
Blindness	No light perception	

2.2.2 Causes of visual impairment/blindness

Understanding the aetiologies of visual impairment is key to the management and prevention of the condition. This section looks at some of the main eye conditions that lead to various forms of visual impairment. There are more than eight known causes of visual impairment or blindness which are summarised in the sections below.

2.2.2.1 Refractive errors

Uncorrected refractive errors account for a significant majority of mild to moderate visual impairment cases worldwide. Refractive errors are conditions characterised by the eye's inability to accommodate and focus on objects. These conditions include myopia, hyperopia, and presbyopia (Lou *et al.*, 2016). Myopia occurs when the eye is only able to focus on objects that are close by. Hyperopia and presbyopia are similar conditions that present with the eye only being able to focus on far away objects. Hyperopia occurs at a young age and presbyopia's onset occurs past the age of 40. Refractive errors are caused by a combination of environmental and genetic factors (Wang *et al.*, 2021). Serious refractive errors can lead to further complications. For example, myopia is one of the predisposing factors that can lead to retinal detachment, glaucoma, and myopic retinopathy (Hyman, 2007). Treatment and management of refractive error includes surgery and the use of corrective lenses (spectacles) (Cochrane, du Toit and Le Mesurier, 2010).

2.2.2.2 Glaucoma

Glaucoma is one of the leading causes of visual impairment/blindness globally. It is a neurodegenerative eye condition that leads to optical nerve damage. Glaucoma is characterised by an increase in intraocular pressure caused by a blockage in the drainage of aqueous humor. The increase in intraocular pressure has been found to be directly linked with optic nerve damage and consequential vision loss (Weinreb, Aung and Medeiros, 2014). Glaucoma can be easily detected through regular screening of at-risk individuals. Treatment of glaucoma includes laser trabeculoplasty, surgical trabeculectomy, and drugs such as sympathomimetics, carbonic anhydrase inhibitors, and beta-blocking drugs (Qadir and Qadir, 2020).

2.2.2.3 Trachoma

Trachoma is the world's leading cause of infectious ocular disease which can lead to mild to complete vision loss (WHO, 2022). Trachoma is caused by the *Chlamydia trachomatis* that causes recurring bouts of conjunctival inflammation. Repeated conjunctival inflammation culminates in eventual conjunctival scaring and fibrosis formations, leading to opacities and vision loss (Ahmad and Patel, 2024). Trachoma is treated using surgical interventions, and antibiotics such as macrolides and tetracyclines (Burton, 2007).

2.2.2.4 Corneal Opacity

Corneal opacity is an ocular condition that is caused by ocular trauma or disease. Such injury results in the formation of white opaque corneal scars. These scars lead to the deterioration in

vision. The causes of corneal opacity include corneal scar formation from measles, vitamin A deficiency, ophthalmia neonatorum and physical injury to the cornea. Treatment includes surgery and pharmacotherapy (Ashaye and Oluleye, 2004).

2.2.2.5 Cataracts

Cataracts are one of the leading causes of visual impairment/blindness worldwide. A cataract is an occlusion of the eye's lens. The progressive deterioration of the lens. Cataract formation depends on various factors such as obesity, blood pressure, age, genetics, and diabetes mellitus. Cataracts are usually treated by surgically removing the opaque lens and replacing it with an artificial lens (Prokkofeyeva, Wegener and Zrenner, 2012).

2.2.2.6 Age Related Macular Degeneration.

Age related macular degeneration is a progressive degenerative disorder affecting the macula. This chronic eye condition can cause mild to complete vision loss. In the advanced stages, vision loss occurs due to choroidal neovascularisation breaking into the neural retina causing blood to enter the neural retina and damaging the retina. This eye condition is common amongst geriatric patients. Anti-vascular epithelial growth factor (VEGF) drugs, photodynamic therapy, and laser photocoagulation are the main treatment options for this disease (Lim *et al.*, 2012; Vyawahare and Shinde, 2022).

2.2.2.7 Diabetic retinopathy

Diabetic retinopathy is one of the most significant secondary complications of diabetes mellitus (Yau *et al.*, 2012). Vision loss occurs because of damage to the retina due to neovascularisation, retinal thickening, and oedema. Severe vision loss is common in advanced stages. Risk factors of include uncontrolled blood glucose levels, hypertension, and dyslipidaemia. Diabetic retinopathy can be prevented by maintaining good glycaemic control, blood pressure control and cholesterol management. Treatment of the condition includes laser photocoagulation surgery in specific cases and anti-VEGF drugs (Kimar *et al.*, 2012; Stitt *et al.*, 2016).

2.2.2.8 Other causes

There are other eye conditions that do not usually causes visual impairment/blindness but if left untreated they can lead to severe vision loss. Examples of these include conjunctivitis, keratitis, and pterygia and pinguecula (WHO, 2021b).

Table 2.2: Summary of the major causes of vision loss and blindness

Condition	Definition	Aetiology	Complications	Treatment
Refractive Errors	Myopia: Eye is only able to focus on near objects. Presbyopia: Eye is only able to focus on distant objects	Genetic and Environmental	Retinal Detachment Glaucoma Myopic retinopathy	Surgery Spectacles
Glaucoma	Neurodegenerative disease that causes optical nerve damage	Increase in intraocular pressure	Optical nerve damage and vision loss	Laser surgery trabulectomy Drugs
Trachoma	Bacterial infection of the eye	*Chlamydia trachomatis*	Blindness	Tetracyclines Macrolides
Corneal Opacities	Damage to the cornea leading to the opacity of the cornea	Trauma Chemical Injury Congenital Vit A deficiency	Visual impairment Blindness	Drugs Phototherapeutic Keratectomy Laser Surgery
Cataracts	Cloudy occlusions of the lens	Genetics Age	Visual impairment Blindness	Surgery
Age Related Macular Degeneration	Macular degeneration and retinal pigments due to a disruption of blood flow to the retina	Genetics Age	Central Vision loss Severe Visual impairment/Blindness	Anti-VEGF drugs Photodynamic therapy Laser photocoagulation
Diabetic Retinopathy	Retinal thickening and neovascularisation that damages the retinal.	Diabetes Hypertension Hyperglycaemia Dyslipidaemia	Vitreous Haemorrhage Retinal Detachment Glaucoma Blindness	Laser Photocoagulation Scatter laser treatment Vitrectomy Anti-VEGF drugs

2.2.3 The economic implications of visual impairment and blindness

Investigating the economic factors associated with visual impairment and blindness provides key information that policy reform and informed decision-making for resource allocation (Gordois *et al.*, 2012; Marques *et al.*, 2022).

Naidoo et al. conducted a systematic review and meta-analysis on available literature on myopia and presbyopia to make evidence-based estimations on the economic impact of these ailments. Their findings estimated that around US$270 billion was incurred annually in productivity loss caused by uncorrected vision loss, with a significant portion of this cost borne by economies from Southeast Asia, South Asia, and East Asia (Naidoo *et al.*, 2019b). In 2012, Frick postulated that the global cost in training personnel and developing the facilities to treat visual impairment/blindness caused by refractive error in 2007 would be US$20 billion over 5 years. Despite estimating costs in 2007, it is still relevant to understand that today's estimated costs of treating and managing visual impairment/blindness far outweigh the costs of implementing policies and developing the infrastructure to prevent visual impairment and blindness (Frick, 2012).

The need for further investment has been highlighted in the WHO's most recent report on visual healthcare globally. The report concluded that an estimated US$24.8 billion will be needed to address the uncorrected refractive errors and cataract healthcare needs at a global level. To achieve global 2030 health targets, middle and low-income countries will have to invest in a further 415,000 new health facilities and 23 million healthcare workers. This investment is necessary to ensure that the financial cost of productivity lost from preventable diseases. To emphasis this, the cost to prevent visual impairment in the 11.9 million individuals globally who have glaucoma, diabetic retinopathy or trachoma, would have potentially required an investment of US$32.1 billion. This investment far outweighs the current financial and social burden that healthcare systems are currently facing due to a lack of financial, and health-economic planning (WHO, 2019b).

In all, the economic benefits of implementing the right strategies and economic health policies. The economics of visual impairment has quite a potential role to play in the economic output of a country's workforce.

2.2.4 Global Statistics of Visual impairment

In 2020, Bourne et al. conducted a systematic review and meta-analysis on data relating to global vision loss. The researchers estimated that around 49.1 million individuals were blind,

221 million people, had moderate visual impairment, while 33.6 million had severe visual impairment (Bourne *et al.*, 2020). In a sequential study on blindness and visual impairment, the researchers estimated that 258 million individuals had mild visual impairment, and 588 million people have visual impairment due to uncorrected refractive error. The global crude visual impairment rate was found to be 4.34%. (Bourne and Steinmetz, 2021).

Bourne et al. further noted an increase in the prevalence rate of visual impairment and blindness. In 1990, data on vision loss revealed that around 34.4 million were blind persons. Thirty years later, data estimates had shown that there were approximately 49.1 million blind persons around the world representing a 42.8% increase in the number of blind individuals. Factors contributing to the increase included increased life expectancy. However, the introduction of prevention and treatment programs and initiatives on visual impairment and blindness led to a decrease in the age-standardised prevalence of visual impairment and blindness globally from 1990 to 2019 (Bourne *et al.*, 2020).

Future projections on visual impairment and blindness have indicated a rising trend in the number of cases. Projections conducted by members of the Vision Loss Expert Group, project that by 2050, 61 million individuals will be blind, 360 million will have mild visual impairment, while 474 million will have moderate and severe visual impairment (Bourne and Steinmetz, 2021).

The leading cause of visual impairment and blindness globally is uncorrected refractive errors (presbyopia and myopia) followed by cataracts, age-related macular degeneration, glaucoma, diabetic retinopathy, corneal opacity, and trachoma (Bourne *et al.*, 2017). The WHO report on visual impairment and blindness highlighted that approximately half of all global visual impairment cases could have been prevented (Table 2.3). It was estimated that approximately 13.1 million people had moderate to severe visual impairment or blindness due to glaucoma, diabetic retinopathy, and trachoma (WHO, 2021b). These causes of visual impairment, if diagnosed and treated in early states, can prevent severe visual impairment. Various treatments and surgery options are available that can help manage or improve vision for some of these eye conditions such as glaucoma, cataracts, and trachoma (Adelson *et al.*, 2020).

Table 2.3: Global estimates of the number of individuals affected by eye conditions that have caused mild to severe visual impairment (WHO, 2021b)

Eye Conditions	**Number of affected individuals**
Presbyopia	1.8 billion
Myopia/ hyper-myopia	123.7 million
Cataract	65.2 million
Age related Macular degeneration	10.4 million
Glaucoma	6.9 million
Corneal opacities	4.2 million
Diabetic Neuropathy	3 million
Trachoma	2 million
Other	371 million
Unknown causes	188.5 million
Total	2.2 billion

2.2.4.1 Global prevalence and burden of visual impairment aetiologies

This section will highlight the global prevalence and burden of disease of some of the major causes of visual impairment.

One of the statistical tools used to measure the burden of disease is called disability adjusted life years (DALYs). This is a time-based measure where one DALYs represents the loss of one year of full health (WHO, 2021c). Approximately 22.6 million DALYs were attributed to visual impairment and conditions that cause blindness at a global scale in 2019. These conditions account for 0.88% of the total DALYs due to all causes. Yang et al. conducted a systematic analysis of the global, regional, and national burden of blindness and vision loss. The analysis concluded that over the past three decades, the top three conditions with the highest DALYs that caused vision loss and blindness are cataracts, refractive error disorders and near vision loss (Yang *et al.*, 2021).

Glaucoma is one of the most significant causes of visual impairment especially if left untreated. According to a study done by (Adelson *et al.*, 2020), Glaucoma is the second leading cause of blindness and fourth leading cause of moderate to severe visual impairment. Glaucoma is most prevalent in regions with a low social development index (Yang *et al.*, 2021) such as Africa,

South America and the Caribbean, and amongst individuals of African and Asian descent (Tham *et al.*, 2014).

Cataracts are one of the main contributors to vision loss and blindness at a global level. Despite the availability of cataract surgery and treatment, there continues to be a significant global presence of cataracts. In 2020, cataracts were the leading cause of blindness globally (Adelson *et al.*, 2020). In 1990 cataracts were the dominant cause of blindness in all areas of the world. By 2010 the percentage of global blindness caused by cataracts decreased by 32%. This decrease was noted in most areas of the globe except East Africa (Khairallah *et al.*, 2015). The decline in global blindness and moderate to severe visual impairment during this time period was significantly attributed to the reduction in cataract cases (Lansigh and Martens, 2007). Efforts by international and national public agencies in implementing programs such as VISION 2020 have attributed to the decline in the cataracts (WHO, 2007). Such programs increased efforts to improve access to cataract treatment. Despite implementations of these health programs and policies, to date, cataracts still pose a significant concern toward visual impairment globally. Current data on cataract caused visual impairment estimates that around 65.2 million individuals worldwide are affected by it (WHO, 2021b).

Trachoma is the leading cause of infectious visual impairment in the world (WHO, 2019a). The disease is endemic in certain regions of Africa, Asia, South America, and the Middle East. Most of these regions have elevated levels of poverty and decreased level of health infrastructure development. In 2003, the WHO stated that there approximately 7.6 million individuals who suffered from serious vision loss as a result of trachoma. Today, that figure has decreased to an estimated 2 million individuals (Adelson *et al.*, 2020). This is testament to the progress made in implementing health policies and programs such as the Global Elimination of Trachoma (GET) in 1997 and the SAFE strategy (Mariotti, Pascolini and Rose-Nussbaumer, 2009).

Age related macular degeneration is the fourth largest cause of moderate to severe visual impairment globally (Jonas, Cheung and Panda-Jonas, 2017). There are an estimated 10.4 million cases of moderate to severe visual impairment worldwide. The disease has been found to be more prevalent in individuals of Caucasian and Asian ancestry (Ling Wong *et al.*, 2014). The prevalence of age-related macular degeneration has decreased between by 30% between 1990 and 2020. This has been attributed to the increase in use and introduction of anti-VEGF treatment (Adelson *et al.*, 2020).

Uncorrected refractive error is a major cause of preventable visual impairment with an estimated 53% of all visual impairment cases result from the condition. It is the main cause of visual impairment and the second leading cause of blindness (Naidoo, Leasher, *et al.*, 2019). The Global Burden of Disease (GBD) Study 2010 estimated that around 108 million cases of visual impairment and blindness were caused by uncorrected refractive error. According to GBD 2013, uncorrected refractive error accounted for the highest DALYs amongst visual conditions at 11.3 million DALYs. Cataracts had 2.9 million DALYs (Murray *et al.*, 2015). According to the GBD Study 2019, there did not appear to be any correlation between the condition and the social development index of the country. Despite this fact, it was noted that the region with the highest burden of this URE is South Asia (Yang *et al.*, 2021).

Diabetic retinopathy is the fifth leading cause of blindness or moderate to severe visual impairment in individuals over the age of 50 years. In 2020, it was estimated that the global estimate of individuals with diabetic retinopathy was 103 million (Teo *et al.*, 2021). The study reported that there was a 14.9% increase in age standardized global prevalence of blindness caused by diabetic retinopathy. The causes of this have been attributed to the increase in life expectancy, with regards to geographical distribution of diabetic retinopathy, Africa has the highest prevalence of diabetic retinopathy globally with 35% of all cases, followed by the West Pacific, and Southeast Asia. The study estimates that there will be a 25.9% increase in the number of Diabetic retinopathy cases by 2030 to 129 million and a 55.6% increase in 2040 to 160 million cases. As compared to all other causes of visual impairment previously discussed in this section, diabetic retinopathy has been found to be the only ailment to have had an increase in prevalence between 1990 and 2020 (Adelson *et al.*, 2020). These increases have been identified most notably in Asia and sub-Saharan Africa, aligning with the global increase in diabetes diagnoses. This trend is expected to increase as by 2040 it is estimated that there will be 642 million individuals living with diabetes (Wong and Sabanayagam, 2019).

The distribution of visual impairment at a global level is not even. Disparities occur due to differences in income level, geographical regions, and various other factors. For example, South, East, and South-East Asia, which are host to over 50% of the world's population are responsible for 62% of individuals who have moderate to severe bilateral distance vision impairment (WHO, 2021b). Similarly, it is estimated that 90% of people with some form of visual impairment live in the developing world (Naipal and Rampersad, 2018). These include regions such as Asia, South America and Africa. Africa, which is home to 12% of the world's

population, is responsible for a fifth of the world's total vision loss population (Budenz *et al.*, 2012).

Low- and middle-income countries also experience higher prevalence rates of certain diseases due to less developed healthcare systems, economic challenges, and geographical location. The prevalence of bilateral blindness in low to middle income countries, as are the majority in Africa for example, is eight times higher than in high income countries (Bourne *et al.*, 2017). Most developing countries have growing populations that have some of the highest population growth rates in the world. For example, of the 47 countries that the United Nations (UN) considers least developed, 32 of them are in Africa and these countries have particularly high population growth rates. With high population growth rates and more individuals living longer, there is an expected increase in age-related ocular conditions that put a strain on the developing health infrastructure (Bourne and Steinmetz, 2021).

The data relating to causes of visual impairment is sparse for sub-Saharan Africa, some high-income countries, and amongst children (Adelson *et al.*, 2020). Further research is required in these regions. Data collected from such studies will aid in developing more efficient and robust programs and policies that will help decrease the prevalence of visual impairment and blindness resulting from avoidable causes.

2.2.5 Visual impairment in South Africa

South Africa is a country located on the southern-most part of the African continent. It has a population of an estimated 60.6 million people in 2022 with an annual growth rate of 1.2% (Stats SA, 2022). The country has a life expectancy of 64 years The country is considered to be an upper middle-income economy with a gross domestic product (GDP) of US$ 419 billion which account for 25% of the total GDP of Sub-Saharan Africa (World Bank, 2022). Despite having one of the biggest economies in Africa, South Africa has the highest unemployment rate on the continent with an estimated 34% of its work force unemployed (Statista, 2022).

The South African private and public health sectors constitute the two major facets of the South African healthcare system. Notably, there is a significant imbalance in resources and accessibility between the two sectors. An estimated 84% of the population is dependent on the public health system. A system that has been chronically underfunded and overstretched, incapable of effectively catering to the population (de Villiers, 2021). Additionally, the public health sector accounts for less than 40% of specialised doctors in the country, leaving public institutions severely understaffed in these areas (Maphumulo and Busisiwe, 2019). The

challenge of an ailing public health system, is that the most negatively affected constitute those who are of vulnerable social groups such as VIB patients, who largely are reliant on public health services and require specialist care (Harris *et al.*, 2011).

Visual impairment and blindness in South Africa are still a major public health concern. In 2003, the South African National Guideline on the Prevention of Blindness (NGPB) stated that the prevalence of blindness in South Africa was 0.75%. The guideline was created to provide information regarding the country's national policy and plan toward preventing blindness. This guideline was developed in response to the WHO's Vision 2020 global initiative. One objective of the guideline was to reduce the national prevalence of blindness from 0.75% to 0.5% between 2003 and 2005 (NDoH, 2003). This data was used by provincial health departments and programme coordinators in the development of plans, policies and programmes aimed at blindness and visual impairment prevention. In 2013, Naidoo et al., conducted a population-based study epidemiological study in the lower Tugela health district in Kwa-Zulu Natal to determine the prevalence of visual impairment and blindness. They estimated that the prevalence of visual impairment within the population was 0.9% which is larger than the estimated prevalence rate that the National department of Health stated in 2003 (Naidoo *et al.*, 2013). More recently, a systematic analysis was conducted on available visual impairment prevalence data from 2010 to 2020 and it estimated that, at present, the prevalence rate of blindness within South Africa is 2% (Xulu-Kasaba and Kalinda, 2022). These statistical figures demonstrate the need to continue to prioritise public health action to prevent and treat visual impairment.

Literature on national data on vision loss and prevalence are not readily available (Naidoo *et al.*, 2020). Addo et al. and Xulu-Kasaba et al. thus conducted studies to determine the state of vision loss in South Africa by providing more recent data (Addo *et al.*, 2021; Xulu-Kasaba and Kalinda, 2022).

With regards to South Africa's vision loss data, the 2011 census recorded 4,085,888 individuals who suffer from mild to moderate visual impairment and,739, 079 individuals who suffer from severe visual impairment (StatsSA, 2011). Data from the International Agency for the Prevention of Blindness's (IAPB) Vision Atlas (an online database of visual impairment and blindness data of countries around the world), indicates that as of 2020, South Africa's estimated VIB population stands at 11 million, while approximately 370,000 are blind (IAPB, 2022). Addo et al. determined the prevalence and associated factors of visual impairment in

South Africa and estimated that approximately 1 in 10 individuals in South Africa have some form of vision loss. They determined that in South African adults 45 years of age and older had significantly higher rates of vision loss as compared to adults between the ages of 15 and 44. Amongst the provinces in the country, KwaZulu-Natal had the highest rates of visual impairment at 17%, while Mpumalanga had the lowest reported prevalence of vision loss at 1.3%. With regards to visual loss and ethnicity in South Africa, they determined that the Indian community had higher levels of vision loss as compared to other ethnic groups such as Africans, mixed race, and Caucasians. As has been established by other studies and other data sources (IAPB, 2022) (Abdulhussein and Hussein, 2021), their analysis successfully showed that among the sexes, female individuals have higher prevalence rates of visual impairment with around 58% of all individuals who experience some kind of vision loss being women (Addo *et al.*, 2021).

Regarding policies and programs regarding VIB patient healthcare, the National Prevention of Blindness program was created by the National Department of Health was introduced in response to the WHO's Vision 2020 global campaign. As part of the program, the National Guideline on the Prevention of Blindness (NGPB) was created (NDoH, 2003). Objectively, the plan aimed to reduce the crude prevalence of blindness from 0.75% to 0.50% by the year 2005 (NDoH, 2003).

Studies analysing the effectiveness of the programme, noted that in 2010 the prevalence rate in the country was estimated at 0.9% (Naidoo *et al.*, 2013) and in 2020, it had increased to 2% highlighting the unachieved primary aim of the prevention plan (Xulu-Kasaba and Kalinda, 2022). It is currently difficult to objectively judge the success of this plan due to the limited research available to determine the effectiveness interventions made (Sithole and Oduntan, 2010).

Furthermore, unlike other countries such as Saudi Arabia, Kenya, and Indonesia, the lack of a national directorate on eye healthcare programmes and services has led to an insufficient level eye healthcare standards in South Africa, within a system beset by various challenges (Sithole, 2018). All matters pertaining to ocular health are under the mandate of the Directorate of Chronic Diseases, Disabilities and Geriatrics (DCDDG) within the South African National Department of Health (Sithole, 2018) Moreover, the lack of a dedicated national directorate has made it difficult to manage and evaluate existing national programmes combatting visual impairment and blindness (Lilian, 2018).

Concerted efforts to prevent visually impairment and blindness in South Africa made by both the government, through the National Health of Department, and NGOs provided much support and help in ensuring that the needs and rights of VIB persons in the country are addressed. Despite the efforts, these interventions have been implemented to treat and prevent the causes off visual impairment and blindness rather than offer solutions to overcome the challenges that VIB individuals face when seeking healthcare.

2.3 Visual Impairment and Health

2.3.1 Definition of Health needs of VIB individuals

The loss of vision has a significant impact on the quality of life of an individual affected by it. Vision loss has an effect not only the health of one's ocular system, but it has far reaching effects on the health of various other bodily systems (Addo *et al.*, 2021). These health challenges include physical ailments like diabetic retinopathy to mental health conditions. Visual impairment and blindness lead to socio-economic challenges that affect the way individuals lead their lives. In this section will focus on exploring and understanding the health needs and challenges of VIB individuals.

2.3.2 Health challenges of VIB individuals

Research has shown that a lower quality of life results in lower health outcomes amongst VIB individuals (Lamoureux and Pesudovis, 2011). In addition, with increased severity of visual impairment, there is a decreased level of satisfaction of life, physical and mental health, level of mobility and activity (Crews *et al.*, 2016). A decreased level in one's quality of life creates challenges with regards to health seeking behaviour, and health maintenance (Brown *et al.*, 2014).

Studies have shown that VIB individuals are more likely to sustain injury due to falls and accidents that can lead to physical trauma such as sprains, and fractures (Black and Wood, 2005; Crews *et al.*, 2016). Ocular restorative surgeries like cataract surgery have been shown to reduce the risk of fractures and injury. A reduction in the risk of fractures, reduces the risk of mortality, most notably amongst VIB elderly patients (Tseng, Yu and Coleman, 2012).

There are various mental health challenges that VIB individuals experience. The increased levels of stress associated with vision loss lead to higher incidences of depression (Kempen *et al.*, 2012). The severity of depression amongst VIB individuals has been found to vary depending on the cause of visual impairment (Cumurcu *et al.*, 2006). Furthermore, it has been postulated that individuals who have experienced vision loss since early childhood may

experience less severe levels of depression as compared to their counterparts who began to lose their vision after being sighted (Demmin and Silverstein, 2020). Though limited research exists on anxiety and visual impairment and blindness, studies have demonstrated that anxiety is prevalent amongst VIB individuals (Bolat *et al.*, 2011). Additionally, several studies have determined that VIB individuals experienced increased rates of suicide. One study observed an 18% increase in the risk of suicide amongst VIB patients (Lam *et al.*, 2008). Such insights are critical for professional healthcare personnel treating VIB patients. Extra care and attention must be given to VIB patients.

Visual impairment and blindness have a direct effect on the management and outcome on patient co-morbidities. Chronic conditions require adequate medication management to ensure therapeutic goals. Studies have shown that polypharmacy creates complex therapeutic regimen that can be challenging to manage for VIB individuals (Welp, Woodbury and McCoy, 2016)..

Healthcare accessibility for VIB patients is another notable challenge. Shorts-Hopko et al. observed that VIB individuals often require assistance when making trips to the hospital or clinic. Studies have recorded VIB patients' discontent at the poor treatment they have experienced when visiting health institutions. Healthcare professionals and staff were, at times, reported as being too occupied with secondary tasks to address the administrative needs of VIB individuals on arrival (Sharts-Hopko, Smeltzer and Zimmerman, 2010). Smeltzer and co-workers further reported that patients noted poor communication etiquette amongst healthcare personnel treating them, lack of empathy and poor or inappropriate communication was provided. Many patients noted that their needs as a visually impaired were not considered, as healthcare professionals would provide written instructions on medication administration. Moreover, some participants reported feeling intellectually discriminated by being seen as less intelligent by healthcare workers (Smeltzer *et al.*, 2005).

2.4 Visual impairment and Technology

This section focuses on the advances in technological innovations with regards to visual impairment and blindness. It highlights, identifies, and reviews the impact that these innovations have had on visual impairment and blindness care, primarily focusing on visual assistive devices.

2.4.1 Visual aid devices/systems definition

Visual assistive devices and systems can be defined as items, equipment, software, or systems that aim to aid and improve the lives of individuals who are visually impaired. These devices

provide assistance in the performance of daily functions such as reading, navigation, and communication (Braille Institute, 2023). Traditionally, braille and the use of tactile stickers, have been one of the primary ways VIB persons read and communicate (Merugu *et al.*, 2022).

Visual assistive technology has generally been categorised into two groups, namely, low-technology and high technology devices. Examples of low-tech devices include canes, spectacles, and hearing aids. High-tech devices, are devices that incorporate the use of computers or smartphones to perform their intended function (Chauhan *et al.*, 2014).

2.4.2 Types of visual aid devices and technologies

Developers of visual assistive devices have utilised various approaches when developing visual assistive devices. Some of the most common approaches include the sensor approach, image processing/Artificial Intelligence (AI) approach and the application (app) based approach (Manjari, Verma and Singai, 2020).

The sensor approach is used by most navigational aid devices such as ETAs. These sensors detect obstacles and transmit spatial information to the user. There exist many various types of sensors (Young and Medioni, 2016). Image processing and AI based solutions utilise cameras that capture visual data and translate it into navigational data. Processes such as depth map estimation, simultaneous localization and mapping, and Image segmentation enable the system to identify and analyse the information in the systems visual field (Bing *et al.*, 2019). Over the past decade, various systems have been developed that utilise image processing in conjunction with AI technologies. These systems utilise various types of AI such as machine learning, and deep learning to enable the system to comprehend dynamic environments without the need for direct programming (Lee *et al.*, 2009).

Smartphones have led to many new possibilities within the context of visual assistive technologies. Smartphone usage among VIB persons has slowly increased over the past decade (Martinello *et al.*, 2022). Visually impaired and blind individuals utilise smartphones for everyday tasks such as communication, GPS navigation, and social media access with the help of screen readers and accessibility features on smartphones (Griffin-Shirley, Banda and Lungdoh, 2017). Martinello et al. concluded that smartphone usage could be slowly replacing traditional assistive solutions (Martinello *et al.*, 2022). The development of assistive mobile applications that are designed to execute various assistive are possible because of the versatility of the smartphone (Manjari, Verma and Singai, 2020).

Some of the most notable assistive mobile applications are Viz Wiz, Be My Eyes, and Digit-Eyes. Viz Wiz was developed by Bigham and colleagues in 2010. The mobile application works by providing a visual aid service where the user would be connected to a sighted individual. The user takes a photo with their device which is sent to the online assistant. The assistant then provides real time feedback regarding the user's queries. This application was later updated to include a feature called VizWiz Locatit, which was equipped with computer assisted vision to help the user identify things (Bigham *et al.*, 2010).

Be My Eyes, developed in 2012, functioned in a similar manner to VizWiz. By 2015, the application had over 25,000 blind users and 300,000 sighted users (Avila *et al.*, 2016). Digit-Eyes is a mobile application that uses Quick Response (QR) tags and smartphones. In this system, audio files containing information about objects are stored on the phone's local storage. The QR tags are programmed to open the respective object's audio file descriptor on the phone's storage. Once retrieved by the application, the phone plays the audio file to the user (Digit-Eyes, 2020) .BlindNFC, similar to Digit-Eyes, uses near field communication technology (NFC) tags instead of QR tags to store audio information that can be played to the user when the user scans the tag (Isomursu, Ervasti and Tormanen, 2009).

2.4.3 Visual aids and medication management

Medication management encompasses all aspects of a pharmacotherapeutic regimen that lead to the success of the applied treatment. Factors that determine the success of a particular regimen include the type of medication prescribed, the dosage, and patient adherence to the pharmacotherapeutic course of action (Nedovic, Umeri-Sali and Denecke, 2019). It is therefore necessary to understand the current techniques and resources that are used by the VIB patients to aid in medication management.

There are various techniques and resources that VIB individuals use. Low tech solutions such as magnifiers, extra-large print on labels, and using differently shaped medicine containers, are some of the most common resources used. These techniques though low tech, have worked for many individuals. Despite this, the risk of misidentification of medicines using these techniques still exists (Easley, Kuber and Ozok, 2017).

A study on the medicine usage patterns of VIB individuals in Saudi Arabia noted that the braille system used on medication packages gave VIB users a sense of independence and comfort in being able to identify their medication without assistance (Almukainzi *et al.*, 2020).

Though an effective literacy method, braille has several shortcomings. Firstly, braille is only imprinted on the outer packaging and not on the patient information leaflet that accompanies the medication. Secondly, each braille dot needs to be printed in a legible manner, because incomplete printing of a single braille dot can change the meaning of the word leading to misunderstandings and poor medicine adherence (Almukainzi *et al.*, 2020). Thirdly, within the South African context, the printing of braille is not mandatory. Hence, the presence of braille on medication packaging is not universal. Examples of medicines in South Africa that have braille are Panado and Lipogen (Sabinet, 2014)

Modern devices and applications have been developed that assist in the medication management of VIB individuals. Scriptalk® by EnVision America® is an audible medication and prescription reader that utilises radio frequency identification (RFID) and text to speech technology. Information regarding the medication name, dosage and administration instructions is encoded onto the RFID tag. When the medication packaging is placed on the device provides all encoded information as audio information to the VIB user (Spektor *et al.*, 2015). AraMedReader is an Arabic assistive mobile application that was developed to scan barcodes on medication packages and provide audio information on medication. The application works by retrieving medication information from its local storage or from the Saudi Food and Drug Authority's website (Al-Quwayfili and Al-Khalifa, 2014). Quick Response tag-based systems, such as Digit-Eyes, utilise QR tags and function similar to barcode systems. The mobile device scans the QR tags and audio information, either stored locally or online, is provided to the user (Digit-Eyes, 2020).

The development of these devices and identification systems provides various advantages to the user. Firstly, most mobile applications such as Be My Eyes and VizWiz, are offered for free and can be downloaded for free from all major app stores. Some smart labelling solutions that use NFC, RFID, QR tags and bar codes, require minimal low-cost resources to operate. Additionally, the portability of these systems makes them very advantageous as the user can easily carry their mobile devices (Almuzaini and Abdullah-Al-Wadud, 2018).

Though innovative, there are a number of disadvantages and challenges. Smart labelling solutions and mobile applications that require the scanning of QR tags, NFC tags, and barcodes, can be difficult to find on medication packaging (Al-Quwayfili and Al-Khalifa, 2014). Secondly, some NFC and QR tag based systems (e.g. Scriptalk®) may require the use of a secondary device to scan the medication packaging that may not be as portable (Spektor *et al.*,

2015). Some systems need to be pre-programmed before they can be used. In such instances, a sighted individual is required to program the prescribed medication details into the system's database. Further investigations are warranted to improve these systems. Furthermore, assistive apps such as Be My Eyes that depend on other sighted users for assistance can be inaccurate as poor device camera placement by the VIB user can make usage challenging (Almuzaini and Abdullah-Al-Wadud, 2018).

Notably, according to observations from available literature, most assistive devices and mobile applications, such as the aforementioned, have been designed and developed in other countries. No record of visual assistive devices and application development and creation in South Africa has been found.

2.5 Current practices, training, legislation

In this section, a brief overview is given on the current international and local (South Africa) laws and regulations in place to preserve the rights of persons with disabilities focussing primarily on VIB individuals. This section identifies current training standards that medical professionals, namely pharmacists, receive with regards to treating VIB patients.

2.5.1 Legislation, and policy regarding visual impairment and blindness

South Africa does not have a parliamentary act that relates entirely to the rights of persons with disabilities and more specifically VIB persons. The lack of such legislation that mandates the creation of a national institution to oversee and monitor the protection of disability rights has resulted in the current status quo, wherein disability rights and all ocular health matters are the mandate of a general directorate, the Department of Women, Children and Persons with Disability (DWCPD).

Several countries around the world have put in place measures to implement legislation and guidelines that direct pharmaceutical standards relating to VIB individuals. The European Union (EU) in 2005 set up a commission that released Council Directive 2004/27/EC which required all pharmaceutical companies to imprint braille labels on all medicinal products. The commission made it mandatory to have patient information leaflets available in formats for VIB patients, such as braille, large print of in audio formats. (Gill, 2006). In 2015, the Gulf Cooperation Council countries passed legislature requiring braille labels on all medicinal products. These labels are required to contain the drug name and concentration in English and Arabic braille (Almukainzi *et al.*, 2020).

Unlike other nations, the US and Canada opted not to impose mandatory braille labels on all pharmaceutical products. Rather, organisations such as the American Council for the Blind, the US Access Board, and the International Association of Die cutting and Die making created their own standards on the inclusion of braille on packaging pharmaceutical products in the US (Botta, 2017).

Similarly, South Africa does not have official legislation that requires all pharmaceutical companies to provide braille labels on their packaging (Van den Berg, 2023). Thus, not all manufacturers have braille labels on their packaging. The South African Pharmacy Council (SAPC) recommends the use of braille labels and alternative labelling formats amongst VIB patients. In its recommendation, the council does not provide specific standards that state exact requirements of what would constitute an appropriate braille label (SAPC, 2019).

2.5.2 Disability training of Pharmacists

Pharmacists have a significant role in providing patient centred equitable quality healthcare to all patients. The WHO report on disability noted that disabled patients are more likely to receive inadequate and insufficient service from healthcare providers (WHO, 2011). This section will look at the disability training and education standards of healthcare professionals focussing on pharmacists.

The need for improved disability training of the medical workforce has been well documented (Nethra *et al.*, 2019; Bowen *et al.*, 2020; WHO, 2021a; Rotenberg *et al.*, 2022). On an international level the healthcare needs and rights of disabled individuals have been recognised under Article 25 of the United Nation CRPD. The article provided guidance on the requirements for healthcare access, and the implementation of monitoring systems to ensure the effective training of healthcare workers, thus supporting the global aim to improve healthcare for disabled individuals (WHO, 2021a).

Furthermore, there needs to be a re-evaluation of the current curricula that are taught in tertiary levels of education. Though limited research exists, several studies have sought to evaluate the disability training of healthcare workers in various countries. In Nigeria, a study was conducted that reviewed the country's pharmacy training curricula. The author found limited to no content or topics covered within the curricula that were aimed at educating students on the specific needs of disabled patients (Adedeji, 2021). Similarly in the US, researchers reported that US pharmacy schools provided brief introductions to patients with disability in their curricula. Though identified as being helpful, these introductions do not provide students

with the appropriate level of competence in interacting with and treating individuals with disabilities (Blakely, 2022).

In New Zealand, despite the advances in establishing disability rights in the country through the creation of the New Zealand Disability Strategy and the New Zealand Code of Health and Disability Services Consumers' Rights, health profession schools are not mandated to include disability training content in their curricula. Peiris-John et al. discovered that the majority of what was taught about disability education was only conducted at the discretion of the academic staff. The authors recommended that the New Zealand health professions training curricula needed to adopt a unified and integrative policy on disability training for health professionals (Peiris-John *et al.*, 2021).

A 2013 study reviewed interventions aimed at improving the training of health professionals from around the world. The review identified that the best forms of disability training included pedagogical approaches that offer experiential learning with reflective components. Proposed forms of this approach included: lectures conducted by disabled individuals; organising experiential learning at organisations that work with disabled persons; undergoing simulation exercises; and participating in clinical experiential learning with disabled patients (Shakespeare and Kleine, 2013). Of the interventions, students who interacted with disabled individuals and participated in clinical experience were reported to produce the most positive attitude change and benefit to the student's training. Such benefits were not limited to solely possessing greater confidence in care, and empathy for disabled patients; but it improved the students' general sense of professionalism to all patients (Symons, McGuigan and Akl, 2009; Khouderchah *et al.*, 2022).

Similarly, Zagar and Baggar, evaluated the effect of simulation-based training amongst pharmacy students. The authors developed low vision simulator goggles that successfully replicated low vision and blindness characteristic of visual conditions such as glaucoma, cataracts, and macular degeneration (Zagar and Baggarly, 2010). The study demonstrated that the simulation-based activities enabled the students to think critically and reflect on the challenges of VIB individuals, increasing their knowledge on visual impairment and blindness in a more profound way than didactic methods (Zagar and Baggarly, 2010).

In all, limited research exists on the current training of pharmacy students in South Africa regarding disability and more specifically visual impairment and blindness. As such, it is

difficult to review and evaluate the pharmacy training standards on disability and VIB pharmaceutical patient healthcare.

2.5.3 Current pharmacy healthcare practices

This section reviews available literature on current pharmacy healthcare practices that have been implemented in the care and treatment of VIB patients. Understanding the best practices in caring for VIB patients is essential to improving pharmacy health services to them.

Cupples et al. proposed several practical recommendations that healthcare professionals can implement when consulting VIB patients. They noted that communication and health access information is one of the biggest challenges faced by visually impaired and blind patients (Cupples *et al.*, 2012). Due to severe vision loss some individuals cannot read. In turn, they rely on verbal forms of communication. The authors recommended that communication with VIB patients be clear, concise, altruistic and understanding, mindful of their inability to comprehend physical forms of communication such as gestures (Mandal, 2014). Pursuant to this, the healthcare professional will seek to constantly provide verbal cues as to procedures they are executing during a consultation,

Patients with sight loss lose their sense of independence and privacy (Ahmed *et al.*, 2015). Within a clinical setting, healthcare professionals must be sensitive to the way information is delivered to the patient. If a patient is accompanied to a consultation, it is recommended that the healthcare worker ensures that the patient is comfortable to have their information shared in the presence of their aid (Cupples *et al.*, 2012). The authors. noted that some healthcare workers tend to communicate directly to the person who accompanied the patient instead of the patient. Such an unprofessional and uncourteous act undermines the need for independence and respect that the patient requires. Health professionals must not be felled by the notion that VIB persons have a lower level of autonomy and understanding.

Pharmacists should be aware of the needs of VIB patients in order to provide effective medical management solutions. Each VIB individual is unique. Low vision patients, for example, may be able to read print and labels that have been enlarged while others may not. In the US, the American Society of Consultant Pharmacists (ASCP) and the American Federation for the Blind (AFB) developed guidelines on the labelling and provision of consumer medication information for individuals with vision loss. Pharmacists should ensure that prescription labels are legible especially for individuals with mild to moderate visual impairment. It is recommended to adjust the font style and size of the labels to ensure legibility. Although not

legally mandated in most countries around the world, pharmacists can use braille labels to help their patients identify their medication (Almukainzi *et al.*, 2020). They can also provide medicine boxes or differently shaped medicine containers that can help patients organise and differentiate their medication (Smith and Bailey, 2014). Some pharmacies stock visual aid devices specifically designed for medical management purposes. Audio based visual aid devices such as Scriptalk®, have proved useful amongst VIB patients (Orrico, 2013).

There is limited research relating to current practices that are implemented by pharmacists when providing health services to visually impaired and blind patients in South Africa. Hence, one of the aims of this paper is to identify these current practices and provide updated information regarding the state of the pharmaceutical care of visually impaired patients in South Africa.

2.6 Experiences, Awareness, and Challenges

This section reviews available literature on the current views, attitudes, and knowledge levels of pharmacists on visual impairment, and VIB persons' experiences and views on pharmacists and pharmacy services.

2.6.1 Global context

In considering, the current state of pharmacy healthcare for VIB patients, it is necessary to explore the knowledge, experiences, and perceptions of pharmacists regarding VIB patient care. Though literature on pharmacists treatment interventions towards VIB patients in limited, a number of relevant studies conducted around the world were identified (Kentab *et al.*, 2019).

A study conducted by Lee and Lee, reviewed the status of pharmacy counselling toward VIB patients in South Korea by analysing the experiences of both VIB patients and pharmacists. Despite this, their findings indicated that the VIB participants did not receive special care and counselling from pharmacists. The results showed that the majority of attending pharmacists did not utilise visual aid devices designed for medical management use. In comparison, data collected from the pharmacist cohort revealed that 60% provided counselling to assistants and caregivers accompanying the VIB patients rather than the patient. Fewer reported using assistive tools to help differentiate medication dispensed, and though readily available in a majority of pharmacies, the use of braille stickers was only utilised by 20% of the pharmacies represented by the cohort. These results highlight the existence of a lack of comprehensive understanding of visual impairment/blindness and the needs of VIB individuals. Pharmacists

need to be able to identify patients who are visually impaired and have a firm understanding on how to provide patient centred care specific to them (Lee and Lee, 2019).

A UK study surveyed 200 pharmacists with the aim of understanding the level of visual impairment and blindness awareness of pharmacy staff in the country. Results showed that over 91% of participants believed that labelling medicines was very important. Despite this, 55% of the participants reported that they assumed that their patients could read the labels. Interestingly, 67% of respondents stated that their pharmacy facility did not provide routine services to VIB patients. Based on such findings, the authors concluded that the level of awareness of pharmacy staff in the UK was poor (Barnett *et al.*, 2017).

Similarly. O'Day et al. conducted a focus group with 19 VIB participants. The participants emphasised the need for basic respect and adequate communication when being attended to. A lack of respect accompanied by pity for the patient's condition, was noted to strain the rapport and patient experience with the health professional. Some participants stated that the health provider sometimes addressed the sighted individual accompanying them to receive treatment. This made the patients feel inferior. The study emphasized that one of the biggest factors of successful quality healthcare is good, effective and adequate communication (O'Day, Killeen and Lezzoni, 2004).

In one clinical review looking at interventions to improve healthcare for VIB persons, several respondents expressed grave frustration at the lack of awareness on visual impairment and blindness that pharmacy staff had during consultations. Their experiences included instances of not being offered navigational assistance around the health centres facilities, and the lack of willingness provide assistance and guidance to appointments (Cupples *et al.*, 2012). Similar findings were reported in a Saudi Arabia study with 95 VIB participants. Forty- six percent of the participants reported that they did not receive sufficient counselling from their pharmacist that would make them feel comfortable to use their medicine in the right way (Kentab *et al.*, 2015).

2.6.2 South Africa

Compared to global research trends, there is a similar paucity of research available in South Africa on the current state of pharmaceutical healthcare of VIB individuals.

Poka et al. conducted a study with 82 VIB participants around Mankweng hospital in Limpopo Province. The researchers reported that participants struggled with medication management activities and resulted in the inability to identify medication which led to inaccurate dosing and

missing medication doses. Most respondents stated that locating their medication was a frequent occurrence and was a source frustration and a great challenge. Twenty-six percent of the participants stated that self-administration of medicine was their biggest challenge. Of concern, 33% of the participants stated that they had taken wrong medication at some point in time. The authors of the study noted that 68% of individuals did not have a method of organising their medication utilising such tools as pill organisers, using tactile stickers, or location spacing methods. Similar to the study conducted by (Kentab *et al.*, 2015), this study reported that the preferred method to improve medication use and identification was to use tactile marks and braille labelling on medicine containers and packaging. Resonating with other studies conducted with VIB individuals around the world, the respondents in this study expressed that they needed time and attention given by pharmacists during the dispensing process of medication (Poka, Chanyandura and Witika, 2022).

Recently, Louren and Zeyen, conducted a study in South Africa looking at the pharmaceutical healthcare experiences of 21 VIB individuals using interviews. They identified the development relationships between pharmacists and patients to be critical to positive pharmaceutical health experiences for VIB individuals. Their findings highlighted that better relationships enabled more detailed and appropriate counselling sessions where patients were able to be sufficiently informed about their medication needs. Furthermore, the authors identified the need for privacy and a quiet environment as an additional theme. They observed that public and loud environments made for difficulties in communication. Their participants also noted that open counselling areas made them self-conscious and worried when the need to discuss private medical information was required. As with global research trends, this study identified a lack of awareness and knowledge of VIB patients and their condition amongst pharmacists. The researchers concluded that pharmacists need more training to improve the pharmaceutical healthcare services currently being offered to VIB patients (Lourens and Zeyen, 2024).

As critical and useful that the above studies are, there remains a lack of data and research pertaining experiences of pharmacists and VIB individuals on the current state of pharmaceutical healthcare in South Africa. One of the aims of this research is to explore and examine the experiences of both groups to better understand the challenges that the health system South Africa faces in relation to care of VIB persons.

Chapter 3: Methodology

This chapter provides a layout of the study's research methodology. The section details the study design, study process, sample selection, data collection, and the analysis of results.

3.1 Introduction

This study was conducted using a convergent parallel mixed methods approach. The convergent parallel design is a mixed methods study design that enables the collection of qualitative and quantitative data at the same time. The collection, and analysis of the two types of data occurred independently of each other. At the stage where the analysis of both types of data has been finalised, the "mixing of the methods" occurred (Figure 3.1). The last phase of the study enabled the integration of the data and results to form appropriate conclusions (Creswell & Clark, 2011). The advantage of this research study design is that it is best suited to research that aims to understand a research topic. This is precisely the case with this study, as this study seeks to collect, and analyse data on the current situation of pharmacists and VIB patients regarding pharmaceutical care in South Africa.

The study was divided into 3 phases as follows:

- Phase 1: Surveying of pharmacist cohort (Quantitative)
- Phase 2: Interviewing the VIB patient and members of the pharmacist cohort. (Qualitative)
- Phase 3: Integration, interpretation and discussion of quantitative (Phase 1) and qualitative (Phase 2) results.

3.2 Ethical considerations

This study involved human participant interaction (visually impaired individuals and pharmacists) in the form of surveys, and interviews. The ethical clearance for this study was obtained from the Wits Human Research Committee (Medical). The ethics clearance certificate number is M210809 (Appendix 1). Consent forms and the post-questionnaire invitation to participate in future research contained identifiable data. To maintain confidentiality and anonymity, identifiable data was delinked from the participants during data management before analysis occurred. No data collection occurred before ethics clearance was obtained. All information was kept secure and confidential

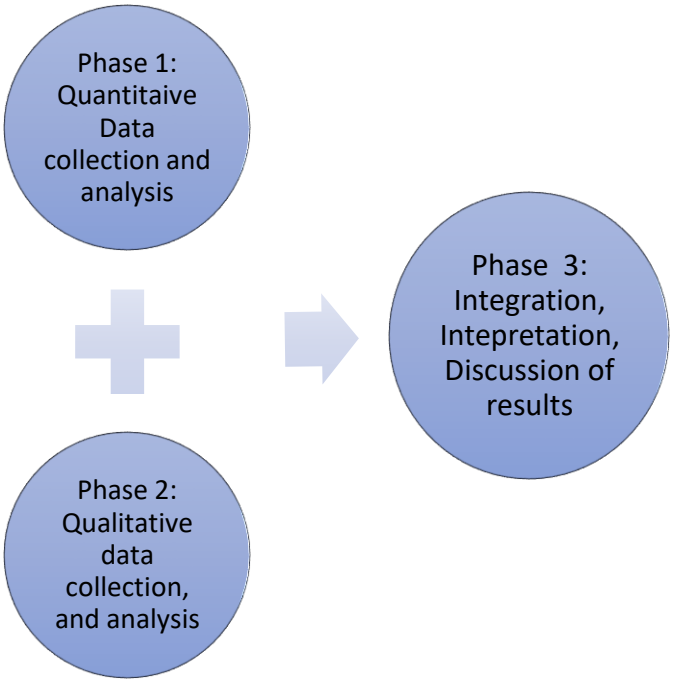


Figure 3.1: Illustration of the convergent parallel mixed methods design used in this study.

3.3 Phase 1: Surveying of Pharmacist Cohort: Quantitative phase.

3.3.1 Study design

Phase 1 of the study was a cross-sectional study that utilised self-administered questionnaires. (Appendix 2). The use of surveys was conducted to collect data from pharmacists to understand the knowledge, attitudes, and practices toward VIB patients.

3.3.2 Study Site

An online questionnaire was sent to all pharmacists across South Africa in public, community and private sectors. To improve the response rate, physical surveys were distributed to pharmacists within the central area of the city of Johannesburg. The surveys were distributed to three pharmacy types within the city, ranging from retail pharmacy store chains, independent retail pharmacies, and hospital pharmacies.

3.3.3 Study population and Sampling method

The study population consisted of all pharmacists registered with the South African Pharmacy Council (SAPC), located across South Africa. The total number of registered pharmacists in South Africa according to the SAPC in 2023 was 17, 227 (SAPC, 2023). The sample size was

determined by utilising the Raosoft online sample size calculator (Raosoft, 2004). The calculation was done with a confidence level of 95%, and an error of margin of 5%. The sample required was calculated to consist of 377 participants.

$$N = \frac{z^2 p(1-p)}{d^2}$$

Equation 3.1: Sample size calculation. N = Sample population size; z = statistical level of confidence (95%); p = Expected proportion of sample with characteristics (p = 0.5); d = margin of error (d=0.05)

Participants were sampled using the simple random sampling approach. This was achieved by using a list-based sampling frame which contained a complete list of all individuals from the target population. From this sampling frame, potential participants were emailed and invited to participate in the study. The simple random sampling method allows for each sample unit in the sampling frame to be selected with equal probability (Sileyew, 2019). The advantage of implementing this approach is that it works best with target sample groups that originate from large homogenous organisations e.g. pharmacists registered with the SAPC (Fielding, Blank and Lee, 2016).

Inclusion Criteria: All pharmacists registered with the SAPC were included in this study. Pharmacists were used in this study because they possessed critical information and experience in providing pharmaceutical care and dispensing medicines to patients.

Exclusion Criteria: Pharmacists not registered with the SAPC and pharmacists who are in the manufacturing sector.

3.3.4 Data collection tool

Data was collected using a self-administered questionnaire (Appendix 2). The questionnaire was divided into 5 sections as follows:

- Demographic section
- Knowledge section
- Attitude and Perception section
- Practice section
- Open ended section

Knowledge statements had two possible responses, “yes”, scoring one point, or “no”, scoring 0 points. Attitude, perception and practice statements were subject to responses based on a five-point Likert scale, comprising of: “5 = strongly agree”, “4 = agree”, “3 = neutral”, “2 =

disagree" and "1 = strongly disagree". The open-ended section contained statements where participants could respond in prose.

3.3.5 Pilot study, Validity, and Reliability

Before the questionnaire was distributed, a pilot study was conducted amongst 21 intern pharmacists from across the country. The purpose of this pilot study was to have the participants complete the questionnaire online and provide feedback on the questionnaire. The feedback that the participants provided included information on the structure, format, and layout of the questionnaire, as well as the syntax, the correct use of grammar, and the comprehensibility of the questions.

In addition, the survey was sent to 5 pharmacists who had expert knowledge on the research topic. They were tasked with completing the questionnaire and providing their expert opinion on the content and nature of the questions presented in the questionnaire. This ensured that the content of the questionnaire successfully addressed the research topic and construct.

Validity

Validity is a measure of how items within a questionnaire accurately measure what they are designed to measure. Validity is concerned with how trustworthy and dependable a measuring tool is at measuring the research construct or topic (Fitzner, 2007). Face validity focuses on analysing and determining if factors of the measurement tool such as the presentation, format, layout, and grammar are easily understood by the respondents. (Aithal and Aithal, 2020). Face validity was tested using data obtained from the pilot study.

Content validity is concerned with how well the items within a measurement tool adequately measure the construct at hand. A panel of experts knowledgeable on the construct can be tasked to evaluate and analyse a data collection tool to determine if the questions within adequately address the research construct. This group of experts are able to provide critical feedback on which questions need editing, or removal, or even the addition of new questions to address an area of the construct that the researcher did not consider (Fitzner, 2007). The phase one questionnaire was tested for content validity using the data, information and feedback procured from the 5 pharmacists, experts on the construct and content of the research topic.

Reliability

The reliability of the questionnaire was determined from the pilot survey. The reliability of a data collection tool refers to how consistent such a tool is in providing the same results if the study or experiment was to be repeated. A data collection tool is considered reliable if items in

the tool all measure and answer the same research construct or topic. This is achieved by minimizing the amount of bias and error such a tool possesses. To determine reliability of the study, internal consistency of the questionnaire was determined. Cronbach's Alpha coefficient, which is a measure of how inter-related a group of items is, was used as a means to determine internal consistency and thus reliability (Sileyew, 2019). Upon calculation the Cronbach's Alpha coefficient for the questionnaire was 0.75, which indicates a degree of high internal consistency (Aithal and Aithal, 2020).

3.3.6 Study procedure

Following approval from the SAPC, distribution of the questionnaire via email commenced (Appendix 3). Study participants received an email invitation to take part in the study. This email contained a brief introduction to the research topic and an attached participant information sheet (Appendix 4). A link to the online questionnaire unique to each participant was included in the email. Participants who wanted to participate in the study used the link and were redirected to the online survey that was administered via REDCap® (Appendix 2), an online web platform that is used to build and manage surveys and database. Following the initial email invitation, a second email reminder was sent to the participants. A week after the second reminder, a final email reminder was sent to the participants. Confidentiality was maintained throughout the study. Names and any identifiable information of the participants were not recorded during the research.

Where possible the researcher distributed the survey to pharmacies around the city of Johannesburg. Permission was obtained from Netcare (Appendix 5) to conduct on site physical distribution of the surveys at two of their hospitals. Independent pharmacies that were located in populous urban areas of the city were selected for participation. Permission was obtained from the responsible pharmacists of the facilities before surveys were distributed on the premises. Before each questionnaire was completed, the participants signed a consent form.

3.3.7 Data analysis

Upon the completion of data collection, the survey data was downloaded from REDCap® and exported to Microsoft Excel® for data management and organisation. All data was stored on a password protected computer and was only accessible to the researcher and supervisors.

Scores for the knowledge, attitude and practice sections were totalled and categorised. The knowledge and practice scores were categorised as poor (<60%), moderate (60% - 80%) and good (≥80%), while attitude scores were classed as negative (<60%), neutral (60% - 80%), and

positive (≥80%). These categorisations were based on Bloom's cut-off point and reviewed literature (Koo *et al.*, 2018; Seid and Hussen, 2018).

Data was analysed using Stata version 18 (StataCorp 2023; College Station, Texas). Descriptive statistics were used to analyse the data, and the results were displayed in the form of frequencies, means, percentages, figures and graphs where applicable. Pearson chi-square test was used to determine any significant associative relationship between participant background characteristics, and knowledge, attitude and practice (KAP) scores. Statistical significance was considered at $p \leq 0.05$. Binary logistic regression analysis was conducted to determine the association between participant background characteristics and KAP scores. Crude odds ratio (cOR) and adjusted odds ratio (aOR) were calculated. Variables having p-values ≤ 0.15 were included in the adjusted model. P values ≤ 0.05 were considered statistically significant (Sperandei, 2014).

3.4 Phase 2: Interviews conducted amongst pharmacist and VIB cohort.

3.4.1 Study population and definitions

This phase of the study had two cohorts of participants. The two cohorts of participants were comprised of the following:

- Cohort 1: Visually impaired/Blind Individuals (VIB)
- Cohort 2: Pharmacists (registered with the SAPC).

For this study, the visually impaired cohort includes the following types of participants:

- *Visual Impaired/Blind:* Individuals that fall within the following categories of visual impairment/Blindness will be included:
    - *Moderate visual impairment:* A visual acuity score between 6/18 and 6/60
    - *Severe Visual impairment:* Visual acuity score between 6/60 and 3/60
    - *Blindness:* Visual acuity scores less than 3/60

3.4.2 Sampling and sample size

The sampling method chosen for this phase of the study was the purposive, convenience sampling method. This sampling method selects appropriate participant based on the richness of information regarding the research topic that each sample unity possess. In other words, the participants who possess knowledgeable information, and experience on the research topic are identified and selected (Palinkas *et al.*, 2015). This sampling method was chosen because it

enabled the researcher to select only individuals who met the inclusion criteria for this phase of the study namely individuals who were VIB and pharmacists who had completed the questionnaire in phase one of the study.

Regarding sample size, participants were recruited until sample data saturation was reached. Data saturation was reached at n=12 participants for the pharmacist cohort and n=12 for the VIB cohort. Data saturation was achieved when the researcher began to collect repeated comments, answers, and responses from new participants (no new data emerged) as had been previously noted from previous participants (Saunders *et al.*, 2018).

3.4.4 Study Site

VIB cohort

Interviews for the VIB cohort were conducted online using various platforms, that were most convenient for the participant. These platforms included Zoom, Microsoft Teams, and Google Meet. Participants all resided in South Africa when they participated in the study.

Pharmacist cohort

Pharmacist cohort interviews were conducted online and in person depending on the participants preference. Online interviews were conducted telephonically or on online platforms such as Zoom or Microsoft Teams. In person interviews were conducted amongst participants who worked in various pharmacies across the city of Johannesburg, South Africa.

3.4.5 Study Design

Phase 2 of the study was conducted using cohort-specific, semi-structured interviews. These interviews were conducted telephonically, in person, or online on Microsoft Teams. This qualitative interview approach method was implemented because interviews allow for a deeper exploration of the research topic and issues in question (Silverman, 2017). Within the context of this study, these interviews enabled the researcher to gain an in depth and detailed understanding of the views, perceptions, attitudes, and practices of both the visually impaired cohort and the pharmacist cohort.

Open-ended questions allowed the participants to freely approach and provide information on the questions. Where appropriate, the researcher asked follow-up questions based on the responses provided by the participants.

VIB cohort

The aim of the VIB cohort interviews was to collect primary data on experiences, and challenges that the participants faced pertaining to their pharmaceutical healthcare. Interviews proved to be the most convenient way to collect data from this cohort as some VIB individuals struggle to complete online questionnaires. Questions for this interview were based on reviewed literature, and were adapted from a similar study conducted in South Korea by Lee et al., (Lee and Lee, 2019). Interviews ranged from 45 minutes to 1 hour.

Pharmacist cohort

Interviews conducted amongst the pharmacist cohort comprised of participants who had completed the questionnaire in phase 1 of the study. These interviews gave participants the opportunity to expound further on key issues and concepts derived from data collected in phase 1. Some of the key issues explored focused on the current knowledge and practices that pharmacist had in place to aid visually impaired individuals. Questions for the semi-structured interview guide were collated from phase 1 data and reviewed literature. The duration of the interviews ranged from 15 minutes to 30 minutes.

3.4.6 Inclusion Criteria

Visually impaired/Blind individuals with an acuity score less than 6/18 were included in this study. Pharmacists registered with the SAPC and who participated in phase 1 of the study were included in the study.

3.4.7 Data collection

Cohort-specific semi-structured interview guides (Appendix 6 and 7) were used to facilitate data collection during this phase. Information such as views and perceptions toward the challenges faced by the VIB cohort were utilised to reference some interview questions. Other interview questions sought to identify what assistive devices, were used by the VIB participants; and whether their pharmacist offered such assistive devices to them. The pharmacist cohort was asked questions that related to data collected from phase 1 of the study. These questions helped to identify the challenges and needs of treating VIB patients.

3.4.8 Trustworthiness and rigor

Both interview guides underwent pilot testing. The pharmacist interview guide was piloted amongst two practicing pharmacists. The interview guide for the visual impaired cohort was piloted amongst two visually impaired individuals. In both cases, the participants provided feedback on the nature and content of the questions as well as the layout and structure of the

interview guide. Where necessary the feedback that was provided was used to add, edit, rephrase or remove certain questions. All participants from the pilot testing were content with how understandable and clear the questions were.

Achieving trustworthiness in qualitative data has been described as the process by which an author aims to persuade the reader that their study is trustworthy (Sandelowski, 1993). Trustworthiness of the data was attained by ensuring that aspects of trustworthiness in qualitative data such as credibility, dependability and transferability were considered and maintained during all processes of the study design (Jamieson, 2016). Credibility was ensured by having the thematic analysis process reviewed and evaluated by a member of the Department of Pharmacy and Pharmacology experienced in thematic analysis. Dependability and transferability were achieved by having a clear description of the methodology process and providing a complete and clear audit trail of all the thematic analysis process from the beginning to the end (Gunawan, 2015).

3.4.9 Study procedure

The VIB cohort was contacted via email, telephonically or in person with the assistance of Blind SA, an organization that advocates for the needs of VIB individuals in South Africa. Participant information sheets (Appendix 8) were sent electronically to participants prior to each interview. The participants were able to use mobile devices or computers to read the participant information sheet.

Upon completion of the phase 1 questionnaire, pharmacist participants were asked if they would like to be contacted to participate in future research relating to the topic. They were contacted via email, telephonically or in person. Participant information sheets (Appendix 9) were provided to each participant upon being contacted. Each participant was contacted to identify a suitable time and online platform to hold the interview. Each interview took between 15 to 30 minutes to complete.

Each participant was contacted to identify a suitable time and online platform to hold the interview. Prior to each interview, the participant was provided with an online consent form to complete. This was done to indicate consent to the interview process (Appendix 10) and the audio recording of the interview (Appendix 11). The interview process and all information collected from the interview remained confidential. The interview was conducted telephonically, and all interview sessions were recorded. Demographic information was obtained from the participants at the start of the interview. All recorded data was stored on the

researcher's password protected computer. The interview was transcribed verbatim onto Microsoft Word® where it was cleaned and organised for analysis. All participants were assigned an identifying number code that ranged from 1 to 12.

3.4.10 Data Analysis

The thematic analysis method by Braun and Clarke was used to identify and generate themes and patterns from the data collected from the interviews (

Figure **3.2**) (Braun and Clarke, 2006). This process involved the identification of themes through the analysis of qualitative data. A combined deductive and inductive approach was utilized. The qualitative data was subsequently coded meaning that important themes and patterns were identified and given a code. The encoding process enabled the researchers to be able to identify and develop themes from the data (Fereday and Muir-Cochrane, 2006). The process of coding and analysis was an iterative and reflexive process.

3.5 Phase 3: Integration of Phase 1 and Phase 2

The integration of data was defined as the interaction or conversation between quantitative and qualitative data (O'Cathain, Murphy and Nicholl, 2010). The advantage of data integration was that it increased the value of the mixed methods approach (Fetters, Curry and Creswell, 2013). The integration process occurred at the interpretation phase of the study when both phase 1 and phase 2 data had been separately collected and analysed. By triangulating findings from both phase 1 and phase 2, the researcher identified if the findings from both datasets aligned with each other (O'Cathain, Murphy and Nicholl, 2010). This permitted the researcher to identify new trends, findings, and conclusions.

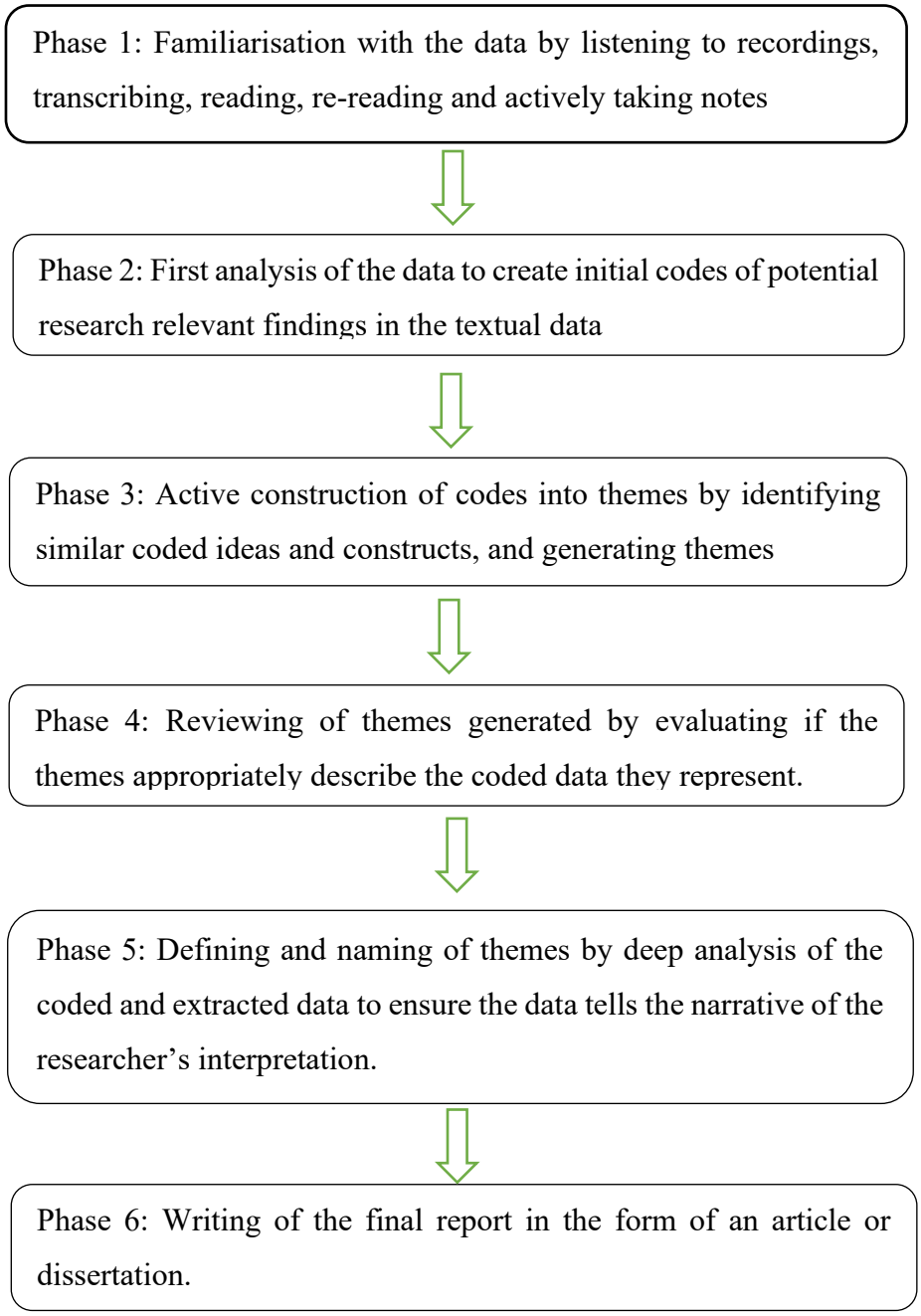


Figure 3.2: Representation of the six phases of thematic analysis by Braun and Clarke that was followed during the thematic analysis of the qualitative data in this study (Braun and Clarke, 2006).

Chapter 4: Objective 1 Results

This chapter presents data collected from phase 1 of the study, where a self-administered questionnaire was distributed to pharmacists in South Africa. The objective of the survey was to collect data on the knowledge, attitudes, and practices of pharmacists in South Africa on how they treat and care for visually impaired/blind (VIB) patients. The findings on participant demographics, descriptive statistical analysis, Pearson's Chi-square test, and logistic regression models are presented.

A total of 17,000 questionnaires were distributed electronically, and 80 physical surveys were distributed in person to registered pharmacists in South Africa. A total of 374 responses were returned, with 300 questionnaires included in final analysis as 74 questionnaires were excluded for being incomplete or not meeting the inclusion criteria for further analysis.

4.1 Participant sociodemographic variables

Of the total number of participants, 74% (n=221) were female, 25% (n=75) , male and 1% (n=4) did not wish to specify their gender (Table 4.1). The majority of the participants surveyed were hospital pharmacists 34% (n=103), retail pharmacists 33% (n=101) and 5% (n=14) were community pharmacists. Most pharmacists 65% (n=200) reported working in the public healthcare sector, as compared to private 27% (n=79). Only 8% (n=24) stated that they worked in both sectors. Regarding highest level of education, 77% (n=232), of participants held Bachelors' degree only, while 20% (n=60) had Masters' degrees, and 3% (n=8) attained Doctorate degrees. Regarding years of experience, 21% (n=65) had less than 5 years, 29% (n=89) 5 – 10 years, 15% (n=46) 10 – 15 years, 10% (n=32), and 25% (n=76) had more than 20 years of experience.

Table 4.1: Demographic distribution of pharmacist participants who responded to the survey.

Category	Sub-category	Frequencies (n)	Percentages (%)
Gender	Male	75	25
	Female	221	74
	Non-specified	4	1
Age group	18-25	22	6
	26-30	72	23
	31-35	57	18
	36-40	54	17
	41-45	28	9
	46-50	18	6
	Above 50	58	19
Current Role	Community Service Pharmacist	14	5
	Retail Pharmacist	101	33
	Hospital Pharmacist	103	34
	Academic Pharmacist	12	4
	Other	77	25
Health Sector	Private	79	27
	Public	200	65
	Both	24	8
Highest Qualification	Bachelor of Pharmacy	232	77
	Master of Pharmacy	60	20
	Doctor of Pharmacy	8	3
Years of experience	<5	65	21
	5-10	89	29
	10-15	46	15
	15-20	32	10
	>20	76	25

4.2 Knowledge, attitude, practice survey responses and analysis

4.2.1 The KAP scores and cut off points

Responses were categorised as described in section 3.2.7.

Table 4.2: Mean and Standard (Std) deviation of KAP scores

Domain	Mean score (n)	Std deviation	Mean score percent (%)
Knowledge	3	1.85	27
Attitude	57	5.85	82
Practice	14	3.00	69

4.2.2 Responses to the knowledge statements

The analysis of the participants' knowledge levels on visual impairment/blindness and affected patients showed that, the mean knowledge score was 3 (27%) with a standard deviation of ±1.85 (Table 4.2). The knowledge levels of most respondents (90%) were classified as poor, with only 23 (8%) and 8 (3%) possessing moderate and good knowledge levels, respectively (Table 4.3).

Responses to the knowledge questions showed that 288 (97%) of the participants did not know the percentage of VIB persons in South Africa (Table 4.4). Despite this, 210 (70%) acknowledged that that they were aware of the challenges that VIB persons face when they seek pharmacy healthcare. Only, 13 (4%) respondents stated that they had received some form of training on how to care for VIB patients. A large proportion of the participants, 228 (77%), stated that they are not familiar with techniques that can be implemented to treat VIB patients in their pharmacies. Only 58 (19%) of respondents were knowledgeable on techniques and strategies that VIB individuals used in their medication management. A large proportion of participants, 288 (97%) recorded that they were not cognisant of national or provincial Department of Health policies on how to care for VIB patients (Appendix 12).

Table 4.3: Frequencies and percentages of participant scores organised into predefined categories based on Bloom's cut-off points (Koo *et al.*, 2018; Seid and Hussen, 2018).

Category	**Sub-category**	**Frequencies (n)**	**Percentages (%)**
Knowledge	Poor	269	90
	Moderate	23	8
	Good	8	3
Attitudes	Negative	3	1
	Neutral	102	34
	Positive	195	65
Practice	Poor	35	12
	Moderate	199	66
	Good	66	22

Responses relating to the knowledge of existing assistive devices for the VIB patient varied. Pill boxes and braille labels were the most known assistive devices with 202 (67%) and 199 (66%) of participants stating that they knew of them (Figure 4.1). Assistive mobile phone applications were known by 70 (23%) of the participants. Tactile stickers, used to differentiate medicine packages, were known by 42 (14%) of respondents. The least known medication assistive device was PenFriend® with 97% stating that they were not aware of this technology. Scripttalk®, a device used to provide audio information about preprogramed medication packages when the medication is placed on the device, was only known by 6% of participants.

Table 4.4: Descriptive statistics of respondents' knowledge relating to visual impairment/blindness.

Knowledge Statements	**Responses**	
	Yes **n (%)**	**No** **n (%)**
Do you know the percentage of blind/visually impaired persons in South Africa?	10 (3)	288 (97)
Are you aware of some of the specific challenges that visually impaired patients experience in relation to pharmaceutical services access and their medicine compliance?	210 (70)	90 (30)
Have you received any training on how to care for blind/visually impaired patients?	13 (4)	286 (96)
Are you familiar with any techniques to apply should you need to assist a blind/visually impaired patient presenting at your facility?	68 (23)	228 (77)
Do you know of any techniques or practices employed by blind/visually impaired patients to assist in medicine compliance in the absence of a caregiver?	58 (19)	240 (81)
Are you aware of national or provincial policies or guidelines relating to the care of blind/visually impaired patients in a pharmacy setting?	8 (3)	288 (97)

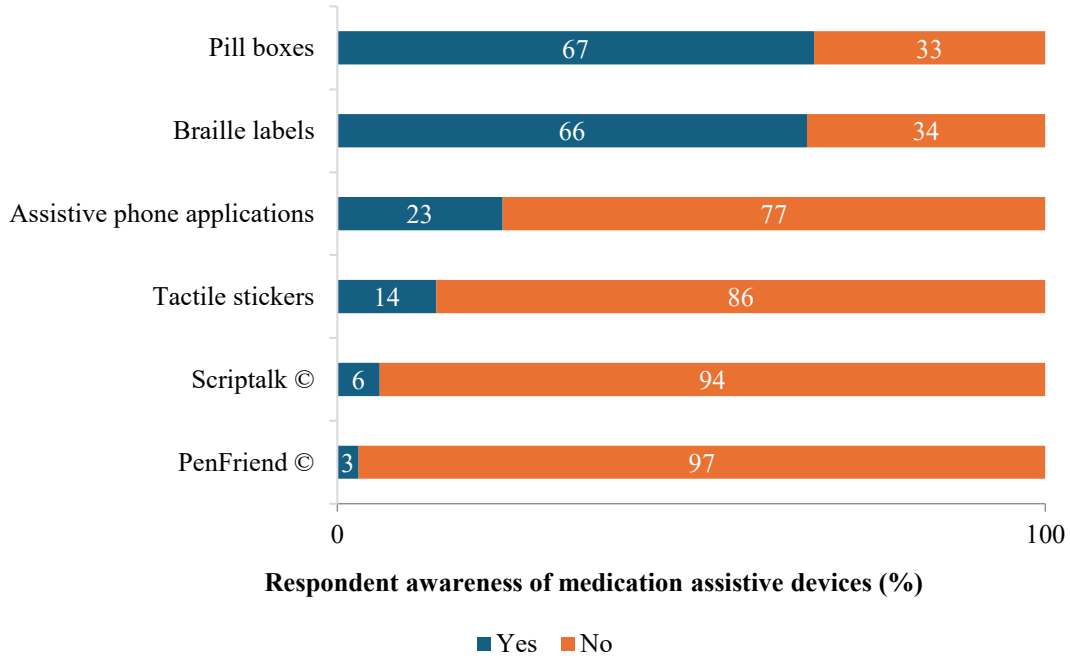


Figure 4.1: Distribution of responses related to knowledge of medication management assistive devices known to pharmacists (n=300).

4.2.3 Attitudes and perceptions

The assessment of pharmacists' attitudes towards VIB patients and their condition revealed that the mean attitude score was 57 (82%) with a standard deviation of ±5.85 (Table 4.2). Overall, most participants scored favourably in the attitude section of the survey (Table 4.3), with 195 (65%) possessing a positive attitude, despite the lack of knowledge evident previously in Table 4.4.

Of the 14 attitude statements in the survey, 11 questions posed received positive attitude responses (Appendix 13). Despite 97% of participants not knowing the exact levels of visual impairment and blindness in South Africa, 210 (73%) strongly agreed and 79 (27%) participants agreed that these disabilities need to be addressed in the country (Figure 4.2). Similarly, 210 (70%) strongly agreed, and 78 (26%) agreed with the belief that pharmacists should possess or develop the prerequisite skills to care for VIB patients.

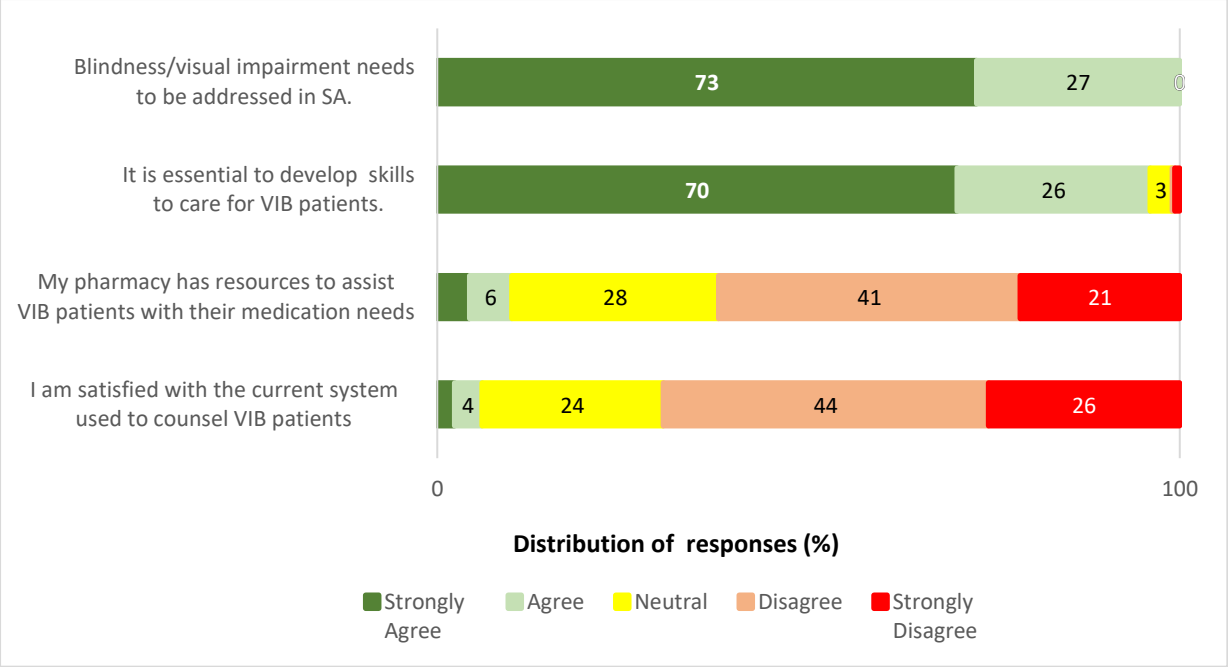


Figure 4.2: Distribution of responses to attitude statements (n=300)

Despite, overall positive attitudes towards VIB patient care, the data showed that a large proportion of participants did not believe that their pharmacies had the necessary resources to properly care for VIB patients. Precisely, 121 (41%) participants disagreed and 64 (21%) strongly disagreed to the fact. When asked about the satisfaction of the systems in place to care for VIB patients in their respective pharmacies, a similar trend was noted. Of the participants 131 (44%) disagreed with 77 (26%) strongly disagreeing that they were content with such systems (Appendix 13).

A further positive attitude was demonstrated, with most respondents 162 (55%) strongly agreeing and 118 (40%) agreeing, that they would provide additional time to VIB patients (Figure 4.3). However, only 9% strongly agreed and 25% agreed to feeling confident that VIB patients would remember their counselling when they left the pharmacy.

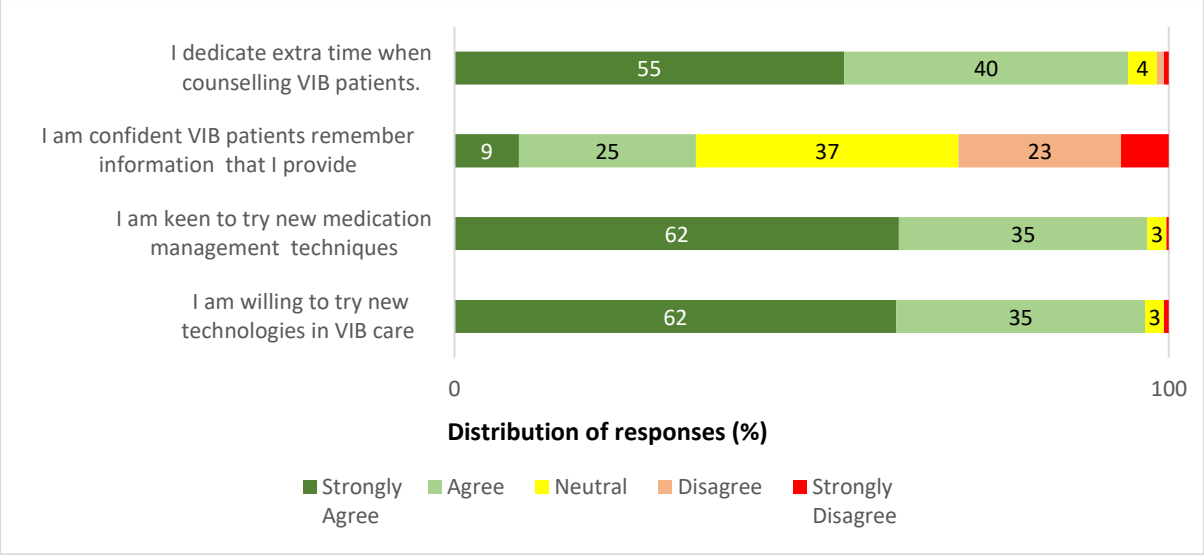


Figure 4.3: Distribution of responses related to knowledge of medication management assistive devices known to pharmacists (n=300).

In relation to implementing new technologies and techniques to their current VIB care, participants reported in very similar manner to each question. For both questions, 62% stated that they strongly agreed while 25%, stated that they agreed with the statements.

Many responses noted a need for improvement in general pharmacy standards and practices relating to VIB patient care. Of the participants, 174 (58%) strongly agreed, and 97 (32%) agreed (Figure 4.4). A similar result was found when participants were required to state their attitudes and perceptions towards healthcare authorities creating policies aimed the VIB community. More than 90% of respondents displayed a positive attitude to the statement. Of these responses, 179 (60%) strongly agreed and 105 (35%) agreed. Regarding the improvement of VIB care, a large part of the cohort, agreed with the notion that pharmacists have the responsibility to develop means and ways of ensuring compliance amongst their VIB patients. The data revealed that 157 (53%) strongly agreed and 128 (43%) agreed.

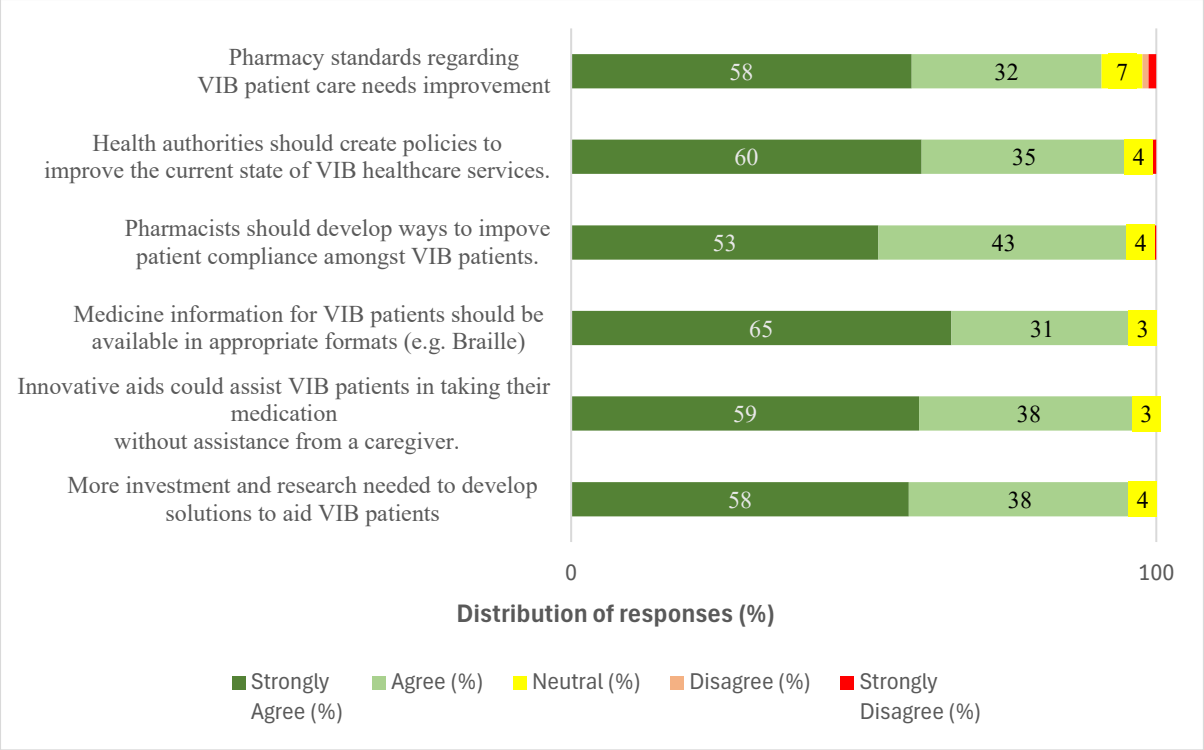


Figure 4.4: Distribution of responses related to knowledge of medication management assistive devices known to pharmacists (n=300).

Over 90% of participants possessed positive attitudes towards providing information to VIB patients in appropriate formats. Most participants 193 (65%) strongly agreed and 91 (31%) agreed. Similarly, participants positively perceived the benefits of devices that assist in the medication management of VIB patients, with 176 (59%) strongly agreeing and 111 (38%) agreeing. Most respondents responded favourably when questioned on the need for more development and research into innovations to assist VIB particularly with their medication management. Of the responses, 172 (58%) strongly agreed and 113 (38%) agreed.

4.2.4 Responses to practice statements

The evaluation of participant information seeking practices relating to VIB patients showed that the mean score was 14 (69%) with a standard deviation of ± 3.00 (Table 4.2). Most participants, 199 (66%), possessed moderate practice levels, 66 (22%) had good practice levels, and 35 (12%) with poor practice levels (Table 4.3)

The findings indicate that almost half of the participants 127 (47%) were neutral on keeping up to the latest therapeutic care developments of VIB patient (Figure 4.5). Interestingly, more respondents disagreed 75 (26%) and strongly disagreed 23 (8%) to implementing the practice than those who agreed or disagreed. Over 80% of participants (strongly agreed 103 (35%), agreed 141 (48%)) collectively affirmed to seeking to alleviate the challenges VIB patients had

when they visited. Most respondents stated that they committed additional time and attention to caring for VIB patients. Of those who positively responded, 134 (46%) strongly agreed and 139 (47) agreed with the question. When inquired as to the implementation of national or provincial guidelines the majority, 114 (39%) were neutral on the practice. A fair proportion of respondents stated that they did not implement the guidelines in their practice. Of those, 101 (34%) disagreed and 28 (10%) strongly disagreed (Appendix 14).

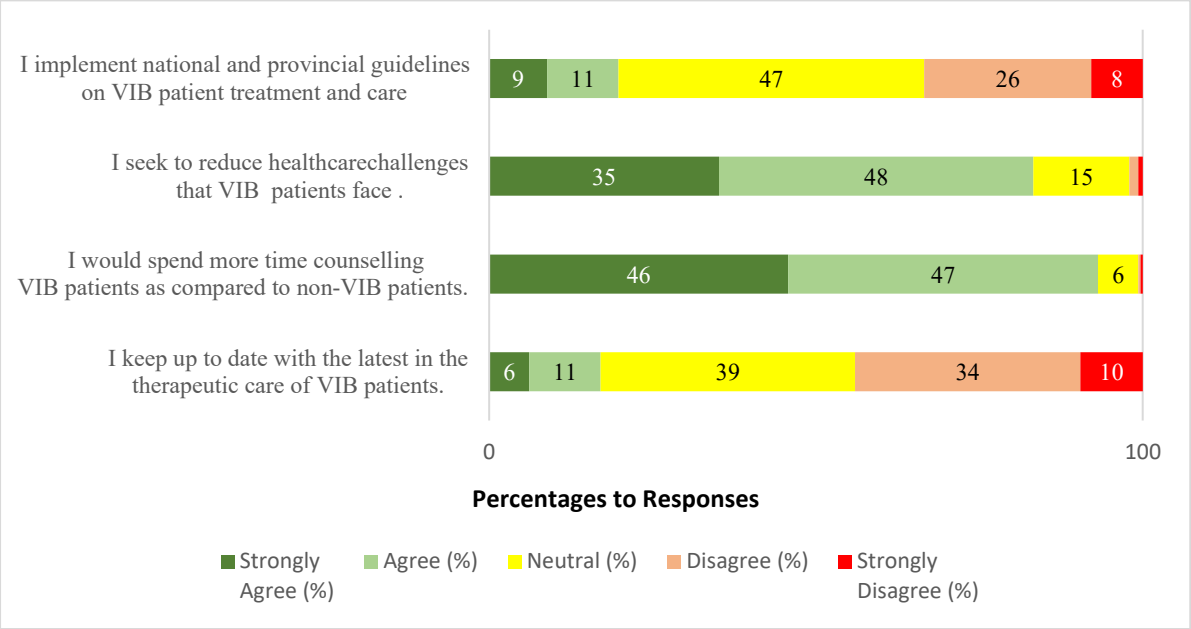


Figure 4.5: Percentages of responses to pharmacist practices regarding treatment and care of VIB patients.

4.3 Association between KAP scores and participant characteristics

Evidence was not sufficient to determine any association between gender, age, current role, health sector qualification, and year of experience with KAP scores (Table 4.5), using the Chi square test. Statistical significance was considered at $p \leq 0.05$.

Table 4.5: Association of KAP scores with participant demographic and background characteristics.

Characteristics	Subcategories	Knowledge			Attitude			Practice		
		Poor n (%)	Moderate n (%)	p-value	Neutral n (%)	Positive n (%)	p-value	Moderate n (%)	Good n (%)	p-value
Gender	Male	63 (84)	12 (16)	0.051	28 (37)	47 (63)	0.544	60 (80)	15 (20)	0.580
	Female	203 (92)	18 (8)		74 (33)	147 (67)		170 (77)	51 (23)	
Age group (years)	18-25	21 (95)	1 (5)	0.226	7 (32)	15 (68)	0.380	15 (68)	7 (32)	0.742
	26-30	65 (94)	4 (6)		16 (23)	53 (77)		54 (78)	15 (22)	
	30-35	50 (91)	5 (9)		21 (38)	34 (62)		43 (78)	12(22)	
	36-40	43 (84)	8 (15)		21 (41)	30 (58)		42 (82)	9 (18)	
	41-45	22 (79)	6 (21)		11 (39)	17 (61)		20 (71)	8 (29)	
	46-50	17 (94)	1 (6)		6 (33)	12 (67)		13 (72)	5 (28)	
	Above 50	51 (89)	6 (11)		23 (40)	34 (60)		47 (82)	10 (18)	
Current Role	Community Service P.	12 (86)	2 (14)	0.114	6 (43)	8 (57)	0.548	9 (64)	5 (36)	0.538
	Retail Pharmacist	84 (84)	16 (16)		38 (38)	62 (62)		78 (78)	22 (22)	
	Hospital Pharmacist	93 (93)	7 (7)		37 (37)	63 (63)		80 (80)	20 (20)	
	Academic Pharmacist	9 (82)	2 (18)		2 (18)	9 (81)		10 (91)	1 (9)	
	Other	69 (95)	4 (6)		22 (30)	51 (70)	0.938	55 (75)	18 (25)	
Health Sector	Private	70 (90)	8 (10)	0.951	26 (33)	52 (67)		58 (74)	20 (26)	0.077
	Public	172 (90)	20 (10)		68 (35)	124 (65)		148 (77)	44 (23)	
	Both	22 (92)	2 (8)		8 (33)	16 (67)		23 (96)	1 (4)	

Characteristics	Subcategories	Knowledge			Attitude			Practice		
		Poor n (%)	Moderate n (%)	p-value	Neutral n (%)	Positive n (%)	p-value	Moderate n (%)	Good n (%)	p-value
Qualification	Bachelor of Pharmacy	207 (89)	25 (11)	0.613	78 (34)	154 (66)	0.528	174 (75)	58 (25)	0.068
	Master of Pharmacy	54 (90)	6 (10)		23 (38)	37 (62)		53 (88)	7 (12)	
	PhD Pharmacy	8 (100)	0 (0)		4 (50)	4 (50)		7 (88)	1 (13)	
Years of experience	<5	61 (97)	2 (3)	0.071	17 (27)	46 (73)	0.308	48 (76)	15 (24)	0.679
	5-10	77 (90)	9 (10)		26 (30)	60 (70)		65 (76)	21 (24)	
	10-15	35 (80)	9 (20)		18 (41)	26 (59)		33 (76)	11 (25)	
	15-20	27 (87)	4 (13)		13 (42)	18 (58)		27 (87)	4 (13)	
	>20	68 (91)	7 (9)		30 (40)	45 (60)		60 (80)	15 (20)	

4.4 Binary logistic regression analysis

Binary logistic regression analysis was conducted to determine the association between participant background characteristics and knowledge, attitude or practice scores. Crude odds ratio (cOR) and Adjusted odds ratio (aOR) were calculated.

4.4.1 Association between demographic variables and knowledge outcomes

No statistically significant associative trend was determined between gender, age, health sector, and qualification (Table 4.6) Analysis revealed a statistically significant association between hospital pharmacists and knowledge outcomes. The aOR was calculated to be 0.30 (95% CI: 0.11 – 0.84) with a p-value of 0.022, implying a 60% decrease in odds of hospital pharmacists obtaining positive knowledge outcomes in comparison with retail pharmacists as reference. Pharmacists with other roles had a statistically significant association with knowledge outcomes. Analysis revealed an aOR value of 0.25 (95% CI: 0.08 – 0.80), indicating that the pharmacists were 75% lower odds of positive knowledge outcomes as compared to retail pharmacists.

Participants with less than 5 years of experience had a cOR value of 0.127 and aOR value of 0.11 (95% CI: 0.02 – 0.59) which was statistically significant. This indicated that participants with less experience had 89% lower odds of having positive knowledge outcomes compared to those with 10 – 15 years of work experience as reference (Table 4.6).

4.4.2 Association between demographic variables and attitude outcomes

No statistically significant association was found between gender, current role, heath sector, qualifications, years of experience and positive attitude scores (Table 4.7). Notably, analysis of the age group characteristics revealed that only the 26-30 was statistically significant. The cOR for the 26-30 category was 2.32 (95% CI: 1.05 – 5.11) which indicates that the odds of achieving positive attitude outcomes were 2.32 times higher than the reference group (36-40 years). No statistical significance was noted for any other age category. Nonetheless, the cOR for all groups had higher odds of achieving the outcome than the reference group (36-40).

Table 4.6: Logistic regression analysis of the participant demographic variables and knowledge outcomes.

Variable	Category	Knowledge					
		cOR	(95% CI)	P-value	aOR	(95% CI)	P-value
Gender	Male (ref)	1.00					
	Female	0.47	0.21-1.02	**0.056**	0.57	0.24 – 1.29	0.172
Age group (years)	18-25	0.26	0.30-2.18	0.213			
	26-30	0.33	0.94 -1.17	0.085			
	30-35	0.54	0.16 – 1.77	0.306			
	36-40 (ref)	1					
	41-45	1.47	0.451 – 4.75	0.524			
	46-50	0.32	0.36 – 2.72	0.295			
	Above 50	0.63	0.20 – 1.96	0.428			
Current Role	Community Service Pharmacist	0.88	0.18 – 4.29	0.869	0.73	0.14 – 3.90	0.714
	Retail Pharmacist (ref)	1					
	Hospital Pharmacist	0.40	0.15 – 1.00	**0.052**	0.30	0.11 – 0.84	**0.022**
	Academic Pharmacist	1.17	0.23 – 5.91	0.852	1.34	0.24 – 7.34	0.741
	Other	0.30	0.10 – 0.95	0.041	0.25	0.08 – 0.80	**0.020**
Health Sector	Private	1.26	0.25 – 6.36	0.782			
	Public	1.28	0.28 – 5.85	0.751			
	Both (ref)	1					
Qualification	Bachelor of Pharmacy (ref)	1					
	Master of Pharmacy	0.92	0.35-2.36	0.862			
	PhD Pharmacy	1					
Years of experience	<5	0.127	0.26 – 0.62	**0.011**	0.11	0.02 – 0.59	**0.010**
	5-10	0.45	0.16 – 1.24	0.125	0.43	0.14 – 1.27	0.127
	10-15 (ref)	1					
	15-20	0.58	0.16 – 2.07	0.399	0.60	0.15 – 2.38	0.472
	>20	0.40	0.14 – 1.17	0.093	0.36	0.11 – 1.16	0.088

cOR: crude odds ratio; aOR: adjusted odds ratio; ref = reference

Table 4.7: Logistic regression analysis of the participant demographic variables and attitude outcomes.

Variable	Category	Attitude						
		cOR	(95% CI)	p-value		aOR	(95% CI)	p-value
Gender	Male (ref)	1		1				
	Female	1.18	0.69 – 2.04	0.545				
Age group (years)	18-25	1.50	0.52 – 4.31	0.452				
	26-30	2.32	1.05 – 5.11	0.037				
	30-35	1.13	0.52 – 2.47	0.753				
	36-40 (ref)	1						
	41-45	1.08	0.42 – 2.77	0.870				
	46-50	1.40	0.45 – 4.32	0.559				
	Above 50	1.03	0.48 – 2.23	0.931				
Current Role	Community Service Pharmacist	0.82	0.26 – 2.53	0.727				
	Retail Pharmacist (ref)	1		1				
	Hospital Pharmacist	1.04	0.59 – 1.85	0.884				
	Academic Pharmacist	2.76	0.57 – 13.45	0.210				
	Other	1.42	0.75 – 2.70	0.284				
Health Sector	Private	1.00	0.38 – 2.64	1.000				
	Public	0.911	0.37 – 2.24	0.840				
	Both (ref)	1		1				
Qualification	Bachelor of Pharmacy (ref)	1		1				
	Master of Pharmacy	0.81	045 – 1.47	0.494				
	PhD Pharmacy	0.51	0.12 – 2.08	0.345				
Years of experience	<5	1.87	0.83 – 4.35	0.133				
	5-10	1.60	0.75 -3.41	0.225				
	10-15 (ref)	1						
	15-20	0.96	0.38 – 2.44	0.929				
	>20	1.04	0.49 – 2.22	0.922				

cOR: crude odds ratio; aOR: adjusted odds ratio; ref = reference

4.4.3 Association between demographic variables and practice outcomes

No statistically significant association was noted between gender, age, current role, health sector, years of experience and having positive practice outcomes (Table 4.8).

Binary logistic regression of the qualification characteristic revealed that participants with Masters degrees had an aOR of 0.42 (95% CI: 0.18 – 0.98) which was statistically significant, indicating that possession of a masters degrees signified a 58% decrease in odds of positive practice as compared to the reference (bachelor's degree).

Table 4.8: Logistic regression analysis of the participant demographic variables and practice outcomes.

Variable	**Category**	**Practice**						
		cOR	**95% CI**	**p-value**		**aOR**	**95% CI**	**p-value**
Gender	Male (ref)	1						
	Female	1.2	0.63-2.29	0.580				
Age group (years)	18-25	2.18	0.69 – 6.88	0.185				
	26-30	1.30	0.52 – 3,25	0.580				
	30-35	1.30	0.50 – 3.41	0.591				
	36-40 (ref)	1						
	41-45	1.87	0.63 – 5.56	0.262				
	46-50	1.79	0.51 – 6.31	0.362				
	Above 50	0.99	0.37 – 2.68	0.989				
Current Role	Community Service Pharmacist	1.97	0.60 - 6.48	0.265				
	Retail Pharmacist (ref)	1						
	Hospital Pharmacist	0.87	0.45 – 1.75	0.729				
	Academic Pharmacist	0.35	0.04 – 2.92	0.335				
	Other	1.16	0.57 -2.37	0.682				
Health Sector	Private	7.93	1.00 – 62.57	**0.049**		7.27	0.91 – 57.80	0.061
	Public	6.84	0.90 – 52.07	**0.063**		6.23	0.81 – 47.85	0.078
	Both (Ref)	1						

Variable	Category	Practice						
		cOR	95% CI	p-value		aOR	95% CI	p-value
Qualification	Bachelor of Pharmacy (ref)	1						
	Master of Pharmacy	0.40	0.17 – 0.92	**0.031**		0.42	0.18 – 0.98	**0.045**
	PhD Pharmacy	0.43	0.051 – 3.58	0.433		0.51	0.06 – 4.41	0.544
Years of experience	<5	0.94	0.38 – 2.30)	0.888				
	5-10	0.97	0.42 – 2.25	0.942				
	10-15 (ref)	1						
	15-20	0.44	0.13 – 1.55	0.204				
	>20	0.75	0.31 – 1.82	0.525				

cOR: crude odds ratio; aOR: adjusted odds ratio; ref = reference

4.5 Open ended Questions

This section presents results from the last section of the study. In this section, open ended questions were presented to the participants where they were able to respond in short written answers. Table 4.9 depicts the main themes and associated sub-themes that emerged from during data analysis.

Table 4.9: Themes and subthemes generated from the open-ended responses.

Themes		Subthemes
4.1	Reported VIB practices of pharmacists	1. Dispensing techniques 2. Counselling practices
4.2	Experienced and perceived problems and challenges in treating VIB patients	1. Counselling challenges 2. Infrastructure challenges
4.3	Call for better pharmacist training	
4.4	Observed Impact of VIB patients on pharmacists	

4.5.1 Theme 4.1 – Reported VIB practices of pharmacists

This theme explored the practices and strategies that the participants implemented in their practices. This theme was divided into two subthemes as follows, dispensing techniques and counselling practices.

4.5.1.1 Dispensing techniques

This subtheme focused on the practices and techniques that the pharmacists employed. Dispensing techniques constitute strategies, devices, or practices that the pharmacists used to helped with the dispensing process and aided the VIB patient better manage their medication.

The most common assistive measure reported was the use of braille. Almost half of all responses mentioned the use of braille. Many participants reported the use of medicines embossed with braille on their packaging. As a suggested form of best practice, several participants suggest the use of braille labels, braille package inserts or the use of braille printers, to better serve the VIB community.

Pill boxes were another common tool used to help organise VIB patients' medication. For patients who were moderately visually impaired, several participants described printing labels with larger fonts or using different coloured stickers to help identify and differentiate medicines. Similarly, some participants stated that they utilised rubber bands and placed them around the medication packaging so that the patient could feel and identify what it was.

Numerous respondents reported that they used mobile phones to help better serve VIB patients. A couple of pharmacists stated that they used mobile phones to record voice recordings of important information so that the patient could listen to it when at home. Though no one affirmed the active use of any assistive mobile applications, some participants demonstrated that they were cognisant of such applications and their use potential.

4.5.1.2 Counselling practices

This subtheme explored the practices and procedures that the pharmacist participants did during the counselling sessions with VIB patients.

With regards to counselling practices, it was observed that communication was a notable theme. Several participants stressed that, as their measure of accommodating VIB patients, they communicated with the patient slowly and attentively. The aim was to ensure that the patient understood what the pharmacist was saying and doing during the consultation process. Participants did this by doing such things as "describing the size of the tablet to the patient to give them an idea of what to feel for" The following quote represents similar actions taken by a number of participants.

> "[I] Communicate the use of medication in a way they use will be able to use their other senses [to identify their medication]."

Respondents did not just prioritise communication, they also placed an emphasis on spending extra time and attention on VIB patients during their counselling sessions. One participant noted that doing so was "necessary" to counselling VIB patients. Spending extra time and attention on the patients was observed to improve the counselling session and ensure that the patient understood their medicine better. Another participant recorded the following with regards to providing extra time and attention during counselling session.

> "I realised that there are instances when giving additional time to patients is the greatest gift you can give both to them and to yourself. Be it to the visually impaired or to those with neuropsychiatric conditions, physical impediments, special need, terminal or palliative settings."

Some participants stated that they utilised private counselling areas to create a safe, and quiet environment where they could counsel the patient. Interestingly, a couple of respondents reasoned that one of the benefits to this was that the booth was considerate of the VIB patient's hearing sensitivities especially in noisy waiting areas. One participant narrated their practice and use case of such a private counselling area.

> "His hearing is very sensitive, and I always try to call him and his caregiver by walking to them in the waiting area and inviting them to join me in a separate private room attached to the pharmacy where I can talk to him without any disturbances. I have to explain things in such a way that he and his caregiver fully understand the dosages each time."

One noteworthy practice that was implemented amongst some participants was the act of following up with the VIB patient after the consultation. Participants reported calling patients to check up on them. In some cases, participants used this opportunity to schedule appointments or organise deliveries with the patients. One participant described this practice in the quote below.

> "I keep in contact with patient via telephone or voice mail. patient can query or order medication directly I am very aware of the difficulties involved. usually get meds ready for collection on request"

4.5.2 Theme 4.2 – Experienced and perceived problems and challenges in treating VIB patients

This theme looked at the reported problems and challenges that the pharmacists encountered when treating VIB patients. This theme was divided into two subthemes that explored different types of challenges. The first theme looked at the challenges and obstacles faced during counselling sessions. The second highlighted the pharmacy infrastructure challenges that hindered service to VIB patients.

4.5.2.1 Counselling session challenges

There were a number of observed challenges that pharmacists experienced during their counselling sessions with VIB patients.

One of the most frequently reported challenges related to communicating with VIB patients. Some participants acknowledged that the means of communication between VIB patients and normally sighted individuals are different. This obstacle was described as a "Huge challenge" due to it being "Difficult to explain medication" to VIB patients. Several participants stated that communication was difficult because they could not easily show the patients the different medicines being dispensed but rather had to described them to the patients. One participant highlighted the intrinsic "dependence" on notes and written labels to aid in communicating vital medical information to patients. Another respondent expressed this sentiment by stating the following,

> " [It is] not always easy to explain terms or ideas to them. Sighted persons you can draw a picture, write up numbers, [or] similar things but can struggle to explain to these patients."

This lack of certainty in effective communication led to observed worries and concerns of patient understanding and patient therapeutic compliance when they returned home. Some participants were noted to be unsure, and not confident if the patient understood the medication information they received during the session. This was observed in the quotes below.

> "It made me feel unsure if patient understood the explanations I gave as to the medication that was dispensed as i could not make eye contact and she kept looking at her husband and he nodded that he understood me."

> "Even when a pharmacist advises and educate blinds about their medications, it remains a challenge as to how the blinds will comply at home..."

Another participant noted observed link between the difficulty in communication and the lack of therapeutic compliance to their regimen.

> "…it was challenging to explain in first place, issues of compliance to treatment was observed."

This concern for patient compliance was noted to be rooted in the VIB patient's inability to identify their medication. This fact was noted by a number of respondents. When asked to described challenges from their experiences, some noted "medicine identification and dosage instruction [compliance]" as a major challenge. Particularly in cases where patients were provided with lots of medicines to take home. A number of pharmacists noted the extra challenge polypharmacy has on the ability to identify and differentiate medicines for VIB patients. One response summarised this concern as follows,

> "Generic substitution may be a challenge, especially if a particular product is somewhat different in presentation as compared to the originator. Polypharmacy - most certainly. Most patients struggle to be treatment adherent when faced with a multitude of medicines to take... how much more so in a patient who is visually challenged?"

4.5.2.2 Infrastructure challenges

This subtheme explored the more physical, and logistical challenges that prevent VIB patients from receiving appropriate care, from the perspective of pharmacists.

Several participants noted was the lack of accessibility and mobility features in their pharmacies was a challenge for some of their VIB patients. Participants reported that the patients found it difficult to navigate the pharmacies and required assistance or accompaniment. This problem was noted to be compounded for pharmacies located within large hospitals. Some respondents noted that their needs to be a change in the design and layout of pharmacies to accommodate VIB patients and ensure that they are "blind friendly". More specifically, some participants noted that some of their VIB patients needed assistance to navigate to the pharmacy counter once they entered the pharmacy. Others observed that queues and waiting areas that use ticketing systems are challenging for VIB patients. To mitigate this, some reported to meeting their patients at the waiting area or organise for the patient to be fast tracked to the front of the queue.

One respondent noted the effects of poor accessibility to pharmacies. They noted that poorly designed facilitates leads to VIB patients staying away and not receiving the healthcare they need.

> "I can think that even their access to medical assistance is limited, because they need assistance to even go to a pharmacy. So, healthcare providers could also improve on availability to visually impaired patients at central points accessible to the visually impaired patients."

Furthermore, a lack of policies and guidelines to standardise procedures with relation to VIB patients was observed from the data. The lack of policies led to unstandardised practices and procedures occurring. Essentially, pharmacists described practices and procedures that were based on their own initiative, and intuition in conjunction with whatever resources were at their disposal. These resources were often limited or entirely not available, as one participant succinctly stated, "We are not equipped with any aids to help the blind patient". The lack of policies was noted to be present in both private and public pharmacy sectors, as was noted below.

> "I have not seen any practices in place to assist visually paired in private or government sectors (hospitals & clinics) I'm sure there should be existing SOPs [standard operating procedures] to comply with inspections but no staff awareness, training or application there off."

4.5.3 Theme 4.3 – Staff training

This theme focuses on the observed lack of training of pharmacists with regards to visual impairment/blindness and VIB patients.

The lack of training and knowledge on VIB patients evident amongst the participants. Some participants reported not being able to treat patients because of inexperience and limited to no training on them and their conditions. For example, most accounts of relating to implemented VIB patient practices relied on verbal descriptions and explanation of the medication to the patients without complementary assistive measures because a lack of cognisance of such measures. One participant reasoned that the effects of this lack of training and understanding, led to them observing less VIB patients at their facility because of low quality of service toward them.

> "In my experience in a private hospital setting, we as pharmacist and healthcare workers only have direct access to the patient while they are in hospital. As soon as they are discharged, they send their relatives to collect the medication. I think the reason for that is because of the fact that we are not at all geared to help and

> dispense medication to visually impaired patients. I would like to improve on the services we offer"

Notably, there were several respondents who called for changed and an increase in training of pharmacists in visual impairment/blindness as was noted in the quote below.

> "All healthcare workers need to have training to treat blind/visually impaired patients."

4.5.4 Theme 4.4 – Observed impact of VIB patients on pharmacists

This last theme looked at the effects that treating and taking care of VIB patients has had on the pharmacists. In essence, described the impact that VIB patients had on pharmacists and their knowledge, attitude and practices toward VIB patients.

More than a quarter of all responses relating to this theme described an improvement in the understanding of the condition and the patients. Participants reported acquiring a better comprehension of the challenges and needs of VIB patients. A couple participants, such as seen in the response below, realised that VIB patients are capable to manage their lives, which contrasts with the preconceived notions that some participants possessed about them.

> "I realised that they are only visually impaired but they are able to do a lot more independently so they must be treated as individuals who can make their own decision and must be included in healthcare decisions."

One participant described the effects it had on them by stating that, "It has made me more mindful and aware as a pharmacist of the patient's barriers to access and my own being able to provide the care that they would deserve.". Another described the effects as causing them to be "mindful and aware as a pharmacist of the patient's barriers to access [healthcare] and my own being able to provide the care that they would deserve.".

Some participants reported an increase in emotional awareness toward VIB patients after treating them. These participants recorded the experiences as having "worked on my emotions" which resulted in an increase level of "pity", and a general sense of "feeling sorry" for their patients.

Others realised how "not accommodated enough" and neglected the blind patients are in our healthcare system". In a similar manner, interactions with the patients highlighted deficiencies in their professional capacities to treat and care for them. Such realisations promoted some

participants to commit to conducting their own research aimed at discovering better ways of caring for VIB patients. An example of such a commitment was observed in the quotes below,

> "It has challenged me to think of better strategies to explain and package medications."
>
> "It made me realize the gap that needs to be filled and to search for ways (via watching YouTube videos) to assist such clients"

4.6 Conclusion

In conclusion the survey data revealed that the participants largely had poor knowledge levels, positive attitude levels and moderate practices relating to the care and treatment of VIB patients.

The respondent's knowledge of visual impairment and blindness and the care of VIB patients was low. Participants were not familiar with medication management assistive devices used in VIB patient care. Awareness of any guidelines relating to treatment of VIB patients was limited to non-existent. The majority of participants did not receive any training, nor were they aware of any guidelines on VIB patient management, possibly factors of observed poor knowledge levels.

Most participants had positive attitudes towards VIB patient care. Participants displayed positive attitudes towards the improvement of their VIB patient services by improving their counselling practices, dispensing techniques, and the accessibility to the pharmacy for VIB patients.

Participants mostly had moderate VIB patient practice levels. Most participants did not implement recommended VIB patient guidelines in their practice but were possible they sought to alleviate the challenges VIB patients face in seeking pharmacy health care.

Upon analysis, no statistically significant association was observed between patient demographics and the KAP scores. Binary logistic regression analysis revealed three significant associations between the variable characteristics and positive domain outcomes (knowledge, attitude, practice). Analysis revealed that hospital pharmacists, and pharmacists who had less than 5 years of experience had lower odds of positive knowledge outcomes. Additionally, the possession of a Masters degree amongst pharmacists lowered the odds of obtaining good practice levels.

Analysis of open-ended survey data generated four themes which included the following: reported VIB practices of pharmacists, experienced problems and challenges in treating VIB patients, call for better pharmacist training, and observed impact of VIB patients on pharmacists. The data showed that pharmacists used low tech techniques during the dispensing process. The biggest challenge they faced was knowledge on how to care for VIB patients because of a lack of formal training. Interactions with VIB patients improved.

Chapter 5: Objective 2 Results (Pharmacist Cohort interviews)

This chapter presents data from the pharmacist participants interviews which constituted part of the second phase of the study. The findings constitute major themes that were generated from the thematic analysis of the data.

5.1 Demography of Participants

In this phase of the study, 12 practising pharmacists were interviewed to provide further insight into their experiences, knowledge and attitudes toward visually impaired or blind (VIB) patients during interviewing. The cohort comprised of seven male and five female pharmacists (Table 5.1). The ages of the interviewees ranged from 27 to 80 and mean age of 43.83 ± 18.1 years. The participants were all from South Africa. The majority (9) of the participants were from Gauteng, while the remaining from Mpumalanga (1), Kwa-Zulu Natal (1) and Limpopo (1). The mean number of years of experience was 19.83 with a standard deviation of 17.95 years. The median years of experience was 14 years. The maximum number of years as a pharmacist was 55 years, while the minimum was 3 years. All participants worked in either the retail sector (75%) or in hospitals (25%). Only one participant worked in the public health sector and the remaining 11 were in the private health sector (Appendix 15).

Table 5.1: Participant demographics and background information of pharmacists who took part in the interviews.

Variable	Category	Frequencies (n)	Percentages (%)
Gender	Male	7	58
	Female	5	42
Age group	18-25	0	0
	26-30	5	42
	31-35	1	8
	36-40	0	0
	41-45	2	17
	46-50	1	8
	Above 50	3	25
Province	Gauteng	8	67
	Mpumalanga	1	8
	Limpopo	1	8
	Kwa-Zulu Natal	1	8
Pharmacy	Hospital Pharmacy	3	25
	Retail Pharmacy	8	67
Health Sector	Private	11	92
	Public	1	8
Highest Qualification	Bachelor of Pharmacy	9	75
	Master of Pharmacy	2	17
Years of experience	< 5	3	25
	5 – 10	2	17
	11 – 15	2	17
	16 – 20	3	25
	> 20	2	17

5.2 Emergent Themes

During qualitative data analysis, three main themes emerged (Table 5.2). Two themes were further divided into sub-themes. A thematic map further illustrates the relationship between themes and subthemes (Figure 5.1).

Table 5.2: Summary of themes and subthemes generated from the data

Themes		Subthemes
5.1	Current VIB patient practices of practising pharmacists	1. Counselling practices 2. Dispensing techniques 3. Use of assistive devices
5.2	Lack of knowledge on visually impairment and blindness and VIB patients	1. Poor pharmacist knowledge levels 2. Lack of training
5.3	Poor pharmacy standards and infrastructure	

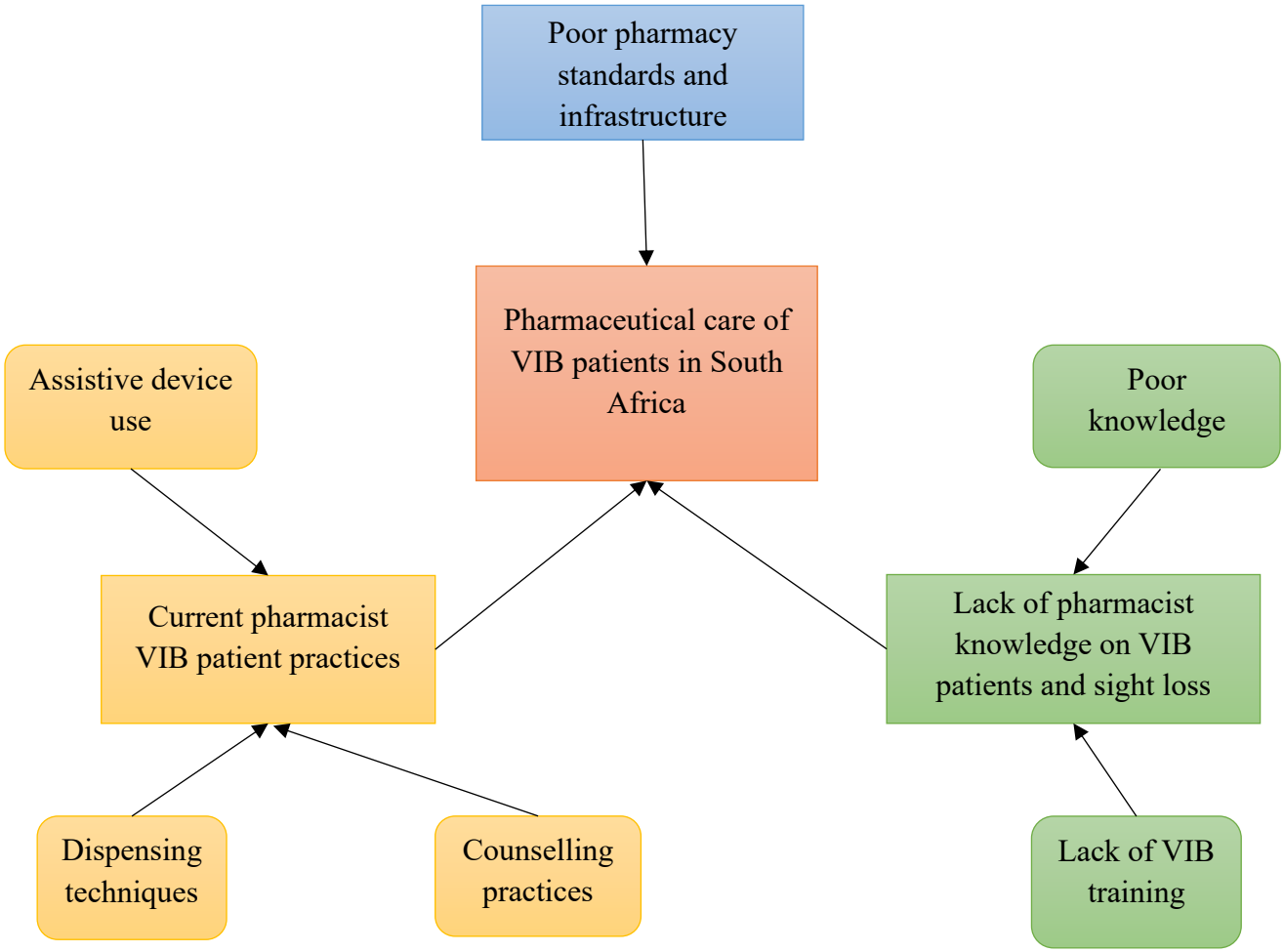


Figure 5.1: Thematic map generated from the data. The map displays how each theme and subtheme is related to other.

5.2.1 Theme 5.1 – Current practises employed by practising pharmacists in the treatment of VIB patients

This theme reports the practices implemented by pharmacists treating VIB patients. From this theme, three distinct subthemes were generated. These subthemes focused on the dispensing techniques, counselling procedures, and the use of assistive tools in their practice.

5.2.1.1 Counselling of VIB patients

All participants (n=12) described various practices, challenges or concerns during their counselling sessions. Of the 12 participants, the majority (n = 11) stated that they had seen and counselled at least one VIB patient in their years of experience. Some participants stated that they counselled the patients like any ordinary patient, while others described going the extra mile to accommodate the needs of the patients. For instance, participant (P) 1 indicated:

> "It would be basically the same as a sighted person. But get their personal information so I can get into their profile. Find out exactly what medication they want, dispense it and give them any information on the medication, and what the directions are." ~ P1

In contrast to this, there were some participants who went over and beyond what they did in ordinary counselling session to ensure that the VIB patient understood the medication they were receiving.

> "At the end of the day, our role is to look after the patient and to apply pharmaceutical care." ~ P2

> "You would obviously, make the extra effort to ensure the understanding. Because I mean the whole point, or the end of the dispensing procedure is to make sure that they understand" ~ P5

Some participants demonstrated that they recognised that the communication and understanding needs of VIB patients were different from ordinary patients. One participant noted that patients robbed of sight also faced a lack of trust and confidence in what is being communicated to them due to inability to engage with non-verbal cues of communication.

> "… confidence because they wouldn't be able to express themselves, trying to trust whatever that I am going to give them. If it is what they want. Because even if I can mention the word generic to them. It means nothing to them because what is the generic? I cannot see that item. I had wanted Panado and you are

> telling me about Pinamol and you are telling me that it is generic. Hello! So, it is like they wouldn't understand. They will be stunned." ~ P6

Furthermore, various participants (n=5) displayed cognisance of the limitations VIB patients had in managing their medication when they left their counselling session and returned home. They demonstrated concern and worry as to how the patients would be able to remember and properly identify their medication.

> "My biggest issue is just making sure that they go home and know what, what is" ~ P5

> "My biggest worry is how they are going to identify the medication when they get home. I can pack for them, but when they get home how will they know which one is which." ~ P12

To ensure better understanding, several participants described aiding VIB patients by committing extra time to counselling, by repeating instructions, and by providing a safe and comfortable environment during the counselling process. Some of the participants (n=3) said that they had used or would use the available mandated private counselling area to counsel their VIB patients.

> "I don't think I would give them counselling in public. I would rather allow them to go and sit down in a safe environment. So that at least we can identify the ecology. You know when we do ecology check they must be comfortable, and then they must be given the element that whatever is given to you right now it will be handy for you because you will be able to know that whenever I am being given a service, this is how I must actually ask for it as well in future, I think that is the best and first step I would go." ~ P6

The effects of such considerations led to more effective interactions with VIB patients and pharmacists, where VIB patients recognised that they had the full attention and care of the pharmacist. This was observed in the previous and following quote:

> "So, I mean she [VIB patient] would come in with her caregiver and she would want to talk for long. And then she would say repeat. And I would say I have told you over and over. And she would be grateful and then she would ask the same thing again. I think maybe it was a way of her remembering things." ~ P3

Not all participants seemed to be confident in their communication skills when counselling VIB patients. Several participants reported that VIB patients sometimes came to the pharmacy with an assistant. Over half of the participants (n=7) addressed both the assistant and the patient in a counselling session and found the additional support beneficial because the assistants were able to aid in communicating to the patient and ensure the patient understood their therapy. Participant 10 found that the presence of an assistant during counselling provided a "double assurance" for medication adherence once returned home. One pharmacist likened the advantage of having an assistant to that of a language translator.

> "I think If somebody came to me who was visually impaired, I would have to take a step back and think, "how am I going to..?. It could be a little bit confronting you know. But it is the same when somebody can't speak a language. It is the same thing, in other words, my mode of communication would have to be different, or I would have to find someone to translate or assist, who perhaps knows the patient. I am not sure." ~ P7

5.2.1.2 Dispensing practices, processes and techniques employed with VIB patients

On the implementation of techniques and measures to aid VIB patients during the dispensing phase, the participants were observed to belong to two groups. One group consisted of those who had describe dispensing techniques when counselling VIB patients, while the other group constituted those who did not use any specific techniques or measures to aid VIB patients identify their medication. Of the former group, most stated that they tried to take the time to explain and guide the patient without complementary aid solutions. This was accompanied by getting the patient to feel the medicine packaging, blister packs, or tablets where possible.

> "Then the actual dispensing process of being able to show what medication is used for what…opening them [medication boxes] so that they can feel what is inside the box. So that they can feel the medication inside the box and know that maybe like a Glucophage is larger, or something like that." ~ P4

> "I probably would let them feel the tablet, feel the box. Use the other senses and tell them this one is in a blister pack; this one is in a vial." ~ P11

Of those who had used dispensing aids for VIB patients (n=5), it was observed that several techniques were tactile based. These included using different sized or different shaped containers to separate medicines for identification purposes. The use of different containers

was the most used solution especially in pharmacies that did not have specific dispensing and identification solutions for VIB patients.

> "No. I don't have any of that [specific dispensing aids] at all. Obviously different sizes of containers, that is what I would use. This size that size, maybe we could make a plan." ~ P7

All participants stated that they did not have readily available braille labels or health promotional material in braille to use for VIB patients. Most interviewees, however, did acknowledge that they had some medicines in their pharmacies with braille imprinted on the packaging. The use of pill boxes with compartmentalised medication placements identifiable through imprinted braille labels, was not common (n=1).

> "Lucky there are some boxes which have braille on them, and you could give to them to feel it and know which one it is. And then it gets difficult with the boxes like the simvastatin because they do not have any braille on them." ~ P12

Due to a lack of available resources for VIB patient dispensing, participants were observed to possess a "make a plan" attitude toward finding solutions to aid their VIB patients. One participant provided an account where they used available resources to produce colour coded stickers that helped a visually impaired patient identify their medication because the label font was too small, and they were unable to read.

> "I actually made use of colour coded stickers which were not available at the facility. I sort of just created them. I just found those different coloured sticky dots kind of things. The lady was quite comfortable seeing colour. She couldn't see writing on there. So, I would tell her red would be for the night and blue would be for the morning sort of thing." ~ P10

During the sessions, some participants postulated the use of several possible dispensing techniques that they would have used if they had the resources. The use of braille stickers, or labels were often suggested ideas. One participant suggested "having some kind of printer that prints stickers in braille" ~ P4.

It was noted that several participants did not have specific dispensing measures in place. Upon inquiry, various reasons for the lack of specific dispensing techniques for VIB patients were revealed. The most notable reason was a lack of enough VIB patients seen on a regular basis

to warrant the investment or purchase of such resources for the patients. Participant 7 summarised it well:

> "I think it depends on a cost issue. If I have one patient who is visually impaired, I can't buy 100,000 labels to be able to cater for that particular patient. I think there again, one would have to look at your cost verses, what is out there." ~ P7

Another reason for a lack of available dispensing solutions for VIB patients was due to a lack of knowledge relating to the requirements of the patients. As such, some of the participants demonstrated the desire to be able to do something but they were limited by their lack of awareness and education on visual impairment and blindness and how best to provide the right aids, solutions and services.

> "I would like to do something different but what more can I do? Besides given them the medication one by one so that they feel it. There is really nothing else I can do for them unfortunately." ~ P12

5.2.1.3 Pharmacists knowledge and attitudes towards assistive devices

This subtheme explored the knowledge, attitudes, opinions and use of assistive devices amongst the participants in providing pharmaceutical care for VIB patients.

The use of assistive devices designed specifically to aid VIB patients in their medication management was low. Most participants lacked knowledge and awareness on assistive devices that VIB patients use in their daily lives or specifically for medical management purposes. Most participants (n=8) when inquired about assistive devices where only able to provide one or two general examples. All participants reported having come across braille on medication packaging in their experience. Some participants were aware of the existence of mobile applications that VIB patients use on their smartphones. In relation to assistive devices within the pharmacy context, none of the participants, reported possession of such devices designed to aid VIB patients with their medication management. This was observed from the following responses:

> "Other than explaining to them how to take their medication. There is no other devices or thing that we could use." ~ P1

> "I don't know in a pharmacy setting what is available directly to assist a patient other than giving them time, explaining and then working with the caregiver." ~ P7

Despite the overall observed lack of knowledge of assistive devices for medical management, all participants (n=12) displayed positive attitudes and opinions towards the use of assistive devices within the pharmacy setting. The participants acknowledged that such devices "would definitely, help a lot." ~ P3, they "would be great." ~P9, and "could be useful" ~ P5. A couple interviewees (n=2) recognised that such assistive devices would allow better therapeutic monitoring and assurance of correct adherence amongst VIB patients. Some displayed positive attitudes toward implementing such devices in pharmacies for VIB patients. Such attitudes were noted by quotes from P5 and P12:

> "My pharmacy is all about integrating things with apps and making things easier. So, I am sure that is something we would jump on board with" ~ P5

> "That would be good because we would know that the patient would be taking the right medication. In my opinion it is something that we must have, and it would be helpful for both us and the patient." ~ P12

Minor concerns were raised by the participants on the implementation of assistive devices and technologies in their pharmacies. It was noted that the low demand for assistive devices resulted from low VIB patient numbers. This led some pharmacists to make the decision not to acquire these devices. Another participant recognised the need for regulation as these devices, mobile applications, or systems would be using sensitive medical information that needs to be regulated. Despite these concerns, the realisation of the need to improve service and care of VIB patients was superior to the concerns they raised.

> "If that is the medium that VIB that they use, we should then accommodate them by having those type of printers that can do that type of work." ~ P4

> "If the need arose, that is something I would look at. I think anything that is of progress is important. I think again. It is always just the need compared to the benefit of you know do I come across it or will I ever come across it. A needs analysis. That kind of thing. It would require a needs analysis. But certainly, if there was something that is going to improve the patient's life I would look into it." ~ P5

5.2.2 Theme 5.2 – Lack of knowledge on visually impairment/blindness and VIB patients

This theme explored the knowledge levels that the participants possessed in attending to VIB patients. From this theme two subthemes emerged, namely poor pharmacist knowledge levels and lack of pharmacist VIB patient training.

5.2.2.1 Poor pharmacist knowledge levels

Poor knowledge levels were noted to be caused by insufficient training and education of pharmacists. As a result of both preceding factors, pharmacists reported low confidence levels in their ability to treat VIB patients.

All participants self-reported poor to moderate levels of knowledge and understanding of things relating to visual impairment and blindness. When asked to rate how much they knew on the research topic, some participants stated that they knew "Not much" ~ P3, they were "not confident at all" ~ P6, or they expressed sentiments similar to the following quote,

> Other than the fact that we are dealing with someone who is VIB, I don't know how to handle that." ~ P2

These self-expressed levels of knowledge and understanding were observed by the lack of the participants' understanding of the specific needs and requirements VIB patients possess. Some of these needs and requirements included accessibility needs, medication management needs and the need for extra time and care during counselling. The way participants described their interactions with the patients highlighted these concerns. For example, when counselling patients, some participants stated that they treated the patients as they would normal sighted patients. Namely, they would counsel the patients by providing information on the medication and dispensing it.

> "No, it would be basically the same as a sighted person…Find out exactly what medication they want, dispense it and give them any information on the medication, and what the direction are." ~ P1.

Another participant was asked to describe if their pharmacy was VIB patient friendly. Their response highlighted the poor awareness levels displayed by participants.

> "I am not sure, about blind friendly, because I am not sure what blind friendly would mean, or what they would require" ~ P9

Some participants (n=7) acknowledged that there exists a deficiency in VIB awareness on what to do when a VIB patient visits the pharmacy. This awareness is critical to ensuring that appropriate and equitable healthcare is provided to such patients.

> "Generally, when you see someone in a wheelchair everyone knows that this person needs extra care, they need help reaching items. Those type of things.

> Nobody ever thinks, if a blind person walks into the store what would we do." ~ P4

Similarly, participant 7 highlighted similar concerns.

> "I think the barrier is on our side in terms of understanding what they are going through and how we can work it. I don't think it is an issue with them using smartphones or anything. Like white canes or braille. It's just that we do not know that. We don't know what to do." ~ P7

The existence of this knowledge barrier was significant as participants were not able to provide assistive solutions based on the needs of the VIB patients. Essentially, such a lack of awareness led to reports of not knowing how to provide assistive solutions to the patients. One participant simply stated that "Other than explaining to them how to take their medication. There is no other devices or thing that we could use to help them." ~ P1

One observed reason for a lack of awareness was attributed to the low number of VIB patients that the participants reported seeing. No participant stated that they had regular visits from VIB patients. The majority noted that they come across a few VIB patients across their entire careers. Participant 3 described the demand they saw for VIB patients by stating that "it isn't a lot of patients. It is probably 1 in 1000." Some participants (n=2) stated that they see more hearing-impaired patients than they do VIB patients.

> "I see hearing impaired all the time. But I never ever see VIB people coming into our stores." ~ P4

Another noted that the low numbers meant that they did not have the opportunity to gain experience and awareness on "how to actually counsel the patients and deal with them" ~P10. Low VIB patient numbers meant lack of participant exposure, with focus geared toward sighted individuals only in pharmacies. This was emphasised by participant 7 when they stated the following "Our business is geared towards able bodied talking, thinking people who can understand". This recognised the lack of consideration and awareness for the needs of non-able-bodied individuals in the pharmacy space such as VIB patients.

5.2.2.2 Lack of training, education and awareness

All the participants stated that they had not received any formal training on visual impairment/blindness or on how to treat VIB patients, at an undergraduate level or during their years of work experience. Only two participants recalled coming across literature or

involvement in informal presentations relating to VIB patients during their professional careers. Upon further inquiry, some reported that they had not received any training on any disability. Similarly, that training was described as "pretty little" ~ P8. One participant put is as follows,

> "I mean we do pharmacy practice. And we are taught how to be open and how to give people a space where they feel comfortable. But nobody ever talks about like VIB and hearing-impaired people and what you can do to assist them" ~ P4

Without training, most participants showed that they were unaware of assistive devices that VIB patients use to manage their medication. Without training, the participants were unable to know about such devices and how to incorporate them into their practice.

> "I think the barrier is on our side in terms of understanding what they are going through and how we can work it… It's just that we do not know that. We don't know what to do." ~ P7

> "In a professional setting I wouldn't say I am extremely confident in being able to liase with somebody who is VIB." ~ P4

No participant acknowledged having plans in place to treat VIB patients. Hence, when VIB patients visited the participants' pharmacies, the participants took personal unofficial actions to use the resources available to assist patients. In some cases, the participants with all good intention and desire to serve VIB patients well, were limited by their lack of training to do so. The following response highlighted this.

> "Yeah, I think I would do something. I am not sure what, but I am sure it would come through to me." ~ P9

Some participants acknowledged the need for better training and displayed positive attitudes when inquired if they would seize training opportunities, if availed to them. There were calls by the participants to train not only pharmacists but pharmacy floor staff because of the role they could play in identifying VIB patients and quickly assisting them to the pharmacists once identified.

> "Us who are in the dispensary we trained in terms of healthcare, those in the front shop are not. So, training to ensure that everyone knows what to do. Training not just for VIB patients. Generally, when you see someone in a wheelchair everyone knows that this person needs extra care, they need help

> reaching items. Those type of things. Nobody ever thinks, if a blind person walks into the store what would we do." ~ P4
>
> 'There must be training. People should be trained on how to handle VIB patients. There should be SOPs. I believe the people that could be trained to guide the patients will be the securities, because you know the pharmacies are just a bit complicated with the shelves. So, the securities should know what to do when they encounter such patients and how to assist them and take them to the pharmacy and then leave them there for the privacy and then know what to do with the them when they are done with the medication." ~ P12

From the data there appeared to be a need for sensitisation and education on visual impairment/blindness. For instance, participants were aware of wheelchair mobility access requirements due to SAPC regulations, unlike the mobility and accessibility requirements for VIB patients. Participant 2 had this to say on the matter.

> "In general, they talk about wheelchair disabilities I think because it is common like when a guy breaks his leg and he needs to come through. But they rarely talk about VIB patients or deaf patients for that matter, nobody says have you any measures in place to help deaf patients" ~ P2

Furthermore, the participants displayed a decreased level of confidence and ability to effectively treat the patients due to a lack of VIB training. Various participants stated that they did not know how best to handle such patients if they came to their pharmacy. This lack of confidence and ability to treat VIB patients was observed by the way the participants counselled such patients.

> "I would like to do something different but what more can I do? Besides given them the medication one by one so that they feel it. There is really nothing else I can do for them unfortunately." ~ P12

Coming across VIB patients instilled a sense of hesitancy and daunting in some participants because of a lack of confidence in their ability to handle the situation and provide the necessary pharmaceutical healthcare. As such participants, when asked what they did when treating VIB patients had to think twice about how best to help their VIB patients.

> "I think If somebody came to me who was visually impaired I would have to take a step back and think, "how am I going to do this?. It could be a little bit confronting you know." ~ P7

Without the necessary knowledge and training, the confidence in knowing the effectiveness of their counselling and dispensing techniques was a source of worry and concern. For example, the expressed sentiment below was mirrored by several interviewees.

> "My biggest worry is how they are going to identify the medication when they get home. I can pack for them, but when they get home how will they know which one is which." ~ P12

5.2.3 Theme 5.3 – Poor pharmacy standards and infrastructure

This theme looked at the current state of participant reported pharmacy facility standards with regards to VIB patient care.

From the data, it was evident there were no provisions, guidelines, or mechanisms in place to guide pharmacists on how to cater for VIB patients. All participants stated or demonstrated that they did not have sufficient provisions in place to cater to VIB patients. Some participants were not familiar with the concept of a VIB patient friendly pharmacy. For example, participant 9 candidly acknowledged their lack of knowledge

> "I am not sure, about blind friendly, because I am not sure what blind friendly would mean, or what they would require." ~ P9

When inquired to state if they had sufficient facilities in place to help VIB patients with mobility and access to their pharmacy, one participant concluded that the existence of plenty space and demarcations would be sufficient to cater to VIB patients to navigate the pharmacy.

> "I would think so, because we have enough space. We have demarcations." ~ P6

Notably, there was a reported lack of resources and provisions to meet the specific needs of VIB patients. Most pharmacies lacked VIB essentials like braille material, appropriate dispensing techniques and procedures.

> "Secondly, resources, I mean I could know how to do these things, like I said this patient can see colour but can't see fine writing, but do I have the resources to now carry out the task. I might have the knowledge but not the resources and equipment to actually do it." ~ P10

With regards to disability friendly requirements in the pharmacy, most participants only related to the need for wheelchair mobility access ramps in the pharmacy as required by regulations. With respect to having mobility and accessibility provisions in the pharmacy for VIB patients, all participants reported not having any accessibility features in their pharmacies for VIB patients. As described by one of the participants, pharmacies are "geared towards able bodied…people" ~ P7. The layout and navigation of pharmacies have been designed without the consideration of VIB patients. Pharmacies have signs leading to the pharmacists, where patients form queues depending on whether they need a prescription to be dispensed or would like to acquire over the counter medication. These otherwise simple tasks for sighted individuals, is a mobility challenge for VIB patients. This was observed in the quote below:

> "We have a sign that says dispensary, but obviously, a VIB individual would not be able to see that. Then, knowing which queue to wait in, or who or where to actually go. When we call a customer, we press a button and it says customer to teller number so and so, they wouldn't be able to tell which teller they will be going to. They wouldn't be able to see them." ~ P4

Another notable observation from the data, was that all participants reported that their pharmacies or institutions did not have VIB patient guidelines or standard operating procedures, that help direct pharmacists and pharmacy staff on what to do when VIB patients visited the pharmacy. A lack of documented guidelines meant that pharmacists were not able to have a unified course of action that could be followed as compared to each pharmacist doing what they think is best.

5.3 Conclusion

Qualitative data analysis revealed the current practices and techniques employed by pharmacist in treating VIB patients. As part of their VIB patient care practice, participants reported committing extra time and attention to VIB patient, repeating instructions, and conducting counselling sessions in a private counselling area. Most participants implemented tactile based dispensing techniques such as using different container shapes or rubber bands. The use of braille material such as braille labels and health promotional material in braille was not common. Participants did not use commercially available medication management assistive devices for VIB patients as part of their practice. Participants demonstrated poor knowledge levels on VIB patient healthcare and sight loss. The lack of VIB patient training and education amongst pharmacists was identified as a key factor responsible for the current state VIB patient

care. Participants reported a lack of accessibility features in their pharmacies that pose challenges to VIB patients in accessing their services.

Chapter 6: Objective 3 Results (VIB Cohort Interviews)

This chapter presents data from the VIB participant interviews which constituted part of the second phase of the study. The findings in this chapter constitute the major themes generated from the analysis of the interviews conducted.

6.1 Demography of Participants

Twelve VIB adults participated in this phase of the study. The cohort comprised of five male (42%) and seven female (58%) participants. The age of the participants ranged from 31 to 51 years with a mean of 44.17 ± 5.79 years. The participants were all from South Africa hailing from various provinces in the country (Table 6.1).

All participants had impaired vision ranging from moderate visual impairment to complete blindness. Of the participants, nine (75%) were totally blind and three (25%) possessed varying degrees of partial sight. The majority (50%) of the individuals had been blind since birth, while the rest attributed the cause of their VIB to secondary medical complications (Appendix 16).

Table 6.1: Demographic information on the VIB participants interviewed in phase 2 of the study.

Variable	Category	Frequencies (n)	Percentages (%)
Gender	Male	5	42
	Female	7	58
Age group	31-35	2	17
	36-40	0	0
	41-45	4	33
	46-50	5	42
	Above 50	1	8
Province	Gauteng	5	42
	Mpumalanga	1	8
	Limpopo	1	8
	Western Cape	2	17
	Kwa-Zulu Natal	1	8

Variable	Category	Frequencies (n)	Percentages (%)
Highest Qualification	Matric	4	33
	Certificate	1	8
	Diploma	5	42
	Bachelor	2	17
Cause of VIB	Congenial	6	50
	Non-congenital	6	50
Degree of VIB	Moderate	2	17
	Severe VI	1	8
	Blind	9	75

6.2 Emergent Themes and Subthemes

The collected responses were analysed using thematic analysis (

Figure **3.2**). The four core themes and eight subthemes that were generated from the data were summarised below (Table 6.2) and illustrated in (Figure 6.1).

Table 6.2: Summary of themes and subthemes:

Themes		Subthemes
6.1	Experience of pharmaceutical care practices	1. Lack of appropriate counselling and poor communication skills appropriate for VIB patients 2. Poor pharmacist knowledge in managing VIB patients
6.2	Recommended practices in treating VIB patients	
6.3	Attitudes toward medication management	
6.4	Medicine Management practices amongst VIB patients	1. Medication Management techniques 2. Use of Technology in MM 3. Caretaker's role in MM
6.5	Barriers to health-seeking behaviour	1. Experienced social challenges 2. Mobility and accessibility

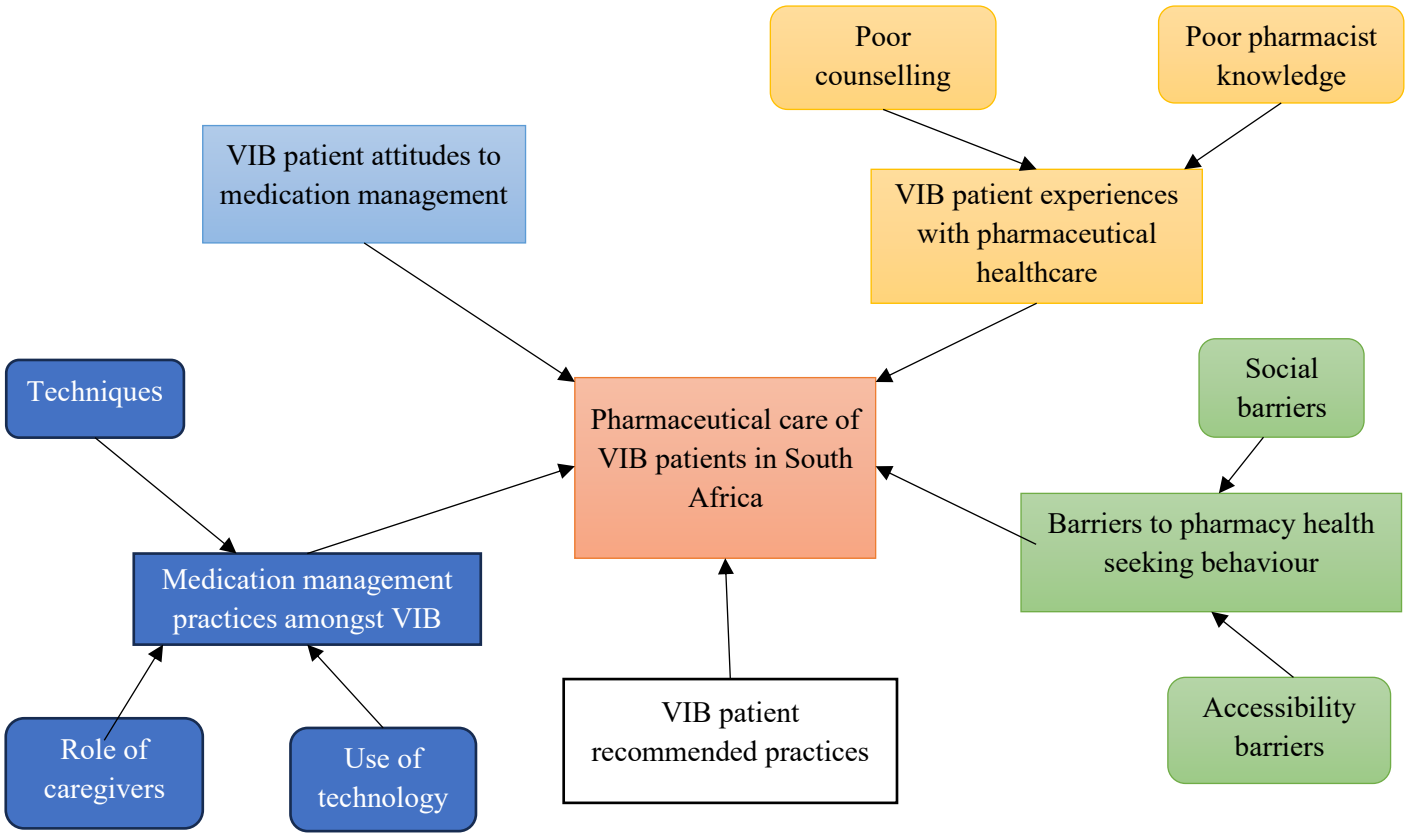


Figure 6.1: Thematic map of themes generated from the data. The map displays how the themes and subthemes are interrelated.

6.2.1 Theme 6.1 – Experience of pharmaceutical care practices

Theme 6.1 summarises the experiences that VIB patients had when interacting with pharmacy healthcare services. This theme was further subdivided into two subthemes namely, lack of appropriate counselling and communication skills appropriate for VIB patients, and poor pharmacist knowledge in managing VIB patients.

6.2.1.1 Lack of appropriate counselling and poor communication skills appropriate for VIB patients

This sub-theme focused on the lived experiences of the participants when they sought or obtained pharmaceutical healthcare. All participants (N=12) provided experiences with pharmacists ranging from positive to negative.

All participants described the lack of proper counselling and assistance as the most common experience during consultations with pharmacists. They gave accounts of a lack of appropriate time and attention during consultations, a lack of sufficient counselling relating to information on their dispensed medication, and general poor communication skills demonstrated by pharmacists. For instance, participant (P) 4 when asked if they inquired for more information

from their pharmacist if they were unclear about something; simply responded that "They [pharmacists] do not have time unfortunately'. Such a lack of time and care led to participants seeking medication information from other sources such as family members or community members who are pharmacists as was narrated by P1:

> "My neighbour is a pharmacist. And sometimes I ask him when he comes home. What is this? And he say he will check. And he tells me this one is fine. It helps you with this for example there was this time I was avoiding to take Simvastatin and he said take it, it has to burn the fats when you take it at night. It helps to lower cholesterol. Especially when you sleep you must not avoid it." ~ P1

A lack of sufficient time and attention taken to fully counsel the participants on their medication, led to a number of participants self-reporting low levels of information and knowledge on their medication. Few participants (n = 3) were knowledgeable on pertinent medicine information such as side effects, indications, and expiry dates of the medicine they were taking. Participant 7 echoed this reality by stating "Unfortunately, to be honest with you I just took the medication as per instruction. What was written there, what it is called I do not know. The expiry date, because of my VIB, I could not know at all."

Similarly, P12 also reported,

> "I know nothing at all about my medication. I just take my medication. I don't even know about the name of the medication. I have to ask my husband to read to me things about my medication. He will just read the medication and then tomorrow the next day I will forget about it. The name is not important just as long as I am taking it consistently. You can ask me what is the type of medication I am taking and I will not be able to tell you… I don't know any information regarding my medication. I don't even know if they even have side effects." ~ P12

A lack of adequate communication skills was noted by various participants (n=6). For example, P8 expressed frustration and annoyance at how some pharmacists addressed the person accompanying them to the pharmacy during consultations instead of them. Specifically, P8 recounted:

> "…you know one thing that annoys me it is when they explain to the person who is next to me and not to me as if I am deaf. Then I will tell them, listen, I am the

one who came here, you have to talk to me. They will like to convey the message to the person you are with." ~ P8

In support of this sentiment, P9 described such pharmacist actions as a cause of strife and frustration. P9 made the following remark:

> "Myself I open my mouth. They do not feel like it is I who is sick. They always ask someone who is next to me. Other people they can't always explain your problem I always fight with people like that." ~ P9

6.2.1.2 Poor pharmacist knowledge in managing VIB patients

This sub-theme outlines the way in which the participants reported a perceived lack of poor knowledge, attitudes and perceptions experienced during consultations with pharmacists. Participants (n=10) described various occurrences of lack of knowledge of visual impairment and blindness amongst pharmacists.

As such, participants stated that they sometimes had to inform the pharmacist that they were visually impaired to receive appropriate assistance. This notably led to feelings of discontentment, and frustration in some cases. Participant 1 narrated:

> "…we do have challenges with the people in the pharmacy, the pharmacist and all that. Because sometimes you are not written here [forehead] that you are blind…No one notices that you cannot see. Then whenever you start talking to that person needing more information, it means even the people who are not VI. They are still treated wrongly so. Until you say to the person that I am blind and can't see what you are giving me. But somebody cannot tell that you are blind even if the person is able to see it means that they are just going to walk without getting any help that he wanted." ~ P1

Another participant stated that a lack of awareness made it harder to go to the pharmacy because they had to constantly explain themselves. "Most of the time I do not go there alone. They do not have knowledge of blind people. Because I have to explain myself and try to explain harder so that they can try and understand what I am trying to say." ~ P9.

The perception held by pharmacists that most patients who they treat will be sighted, negatively affected the way the VIB participants were treated. "When I come with my script, I don't know what is written by the doctor, so don't expect me to know everything that is written by the doctor. Just prescribe me. And give me attention." ~ P9.

Other participants found that pharmacists sometimes counselled them without consideration or awareness of their condition. Participant 12 particularly shared this sentiment when she was asked if pharmacists should provide medication identification solutions for them. She responded,

> "They can if they are trained for it. Because if they can explain to a sighted person, why not me. There is nothing wrong with me I am just blind. They can just explain the very same solutions they use on a normal person they can use for me especially when it comes to identifying. To a sighted person they would say, you see this type of tablet. I don't see them. They must explain them to me, what type of pills/tablets. Yes, I can't see the colour whether it is brown, pink or what. But I can feel whether it is round. If they take that time. That would be appreciated." ~ P12

Pharmacists who displayed poor awareness and understanding of the VIB condition coupled with false perceptions of the capabilities of VIB individuals, led to the presentation of negative attitudes toward such patients. Such attitudes were noted by participants to affect the way pharmacist spoke to them and treated them. For instance, P10 reported that a pharmacist questioned why visually impaired patients came to the pharmacy without a sighted companion. She recalled,

> "Yeah, I think…maybe like I said, if you were very unfortunate you could get someone that does not have the understanding. I think some of the pharmacists would be asking you why are you coming on your own because you need some assistance." ~ P10

Such perceptions and attitudes produced negative sentiments amongst some of the participants. It made them feel less intelligent and capable than sighted individuals. Participant 9 expressed this succinctly,

> "They think that we know nothing. We do not think. And they do not know that some of us just became blind recently and we know a lot. When they talk to you, they talk to you as a child, you don't have a brain, you can't think." ~ P9.

Negative experiences caused by poor attitudes by pharmacists and their staff led to participants not desiring to return to such pharmacies, where they encountered negative attitudes that affected the level of helpfulness and service they received. Participant 3 recounted his experience:

> "Then I asked somebody that I needed helped. I was looking for soap and something else and I said where is it and they said over there. I was like can you show me. And they said just go over there. I don't go to those places anymore." ~ P3

6.2.2 Theme 6.2 – Recommended practices in treating VIB patients

This theme focused on understanding changes that the participants wanted improved after their experiences with pharmacy healthcare.

Most participants (n=9) wanted to see improved communication and better understanding between pharmacists and themselves. Participants wanted pharmacists to realise the importance of providing appropriate time and attention, within a space where respectful conversation comprising active listening and comprehension could occur. Participant 12 stated,

> "I would like to get the attention that I need. And I would like them to at least be willing to take the 5-10 minutes just to explain to me about my medication, what it is about. Yes, the doctor told you he will give you this medication for this type of problem. If you go there, they are the ones giving you the medication, they shouldn't explain to the next person about your medication. You are there. You are the one taking the medication. They should explain to you about the medication" ~ P12

Participant 9 shared similar sentiments as she emphasised that being cordial and providing a listening ear is not only a sign of respect but also creates a platform for constructive and efficient service. She pointed out, "Pharmacists should be friendly, not that you should love all the time. You listen to me when I need to talk to you. Just give me attention when I come to your counter" ~ P9.

It is this attention that enables a pharmacist to understand the patient and formulate solutions that cater to their specific needs. Essentially, the participants expressed a desire to be greeted warmly, attended to in a respectful and polite manner. In this instance, P4 wished,

> "Greeting someone. Remember I cannot see your features. Be nice. It is nice to be nice. By being rude it helps someone to talk and ask for help. How one greets you tells you if they will be helpful or not. If you can learn to be nice and patient to customers, it makes life easier to ask for help." ~ P4

An observable trend from the above accounts shows that, in some cases, pharmacists addressed the assistants who accompanied the participants to the pharmacy instead of the visually impaired or blind participants. This was seen as impolite, hurtful and disrespectful by various participants.

Participant 11 further alluded to the fact that

> "People [pharmacists] aren't educated about us. They don't know how to address our issues. For instance, with talking to blind persons, they would rather address the person assisting" ~ P11

Two other participants recounted occurrences of annoying, and frustrating behaviour. Participant 8 recalled,

> "Say I go to the clinic, and I have someone who is accompanying me, you know one thing that annoys me it is when they explain to the person who is next to me and not to me as if I am deaf. Then I will tell them, listen, I am the one who came here, you have to talk to me. They will like to convey the message to the person you are with." ~ P8

Meanwhile P12 stated,

> "I go to the window with him [husband] to fetch the medication, they will rather explain to him about my medication instead of explaining to me about my medication. About how I must take it. Those very same things they explain to him they explain to him. I stand there but they are actually talking to him about my medication. As annoying as it is…" ~ P12

Majority of the participants (n=9), respondents desired better relationships between pharmacist and themselves, creating a space where issues can be raised. Participants further expressed a need for better strategies and solutions provided by pharmacists to better serve VIB patients. Such strategies included the provision of braille material, an increase in education, training and awareness of pharmacists and their staff, and better counselling services. When asked about the ideal pharmaceutical services they would like to receive, participant 7 stated the following:

> "I need to know how that medicine works, the effects even if they set aside a closed area wherein, they are going to tell me. I understand that some of these things they can't say openly but maybe if there is a closed area where they can tell me, I would appreciate that. But also, if there are things like these pill boxes

> we need to know about. Any interventions, like brailed labelled medicine. One may need to know about that." ~ P7

Despite some implemented strategies to provide solutions, some were noted to have fallen short due to a poor understanding of how to effectively implement these solutions based on the needs of VIB patients. Participant 5 expressed this concern.

> "The first one is that nower days a lot of people have been telling me that yeah we trying to make things accessible so on our doors we have braille print as well as on our counters, and on our bathrooms. Then I would ask them, that is great I thank you for that. But tell me how do I get to that braille sticker. And they look at me like 'huh?" ~ P5

6.2.3 Theme 6.3 – Attitudes toward medical management

This theme outlines how the participants' attitudes to medicine, and medicine management impacted on the success of the pharmaceutical health outcomes of the VIB patient. Eleven of the respondents, gave various insights on the theme.

They noted how their attitude to their health condition affected their ability and attitude to managing their medication needs. Some participants (n=6), who developed non-congenital vison loss, described the trauma of losing their sight as adults. Through traumatic and difficult, these participants showed the determination and will power to adapt and thrive. It was observed that these individuals also possessed positive attitudes toward their medication management and practices. The essence of the positive attitudes was displayed in the following quotes:

> "God! You know. It was so difficult with me, but I have integrated myself in the blind community because I didn't have any proper training or whatsoever or life skills how to deal/survive when you are blind." ~ P1

Similarly, P4 lost their sight through an undiagnosed brain tumour. During the interview, they narrated their story as they reported:

> "What can I say? I have been through a lot. I am surviving. Life is about fighting every day and not giving up and not letting the struggles defeat you. That is what I have learnt from what I have been going through." ~ P4

Vision loss changed their ability to interact with the world around them as before. They had to learn new ways to manage themselves and, their medication needs. Their attitude toward adapting to their new way of life had an impact on their desire to learn new ways of adapting.

For example, braille was described by most individuals as difficult or challenging to learn. When further inquired as to what leads to the success of learning braille, participants (n=5) highlighted that one's outlook and attitude is a crucial determining factor.

> "It depends on how much they want to do braille. Braille is not impossible. If you want to do it. No matter your age you will do it. It depends on the person and whether they really want to do it. It is possible no matter the stage." ~ P12

It is this described attitude of determination that can be seen in the routines of participants who showed initiative in taking control of their medical management process. It was observed that those who had a positive attitude and outlook to their situation were more organised and took various initiatives to achieve their medical management goals. Participants were noted to have taken actions such as standing up for themselves during poor pharmacist consultations and taking active responsibility for their own medication needs. Participant 4 came across as possessing attitudes of independence, fearlessness and positivity during their interview. This was observed by the following remarks:

> "You know, somethings are not about the medication itself or having challenges or drinking the medication. I take it about how you take life. You know life, you have to have a fighting spirit. I have learnt to survive. I have learnt to make sure that I am able to do everything that I am able to do. I refuse to depend on people. I refuse to ask people for things. I will ask people when I have tried and failed." ~ P4

The influence of such attitudes was observed in the way their desire to be independent translated into the structuring of their own medication management processes. Such attitudes appeared to motivate participants to find their own creative ways to overcome challenges they faced with their medicine management. Participant 8 demonstrated this point.

> "…some other techniques you teach yourself. If I can differentiate other things like sticky tac. You can also use that to differentiate some of your things. By me, I can differentiate my things. You will find that even if they teach us, I also put my own ideas, and they get surprised we never taught you. Not everything you will have to be taught. You have to come up with your own ideas as well." ~ P8

6.2.4 Theme 6.4 – Medicine management practices amongst VIB patients

This theme delved into the processes, techniques and challenges relating to the medication management of the VIB participants. Upon analysis of data, three subthemes were derived.

These subthemes revealed insights related to the medication management techniques implemented by the participants, the use of technology in medication management, and the role carers and assistants of the participants took assisting various medication management processes.

6.2.4.1 Medication management techniques

All participants (N=12) had some type of process or routine in place to assist in managing their medication. These processes differed in the manner of execution or techniques used to accomplish successful management.

Without the sense of sight, participants relied on their sense of touch to navigate the world around them. The cohort used this ability to tactilely differentiate the shape and size of the tablets and their respective packaging. The familiarisation of the participants with their medicine was noted to take place at the point of consultation with a pharmacist or at home. Overtime a form of "touch-memory" developed that helped the participants to identify their medicine. This was the case with P3 who identified and memorised their medicines that way. They reported, "I actually asked the pharmacist like please explain to me which is which so that I can memorise the shape of the pill and the feel of the box."

Likewise, P2 described a similar process when getting new medication. The participant with the aid of a community worker would sit down and the assistant would help them feel the shape and size of the tablets and the containers they came in.

> "…my medication gets delivered to me. The lady sits with me. She tells me to feel. Most of them are coming in boxes. But they are in trays. She makes me feel the tray and feel the tablet on the tray. So, I know that my Metformin is the biggest one. I know the glycol something is in a different shape. Ridaq is also a different shape. Aspirin is another shape. Amlodipine is also different. What is the other one…Pharmapress." ~ P2

Most participants (n-9) identified their medication based on the unique shape and size of the medicine packages or by knowing the container in which the medicine is kept. In other instances, participants showed that familiarisation with their medication packaging gave them a sense of independence and confidence in their medication management routine. When faced with new or unknown medications, some participants skipped doses or stopped taking their medicine, for fear of overdosing, until a sighted individual helped clarify the doubt.

> "So, when I get extras, it becomes difficult. You get instructions to take in the morning and at night, so it is very difficult to differentiate, I check the size, how round, is it flat, is it big, something like that. Unfortunately for me I am unable to read written labels so I check with shape. If there is no one to read it for me like twice a day I don't take…I have to skip it. I take it in the morning, at least in the morning, I know I have to take this, If I have four tablets, I know I have to take 3 in the morn and 1 at night. And if I do not have an assistant. It means that the one I was supposed to take at night because I am scared of overdosing, I am struggling a bit on that one." ~ P9

When participants were asked if they used pillboxes or pill organisers to help compartmentalise and identify their medication, none reported any active usage of pill boxes in their medication management routine.

Participants like P5 invented and adapted their own techniques to improve their medication management. Participants used readily available items such as different shaped containers, adhesive sticky tack, paper clips, adhesive tape or staples to help identify their medicine or as part of a system to keep track of what medication they have already taken. The extract below highlights the use of a couple of these techniques.

> "What I then do if the medication is in the box I will ask my pharmacist to put staples in the box. If three times a day, 3 staples. With a bottle I ask them to place cello-tape or prestick [adhesive sticky tac]. On the other side I will ask them to mark 2 pieces of prestick/staples so that I know how many tablets to take. Sometimes when they use the little bank bags. I ask them to make a mark on the sticker." ~ P5

The use of braille as a medication management tool was reported amongst some participants. Of all the participants interviewed, eight were able to read braille. Out of the eight, seven learnt braille from childhood due to the congenital causes of their conditions. Despite the ability to read braille, these participants experienced the lack of braille on medication labels and packaging as a major challenge. Amongst, those able to read braille, only three came across medication packaging that contained braille. The lack of braille labelling was noted to be a challenge, such that one participant (P6) remarked that its existence "would help a lot".

Braille on medication labels was observed to bring about a sense of independence as participants were able to identify medication without the need of a sighted individual.

Participant 8, though a non-braille reader, expressed the essence of this sentiment by saying that braille labels on all medication would ensure that "people don't depend on people". The lack of braille leads to situations like the following,

> "Uhm, yeah because sometimes since we spoke that it is not braille branded, I need to make sure that maybe my mom or anyone in my family to check if this is real Panado or I am taking the correct [one]." ~ P7

Participants were asked if they had knowledge of, had used, or were provided with braille stickers by their pharmacists. Most of the participants (n=11) stated that they had no knowledge of them and had never come across them. Only P3 stated that they had heard of them being available but had never used them.

6.2.4.2 Use of Technology in Medication management

The use of technologies during the medicine management routine of the participants was a notable subtheme. Most participants reported using some form of technology daily. These technologies were used in an assistive capacity to help them navigate the world around them, provide information, or communicate with other individuals

All participants (N=12) reported regular access and use of mobile devices such as smartphones or tablets. With the use of accessibility features on these devices, participants used them for a range of tasks and activities ranging from information seeking behaviours to communication. One participant described their smartphone as their "friend", a friend that enabled them to "interact with the world.", a friend who enabled them to "talk to anybody at any time" ~ P1.

It was observed that all participants used at least one kind of mobile application that was designed to aid VIB individuals. The most common applications that were used as part of their medical management processes, included camera-based applications integrated with artificial intelligence (AI) that the participants used to read and identify things. Examples of such applications used included, EnVision AI, Kibo, Seeing AI, and Be My Eyes.

Within the context of medication management, participants described the essential part mobile assistive applications played. They were used to perform tasks such as reading labels, prescriptions and identifying medication. One participant described the key role that Be My Eyes played in helping them identify their medication.

> "I am very familiar with Allergex [antihistamine]. That is the only [one] I can touch and understand that this is Allergex. But otherwise, if there is no one I am

> not able to take those kinds of medicines unless I use Be My Eyes. I depend on Be My eyes." – P7.

Similarly, P3 used document readers to read patient information leaflets. They further expounded that, "The apps, especially the document readers, actually help me read the whole patient information leaflet. So you can know exactly the doses and you know what exactly is in it.". Being able to use such technologies to independently identify and access important information on their medication is an essential component of successful medication management.

Various participants relished the opportunity to no longer be entirely dependent on sighted individuals for their medication needs. One individual in response to the use of mobile applications as medical management tools stated that their use "would be brilliant as I won't have to keep on asking somebody to keep on telling me how many times, because sometimes it gets too much, and you forget." ~ P2.

Furthermore, the reduced need and dependence on sighted assistants, resulted in an increased sense of privacy. One of the noted challenges of having a caretaker was that the participants expressed concern at the lack of privacy they sometimes experienced when assisted especially when sensitive private medical information was involved. Participant 1 described such sentiments as follow,

> "Sometimes there are things that need to be known by you as an individual and no one else. Whenever you get your medication out for others to help you then they start reading and say oh look this guy is suffering from a b c d…So, they treat you differently from before they knew your condition." ~ P1

The respondent revealed that the use of mobile assistive apps and devices as being able to provide a sense of privacy and information security like "those things like doctor and patient confidentiality…[wherein]…This is my medication it is only for me to know about them" ~ P1

Despite the observed used and advantages of assistive technologies had on the medical management processes of the participants, a few (n=3) expressed concern at the lack of affordable, accessible, and readily available, medical measuring devices like blood pressure sphygmomanometers, and blood glucometers with capabilities to reveal the results in an audio format.

> "that does not go well on my throat is the machine that I am using to check my glucose level because it does not talk to me. I don't know if there is a new thing on the market that can talk to me. For example, if I can test my sugar, it needs somebody to be here with me to tell me what the level is. Is it a six or a seven? because it does not talk to me, I can't tell what my level is. I know how to prick myself. I know how to pour that drop on the strip. But I cannot see the readings because the machine does not talk and speak." ~ P1

6.2.4.3 Caretakers role in medication management

This subtheme focused on understanding the role of sighted assistants, played in the medication management processes of the VIB participants. Majority of participants (n=10) had someone who assisted them with their medical management processes. For some of the participants (n=8) had family members that assisted them while other participants (n=2) reported that neighbours, or community workers who assisted them.

Participants reported that caregivers provided them with confidence when administering their medicine, as they felt at peace, knowing that the right medicine and correct dose was being taken. Examples of this were reported by P6 and P7:

> "Well, my partner does assist me a lot given the challenges I have mentioned about directions. And some of these medicines are in containers which look similar especially with syrups." ~ P6

> "…[If] it is not braille branded, I need to make sure that maybe my mom or anyone in my family to check if this is real Panado or I am taking the correct yes." ~ P7

Conversely, the lack of an available person to help them caused some participants to skip their medicine, risk it and take their medicine without confirmation, or stop taking their medication entirely; highlighting the importance assistants play.

> "Unfortunately for me I am unable to read written labels, so I check with shape. If there is no one to read it for me like twice a day I don't take…I have to skip it. I take it in the morning, at least in the morning, I know I have to take this, If I have four tablets, I know I have to take 3 in the morn and 1 at night. And if I do not have an assistant. It means that the one I was supposed to take at night because I am scared of overdosing, I am struggling a bit on that one." ~ P8

> "I depend on assistance if someone is available. If I don't have anyone, I just take risks." ~ P8

One participant reported that they were assisted by a community worker who would spend time with them to help organise and provide information about their medicine.

> "The lady sits with me. She tells me to feel. Most of them are coming in boxes. But they are in trays. She makes me feel the tray and feel the tablet on the tray. So, I know that my Metformin is the biggest one. I know the glycol something is in a different shape. Ridaq is also a different shape. Aspirin is another shape." ~ P2

One of the challenges that several participants reported when visiting the pharmacy was the inability to go to the pharmacy unaccompanied. To overcome this challenge, participants used assistants to accompany them to the pharmacy. Participants were able to safely navigate the pharmacy and receive the necessary attention from pharmacy staff with the aid of assistants.

> "When I go, I go with someone to the pharmacy like to the clinic or someone goes and fetches the medication for me." ~ P12

> "I don't normally go myself. I always have an assistant which is not what really should be happening. I don't feel comfortable with that." ~ P11

It was noted that having an assistant was associated with some challenges. Some participants (n=3) reported discomfort associated with having an assistant present particularly when privacy was needed. One participant expressed this sentiment by saying, "Sometimes there are things that need to be known by you as an individual and no one else." ~ P1. Furthermore, the presence of an assistant had the potential to compromise patient confidentiality, which could lead to such fears as described by P1 below,

> "Whenever you get your medication out for others to help you then they start reading and say oh look this guy is suffering from a b c d. Even if that thing is not contagious. They will say you can see he is a bipolar, this guy. So, they treat you differently from before they knew your condition. They heard it from somebody else who was helping you." ~ P1

Assistants are not always available to assist. Some reports indicated that the provision of assistance could be a could be stress for both assistant and VIB individual, resulting in a reduced quality in service. In other instances, they did not properly check or read through

critical medical information such as expiry dates, side effects and dosage before administering to the person they are helping.

> "You know as a visually impaired person we undergo [so much] …we are even treated badly our families if you keep on asking like…what is this…they like get annoyed." ~ P8

> "…the people who are assisting me here go and get the medication. They do not check. The other time my sister came, and she decided to check my medication, she found that the other medication was expired." ~ P9

Some participants (n=5) acknowledged that the responsibility for their medication management was primarily theirs. Though assistants are useful, the need to understand the limitations of assistants was significantly understood. In other words, "Other people they can't always explain your problem" ~P9 and one must take the responsibility for their own healthcare. This understanding was demonstrated when P9 further explored this concept by saying," the challenge is if you do not keep your appointments yourself it means that you will miss out on your check-ups and stuff. So, it depends on you as a person."

One of the participants held a particularly distinct view on the roles, benefits and limitations assistants play in the care of VIB individuals.

> "I don't want people to stop living their lives and be concerned about me. I don't want the label of being, I can't see, or, I am partially blind and can't do anything for myself. Yes, I know it is my condition but that shouldn't put me in a position where I think that I cannot do anything. I refuse to say I can't do anything." ~ P4

6.2.5 Theme 6.5 – Barriers to health-seeking behaviour

This theme focused on the challenges, factors, and obstacles that prevented, discouraged or inhibited the VIB participants from successfully receiving pharmaceutical healthcare. This theme was divided into two subthemes. The experienced social challenges of seeking pharmacy healthcare, and the mobility and accessibility challenges of going to the pharmacy were reported.

6.2.5.1 Experienced social challenges

This subtheme summarises the social factors that discouraged or hindered the participants from visiting a pharmacy. These social experiences included, among others, experiences of stigma from pharmacists and their staff, experiences of stigma from the public at a pharmacy, and

experiences of anxiety and fear associated with pharmacy health seeking behaviours. Several participants (n=8) disclosed that they experienced some form of social stigmatisation due to their condition within the context of pharmacy healthcare.

Some of the participants (n=6) recounted that they were treated in a way that lacked empathy, and understanding towards them by pharmacy staff. Some participants felt judged and looked down on by pharmacists during their consultation sessions. This led to some participants feeling like they were seen as a burden rather than a patient deserving of time and attention like any other patient. This sentiment was expressed in an account told by one of the participants as stated below:

> "My problem with pharmacist is that they see you are visually impaired, but they are already criticizing somehow. You can hear it in their tone. What are you doing here kind of tone. Do I really have the time to come and explain to you. Like…hello I have work here and now you taking up my time I could use for someone else. But I mean I need help just as much as another person. That 10-15 minutes is the same time you would spend with another. So, what is wrong with explaining to me. I don't know how to explain, what would you call it…stigma but the way they treat us is not fair. At the end of the day, we are all people and we are there to receive treatment as much as anyone else. We deserve what we deserve. We do have the right to it. They just should give a bit of understanding." ~ P12

It is from a background of such preconceived misunderstanding, that such discriminating actions and behaviours occurred. Thinking VIB personnel are limited, attending pharmacy personnel were reported to inquire of one participant as to why they came to the pharmacy alone without an assistant to accompany them. They were described as unable, and reluctant to assist a visual impaired or blind individual.

> "I grew up knowing if I am walking alone to a supermarket. I have that privilege. I can't say a right it is something that is there though, that I can ask somebody to assist me to buy items now that is the same logic I use when going to pharmacies. But you find that in some cases they are more reluctant to be available to do that. I think that is unacceptable because a person asks why doesn't you find someone to accompany you. And I think that is off." ~ P6

A similar experience was described by another participant where due to their condition, the pharmacist, required the participant's assistant to be present during the counselling process.

> "I remember it happened once. I asked for the contraindications of this medication, and she was like no I can't attend to you all by yourself." ~ P1

Another felt belittled by the pharmacy staff because they appeared to question their intellectual capabilities. Being seen as less capable and intelligent was an observed concern of some participants (n=5). This notion of inferior intellectual abilities was noted to arises from other people's incorrect understandings of visual impairment and blindness. These preconceived perceptions led to the stigmatisation of these individuals. As one participant put it, "To them, if you are blind, you are just stupid." ~ P8. This left participant feeling stigmatised and hurt by such treatment.

> "I always fight with people like that…[that] think that we know nothing. We do not think. And they do not know that some of us just became blind recently and we know a lot. When they talk to you, they talk to you as a child, you don't have a brain, you can't think." ~ P9

In some cases, some members of the public at the pharmacies said things that the participants felt were negative. In such cases, participants were given equitable preferential treatment and certain people in the vicinity, without knowledge of the situation, made their discontent known. This made it uncomfortable for some of the participants. Participant 2 recognised this when they described such a situation.

> "Whenever I go with someone who is accompanying me, and they hear I am not supposed to be queuing, and they are here long before me. They do give those ugly stares at the person and me. So, I think they don't really like it." ~ P2

One participant noted that such negative societal pressures exerted on VIB individuals, led to them struggling with shame and anxiety because of their condition. Some of the participants stated they rarely or never went to the pharmacy alone in part because of these described social occurrences.

> "The very first time I have been to the pharmacy there are a lot of people who do not know even what the white cane is and that is an education thing. It is across all industries. Very few know what it is. A lot of blind people who are not comfortable walking with a cane are going to feel ashamed." ~ P3

6.2.5.2 Mobility and Accessibility

This subtheme explored how visual impaired-friendly the pharmacies that the participants visited were. Various participants (n=6) provided input in informing this subtheme.

The biggest mobility challenged that was observed related to transportation. For some, the long distances to pharmacies raised the problem of how to get there as some had limited to no access to private transportation. For others, fiscal limitations exacerbated travel logistics to distant pharmacies. Often, participants relied on family, friends or neighbours to assist in providing, or organising transportation. In such cases, it was common for them to be accompanied by an assistant when visiting a pharmacy. One participant while expressing their discontent at being given the wrong pen needles for their insulin pen in the past, stated the following in relation to organising travel to pharmacies,

> "Because for me it is difficult when I am home to go back to the pharmacy. They should take care of their own work and make sure. It isn't easy to go back even to get someone to take you back there" ~ P9

A few participants (n=5) indicated that they had visited pharmacies unaccompanied. These participants were observed to have an attitude of confidence and courage in their pursuit to be independent and not limited by their condition. In visiting pharmacies unaccompanied, various participants noted that they were not met with assistance at the entrance of the pharmacy by an attending floor staff or the security. It was observed from participants recollections, that some pharmacy staff were not able to identify participants who were blind even when they walked in using their white cane. Participants recalled having to inform staff about their condition before being guided to see the pharmacist. This raised concerns at the level of awareness that some pharmacy personnel possess with regards to persons who are visually impaired or blind.

> "The very first time I have been to the pharmacy there are a lot of people who do not know even what the white cane is and that is an education thing." ~ P3

The lack of recognition and assistance from pharmacy staff when entering the pharmacy made it more difficult to find their way round the pharmacy and receive the healthcare they needed. Some found it daunting, especially if they were unaccompanied. To improve the experiences of VIB individuals, some participants called for pharmacy staff to be more knowledgeable and receptive to their needs and aid where needed.

> "If you [pharmacy staff] see they walking into a pharmacy and they have the guide. Leave them to stand in the queue. Don't give them preference they have assistance. If they do not have assistance, yeah, go to them and asset them." ~ P5

As an aid to easier access within the pharmacy, some participants suggested that the lack of clear landmarks or guidance apparatuses aimed at visually impaired individuals made it difficult to independently navigate the pharmacy. The absence of braille on price tags and braille material at accessible locations in the pharmacy, meant those who could read braille had to find a sighted assistant or pharmacy personnel to assist.

> "The other thing is if you would really like to be a number one pharmacy is, you know these queuing systems where you have the ropes etc if that could be on the sides. Give us some guidance, landmarks where we can walk through your shelves. For example, those ropes that we can fell onto, and it guides us onto different shelves." ~ P5

Furthermore, several participants requested better guidance and procedures when waiting and queuing to see the next available pharmacist. Some pharmacies utilise audio ticket number system that calls patients to a particular counter that is available. In the case of unaccompanied visually impaired or blind patients, this becomes a daunting task without the necessary guidance from pharmacy personnel or an implemented guidance system.

6.3 Conclusion

In conclusion, the VIB interview participants reported experiencing poor counselling, communication, and assistance from pharmacists during pharmacy visits. This chapter revealed that pharmacists were reported to spend sufficient time during counselling sessions. Pharmacists were noted to possess poor knowledge, and awareness of the visual impaired/blind condition which affected the quality of VIB patient care. This led to negative VIB patient experiences that left participants feeling annoyed and frustrated. Participants wanted pharmacists to treat them cordially, and with respect, and to primarily address them and not their accompanying caregiver. Participants mainly used low tech assistive solutions during their medication management routine which included the use of braille, tactile markings and different containers. The use of mobile phones and mobile applications as part of their medication management processes was very common. Sighted assistants and caregivers played a key role in helping the participants identify and administer their medication. The attitude of the participants was noted to play a role in the success of their medication management.

Barriers to seeking pharmaceutical healthcare included the lack of accessibility features and blind friendly facilities, as well as negative social interactions and experiences at pharmacies.

Chapter 7: Discussion

This section presents discourse on the results and analysis of the data collected from the study. This current study is unique in that it is one of the first studies to explore the current state of pharmaceutical healthcare with VIB patients in South Africa, by investigating the challenges, and lived experiences of both VIB patients and pharmacists.

7.1 Purpose of the study

The aim of the study was to explore and assess the state of pharmaceutical healthcare regarding the care and treatment of visually impaired and blind (VIB) individuals in South Africa. The study achieved this by researching the knowledge, attitudes, and practices of pharmacists in the treatment and counselling of VIB patients. The research also determined the practices, experiences and challenges of VIB patients regarding their medication management.

7.2 Discussion

7.2.1 Pharmacist knowledge. attitude, and training needs

The first phase of the study was focused on determining the current state of pharmaceutical healthcare with VIB individuals amongst pharmacists in South Africa. This was achieved using a survey. Data collected revealed a number of notable findings.

The level of knowledge among pharmacists relating to visual impairment, blindness and the provision of services to VIB patients was poor. Additionally, most participants from the pharmacist cohort were not knowledgeable of existing assistive aids or practices used to care for VIB patients. Most pharmacist interviewees self-reported poor to moderate knowledge levels. These levels were observed during recollections of their experiences that demonstrated a lack of understanding of VIB patients. Interviewees were not knowledgeable on the best ways to interact, counsel and treat these patients. This led to negative pharmacist attitudes and perceptions, that affected the level of care they provided to VIB patients. The net effect caused frustration amongst the patients at the manner of service rendered. Notably, several participants stated that poor awareness and perceptions of VIB patients was a contributing factor in deterring them from seeking pharmaceutical healthcare.

These results obtained in this study agree with similar findings by Badr, that poor knowledge levels significantly compromise service delivery service to VIB patients (Badr, 2024). The lack of knowledge regarding VIB patient pharmacy healthcare has been shown to cause negative experiences particularly where poor level of knowledge lead to the inappropriate service and

treatment of VIB patients (Harrison, Mackert and Watkins, 2010). This present study also found that patients felt of less perceived value by pharmacists because of the poor service they received. Clearly, poor knowledge levels amongst pharmacists could be seen as a barrier to pharmacy seeking behaviour (Koo *et al.*, 2016). As pharmacists are key healthcare providers for VIB patients, pharmacists need to be able to identify patients who are visually impaired and have a firm understanding on how to provide patient centred care services.

This general lack of knowledge, and awareness observed in this current study is consistent with outcomes from other studies. In 2010, Sharts-Hopko et al. studied how VIB women experienced healthcare by conducting focus groups amongst 18 VIB women. They identified the lack of health professional's awareness regarding visual impairment and blindness as a major theme. Participants noted that health professionals were insensitive to the limitations of their condition when they wrote instructions down assuming they could read, used non-verbal communication gestures during consultations, and did not provide navigational assistance round facilities (Sharts-Hopko, Smeltzer and Zimmerman, 2010). A UK study also showed that the knowledge levels among their respondents were poor, noting that such levels led to improper medicine counselling to VIB patients (Barnett *et al.*, 2017). A systematic review of available data on pharmaceutical care of patients with sensory loss, observed a similar trend. Based on their findings, the authors concluded that providers of pharmaceutical healthcare were neither sufficiently skilled nor knowledgeable in providing health care to VIB patients (Killick *et al.*, 2018).

One of the main reasons for the observed poor knowledge levels of the pharmacists can be ascribed to a lack of poor training and education. As this study found, only 4% of survey respondents had some form of disability or VIB training. Similarly, under Theme 5.2, a lack of training and education a significant subtheme. Amongst the pharmacist interview cohort, 2 (17%) participants acknowledged personal unofficial study of visual impairment and blindness to improve their practice. The remaining participants did not receive any training on disability or visual impairment and blindness. Theme 4.3 (staff training) of the open-ended survey questions noted improper VIB treatment techniques because of a lack of experience and training.

The observed lack of training and awareness of pharmacists has played a significant role in the current state of pharmaceutical healthcare for VIB patients in South Africa. This study suggests that lack of tertiary pharmacist training on the healthcare needs of VIB patients has resulted in

poor pharmaceutical care towards VIB patients. This has been evidenced by accounts of pharmacists not providing enough time and information during counselling sessions, or medication management solutions to their VIB patients because they were not trained on their availability or use. The study's VIB interview participants perceived some pharmacists' counselling and communication skills as ignorant and insensitive primarily owing to a lack of adequate sensitisation and education.

Consistent with this study's findings, global research on training and education of pharmacists indicates a lack of disability and VIB training amongst pharmacists. A Saudi study seeking to improve dispensing and counselling for VIB patients, interviewed 26 pharmacists. Their results indicated that none of their participants had received any tertiary training on VIB patient care (Kentab *et al.*, 2024). Moreover, Alhusein et al. conducted interviews with 30 UK community pharmacists and support personnel, exploring their experiences in treating elderly patients with sensory loss such as visual impairment and blindness. Similarly, the study revealed a significant need to improve the disability and VIB training standards of pharmacists in dealing with VIB patients as participants admitted to not having strategies or procedures to accommodate patients with sensory loss (Alhusien *et al.*, 2019). Notably, the absence of appropriate disability and VIB content in undergraduate and postgraduate curricula has prompted calls for evidence based training to be identified and included in the training of pharmacists and their support staff (Barnett *et al.*, 2017; Killick *et al.*, 2018; Lee *et al.*, 2023).

A re-evaluation of current curricula that are taught in tertiary levels of education to include more structured and comprehensive VIB patient training content has been shown to have a positive impact on the knowledge, awareness and understanding levels of pharmacists (Tang *et al.*, 2021). Training curricula and lectures should be informed by or conducted with VIB individuals to provide a platform with trainees to interact with the lived experiences and challenges of visual impairment and blindness. Simulation training with VIB persons has been shown to be very beneficial in improving the training outcomes of students by producing a holistic and deeper understanding of the disabled patient's experience, especially with regards to pharmacy healthcare (Juniat *et al.*, 2019). Training interactions with VIB persons will enable students to understand the best practices in effective and appropriate communication and counselling practices.

Training should include lectures on the condition, causes and challenges of visual impairment and blindness. Education and training on available assistive visual aids, and useful dispensing

techniques should be included in curricula. Pharmacy practice courses should provide training on practical ways to aid VIB patients in the pharmacy. Based on findings from this current study, examples of such practices can include the provision of a sighted staff assistants to aid patients round the pharmacy, the possession and provision of dispensing and medication management solutions for VIB patients, and the utilisation of a private counselling area when attending to VIB patients.

The potential benefits of effective VIB patient training include increased sensitivities and empathy towards VIB patients (Miller, 2015). This will inevitably aid in breaking the stigma and negative perceptions some pharmacists hold towards patients with sight loss. The pharmacy community can then appreciate not just the limitations but the capabilities of VIB patients (Peiris-John *et al.*, 2021). Understanding the lived experiences of people living with disabilities has been shown to have the potential to change the attitudes of trainees (Shakespeare and Kleine, 2013). Furthermore, better trained pharmacists increases the possibility of having more VIB patients seek pharmaceutical healthcare because of better services (Kentab *et al.*, 2024). Competently trained pharmacists will improve the standard of pharmaceutical health care to VIB patients in South Africa.

Furthermore, the present study indicated that the survey respondents overall possessed largely moderate (34%) to positive (65%) attitudes towards VIB patients and sight loss. The findings indicated that they recognised the importance of addressing the needs of VIB patients. This was demonstrated by their positive attitudes towards VIB care, and implementing new VIB assistive technologies and counselling techniques, and improving their facilities and skills to better serve the VIB community.

The positive attitudes towards the importance of VIB patient care and the pursuit to improve such care was a finding in line with outcomes from available literature. Kentab et al, noted that their Saudi pharmacist interviewees, despite possessing no VIB training, emphasized the necessity of undergoing training to improve care for VIB patients (Kentab *et al.*, 2024). According to results from their study, the participants who showed positive attitudes to VIB patient care were observed to be proactive in seeking ways to improve the patient's pharmacy experience, despite receiving no formal training. This possibly supports the hypothesis that positive pharmacist attitudes lead to better patient satisfaction and overall health outcomes as proposed by Barghouth et al. (Barghouth, Al-Abdallah and Abdallah, 2021). Furthermore, positive attitudes toward VIB patient care by pharmacists may result in pharmacists being more

inclined to participate in VIB patient training activities, imperative to the improvement of VIB patient health service delivery.

The consequences of negative pharmacist attitudes can have detrimental to patients. For instance, a qualitative study exploring health literacy challenges within the US healthcare system, noted that negative healthcare attitudes was a hindrance to health literacy education and overall medication awareness (Harrison, Mackert and Watkins, 2010). Pharmacists must be encouraged to always ensure positive attitudes and perceptions regarding VIB patients. The inclusion of VIB patient care content in undergraduate pharmacy programs has the capacity to improve the attitude outcomes of future pharmacist in the country.

Interestingly, though results from the survey identified positive attitudes towards VIB care, results from the VIB interview cohort provide a different perspective. Theme 6.1.2 revealed that participants faced negative attitudes based on false perceptions of VIB persons that negatively affected the level of care they received. In some cases, pharmacists were reported to be unkind, condescending and demeaning in communication and care (Barghouth, Al-Abdallah and Abdallah, 2021). Such a result indicates a gap in the apparent and perceived pharmacist attitudes regarding their practice toward VIB patients. This further highlights the powerful influence that attitudes and perceptions have on patient care and the need to address them.

7.2.2 Pharmacist implemented practices in VIB patient care and experienced challenges

The pharmaceutical care of VIB patients poses various challenges (Badr, 2024). This current study revealed insights into the current practices implemented by pharmacists in VIB patient care and treatment. According to the survey data, only 12% of respondents were determined to have poor practice levels, implying that the majority of pharmacists implemented positive and helpful practices and techniques.

This study found a variety of counselling practices used by the pharmacist in South Africa. Counselling interventions ranged from treating VIB patients the same way as sighted individuals with no regard to adapt to the needs of the patients, to implementing measures such as spending extra time and attention on the patient; repeating instructions to ensure patient understanding, and conducting counselling in private, quiet counselling areas. These counselling practices have been observed in previous studies. Lee and Lee identified that the repetition of instruction by their pharmacist sample was the second most common counselling practice (Lee and Lee, 2019). Similarly separate counselling areas have been proven especially

useful to VIB patients (Badr, 2024; Lourens and Zeyen, 2024). An innovative practice by a few participants was the act of following up with VIB patients to ensure medication adherence, address challenges or even book future appointments. This practice was consistent with similar practices identified by Alhusein et al. where such visits were identified as beneficial in ensuring medication adherence, and patient satisfaction (Alhusien *et al.*, 2019).

On the other hand, results from the VIB interview cohort provided a contrasting perspective on the state of pharmacist's counselling practices based on their pharmacy experiences. The biggest complaint that interviewees had was the lack of appropriate counselling and poor communication skills. The VIB participants reported that some of pharmacists appeared rushed for time and were not able to answer questions or commit enough time counselling on the dispensed medication; similar to observations in available literature (Alhusien *et al.*, 2019). This was particularly evident in public health institutions where patients left without a complete understanding of their medication and regimen therapy. A similar study found that 46% of their VIB participants did not feel sufficiently informed to ensure the safe and appropriate use of their dispensed medication when they left the pharmacy because of the poor communication and counselling (Kentab *et al.*, 2015). A Belgium study on VIB patients and 18 community pharmacists, found that the pharmacists lacked adequate counselling practices and struggled with communicating appropriately with VIB patients (Merenda, Denis and Patris, 2024). Poor communication skills between pharmacists and VIB patients could possibly have been a causal factor in the poor knowledge of key medication information (warnings, expiry dates, dosing instruction) amongst the majority of VIB participants. In some cases, this led some to seek medication information from other sources, such as family members, friends, or the internet.

The aim of pharmacist-patient counselling session is the efficient transfer of health and medication information from pharmacist to patient. Pharmacists play a crucial role in providing medication information to VIB patients, otherwise the practice of seeking information from other sources can pose risks to patients' health literacy due to the unreliability of information sources (Riewpaiboon, 2009). Thus, pharmacists should ensure that enough time and attention is provided during counselling sessions to ensure patients understand their dispensed medication and are confident with its safe and correct use (Orrico, 2013).

From the pharmacist participants perspective, results indicated that it was common for VIB patients to visit the pharmacy accompanied by a sighted assistant, usually a family member or a friend, a finding consistent with observations from previous research (McCann *et al.*, 2012;

Kentab *et al.*, 2015). Pharmacists found it useful to have an assistant with the VIB patient during counselling sessions. Despite this, during consultations some pharmacists did not know who best to address, the patient or the assistant. This resulted in a variety of pharmacist behaviours where slightly over 50% of pharmacists interviewed addressed both individuals and the rest addressed one or the other. The uncertainty in counselling practice, could have possibly resulted in the reported feelings of alienation, frustration and annoyance by the interviewed VIB participants in this current study. This finding contrasts results obtained from a study that evaluated the medication use and pharmacy services for VIB persons in South Korea. The findings indicated that 62% of pharmacies addressed the assistants who accompanied the VIB patients to the pharmacy. The authors hypothesised that such actions were responsible for the poor levels of medication and health knowledge amongst their VIB participants (Lee and Lee, 2019). True to the findings of this present study, pharmacists need to counsel both the VIB patient and their assistant, whilst primarily addressing the patient, in order to improve medication knowledge and awareness outcomes amongst VIB patients.

Suggestions and improvements for better pharmacist practices were provided by the VIB interviewed cohort. They requested better quality in counselling and communication during their consultations with pharmacists. They wanted pharmacists to be more understanding and empathetic. Participants desired to be respected, greeted warmly, and made to feel welcome. These findings suggest that such changes would foster better VIB patient-pharmacist relationships (Lourens and Zeyen, 2024). Majority of participants identified that the lack of poor counselling and communication of the pharmacists was caused by their lack of knowledge and understanding of VIB patients and sight loss. This led to a repeated calls by VIB participants to see better training, and sensitisation occur amongst pharmacists (Riste et al., 2023; Kentab et al., 2024).

Additionally, VIB interviewees requested the provision of better solutions and strategies to assist them when they sought pharmacy health care. This included solutions to navigating inside the pharmacy, and medication management challenges they faced. These recommendations were consistent with observations made by VIB samples in previously conducted research (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017; Almukainzi *et al.*, 2020). Similarly, a Thai study investigating medication usage amongst 86 blind participants, recommended including the provision of braille labels (77%) or tactile markings on packaging (64%), and the provision of more thorough explanations of their medication during the counselling and dispensing process (64%) (Riewpaiboon, 2009). The improvement of

pharmaceutical healthcare to include appropriate counselling and dispensing strategies for VIB patients, has the potential to improve VIB patient's pharmacy experiences, medication/ health information, and medication adherence (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017).

In all, one of the main goals of counselling is the formation of relationships between pharmacists and VIB patients. Fostering good social and professional relations with VIB patients has the capacity to positively improve the pharmaceutical care they receive. The lack of good pharmacist – VIB patient relations in South Africa was identified by a study that explored the state of pharmaceutical healthcare in South Africa for VIB patients. Based on their findings, the authors strongly recommended an improvement in relations between pharmacists and VIB patients as a means of improving service delivery to the VIB community (Lourens and Zeyen, 2024). The state of poor relations stems down to the lack of awareness regarding VIB patients. When faced with VIB patients, some pharmacists are not sure how to engage VIB patients, which leads to uncomfortable counselling sessions, and ultimately negative pharmacy experiences for the patients.

Regarding dispensing practices and assistive medication management aids provided by pharmacists, braille was the most well-known visual aid amongst participants. The use of braille on medication packaging, braille labels and braille stickers were reported uses of braille in the pharmacy. Notably, the actual use of braille material during dispensing was solely limited to medication products that had braille imprinted on the packaging by the manufacturer. Pharmacists did not report the use of braille labels, or the provision of medical information in braille format. This was further corroborated by VIB participants from the interview cohort. The interviewees confirmed that they did not receive any medicine information in the form braille pamphlets nor were any braille labels provided by pharmacists. The a lack of braille labels and medicine/health information leaflets in braille used in pharmacies is not solely a South African observation, but a trend that has been reported in pharmacies around the world in countries like South Korea (Lee and Lee, 2019), Ethiopia (Dagnachew, Mesheshea and Mekonen, 2021), the UK (Barnett *et al.*, 2017; Riste *et al.*, 2023), Malaysia (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017) and Thailand (Riewpaiboon, 2009). Similar findings were reported by Kentab et al., who conducted an exploratory study on the medicine use of blind patients in Saudi Arabia. From their survey of 95 VIB participants, none reported receiving patient medication information pamphlets in braille, while only 17 participants stated they had been provided with braille labels from their pharmacists. Despite this, their results showed that over 90% of their participants identified braille as a helpful medicine identification aid (Kentab *et*

al., 2015). A similar study conducted in Saudi Arabia 5 years later, found that the use of braille and braille labels was the preferred assistive aid for their sample noting that it provided a sense of independence to VIB persons when labels and medicine information in braille were made available (Almukainzi *et al.*, 2020).

The findings from this current study, indicate that the lack of braille as an assistive tool within pharmacies leaves much to consider. Firstly, it highlights the lack of knowledge and awareness of braille and other braille products (braille labels, braille printer, braille medicine information leaflets). This situation could be improved via appropriate training and sensitisation on braille and other similar assistive solutions. The results further demonstrate a lack of resource allocation for braille aids by pharmacies. As braille has evidenced benefits for VIB patients, pharmacies need to make efforts to ensure that they have the capacity to provide braille labels, and medication information in braille. Thirdly, the lack of medication information in braille formats leaves VIB patients at risk of not sufficiently understanding key medication and health information such as side effects, warnings and dosing instructions, which are necessary for the safe and effective use of medicine (Dagnachew, Mesheshea and Mekonen, 2021). It is recommended that medical information be available in formats that are conducive to the needs of the VIB patient (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017).

Despite the usefulness of braille as a mode of communication and a medication management aid, not every VIB individual can read braille. The majority of VIB participants in this current study could not read braille as they lost their sight later in life. Most participants attributed their inability to read braille to its challenging nature and to the lack of opportunities to learn braille as an adult. Considering this, pharmacist must be cognisant of this fact and provide alternative medication management aids, such as assistive devices that provide information in an audio format, to their patients

Other pharmacist reported dispensing aids included pill organisers (e.g. pill boxes), using different sized or shaped containers when dispensing or the use of tactile aids (tactile stickers, rubber bands, staples, markings on packaging). Most pharmacist interviewees stated that they tried to help the patients identify their medicine by directing them to feel the medication (e.g. tablet shape and size) and its packaging (e.g. blister packs) during counselling sessions. The next most common technique was the use of different container shape and sizes. For patients who were moderately visually impaired, participants reported the use of larger font sizes, or coloured stickers to aid identification. The use of such dispensing aids by pharmacists has been

observed and reported in a number of studies (Orrico, 2013; Kentab *et al.*, 2015; Easley, Kuber and Ozok, 2017; Almukainzi *et al.*, 2020). Described as low tech assistive visual aids, they offer simplicity, affordability, and intuitive solutions that are effective if made available to VIB patients. (Almuzaini and Abdullah-Al-Wadud, 2018).

According to this current study's findings, the overall reported use of low-tech aid solutions was relatively low in practice. Reported aids included the use of different sized containers and and pill boxes. Various South African studies have observed similar low usage rates of visual assistive aids for VIB patients in the country (Poka, Chanyandura and Witika, 2022; Lourens and Zeyen, 2024).

Globally, according to available literature the use of such dispensing aids varied around the world. One study reported that only 20% of their VIB participants had medication dispensed to them with tactile markings on them (Riewpaiboon, 2009). Similar low usage of these aids was observed in a South Korean study, where only 36% of pharmacies in the study acknowledged the use of dispensing aids to different dispensed medicine (Lee and Lee, 2019). Notably, the use of assistive devices designed for VIB patient medication management, such as Scriptalk® and Talking Rx®, was not reported. Most participants stated that they were not aware of commercially available assistive devices. The use of such devices in developing countries has been shown to be uncommon owing to the lack of availability of these devices in these countries and the high costs associated with procurement (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017). Additionally the low use of these aids could be attributed to lack of training awareness and resource allocation to stock such aids in the pharmacy (Merenda *et al.*, 2024). The use of economical low tech aid solutions should be encouraged as they are more affordable than assistive devices such as Scriptalk®. Essentially, medication management aids for VIB patients has been used to improve the health outcomes of patients, as it aids in medication adherence and overall therapeutic regimen therapy (Cooper *et al.*, 2023).

The use of mobile phones and mobile applications was not a common tool used by pharmacists in their medication dispensing practices toward VIB patients. A few survey respondents used VIB patient's mobile devices to record voice recordings of medication instructions. The results suggest that most participants were not aware of VIB individuals use of smartphones and assistive applications in their daily lives to be able to utilise such technology as a platform to better provide medication management solutions. Medication management mobile assistive technologies for VIB persons offer many benefits that warrant use in pharmacy practice

(Senjam, Manna and Bascaran, 2021). However, studies have shown that concerns such as mobile application security, reliability, ease of use, and content quality can act as barriers to the adoption of such tools in practice (Illiger *et al.*, 2014; Davies *et al.*, 2015). Designing applications and devices with these factors in mind has the potential to improve their use in the pharmacy setting.

Generally, results from this study highlighted a general lack of dispensing solutions, resources and readily available services for VIB patients. No pharmacists reported offering VIB services in their pharmacies as part of their standard practice. Pharmacists provided treatment and services to VIB patients as and when needed. This is in line with findings from studies conducted in the UK and Saudi Arabia that identified an absence of regular routine pharmacy service packages tailored to VIB patients and customers (Kentab *et al.*, 2015; Barnett *et al.*, 2017).

Several pharmacist participants from this current study provided insights into possible reasons. Firstly, participants stated that they did not receive enough visits from VIB patients to warrant the inclusion of such services in their practice. Secondly, the low number of VIB patients deterred some pharmacists in economically investing in VIB services for fear of a poor return on monetary investments made. In spite of these reasons, there are many VIB practices and assistive aids that can be provided that are affordable and made available whenever a VIB patient seeks pharmaceutical healthcare. The provision of excellent pharmaceutical healthcare services mandates that pharmacies need to be able to have services and solutions on hand ready to provide the best care to VIB patients.

7.2.3 VIB self-medication management practices and challenges

Medication management has been defined as the processes, and procedures put in place to enable the safe and proper use of medication (Aykan, 2012). Medication management encompasses all aspects of a pharmacotherapeutic regimen that lead to the success of the applied treatment. This study identified the various self-medication management techniques that the VIB participants used in their daily lives.

The main medium by which participants identified their medication was via the sense of touch. This involved familiarisation with the medication packaging, and the dosage form (shape and size). Although commonly reported in previous research, participants from this study did not report using their sense of smell to differentiate between the different odours of the their medicines (Easley, Kuber and Ozok, 2017; Almukainzi *et al.*, 2020). In instances where the

packaging between two medicines was similar, the use of other containers that were differently shaped and sized was common. There was no reported use of pill organisers such as pill boxes. Most participants were not aware of the possible use of pill organisers as medication management tools. The use of self-devised tactile techniques was common which included the use of household items to help mark and identify medication. These items included objects such as adhesive sticky putty, paper clips, or staples. Similar usage patterns and techniques have been observed by studies investigating the medication management of VIB patients (Lee and Lee, 2019; Almukainzi *et al.*, 2020).

Though majority of participants were able to read braille, the use of braille as an identification technique was not common as not all medication packaging had braille on it and pharmacies did not provide braille stickers or braille labels during dispensing. The use of braille labels and braille on medication packaging must be encouraged as it has been shown to significantly reduce therapeutic errors such as misidentification of medication and taking the wrong medicine (Shetty, Sunita and Shetty, 2021). Additionally, the use of braille labels and other such dispensing aids helped reduce the dependence on sighted caregivers, or assistance (Easley, Kuber and Ozok, 2017).

The use of medication management assistive devices, such as PenFriend® and Scriptalk®, was not reported amongst the participants. Studies done in Malaysia and Saudi Arabia, revealed similar usage patterns (Kentab *et al.*, 2015; Zhi-Han, Hui-Yin and Makmor-Bakry, 2017). The high costs and lack of commercial availability of such assistive devices in South Africa were the main reasons for them not being adopted in medication management routines. Over half of the VIB participants interviewed were on social welfare, and the high costs of these devices were not an economically viable option.

The use of mobile devices and assistive mobile applications as tools in VIB patient medication management has been well documented (Easley, Kuber and Ozok, 2017). All VIB participants revealed that they used mobile devices and mobile phone applications as part of their medication management routine. The smartphone was observed to play a key role in the participants life as it enabled the participant to interact with the world around them. One participant described their phone as a "friend". The one friend who is always present ready to assist with social interactions, information access, and navigation. This is possible due to the advances in accessibility features on mobile devices (Senjam, Manna and Bascaran, 2021). Smartphones and mobile devices have created a platform for the development of assistive

mobile applications such as Be My Eyes, Kibo, Seeing AI, and Envision, which were some of the most used assistive applications by the VIB participants in this present study. As part of their medication management routine, these applications enabled the participants to identify their medication and read medication labels and patient information leaflets. These mobile applications were free to download, easy to use, and usually of no cost to the patient, which are key factors that have been identified to improve the success of an assistive applications (Riste *et al.*, 2023).

This current study's findings on the frequent and ease of use of mobile application contrasts findings by Nimmolrat et al. who interviewed 60 VIB volunteers analysing the problems they experienced with their self-medication management. Their data revealed that nearly 45% of their sample found the use of smartphones and the operation of pharmaceutical mobile application difficult to use (Nimmolrat *et al.*, 2021). Possibly, with the increase and improvement in mobile application design and phone accessibility features over the years, the use of mobile applications has become easier further spurring the use of assistive mobile applications and mobile device use amongst VIB patients (Senjam, Manna and Bascaran, 2021).

Various participants had chronic conditions such as diabetes and hypertension that required the use of devices such as sphygmomanometer and glucometers to help manage their conditions. Most of available parametric devices do not have audio output functions to make results accessible to VIB patients. Devices that do offer such accessibility features, are often expensive and inaccessible to patients with financial constraints (Easley, Kuber and Ozok, 2017). The interviews from this present study echoed similar sentiments. The biggest concern that the VIB participants had was the lack of affordable and accessible assistive measuring devices, for most participants, this excluded them from accessing these devices. Hence, they relied on sighted caregivers to aid in testing and reading the results.

Furthermore, results from the VIB cohort interviews, suggest that the attitudes the participants possibly had an effect on the success of their medication management and overall therapeutic regimen success. Participants who had positive attitudes to their condition, and circumstances were observed to be more determined, courageous, independent, and took better initiative to improve their lives (McCann *et al.*, 2012). They reported performing activities such as going to the pharmacy or going shopping unaccompanied more than the other interviewees. A study investigating factors affecting VIB patients attitudes, speculated that positive attitudes led to

more optimistic individuals who interacted more with the world around them by participating in such activities as have been described above (McIntosh, 2018). Such positive attitudes and a desire for independence, appeared to have a positive effect on the self-medication management processes of the VIB participants in this current study. They often had more organised medication management routines, and techniques. They were also observed to use more mobile applications to increase their independence and need for sighted assistants.

Caregivers play an important role in the medication management routines and healthcare outcomes of VIB persons. McCann et al. identified that VIB patients are 2.8 times more likely to need assistance with their medication management than sighted control groups (McCann *et al.*, 2012). Caregivers and assistants were often used by the VIB participants to assist in key medication management processes. In accordance with findings from available literature, assistants aided the participants in tasks such as medication identification, and administration, accompaniment to pharmacies, as well as, reading material such as medicine labels and patient information leaflets (Easley, Kuber and Ozok, 2017; Almukainzi *et al.*, 2020). The role caregivers and assistants play in the medication management processes of VIB patients cannot be overstated. Beyond the scope of medication management, they provide a source of physical, mental and emotional support to VIB individuals that is vital to achieving positive health outcomes (Bambara *et al.*, 2009).

Though useful, various limitations were identified. Caregivers were not always present. In cases where caretakers were not available, the VIB participants notably skipped their medication, or took chances and administered unidentified medication; actions which can pose serious health risks to the patients. VIB participants were also concerned at the lack of privacy they had if caregivers were present during sensitive counselling sessions. VIB interview participant, P1, was particularly vocal of the social implications that having a sighted assistant privy to their sensitive health information would have. Caregivers, when representing the patients during pharmacy counselling sessions, were reported to sometimes not comprehensively explain the problems and inquiries of the VIB participants. As studies have demonstrated, difficulties often arise when carers fail succinctly express the sentiments and health information of VIB patients (Harrison, Mackert and Watkins, 2010; Easley, Kuber and Ozok, 2017).

Sighted assistants were most often family members, and some participants expressed the desire to not be a burden to them indicating a need for independence and control of their healthcare

management without total dependence on others. Thus, the use of medication management techniques, whether low tech or mobile assistive technologies, must be encouraged as it has been shown to help regain VIB patients sense of independence, and privacy (Almukainzi *et al.*, 2020). Total dependence on sighted carers has the potential to result in negative social relations between the carer and the patients, which could possibly result in further psychological and emotional stress for assistant and patient (Alhusien *et al.*, 2019). Providing care to VIB patients can sometimes place carers at risk of developing psychosocial stress from the demands and tasks associated with caring for a VIB patient (Bambara *et al.*, 2009). Awareness must be raised amongst VIB participants and pharmacists to be wary of the stresses and challenges that accompany the role of being a caregiver. Pharmacists must be able aware of this and be available to provide support to caregivers where necessary.

Some other challenges that the VIB participants experienced in relation to their medication management were medication identification, and administration. The loss of sight made it difficult to read labels, patient information leaflets and clearly identify medicines based on their colour, packaging or dosage form (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017). Half of the participants expressed concern at the challenges posed by low vision, and medicine identification. Interestingly, this was not a source of concern for individuals who demonstrated well organised medication management processes and routines. This possibly suggests that one of the keys to successful self-medication management is organisation. This observed link was noted in earlier research that identified organisation within the daily life of VIB individuals as a positive facilitator to improved quality of life. (Orrico, 2013). Organisation is achieved by implementing several measures. These measures include identifying the best medication assistive measures to help identify and administer medication; properly storing the medication; and creating a habitual medication management routine which has been shown to improve medication adherence.

Though not as commonly found in this present study, studies have shown that taking the wrong medication or dose is a common occurrence amongst VIB individuals (Kentab *et al.*, 2015; Almukainzi *et al.*, 2020). This leaves VIB patients at greater risk of harmful health consequences (Killick *et al.*, 2018). To highlight such risks, considering that VIB patients struggle with the administration of liquid dosage forms, one participant from this current study, stated that they often drank liquid dosage forms straight from the bottle without measuring. As a result, most participants requested the use of non-liquid dosage forms from their healthcare providers were possible. Of note, findings revealed that the diabetic members of the VIB

interview cohort had no issues administering insulin via injection. This was attributed to the ease of use of the modern insulin pen has made it convenient for VIB patients to administer the correct dose of Insulin units as needed without the need for a sighted carer. Similar observations were made by a US study exploring the medication challenges of VIB individuals (Easley, Kuber and Ozok, 2017).

VIB participants had challenges accessing medication information. Of the participants, 33% reported or demonstrated a lack of complete knowledge regarding their medication. Most participants were not able to provide details on pertinent information such as the medication expiry date, contraindications or warnings. Similar to findings by Zhi et al. what appeared important to them was ensuring that the medication they were dispensed was taken. Potential reasons for the poor state of medication awareness include the current state of poor pharmacists counselling and communication skills during pharmacy visits, and a lack of medication information being presented in appropriate formats such as braille and health audio formats for reference when they returned home. Poor medication awareness by VIB patients can lead to negative health consequences (Harrison, Mackert and Watkins, 2010). Pharmacists play an important role in patient health literacy. Pharmacists need to be aware of the health literacy challenges of VIB patients and must strive to consistently be a source of reliable health information (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017).

7.2.4 Barriers to VIB pharmaceutical health seeking behaviours

This study identified several barriers to pharmacy health seeking behaviours amongst the VIB patients.

Participants faced mobility and accessibility challenges when visiting pharmacies unaccompanied suggesting that pharmacy facilities and infrastructure do not sufficiently cater to the needs of VIB patients. This is not surprising as similar observations have been made (Cupples *et al.*, 2012; Dagnachew, Mesheshea and Mekonen, 2021; Kentab *et al.*, 2024). These studies identified that improper pharmacy layouts and the lack of conducive entrances to the pharmacy made it difficult for VIB patients to access pharmacies. Narrow aisles, and complex pharmacy layout were not conducive for VIB patients. Consistent with observations by Koo et al. VIB participants from this current study revealed that going to the pharmacy accompanied assuaged the anxiety and fear of having to navigate the pharmacy alone, particularly in new pharmacies (Koo *et al.*, 2016). Designing and organising pharmacies to cater for VIB patients will encourage pharmacy health seeking behaviours amongst VIB patients (Dagnachew,

Mesheshea and Mekonen, 2021). Improvements in design to increase accessibility, include the use of large font signs, guide rails, and coloured floor lanes; measures that are particularly useful for low vision patients. For individuals with complete vision loss, pharmacies should have dedicated personnel to meet them at the entrance and assist where necessary (Barnett *et al.*, 2017). Stairs pose a challenge to VIB persons. It is encouraged to provide wheel ramp access to pharmacies. The creation of a priority lane, or counter for VIB patients will improve quick access to the pharmacist without the challenges of queuing or waiting in a waiting room (Badr, 2024).

Results from this study indicated that pharmacists were aware of the need for improved pharmacy accessibility for VIB patients which agrees with other studies (Culduz *et al.*, 2014; Alhusien *et al.*, 2019). This demonstrated positive attitudes and a possible willingness to make the necessary changes a reality. Such positive attitudes are encouraged in the pursuit of breaking barriers to pharmaceutical healthcare for VIB patients.

Improvements in accessibility features to pharmacies must be done with the knowledge and understanding of the specific needs of VIB patients. One VIB participant recalled that one pharmacy's attempt to improve accessibility by placing braille signs and labels around the pharmacy was misguided because signage was physically inaccessible to them, and they were difficult to locate without the sense of sight.

Additionally, this present study revealed that the participants faced various social challenges that were a possible deterrent to seeking pharmaceutical healthcare. Harrison et al. observed that negative presumptions held by healthcare providers negatively influenced the quality of care the patients received. Participants reported being seen as less cognitively capable, and less competent in self-care behaviours, leaving participants feeling discriminated. Similar results were observed from this current study. The VIB interview participants felt stigma from some pharmacists made them feel less intelligent or mentally competent during counselling sessions. Like the sentiments observed by Harrison et al. they felt like a burden not deserving of the same health care their sighted counterparts received (Harrison, Mackert and Watkins, 2010). Such stigma in the pharmacy can negatively impact the health outcomes of the VIB patients whilst exacerbating sentiments of shame and anxiety. If left unchecked such practices could result in VIB patients concealing their vision status when visiting the pharmacy or completely deter them from seeking pharmaceutical healthcare (Kentab *et al.*, 2024). The alternative prospects to receiving healthcare and health information from pharmacists can be detrimental

to the health of such patients, as such sources like the internet or family and friends are often unreliable sources (Zhi-Han, Hui-Yin and Makmor-Bakry, 2017).

Reports regarding the lack of staff recognition of their condition and the lack of subsequent assistance from pharmacy staff were common amongst VIB participants in this study. This was a challenge to VIB patients as they often struggled to find their way to the pharmacist's counter or navigate the pharmacy. When at the counter, the inability to identify the VIB state of the patient led to assumptions about the patient's capabilities, namely that they could read labels, identify their medication or administer their medication with ease. This led to patients being frustrated with the pharmacists and they often had to speak up and let the pharmacists know they were visually impaired or blind. Studies have shown a similar trend amongst pharmacists in other countries (Lee and Lee, 2019; Kentab *et al.*, 2024; Merenda, Denis and Patris, 2024). Frustrations such as these can be disheartening for VIB patients (Sharts-Hopko, Smeltzer and Zimmerman, 2010). The results suggest that being able to quickly identify patients with sight loss and proceeding to counsel them with full awareness of their condition will lead to positive counselling sessions without such frustrations. The main reason behind the cause of these social deterrents to pharmaceutical healthcare, is the lack of awareness and knowledge of vision loss and the needs of VIB patients (Barnett *et al.*, 2017). This further highlights the need for training, awareness and sensitisation of pharmacist in South Africa regarding VIB patients.

Furthermore, a lack of policy, regulation and guidelines relating to the standardisation of pharmacies across the country to ensure all pharmacies cater to the needs of VIB patients was observed. No uniform standardisation meant, as was observed by one pharmacist participant, that some pharmacies were not uniform in their efforts to improve VIB care as one pharmacy would implement one strategy, and another would not. Having guidelines and policy are a way to ensure better service delivery by providing standardised procedures

Chapter 8: Strengths, Limitations, Recommendations, and Conclusion

8.1 Strengths and Limitations

8.1.1 Strengths

To the best of the researcher's knowledge, this is among the first comprehensive exploratory studies in South Africa to research the current state of pharmaceutical healthcare towards visually impaired and blind (VIB) patients. By interviewing pharmacists and VIB individuals, this study provided perspectives from both groups. One advantage of the study is that all registered pharmacists in the country were sent invitations to participate in the online survey. There is a paucity of literature available regarding pharmaceutical healthcare and VIB patient care in South Africa and the world at large. This study has made strides to fill the research gap in this topic. Despite being conducted in South Africa, this study may have potential value in informing pharmacy practice in other countries around the world.

8.1.2 Limitations

The small sample size and lack of diversity of the sample size could be improved. A larger sample sizes would have provided greater depth to the study allowing for richer data collection by possibly including participants with different experiences and insights on the current state of pharmaceutical healthcare for VIB persons. Though one of the first studies on visual impairment and pharmaceutical care in South Africa, the sample of survey respondents tended to be skewed as there were four times more female respondents than male. Furthermore, 92% of pharmacist interviewed worked in the private pharmacy sector. Hence, pharmacists who worked in the public pharmacy sector were not fully represented. All interviewed pharmacists resided and worked in the greater Johannesburg area. This is not representative of pharmacists who reside and work in other cities, towns, and particularly rural areas. This decreases the transferability of results to other areas of the country. Recruitment bias was recognised as a limitation as only participants who were interested in the study were sufficiently motivated to take part in the study. This meant that other pharmacists or VIB participants who potentially had different insights into the study topic were excluded. Furthermore, time constraints did not allow for member checking of interview transcripts with the interview participants to ensure veracity and intended meaning of the interviews.

8.2 Future research and Conclusion

8.2.1 Future research and recommendations

Evidence presented in this study suggests the need for the evaluation of current pharmacy training at undergraduate, and postgraduate levels to determine the appropriate curriculum that would address the needs of VIB patient pharmaceutical healthcare needs. This study recommends that more of the training curriculum for undergraduates be committed to VIB patient training. Furthermore, it is recommended that policy and guidelines relating to VIB patient pharmaceutical care need to be developed and incorporated at a provincial level and a national level. Such policy should provide procedures, and strategies implemented by both national and provincial health authorities to address the care of VIB patients in South Africa. The South African Pharmacy Council should provide guidelines on standards and expectations of VIB pharmaceutical care in pharmacies across the country. For example, these guidelines could provide guidance on the implementation of VIB patient friendly patient layouts, the stocking of visual dispensing aids, and the provision of services to improve VIB care. Such policy will help standardise VIB patient care in pharmacies in the county. Sensitization and awareness campaigns regarding VIB patient health care amongst pharmacists need to be implemented at a national, provincial or cooperate level for better VIB patient care. Such improvements will help improve the presently observed poor knowledge, attitude and practice levels relating to VIB patient care.

Additionally, future research could also focus on exploring VIB patient care in public pharmacy institutions. This will provide a more detailed understanding of ways to make public pharmaceutical healthcare more accessible and better equipped to cater to VIB patients.

As this study largely reported on pharmacists, and VIB persons who lived and worked in urban areas, future research could focus on investigating pharmaceutical VIB patient care amongst pharmacists and VIB persons in rural and remote areas. Additionally, future research should be done to determine the best assistive digital or technological solutions that can be incorporated in pharmacy practice to aid during the counselling and dispensing phases of VIB patient health care. Such insight would provide more insights into attitudes, and perceptions of pharmacists, as well as determine the feasibility of implementing such measures in pharmacy practice.

8.2.2 Conclusion

The aim of this study was to investigate the state of pharmaceutical patient care towards VIB patients in South Africa by exploring the experiences and challenges of both pharmacists and patients.

The study demonstrated the key role that pharmacists have in the medication management and health outcomes of VIB persons. Findings relating to VIB patient, showed a deficiency in knowledge, awareness and education levels of pharmacists in South Africa regarding pharmaceutical care VIB patients. Results also showed that pharmacists had extremely limited to no formal VIB patient training. This study supported the need to provide more comprehensive training of pharmacists on improved VIB patient care at tertiary pharmacy institutions.

Despite poor knowledge levels amongst pharmacists, pharmacists self-reported good attitude levels and moderate practice levels. In contrast, VIB reports provided evidence of poor perceptions and attitudes held by pharmacists that negatively impacted pharmaceutical healthcare services.

Pharmacists reported use of low-tech assistive solutions during counselling sessions with VIB patients. The use of braille in pharmacies was limited to non-existent. High tech solutions such as the use of medication management devices, mobile applications and mobile devices were low. The lack of policy and guidelines was identified as a factor in poor standardised pharmacy procedures and practice when VIB patients seek pharmaceutical healthcare services.

In accordance with earlier studies, findings from this study revealed that VIB patients struggle with medication identification, administration and medication/health information access. VIB reported use of various assistive tools, techniques and solutions in their medication management processes. The main solutions included the use of low-tech solutions, mobile devices and mobile assistive applications. Participants demonstrated a competent and satisfied use of assistive applications in medication management. Caregivers were noted to play a significant role in the medication management routines of VIB patients. Barriers to pharmacy health seeking behaviours included lack of pharmacy accessibility features, experienced social challenges, and poor pharmacist counselling. Addressing these would improve patient satisfaction, and overall pharmacy experiences in South Africa.

References

Abdulhussein, D. and Hussein, M. (2021) 'WHO Vision 2020: Have We Done It?', *Opthalmic Epidemiology* [Preprint].

Addo, E. *et al.* (2021) 'Prevalence and associated factors of vision loss in the South African National Health and Nutrition Examination Survey (SANHANES-1)', *BMC Ophthalmology*, 21(1).

Adedeji, O. (2021) 'Assessing the extent and need for disability inclusion in the pharmacy education curriculum inNigeria', *Pharmacy Education*, 21(1), pp. 670–673.

Adelson, J. *et al.* (2020) 'Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study', *The Lancet Global Health* [Preprint]. Available at: https://doi.org/10.1016/S2214-109X(20)30489-7.

Ahmad, B. and Patel, B. (2024) 'Trachoma', *StatPearls* [Preprint].

Ahmed, T. *et al.* (2015) 'Privacy Concerns and Behaviors of People with Visual Impairments', in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pp. 3523–3532. Available at: https://dl.acm.org/doi/abs/10.1145/2702123.2702334.

Aithal, A. and Aithal, P.S. (2020) 'Development and Validation of Survey Questionnaire & Experimental Data – A Systematical Review-based Statistical Approach', *International Journal of Management, Technology, and Social Sciences*, 5(2), pp. 233–251.

Alhusien, N. *et al.* (2019) 'We're really not ready for this": A qualitative exploration of community pharmacy personnel's perspectives on the pharmaceutical care of older people with sensory impairment', *Disability and Health Journal*, 112(3), pp. 242–248.

Almukainzi, M. *et al.* (2020) 'Medication use patterns in the visually impaired in Saudi Arabi and the importance of applying Braille labelling', *Saudi Pharmaceutical Journal*, 28, pp. 274–280.

Almuzaini, M. and Abdullah-Al-Wadud (2018) 'A Review on Medication Identification Techniques for Visually Impaired Patients', in *2018 21st Saudi Computer Society National Computer Conference (NCC)IEEE*.

Al-Quwayfili, N. and Al-Khalifa, H. (2014) 'AraMedReader: An Arabic Medicine Identifier Using Barcodes', in *HCI International 2014 - Communications In Computer and Information Science*. *International conference on Human-Computer Interactions*, Springer, pp. 383–388.

Ashaye, A. and Oluleye, T. (2004) 'Pattern of corneal opacity in Ibadan, Nigeria', *Annals of African Medicine*, 3(4), pp. 185–187.

Avila, M. *et al.* (2016) 'Remote Assistance for Blind Users in Daily Life: A Survey about Be My Eyes', in *Proceedings of the 9th ACM International Conference on PErvasive Technologies Related to Assistive Environments*. *PETRA '16*.

Aykan, H. (2012) *Report to Congress: Aging Services Technology Study*. Washington, DC: Office of the Assistant Secretarty for Planning and Evaluation. Available at: https://aspe.hhs.gov/reports/report-congress-aging-services-technology-study-1#med.

Badr, A. (2024) 'Exploring Barriers Faced by Community Pharmacists in Serving Patients with Disabilities in Saudi Arabia: Recommendations for Enhancing Healthcare Provisions', *Pharmacy*, 12(5), p. 137.

Bambara, J. *et al.* (2009) 'Family Caregiver Social Problem-Solving Abilities and Adjustment to Caring for a Relative with Vision Loss', *Investigative Ophthalmology & Visual Science*, 50, pp. 1585–1592.

Barghouth, D., Al-Abdallah, G.M. and Abdallah, A.B. (2021) 'Pharmacy service factors and pharmacy performance: the role of patient satisfaction in community pharmacies', *International Journal of Pharmaceutical and Healthcare Marketing*, 15(3). Available at: https://www.emerald.com/insight/content/doi/10.1108/ijphm-03-2020-0017/full/html.

Barnett, N. *et al.* (2017) 'How to support patients with sight loss in pharmacy', *The Pharmaceutical Journal*, 299.

Bigham, J. *et al.* (2010) 'VizWiz: nearly real-time answers to visual questions', in *Proceedings of the 23nd annual ACM symposium on User interface software and technology*. *USIT:'10*, pp. 333–334.

Bing, J. *et al.* (2019) 'Wearable Vision Assistance System Based on Binocular Sensors for Visually Impaired Users', *IEEE Internet of Things*, 6(2).

Black, A. and Wood, J. (2005) 'Vision and Falls', *Clinical and Experimental Optometry*, 88(4), pp. 212–222.

Blakely, M. (2022) ‘Call to Integrate Content Related to Disabilities Into Contemporary Pharmacy Curricula’, *Journal of Pharmaceutical Education*, 86(8).

Bolat, N. *et al.* (2011) ‘Depression and anxiety levels and self-concept characteristics of adolescents with congenital complete visual impairment’, *Turkish Joural of Psychiatry*, 22, pp. 77–82.

Botta, M. (2017) ‘Braille in Pharma: Differing Views in the U.S. and Europe’, *Pharmaceutical Processing World*. Available at: https://www.pharmaceuticalprocessingworld.com/braille-in-pharma-differing-views-in-the-u-s-and-europe/.

Bourne, R. *et al.* (2017) ‘Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis’, *The Lancet Global Health*, 5(9), pp. e888–e897.

Bourne, R. *et al.* (2020) ‘Global Prevalence of Blindness and Distance and Near Vision Impairment in 2020: progress towards the Vision 2020 targets and what the future holds.’, *Investigative Opththalmology and Visual Science*, 61(7).

Bourne, R. and Steinmetz, J. (2021) ‘Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the Global Burden of Disease Study’, *Lancet Global Health*, 9(2), pp. e130–e143.

Bowen, C. *et al.* (2020) ‘A call to action: Preparing a disability-competent health care workforce’, *Disability and Health*, 13(4).

Braille Institute (2023) ‘What Is Assistive Technology and Why is it Important for Visually Impaired?’, *Braille Institute*. Available at: https://brailleinstitute.org/blog/sight-loss-blog/what-is-assistive-technology-and-why-is-it-important-for-visually-impaired.

Braun, V. and Clarke, V. (2006) ‘Thematic Analysis in Psychology’, *Qualitative Research in Psychology*, 3(2), pp. 77–101.

Brown, J. *et al.* (2014) ‘Characterizing functional complaints in patients seeking outpatient low-vision services in the United States’, *Opthalmology*, 121(8), pp. 1655–1662.

Budenz, D. *et al.* (2012) ‘Blindness and Visual Impairment in an Urban West African Population: The Tema Eye Survey’, *Opthalmology*, 119(9), pp. 1744–1753.

Burton, M. (2007) ‘Trachoma: An overview’, *British Medical Bulletin*, 84, pp. 99–116.

Chauhan, R. *et al.* (2014) 'Estimation of software quality using object oriented design metrics', *International Journal of Innovative Research in Computer and Communication Engineering*, 2(1), pp. 2581–2586.

Cochrane, G., du Toit, R. and Le Mesurier, R. (2010) 'Management of refractive errors', *British Medical Journal*, 340.

Cooper, L. *et al.* (2023) 'Assistive technologies and strategies to support the medication management of individuals with hearing and/or visual impairment: A scoping review', *Disability and Health Journal*, 16(4), p. 101500.

Crews, J. *et al.* (2016) 'The association of health-related quality of life with severity of visual impairment among people aged 40–64 years: Findings from the 2006–2010 Behavioral Risk Factor Surveillance System.', *Opthalmic Epidemiiology*, 23(3), pp. 145–153.

Culduz, A. *et al.* (2014) 'Opinion of Pharmacists Towards Accessibility of Physically Disabled People to Pharmacy', *Marmara Pharmaceutical Journal*, 18(2), pp. 72–78.

Cumurcu, T. *et al.* (2006) 'Depression and anxiety in patients with pseudoexfoliative glaucoma', *General Hospital Psychiatry*, 28(6), pp. 509–15.

Cupples, M. *et al.* (2012) 'Improving healthcare access for people with visual impairment and blindness', *British Medical Journal*, 344, pp. 42–46.

Dagnachew, N., Mesheshea, S.G. and Mekonen, Z.T. (2021) 'A qualitative exploration of barriers in accessing community pharmacy services for persons with disability in Addis Ababa, Ethiopia: a cross sectional phenomenological study', *BMC Health Services Research*, 21. Available at: https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-021-06488-z.

Davies, M. *et al.* (2015) 'The attitudes of pharmacists, students and the general public on mHealth applications for medication adherence', *Pharmacy Practice*, 13(4), p. 644.

Demmin, D. and Silverstein, S. (2020) 'Visual Impairment and Mental Health: Unmet Needs and Treatment Options', *Clinical Opthalmology*, 14, pp. 4229–4251.

Digit-Eyes (2020) 'Digit-Eyes Identify and organise your world'. Available at: http://www.digit-eyes.com/.

Easley, W., Kuber, R. and Ozok, A. (2017) ‘An empirical study examining medication management among individuals with visual impairments’, *Universal Access in the Information Society*, 16, pp. 483–495.

EU (2009) ‘Guideline on the readability of the labelling and package leaflet of medicinal products for human use’. Available at: https://health.ec.europa.eu/document/download/d8612682-ad17-40e3-8130-23395ec80380_en.

Fereday, J. and Muir-Cochrane, E. (2006) ‘Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development’, *International Journal of Qualitative Methods* [Preprint].

Fetters, M., Curry, L. and Creswell, J. (2013) ‘Achieving integration in mixed methods designs-principles and practices’, *Health Service Research*, 48(6), pp. 2134–2156.

Fielding, N.G., Blank, G. and Lee, R.M. (2016) *The SAGE Handbook of Online Research Methods*. London: SAGE Publications Ltd. Available at: http://digital.casalini.it/9781473959309.

Fitzner, K. (2007) ‘Reliability and Validity: A Quick Review’, *The Diabetes Educator*, 33(775).

Frick, K. (2012) ‘What the comprehensive economics of blindness and visual impairment can help us understand’, *Indian Journal of Opthalmology*, 60(5), p. 406.

Gill, J. (2006) ‘Pharmaceutical packaging and labelling for blind and partially sighted people’, *Pharmaceutical Technology Europe*, 18(11).

Gordois, A. *et al.* (2012) ‘An estimation of the worldwide economic and health burden of visual’, *Global Public Health: An international Journal for Research, Policy and Practise*, 7(5), pp. 465–481.

Griffin-Shirley, N., Banda, D. and Lungdoh, S. (2017) ‘A Survey on the Use of Mobile Applications for People who Are Visually Impaired’, *Journal of Visual Impairment and Blindness*, 111(4).

Gunawan, J. (2015) ‘Ensuring Trustworthiness in Qualitative Research’, *Belitung Nursing Journal*, 1(1), pp. 10–11.

Harris, B. *et al.* (2011) 'Inequities in access to health care in South Africa', *Journal of Public Health Policy*, 32, pp. S102–S123.

Harrison, T., Mackert, M. and Watkins, C. (2010) 'Health literacy issues among women with visual impairments', *Gerontological Nursing*, 3(1), pp. 49–60.

Hyman, L. (2007) 'Myopic and Hyperopic refractive error in adults: An Overview', *Opthalmic epidemiology*, 14, pp. 192–197.

IAPB (2022) 'Country Map and Estimates of Vision Loss: South Africa', *IAPB-Vision Atlas*. Available at: https://www.iapb.org/learn/vision-atlas/magnitude-and-projections/countries/south-africa/.

Illiger, K. *et al.* (2014) 'Mobile Technologies: Expectancy, Usage, and Acceptance of Clinical Staff and Patients at a University Medical Center', *JMIR Mhealth Uhealth*, 2(4), p. e42.

Isomursu, M., Ervasti, M. and Tormanen, V. (2009) 'Medication management support for vision impaired elderly: Scenarios and technological possibilities', in *2009 2nd International Symposium on Applied Sciences in Biomedical and Communication Technologies*.

Jamieson, S. (2016) 'Analyse qualitative data', *Education for Primary Care*, 27(5), pp. 398–402.

Jonas, J., Cheung, C. and Panda-Jonas, S. (2017) 'Updates on the Epidemiology of Age-Related Macular Degeneration', *Asia-Pacific Journal of Opthalmology*, 6(6), pp. 493–497.

Juniat, V. *et al.* (2019) 'Understanding Visual Impairment and Its Impact on Patients: A Simulation-Based Training in Undergraduate Medical Education', *Jouranl of Medical Education and Curricular Development* [Preprint]. Available at: https://journals.sagepub.com/doi/full/10.1177/2382120519843854.

Kempen, G. *et al.* (2012) 'The impact of low vision on activities of daily living, symptoms of depression, feelings of anxiety and social support in community-living older adults seeking vision rehabilitation services', *Quality LIfe research*, 21(8), pp. 1405–1411.

Kentab, B. *et al.* (2015) 'Exploring medication use by blind patients in Saudi Arabia', *Saudi Pharmaceutical Journal*, 23(1), pp. 102–106.

Kentab, B. *et al.* (2019) 'A systematic review of pharmacists' interventions to support medicines optimisation in patients with visual impairment', *International Journal of Clinical Pharmacy*, 41, pp. 1400–1407.

Kentab, B. *et al.* (2024) 'Improving medication dispensing and counselling for patients with vision impairment: a qualitative study of pharmacist-reported barriers and facilitators', *BMC Health Services Research*, 24(534). Available at: https://link.springer.com/article/10.1186/s12913-024-11009-9.

Khairallah, M. *et al.* (2015) 'Number of Poeple Blind or VI by cataract worldwide and world regions 1990 to 2010', *Investigative Opththalmology and Visual Science*, 56(11), pp. 6762–6769.

Khouderchah, C. *et al.* (2022) 'Impact of a 10-week disability elective on health professions students' attitudes towards disabled persons', *Currents in Pharmacy Teaching and Learning*, 14(6), pp. 773–778.

Killick, K. *et al.* (2018) 'A scoping review of the pharmaceutical care needs of people with sensory loss', *International Journal of Pharmacy Practice*, 26(5), pp. 280–386.

Kimar, K. *et al.* (2012) 'Diabetic Retinopathy- Symptoms, Causes, Risk Factors and Treatment', *The Pharma Innovation*, 1(8).

Koo, H. *et al.* (2016) 'Qualitative Study for Medication Use among Visually Impaired in Korea', *Korean journal of Clinical Pharmacy*, 26(1), pp. 24–32.

Koo, H.C. *et al.* (2018) 'Knowledge, attitudes and practices of schoolchildren toward whole grains and nutritional outcomes in Malaysia', *Appetite*, 123, pp. 256–263.

Lam, B. *et al.* (2008) 'Reported Visual Impairment and Risk of Suicide: The 1986-1996 National Health Interview Survey', *Archives of Opthalmology*, 126(7), pp. 975–980.

Lamoureux, E. and Pesudovis, K. (2011) 'Vision-specific quality-of-life research: A need to improve the quality', *American Journal of Ophthalmology*, 151(2), pp. 195–197.

Land, M. (2009) 'Vision, eye movements, and natural behavior', *Visual Neuroscience*, 26, pp. 51–62.

Lansigh, V. and Martens, M. (2007) 'Global cost-effectiveness of cataract surgery', *Opthalmology*, 114, pp. 1670–1678.

Leat, S., Legge, G. and Bullimore, M. (1999) 'What is Low Vision? A Re-evaluation of Definitions', *Optometry and Vision Science*, 76(4), pp. 198–211.

Lee, B.H. and Lee, Y.J. (2019) ‘Evaluation of medication use and pharmacy services for visually impaired persons: Perspectives from both visually impaired and community pharmacists’, *Disability and Health*, 12(1), pp. 79–86.

Lee, H. *et al.* (2009) ‘Unsupervised feature learning for audio classification using convolutional deep belief networks’, *Advances in Neural Information Processing Systems* [Preprint]. Available at: https://proceedings.neurips.cc/paper/2009/file/a113c1ecd3cace2237256f4c712f61b5-Paper.pdf.

Lee, J.-W. *et al.* (2023) ‘Barriers to Safe and Effective Medication for Individuals with Sensory Impairment: A Systematic Literature Review’, *The pharmaceutical Society of Korea*, 67(2), pp. 103–117.

Lilian, R. (2018) ‘Strengthening primary eye care in South Africa: An assessment of services and prospective evaluation of a health systems support package’, *PLOS one*, 13(5), p. e0197432.

Lim, L. *et al.* (2012) ‘Age related Macular degeneration’, *The Lancet*, 379, pp. 1728–1738.

Ling Wong *et al.* (2014) ‘Global prevalence of age-related macular degeneration and disease burden projection for 2020 and 2040: a systematic review and meta-analysis’, *The Lancet Global Health*, 2, pp. e106–e116.

Lou, L. *et al.* (2016) ‘Global Patterns in Health Burden of Uncorrected Refractive Error’, *Investigative Opthalmology and Visual Science*, 57(14).

Lourens, H. and Zeyen, A. (2024) ‘Experiences within pharmacies: reflections of persons with visual impairment in South Africa’, *Disability and Society*, pp. 1–17.

Mandal, F.B. (2014) ‘Nonverbal Communication in Humans’, *Journal of Human Behaviour in the Social Environment*, 24(4). Available at: https://www.tandfonline.com/doi/abs/10.1080/10911359.2013.831288.

Manjari, K., Verma, M. and Singai, G. (2020) ‘A survey on assistive technology for visually impaired’, *Internet of Things* [Preprint].

Maphumulo, W. and Busisiwe, B. (2019) ‘Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review’, *Curationis*, 42(1).

Mariotti, S., Pascolini, D. and Rose-Nussbaumer, J. (2009) 'Trachoma: global magnitude of a preventable cause of blindness', *British Journal of Ophthalmology*, 93, pp. 563–368.

Marques, A.P. *et al.* (2022) 'The economics of vision impairment and its leading causes: A systematic review', *eClinical Medicine*, 46(101354).

Martinello, N. *et al.* (2022) 'Exploring the use of smartphones and tablets among people with visual impairments: Are mainstream devices replacing the use of traditional visual aids?', *Assistive Technology*, 34(1).

McCann, R. *et al.* (2012) 'Help needed in medication self-management for people with visual impairment', *British Journal of general practice*, 62(101), pp. e530–e537.

McIntosh, M. (2018) *Coping with Visual Impairment: Helping our Patients Face the Truth*. Available at: https://www.intechopen.com/chapters/61917.

Merenda, T. *et al.* (2024) 'Assistive products in pharmacy practice to optimize medications use for visually impaired patients: Focus groups to explore community pharmacists' opinions and expectations', *Exploratory Research in Clinical and Social Pharmacy*, 15, p. 100467.

Merenda, T., Denis, J. and Patris, S. (2024) 'Pharmaceutical care for visually impaired patients: a qualitative study of community pharmacists' needs and professional experience', *International Journal of Clinical Pharmacy*, 46, pp. 665–674.

Merugu, S. *et al.* (2022) 'A Review of Some Assistive Tools and their Limitations for Visually Impaired', *Helix*, 12(1), pp. 1–9.

Miller, S. (2015) 'Fostering informed empathy through patient-centred education about persons with disabilities', *Show and Tell*, 4, pp. 196–199.

Murray, C. *et al.* (2015) 'Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition', *The Lancet*, 386(1009), pp. 2145–2191.

Naidoo, K. *et al.* (2013) 'A population-based study of visual impairment in the Lower Tugela health district in KZN, SA', *African vision and Eye health*, 72(3), p. a284.

Naidoo, K., Leasher, J., *et al.* (2019) 'Global Vision Impairment and Blindness Due to Uncorrected Refractive Error, 1990–2010', *Optometry and Vision Science*, 93(3), pp. 227–234.

Naidoo, K., Fricke, T., *et al.* (2019) 'Potential Lost Productivity Resulting from the Global Burden of Myopia', *Ophthalmology*, 126(3), pp. 338–346. Available at: https://doi.org/10.1016/j.ophtha.2018.10.029.

Naidoo, K. *et al.* (2020) 'Prevalence and causes of vision loss in sub-Saharan Africa in 2015: magnitude, temporal trends and projections', *British Journal of Ophthalmology*, 104(12).

Naipal, S. and Rampersad, N. (2018) 'A review of visual impairment', *African vision and Eye health*, 77(1), p. a393.

NDoH (2003) 'South African Department of Health - National Guideline - Prevention of blindness in South Africa'.

Nedovic, T., Umeri-Sali, N. and Denecke, K. (2019) 'Supporting Blind and Visually Impaired Persons in Managing Their Medication', *German Medical Data Sciences* [Preprint].

Nesemann, J. *et al.* (2022) 'Association of visual impairment with disability: a population-based study', *Eye*, 36, pp. 540–546.

Nethra, A. *et al.* (2019) 'Competency-Based Curriculum Development to Meet the Needs of People With Disabilities: A Call to Action', *Journal of the Association of American Medical Colleges*, 94(6), pp. 781–788.

Nimmolrat, A. *et al.* (2021) 'Pharmaceutical mobile application for visually-impaired people in Thailand: development and implementation', *BMC Medicinal Informatics and Decision Making*, 21. Available at: https://scispace.com/pdf/pharmaceutical-mobile-application-for-visually-impaired-33ccgmdbt7.pdf.

O'Cathain, A., Murphy, E. and Nicholl, J. (2010) 'Three techniques for integrating data in mixed methods studies', *BMJ*, 341. Available at: https://pubmed.ncbi.nlm.nih.gov/20851841/.

O'Day, B., Killeen, M. and Lezzoni, L. (2004) 'Improving Health Care Experiences of Persons Who Are Blind or Have Low Vision: Suggestions From Focus Groups', *American College of Medical Quality*, 19(5).

Orrico, K. (2013) 'Caring for visually impaired patients', *Journal of American Pharmacists Association*, 53(3).

Pal, J. *et al.* (2017) 'Agency in Assistive Technology Adoption', *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* [Preprint].

Palinkas, L. *et al.* (2015) 'Purposeful sampling for qualitative data collection and analysis in mixed method implementation research', *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), pp. 533–544.

Peiris-John, R. *et al.* (2021) 'Educating health science students about disability: Teachers' perspectives on curricular gaps', *Disability and Health*, 14(1).

Poka, M., Chanyandura, J. and Witika, B. (2022) 'Challenges faced by blind patients using chronic medication at a tertiary hospital in South Africa', *Health SA Gesondheid*, 27(0).

Prokkofeyeva, E., Wegener, A. and Zrenner, E. (2012) 'Cataract prevalence and prevention in Europe: a literature review', *Acta Ophtalmogica*, 91(5), pp. 395–405.

Qadir, S. and Qadir, M. (2020) 'Glaucoma: Etiology, Pathophysiology and Management', *Biomedical Journal of Scientific and Technical Research*, 30(5), pp. 23695–23698.

Riewpaiboon, A. (2009) 'How the blind cope with problems of medicine utilization: a study in Bangkok, Thailand', *Pharmacoepidemiology and Drug Safety*, 18, pp. 708–712.

Riste, L.K. *et al.* (2023) 'The blind leading the blind: Co-production of medication safety solutions for people with sight impairment in community pharmacy', *International Journal of Pharmacy Practice*, 31(2), p. 47.

Rorsch, A. (2014) 'The Progress of Science—Past, Present and Future', *Humanities*, 3(4), pp. 442–516.

Rotenberg, S. *et al.* (2022) 'Disability training for health workers: A global evidence synthesis', *Disability and Health*, 15(2).

Sabinet (2014) 'Improving accessibility to OTCs : pharmaceutical focus', *Sabinet African Pharmaceutical and Cosmetic Review*, 41(4). Available at: https://journals.co.za/doi/abs/10.10520/EJC152135.

Sandelowski, M. (1993) 'Rigor or rigor mortis The problem of rigor in qualitative research revisited', *Advances in Nursing Science*, 16(2), pp. 1–8.

SAPC (2019) 'Good Pharmacy Practice in South Africa'. Available at: https://www.pharmcouncil.co.za/Media/Default/Documents/Rules%20published%20in%20terms%20of%20section%2035A%20of%20the%20Pharmacy%20Act%2053%20of%201974.pdf.

Saunders, B. *et al.* (2018) 'Saturation in qualitative research: exploring its conceptualization and operationalization', *Quality and Quantity*, 52(4), pp. 1893–1907.

Seid, M.A. and Hussen, M.S. (2018) 'Knowledge and attitude towards antimicrobial resistance among final year undergraduate paramedical students at University of Gondar, Ethiopia', *BMC Infectious Diseases*, 18. Available at: https://link.springer.com/article/10.1186/s12879-018-3199-1.

Senjam, S., Manna, S. and Bascaran, C. (2021) 'Smartphones-Based Assistive Technology: Accessibility Features and Apps for People with Visual Impairment, and its Usage, Challenges, and Usability Testing', *Clinical Optometry*, 13, pp. 311–322.

Shakespeare, T. and Kleine, I. (2013) 'Educating Health Professionals about Disability: A Review of Interventions', *Health and Social Care Education*, 2(2).

Sharts-Hopko, N., Smeltzer, S. and Zimmerman, V. (2010) 'Healthcare experiences of Women with Visual impairment', *Clinical Nurse Specialist*, 24(3), pp. 149–153.

Shetty, S., Sunita, S. and Shetty, I. (2021) 'Empowering the visually impaired by customized Braille prescription and thus reducing medication errors', *Indian Journal of Ophthalmology*, 69(6), pp. 1388–1390.

Sileyew, K. (2019) 'Research Design and Methodology', in *Cyberspace*. Intechopen.

Silverman, D. (2017) *Doing Qualitative Research*. 5th edn. SAGE Publications Ltd.

Sithole, H.L. (2018) 'A situational analysis of ocular health promotion in the South African primary health-care system', *Clinical and Experimental Optometry*, 100(2), pp. 167–173.

Sithole, H.L. and Oduntan, O. (2010) 'Eye health promotion in the South African primary health care system', *South African Optometry*, 69(4), pp. 200–206.

Smeltzer, S. *et al.* (2005) 'Integration of Disability-Related Content in Nursing Curricula', *Nursing Education Perspectives*, 26(4), pp. 210–216.

Smith, M. and Bailey, trista (2014) 'Identifying Solutions to Medication Adherence in the Visually Impaired Elderly Buy Article: $35.00 + tax (Refund Policy)', *The Consultant Pharmacist*, 2, pp. 133–134.

Spektor, T. *et al.* (2015) 'Efficacy of ScripTalk Automated Prescription Label Reader and Veterans with Visual Impairments', *Journal of Visual Impairment and Blindness*, 109(5).

Statista (2022) ‘Unemployment rate in Africa 2022, by country’. Available at: https://www.statista.com/statistics/1286939/unemployment-rate-in-africa-by-country/#:~:text=South%20Africa%20registered%20the%20highest,percent%20and%2026%20percent%2C%20respectively.

Stats SA (2022) ‘Birth and Death: 60.6 million people in South Africa’. Available at: https://www.statssa.gov.za/?p=15601.

Stitt, A. *et al.* (2016) ‘The progress in understanding and treatment of diabetic retinopathy’, *Progress in retinal and Eye research*, 51, pp. 156–186.

Symons, A., McGuigan, D. and Akl, E. (2009) ‘A curriculum to teach medical students to care for people with disabilities: development and initial implementation’, *BMC Medical Education*, 9(78).

Tang, D. *et al.* (2021) ‘Evaluation of educational interventions on eye health for dietetic and pharmacy professions: a pre-post study’, *BMC Medical Education*, 21(1), p. 478.

Teo, Z. *et al.* (2021) ‘Global prevalence of diabetic retinopathy and projection of burden through 2045’, *Opthalmology*, 128(11), pp. 1580–1591.

Tham, Y.-C. *et al.* (2014) ‘Global Prevalence of Glaucoma and Projections of Glaucoma Burden through 2040’, *Opthalmology*, 121(11), pp. 2081–2090.

Tracy, J. and McDonald, R. (2015) ‘Health and Disability: Partnerships in Health care’, *Journal of Applied Research in Intellectual Disabilities*, 28, pp. 22–32.

Tseng, V., Yu, F. and Coleman, A. (2012) ‘Risk of fractures following cataract surgery in Medicare beneficiaries’, *JAMA*, 308(5), pp. 493–501.

Van den Berg, M.D. (2023) *Achieving equality and accessibility for persons with visual impairments: uncovering deficiencies in South African consumer protection and labelling legislation*. University of Pretora. Available at: https://repository.up.ac.za/handle/2263/97362.

Vashist, P. *et al.* (2017) ‘Definition of blindness under National Programme for Control of Blindness: Do we need to revise it?’, *Indian Journal of Opthalmology*, 65(2), p. 92.

de Villiers, K. (2021) ‘Bridging the health inequality gap: an examination of South Africa’s social innovation in health landscape’, *Infectious Diseases of Poverty*, 10.

Vyawahare, H. and Shinde, P. (2022) 'Age-Related Macular Degeneration: Epidemiology, Pathophysiology, Diagnosis, and Treatment', *Cureus*, 14(9), p. e29583. Available at: https://doi.org/10.7759/cureus.29583.

Wang, W.-Y. *et al.* (2021) 'Pharmacotherapeutic candidates for myopia: A review', *Biomedicine & Pharmacotherapy*, 133. Available at: https://doi.org/doi.org/10.1016/j.biopha.2020.111092.

Weinreb, R., Aung, T. and Medeiros, F. (2014) 'The pathophysiology and treatment of Glaucoma', *Journal of the American Medical Association*, 311(18), pp. 1901–1911.

Welp, A., Woodbury, R. and McCoy, M. (2016) *Making Eye Health a Population Health Imperative: Vision for Tomorrow.* Washington, DC: Nartional Academies Press.

West, S., Rubin, G. and Broman, A. (2002) 'How Does Visual Impairment Affect Performance on Tasks of Everyday Life?', *Epidemiology and Biostatistics*, 120(6), pp. 774–780.

WHO (1951) *Expert Committee on Health Statistics : third report [of a meeting held in Geneva from 21 to 26 November 1951]*. Available at: https://apps.who.int/iris/handle/10665/40190.

WHO (1975) 'World Health Organization & International Conference for the Ninth Revision of the International Classification of Diseases'.

WHO (2001) *International Classification of Functioning, Disability, and Health*.

WHO (2006) 'WHO: List of Official ICD-10 Updates Ratified October 2006'. Available at: https://www.who.int/publications/m/item/icd-10-updates-2006.

WHO (2007) *VIsion 2020; The right to sight. Global initiative for the elimination of avoidable blindness: action plan 2006-20011*. Geneva: WHO. Available at: vailable at: http:// www.who.int/blindness/Vision2020_report.pdf.

WHO (2011) *World Report on Disability*. Available at: https://apps.who.int/iris/bitstream/handle/10665/44575/?sequence=4.

WHO (2019a) *WHO Weekly epidemiological record*. WHO, pp. 317–328.

WHO (2019b) *World report on vision*.

WHO (2021a) 'A new landmark resolution on disability adopted at the 74th World Health Assembly', *A new landmark resolution on disability adopted at the 74th World Health Assembly*. Available at: https://www.who.int/news/item/27-05-2021-a-new-landmark-resolution-on-disability-adopted-at-the-74th-world-health-assembly.

WHO (2021b) *Blindness and vision impairement*. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.

WHO (2021c) 'Disability-adjusted life years (DALYs)'. Available at: https://www.who.int/data/gho/indicator-metadata-registry/imr-details/158.

WHO (2022) 'Trachoma: Factsheet'. Available at: https://www.who.int/news-room/fact-sheets/detail/trachoma.

WHO (2023) 'Blindness and vision impairment'. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.

Wong, T. and Sabanayagam, C. (2019) 'Strategies to Tackle the Global Burden of Diabetic Retinopathy: From Epidemiology to Artificial Intelligence', *Ophthamologica*, 243(1), pp. 9–20.

World Bank (2022) 'South Africa'. Available at: https://data.worldbank.org/country/ZA.

Xulu-Kasaba, Z. and Kalinda, C. (2022) 'Prevalence of the Burden of Diseases Causing Visual Impairment and Blindness in South Africa in the Period 2010–2020: A Systematic Scoping Review and Meta-Analysis', *Tropical Medicine and Infectious Disease*, 7(34).

Yang, X. *et al.* (2021) 'Global, regional, and national burden of blindness and vision loss due to common eye diseases along with its attributable risk factors from 1990 to 2019: a systematic analysis from the global burden of disease study 2019', *Impact Journals: Aging*, 13(15), pp. 19614–19642.

Yau, J. *et al.* (2012) 'Global Prevalence and major risk factors of diabetic retinopathy', *Diabetses care*, 35, pp. 556–564.

Young, H.L. and Medioni, G. (2016) 'RGB-D camera based wearable navigation system for the visually impaired', *Computer Vision and Image Understanding*, 149. Available at: https://www.sciencedirect.com/science/article/abs/pii/S1077314216300248.

Zagar, M. and Baggarly, S. (2010) 'Low Vision Simulator Goggles in Pharmacy Education', *American Journal of Pharmaceutical Education*, 74(5).

Zhi-Han, L., Hui-Yin, Y. and Makmor-Bakry, M. (2017) 'Medication-handling Challenges among Visually Impaired Population', *Archives of Pharmacy Practice*, 6(1), pp. 8–14.

Appendix

Appendix 1: Ethics Approval Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO:	Mr C Kawonga School of Therapeutic Sciences Department of Pharmacy and Pharmacology Medical School University E-mail: 1629583@students.wits.ac.za
CC:	Supervisor: Mesdames S Leigh-de Rapper, Z Booth & R Shaikh <Stephanie.deRapper@wits.ac.za> and <HREC-Medical Research Office@wits.ac.za>
FROM:	Mr Iain Burns Human Research Ethics Committee (Medical) Tel: 011 717 1252 E-mail: Iain.Burns@wits.ac.za
DATE:	2022/03/09
REF:	R14/49
PROTOCOL NO:	**M210809** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)
PROJECT TITLE:	*Experiences, challenges and practices of visually impaired patients and pharmacists within the South African pharmacy health care system*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

R49 Mr C Kawonga

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M210809

NAME: (Principal Investigator)	Mr C Kawonga
DEPARTMENT:	School of Therapeutic Sciences Department of Pharmacy and Pharmacology Medical School University
PROJECT TITLE:	*Experiences, challenges and practices of visually impaired patients and pharmacists within the South African pharmacy health care system*
DATE CONSIDERED:	2021/08/27
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Mesdames S Leigh-de Rapper, Z Booth & R Shaikh
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2022/03/09

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **August** and therefore reports and re-certification will be due in the month of **August** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator _____ Date _____

Appendix 2: Phase 1 Self-administered survey

Knowledge, Attitudes, and Perceptions of Pharmacists and Visually Impaired Patients Regarding the Pharmaceutical Care of the Visually Impaired

Dear Sir/Madam,

My name is Chigomezyo Kawonga, and I am conducting a study exploring the experiences, challenges, and current practices of pharmacists with regards to the care of the visually impaired. The aim of this study is to determine the knowledge, attitudes, and perceptions of pharmacists in meeting the pharmaceutical care needs of the visually impaired patient. This study will help understand the current state of pharmaceutical health care being delivered to blind and visually impaired members of our communities.

Instructions:

Kindly complete the questionnaire below.

For further information regarding this study, you may contact:

Chigomezyo Kawonga (Researcher): email- 1629583@students.wits.ac.zaRubina Shaikh (Supervisor): email- Rubina.shaikh@wits.ac.za or Tel: (011) 717-2369Thank you for taking time to participate in this study

Sincerely,

Mr. Chigomezyo Kawonga

Section 1: Demographics	
Age	☐ 18 -25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ >50
Gender	☐ Male ☐ Female ☐ Other ☐ I do not wish to specify
Current Role	☐ Community Service Pharmacist ☐ Retails Pharmacist ☐ Hospital Pharmacist ☐ Academic Pharmacist ☐ Other

Other: Please specify	_____
Health sector currently practicing	☐ Public ☐ Private ☐ Both
Qualification	☐ Bachelor of Pharmacy ☐ Master of Pharmacy ☐ PhD in Pharmacy ☐ Other
Other: Please specify	_____
Years of Experience	☐ < 5 years ☐ 5-10 years ☐ 10-15 years ☐ 15-20 years ☐ >20 years

Section 2; Knowledge statements

	Yes	No
Do you know the percentage of blind/visually impaired persons in South Africa?	○	○
Are you aware of some of the specific challenges that visually impaired patients experience in relation to pharmaceutical services access and their medicine compliance?	○	○
Have you received any training on how to care for blind/visually impaired patients?	○	○
Are you familiar with any techniques to apply should you need to assist a blind/visually impaired patient presenting at your facility?	○	○
Do you know of any techniques or practices employed by blind/visually impaired patients to assist in medicine compliance in the absence of a caregiver?	○	○
Are you aware of national or provincial policies or guidelines relating to the care of blind/visually impaired patients in a pharmacy setting?	○	○

Please state which techniques or practices you are aware of. _____

Please state which policies or guidelines you have come across. _____

Have you heard of any of the following assistive devices:

- ☐ Braille labels/Braille label makers
- ☐ Pill boxes
- ☐ Tactile stickers
- ☐ Assistive mobile phone applications
- ☐ PenFriend
- ☐ Scriptalk

Section 3: Attitude and Perception Statements

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Blindness/visual impairment is a disability that needs to be addressed in South Africa.	○	○	○	○	○
I believe that as a pharmacist it is essential to develop the necessary skills to care for blind/visually impaired patients.	○	○	○	○	○
I believe that my pharmacy has sufficient resources to assist blind/visually impaired patients with their medication management needs.	○	○	○	○	○
I am satisfied with the current system used to counsel blind/visually impaired patients on the use of their medicines.	○	○	○	○	○
I would dedicate additional time in the dispensing cycle when dispensing medicine to blind/visually impaired patients.	○	○	○	○	○
I am confident that blind/visually impaired patients that I counsel would be able to remember all the information that I provide to them when they return home.	○	○	○	○	○
I am keen to try new technologies that would aid blind/visually impaired individuals with their medication management needs.	○	○	○	○	○
I am interested and willing to incorporate new technologies that would assist blind/ visually impaired patients.	○	○	○	○	○
Current general pharmacy standards and practices in relation to blind/visually impaired patients needs improvement.	○	○	○	○	○

Healthcare authorities and policy makers should develop policies that improve the current state of health care services for blind/visually impaired patients.	○	○	○	○	○
Pharmacists should proactively develop ways to ensure patient compliance in the blind/visually impaired community.	○	○	○	○	○
Information about medicine should be made available in different formats (e.g., Braille) to cater to the needs of blind/visually impaired patients.	○	○	○	○	○
Devices that use innovative technology could be a good way to assist blind/visually impaired patients in taking their medication without assistance from a caregiver.	○	○	○	○	○
More investment and research should be devoted to the development and science of innovating new ways to assist people who are blind/visually impaired.	○	○	○	○	○

Section 4: Practice Statements					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I implement national and provincial guidelines that seek to help people who are blind/visually impaired in my practice.	○	○	○	○	○
If I was to encounter a blind/visually impaired patient I would spend more time counselling them as compared to non-visually impaired patients.	○	○	○	○	○
I seek to alleviate the challenges that blind/visually impaired patients face with respect to their healthcare needs.	○	○	○	○	○
I keep up to date with the latest developments in the therapeutic care of blind/visually impaired patients.	○	○	○	○	○

Section 5: Open ended Questions	
Have you employed any current practices, systems, or strategies in your pharmacy that are aimed at helping blind/visually impaired patients?	◯ Yes ◯ No
Please describe what these implemented practices are.	_____
Have you witnessed other pharmacies or pharmacists implement various practices, strategies or systems that aid blind/visually impaired patients?	◯ Yes ◯ No
Please describe what these implementations were.	_____
In your opinion, and from your experiences, what are some of the best practices, and strategies that can be put in place to improve health care delivery to blind/visually impaired patients?	_____
Are there any other challenges that you have experienced or would expect when treating blind/visually impaired patients?	_____
If you have dispensed medication to a blind/visually impaired patient, please state how it has impacted your practice in any way?	_____

Appendix 3: South African Pharmacy Council Approval letter to distribute

South African Pharmacy Council

Registered Office
SAPC Building
591 Belvedere Street
Arcadia, Pretoria,0083

Postal Address
Private Bag X40040
Arcadia, 0007

Customer Care Line
0861 7272 00

Fax
(27)12-321 1492 /1479

E-mail
customercare@sapc.za.org

Website
www.sapc.za.org

COMPANY SECRETARY & LEGAL SERVICES

MR C KAWONGA

Email: 1629583@students.wits.ac.za

Your Reference	Our Reference	Date
P55137	SAPCCL/DG HOFFMANN	8 August 2023

Dear Mr Kawonga

MASTERS IN PHARMACY:
EXPERIENCES, CHALLENGES AND PRACTICES OF VISUALLY IMPAIRED PATIENTS AND PHARMACISTS WITHIN SOUTH AFRICAN PHARMACY HEALTH CARE SYSTEM

We refer to the abovementioned matter and in particular the request for contact details of pharmacists in South Africa in order to conduct research by Mr Kawonga for purposes of a Masters in Pharmacy, where the project is identified as:

"experiences, challenges and practices of visually impaired patients and pharmacists within South African pharmacy health care system".

We confirm that the request for the information was accompanied by the appropriate ethics approval from the University of the Witwatersrand Human Research Ethics Committee (Medical) under Clearance Certificate Number M210809.

Attached hereto please find the requested data, which is includes the details of pharmacists in South Africa, which data includes only email addresses, as the South African Pharmacy Council will not permit the distribution of personal information such as cellular phone numbers.

Kindly note that:

(a) The registers kept by the Registrar in terms of section 14 of the Pharmacy Act, 53 of 1974 may change consistently. For this reason, the Registrar can only guarantee the accuracy of the information as at the time the register was drawn off our data system; and

(b) The accuracy of the information provided is not guaranteed by the Registrar as it relies on the accuracy of information provide by registered persons.

Kindly note further the following strict conditions in processing and using the data provided shall be adhered to at all times:

(a) The data may be used exclusively for the research project as identified in the Human Research Ethics Committee (Medical) approval;

ALL CORRESPONDENCE TO BE ADDRESSED TO THE REGISTRAR

(b) The data may only be used by the researcher and may not be given or sold to any other person for use or distribution thereof, and must be protected from such distribution at all times;

(c) Emails to the pharmacists must explain that the information is for approved research purposes only;

(d) Communication to the pharmacists must allow for an opt out of receiving email communication/further communication; and

(e) The outcome of the research must be shared with the South African Pharmacy Council.

Failure to adhere to the conditions herein, will result in disciplinary action been taken against you in terms of Section 39 of the Pharmacy Act, 53 of 1974.

Yours faithfully

for REGISTRAR

Appendix 4: Participant Information Sheet – Pharmacist Survey

Participant Information Sheet

Study title: Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

Dear Sir/Madam,

Introduction

My name is Chigomezyo Kawonga, and I am conducting a study exploring the experiences, challenges, and current practices of pharmacists with regards to the care of the visually impaired. The aim of this study is to determine the knowledge, attitudes, and perceptions of pharmacists in meeting the pharmaceutical care needs of the visually impaired patient.

Invitation to participate:

I would like to cordially invite you to participate in this study.

What is involved in this study?

Participation in this study involves completing a questionnaire that will be used to determine your experiences, challenges and perceptions relating to pharmacy healthcare and visually impaired patients. Participation in this study is totally voluntary. Participants are entitled to withdraw their consent at any point during this study. Refusal to participate in this survey or the withdraw of consent will not result in you incurring a penalty or loss of any kind. This survey will take between 10-20 minutes to complete.

Confidentiality

Please be assured that all data and information that will be obtained from this study will be confidential. No information that reveals participant identifying information will be obtained at any point during this study. Access to study data and data collected form this survey will be only available to the researchers and their supervisors.

Risks

Participating in this study bears no risks to you as the participant.

Benefits

There are no direct monetary benefits provided to you for participating in this study. In addition, there are no disadvantages or penalties for not participating.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this committee, Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the committee secretaries are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

For further information regarding this study, you may contact:

1) Chigomezyo Kawonga (Researcher): email- 1629583@students.wits.ac.za
2) Ms. Rubina Shaikh (Supervisor): email- Rubina.shaikh@wits.ac.za or Tel: (011) 717-2369

Thank you for taking time to consider participation in this study.

Kind Regards,

Mr. Chigomezyo Kawonga

Masters student

1629583

Appendix 5: Netcare Research Approval

Netcare Hospitals (Pty) Ltd

Tel: + 27 (0)11 301 0000
Fax: Corporate +27 (0)11 301 0499
76 Maude Street, Corner West Street, Sandton, South Africa
Private Bag X34, Benmore, 2010, South Africa
www.netcare.co.za

RESEARCH OPERATIONS COMMITTEE FINAL APPROVAL OF RESEARCH

Approval number: UNIV-2022-0067

Mr Chigomezyo Kawonga

E mail: 1629583@students.wits.ac.za

Dear Mr Kawonga

RE: EXPERIENCES, CHALLENGES AND PRACTICES OF VISUAL IMPAIRED PATIENTS AND PHARMACISTS WITHIN THE SOUTH AFRICAN PHARMACY HEALTH CARE SYSTEM

The above-mentioned research was reviewed by the Netcare Research Operations Committee's delegated members and it is with pleasure that we inform you that your application to conduct this research at Netcare Garden City, & Alberton Hospitals, has been approved, subject to the following:

i) Research may now commence with this FINAL APPROVAL from the Netcare Research Operations Committee.

ii) All information regarding Netcare will be treated as legally privileged and confidential.

iii) Netcare's name will not be mentioned without written consent from the Netcare Research Operations Committee.

iv) All legal requirements with regards to participants' rights and confidentiality will be complied with.

v) All data extracted may only be used in an anonymised, aggregated format and for the purposes of this specific study as specified in the proposal. The data may under no circumstances be used for any other purpose whatsoever.

vi) Netcare must be furnished with a STATUS REPORT on the progress of the study at least annually on 30th September irrespective of the date of approval from the Netcare Research Operations Committee as well as a FINAL REPORT with reference to intention to publish and probable journals for publication, on completion of the study.

vii) A copy of the research report will be provided to the Netcare Research Operations Committee once it is finally approved by the relevant primary party or tertiary

institution, or once complete or if discontinued for any reason whatsoever prior to the expected completion date.

viii) Netcare has the right to implement any recommendations from the research.

ix) Netcare reserves the right to withdraw the approval for research at any time during the process, should the research prove to be detrimental to the subjects / Netcare or should the researcher not comply with the conditions of approval.

x) APPROVAL IS VALID FOR A PERIOD OF 36 MONTHS FROM DATE OF THIS LETTER OR COMPLETION OR DISCONTINUATION OF THE STUDY, WHICHEVER IS THE FIRST.

- This approval granted applies strictly to the proposal as stipulated in the original application received.
- Should any amendments or variation to the materiality of the content of the research study become necessary during the course of the study, the principal investigator/researcher must apply for approval of these amendments/changes to the Netcare Research Operations Committee, prior to implementation.
- Any extension of the duration, and / or site, and / or investigators of the authorisation granted in this approval must be applied for in writing timeously for consideration by the Netcare Research Operations Committee in order to ensure continuity of the study/research.

We wish you success in your research.

Yours faithfully

Prof Dion du Plessis 1/12/22
Full member: Netcare Research Operations Committee & Medical Practitioner evaluating research applications as per Management and Governance Policy

Dr Shannon Nell
Chairperson: Netcare Research Operations Committee
Netcare Hospitals (Pty) Ltd
Date: 07/12/2022

Appendix 6: VIB Semi-structured interview guide

Semi-structured interview guide

Study Title: Knowledge, attitudes, and perceptions of pharmacists and visually impaired patients regarding the pharmaceutical care of the visually impaired.

Introduction:

Good day! My name is Chigomezyo Kawonga. It is an honour to have you here today for this interview. Thank you so much for your participation. How has your day been?

This study seeks to explore the experiences, challenges, and current practices of visually impaired patients and pharmacists within the South African Pharmacy healthcare sector. The aim of this study is to determine the knowledge, attitudes, perceptions, and current practices implemented by pharmacists in meeting the pharmaceutical care needs of the visually impaired patient. The purpose of this interview is to understand your views and perceptions on the challenges and experiences that you have with regards to being visually impaired and pharmacy healthcare. You will be asked questions that will be aimed at understanding what current practices are implemented in pharmacy healthcare settings that are able to address your needs, and how effective those implemented practices are. Participation in this interview is completely voluntary, and you are welcome to withdraw your participation and consent from this interview at any point during the interview. Your responses to the questions will be audio recorded. Please rest assured that these recordings will be kept confidential. My supervisor and I will be the only two people with access to them. In my study write up, I will utilize abbreviations or pseudonyms and remove any information that will identify you. The interview should take between 45 to 60 minutes. If you would like to participate in this interview, please read and acknowledge the consent forms and patient information sheet in front of you that is printed in braille. If you have any questions, please fill free to ask at any point during the interview.

The questions below will serve as a guide during the interview. I will use probing and follow-up questions as required.

- Describe your degree of visual impairment on a scale of 1 to 10, 10 being clear vision and 1 being completely blind and not able to detect light?
- How much effort, time and resources do you dedicate to your health-related needs?
- What type of medication do you use most often? Pills? Tablets? Syrups?
- How do you manage your medication?
- Where do you store your medication?
- Do family and friends help you with your medication needs?
- How confident are you in managing your medication needs independently?
- Have you ever forgotten to take your medication?
- Tell me how you are able to identify?
- Tell me how you administer your medication at home?
- Have you ever taken the wrong medication by mistake because you were unable to identify your medication?
- Do you use pill boxes, different containers, braille stickers to help identify your medication?
- Have you ever experienced an adverse event caused by your medication?
- How do you dispose of excess medication?
- What are some of the challenges you find with medicines?
- How much do you know about the medication you are taking, in terms of information like the expiry date, indication, dosing, and warning information?
- How do you obtain information relating to questions you have about your medication?
- Do you use mobile devices regularly?
- What kind of accessibility features do you use on your mobile device?
- Do you use any assistive devices daily?
- How often do you go to a pharmacy or a hospital?
- Does the pharmacy you go to have practices in place or things they do to assist you?
- Do the pharmacists give you extra attention and time?
- Tell me about some of the challenges of being visually impaired and going to a pharmacy.

- Tell me about some of your positive experiences of going to a pharmacy.
- How effective do you feel the strategies, practices and standards are, that have been implemented to help people who are visually impaired?
- What type of pharmacy counselling or strategies would be best for you?
- Is enough being done to address the needs of the visually impaired community in the pharmacy healthcare sector? If you agree, what is being done that is helping? If not, what needs to be improved on?
- What assistive devices, strategies, practices, etc., would be best to improve pharmacy healthcare services for the visually impaired patient?

Conclusion:

Thank you very much for your time, assistance, and participation, do you have any further questions for me? It was an honour and privilege to interview you and learn more about your experiences. I would like to highlight that the information you have provided today is 100% confidential and will only be accessed by my supervisor and I. Please feel free to contact, my supervisor or I, if you have any further queries, concerns, or questions.

Thank you so much once again and have a good day!

Appendix 7: Pharmacist Semi-structured interview guide

Semi-structured interview guide

Study Title: Knowledge, attitudes, and perceptions of pharmacists and visually impaired patients regarding the pharmaceutical care of the visually impaired.

Introduction:

Good day! My name is Chigomezyo Kawonga. It is an honour to have you here today for this interview. Thank you so much for your participation today and for participating in the online survey. How has your day been?

This study seeks to explore the experiences, challenges, and current practices of visually impaired patients and pharmacists within the South African Pharmacy healthcare sector. The aim of this study is to determine the knowledge, attitudes, perceptions, and current practices implemented by pharmacists in meeting the pharmaceutical care needs of the visually impaired patient. The purpose of this interview is to understand your views and perceptions on the challenges and experiences that you have with regards to being a pharmacist and treating the visually impaired patient. You will be asked questions which will be aimed at understanding what current practices are implemented in pharmacy healthcare settings that are able to address the needs of the visually impaired patient, and how effective those implemented practices are. Participation in this interview is completely voluntary, and you are welcome to withdraw your participation and consent from this interview at any point during the interview. Your responses to the questions will be audio recorded. Please rest assured that these recordings will be kept confidential. My supervisor and I will be the only two people with access to them. In my study write up, I will utilize abbreviations or pseudonyms and remove any information that will identify you. The interview should take between 45 to 60 minutes. If you would like to participate in this interview, please read and acknowledge the consent forms and patient

information sheet in front of you that is printed in braille. If you have any questions, please fill free to ask at any point during the interview.

The questions below will serve as a guide during the interview. I will use probing and follow-up questions as required.

- Do you have any questions, queries, or comments on the online survey that you took?
- How long have you been practicing?
- How many visually impaired patients have you come across in your years of practice?
- Tell me the procedure when a visually impaired individual comes to your pharmacy?
- Tell me how you would provide counselling to a visually impaired patient.
- Do you counsel your visually impaired patients on possible side effects, warmings and adverse reactions to their medication?
- Have you received any reports of adverse events from your visually impaired patients?
- What kind of challenges do you think visually impaired patients face?
- What are some of the challenges you have experienced, or would foresee in treating visually impaired patients as a pharmacist?
- Are you aware of any governmental health or SAPC guidelines that seek to address the needs of the visually impaired patient in the pharmacy health sector?
- Tell me of some of the guidelines/ practices that are in place in your pharmacy that are aimed at visually impaired patients.
- What ways could pharmacy guidelines and practice be improved in order to ensure better service to people who are visually impaired?
- Do you know of any strategies, practices, or assistive devices that you could use to aid visually impaired patients in your pharmacy?
- What kind of assistive devices would be ideal in your practice?
- Are they effective?
- Do you recommend braille printed stickers or material to visually impaired patients?
- Do you counsel visually impaired patients on how to properly store their medication?
- Have any visually impaired patients returned excess medication back to you?
- What essential changes would you make in your pharmacy to improve healthcare for visually impaired individuals?

Conclusion:

Thank you very much for your time, assistance, and participation, do you have any further questions for me? It was an honour and privilege to interview you and learn more about your experiences. I would like to highlight that the information you have provided today is 100% confidential and will only be accessed by my supervisor and I. Please feel free to contact, my supervisor or I, if you have any further queries, concerns, or questions.

Thank you so much once again and have a good day!

Appendix 8: VIB participant Information Sheet (Interview)

Participant Information Sheet

Study title: Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

Dear Sir/Madam,

Introduction

I, Chigomezyo Kawonga, am exploring the experiences, challenges, and current practices of visually impaired patients and pharmacists within the South African Pharmacy healthcare sector The aim of this study is to determine the knowledge, attitudes, perceptions, and current practices implemented by pharmacists in meeting the pharmaceutical care needs of the visually impaired patient. The study has the support and approval of Blind SA. In obtaining support form BlindSA, I have been working directly with Thandile Butana (development officer) and Jace Nair (CEO) BlindSA.

Invitation to participate:

I would like to invite you to participate in this interview. This interview will consist of you, the participant, and the interviewer. These interviews will take place online or by telephone at

a time that is most convenient for you. Arrangements will be made prior to the interview to determine the best way to conduct the interview. Online interviews will be conducted on platforms such as Microsoft Teams, Google Meet, Zoom, or WhatsApp. Please be assured that steps will be taken to ensure that the interview is as convenient for you as possible. For example, all data or airtime costs for the interview will be covered by the study. Provisions can be made for the interview to be conducted in the language of your choice. The interviews will be audio recorded. Before the commencement of the interview, you will be asked to provide consent to the participation of the interview and the audio recording of the interview proceedings.

What is involved in this study?

Participation in this interview involves the answering of questions that will be asked to determine your experiences, challenges and perceptions relating to pharmacy healthcare. Participation in this interview is totally voluntary. Likewise, participants are also entitled to withdraw their consent at any point during this interview. Refusal to participate in this survey or the withdraw of consent will not result in you incurring a penalty or loss of any kind The interview should take between 30 to 45 minutes to complete.

Confidentiality

Please be assured that all data and information that will be obtained from this study will be treated as confidential. Access to study data and data collected from this interview will be only available to the researchers and their supervisors. No names or identifying information will appear in any report or article arising out of this study. All data will be retained for a period of 2 years. After this period elapses all data collected from the questionnaires will be deleted. If the data will be used in a publication, the data will be retained for a period of 6 years, after which all data will be duly destroyed.

Risks

There are no risks associated with participating in this study.

Benefits

This study seeks to be of great benefit to the visual impaired community in South Africa. The data and results from this study will be used to inform policy makers, health officials, and pharmacists on ways to improve the level of healthcare provided towards visually impaired members of our society.

You will not receive any direct monetary benefits from participating in this study, and there are no disadvantages or penalties for not participating.

Costs

There is neither payment nor cost involved in study participation. All data charges will be covered by study.

Results

I will be pleased to provide a results summary on request, free of charge.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. The principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

For further information regarding this study, you may contact:

1) Chigomezyo Kawonga (Researcher): email- 1629583@students.wits.ac.za

2) Mrs. Rubina Shaikh (Supervisor): email- Rubina.shaikh@wits.ac.za or Tel: (011) 717-2369

Thank you for taking time to consider participation.

Kind Regards,

Mr. Chigomezyo Kawonga

Masters student

Appendix 9: Pharmacist participant Information Sheet (Interview)

Participant Information sheet: Research Interview

Study title: Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

Dear Sir/Madam,

Introduction

My name is Chigomezyo Kawonga, and I am exploring the experiences, challenges, and current practices of visually impaired patients and pharmacists within the South African pharmacy healthcare sector. The aim of this study is to determine the knowledge, attitudes, perceptions, and current practices implemented by pharmacists in meeting the pharmaceutical care needs of the visually impaired patient.

Invitation to participate:

I would like to invite you to participate in this interview.

What is involved in this study?

This interview will consist of you, the participant, and the interviewer. These interviews will take place online or by telephone at a time that is most convenient for you. Arrangements will be made prior to the interview to determine the best way to conduct the interview. Online interviews will be conducted on platforms such as Microsoft Teams, Google Meet, Zoom, or telephonically. Please be assured that steps will be taken to ensure that the interview is as convenient for you as possible. For example, all data or airtime costs for the interview will be covered by the study. Provisions can be made for the interview to be conducted in the language of your choice. The interviews will be audio recorded for future data analysis. Before the commencement of the interview, you will be asked to provide consent to the participation of the interview and the audio recording of the interview proceedings. Refusal to

participate in this survey or the withdrawal of consent will not result in you incurring a penalty or loss of any kind. The interview should take between 20 to 30 minutes to complete.

Confidentiality

Please be assured that all data and information that will be obtained from this study will be confidential. No information that reveals participant identifying information will be obtained at any point during this study. Access to study data and data collected form this survey will be only available to the researchers and their supervisors.

Risks

There are no risks associated with participating in this study.

Benefits

You will not receive any direct benefits from participating in this study, and there are no disadvantages or penalties for not participating.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

For further information regarding this study, you may contact:

1) Chigomezyo Kawonga (Researcher): email- 1629583@students.wits.ac.za
2) Mrs. Rubina Shaikh (Supervisor): email- Rubina.shaikh@wits.ac.za or Tel: (011) 717-2369

Thank you for taking time to consider participation.

Kind Regards,

Mr. Chigomezyo Kawonga

Masters Candidate

1629583

Appendix 10: Participant Consent Form (Interview)

Research Interview: Participant Consent Form

Study title: Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

I hereby confirm that I have understood the information contained within the participant information sheet pertaining to the research that I am participating in. I understand the following:

- I understand all that is required for this study.
- I will participate in this study towards the researcher's Masters study.
- I confirm that I have given consent to participate freely and willingly.
- I understand that I may withdraw my consent and permission to participate at any time during the study.

I hereby agree that I have understood the requirements, and I am willing to participate in the study.

Participant Initials: _____

Participant Signature: _____

For further queries please feel free to get in touch with us using the following contact details:

	Name	**Contact Number**	**Email Address**
Supervisor	Rubina Shaikh	011 717 2369	Rubina.Shaikh@wits.ac.za
Researcher	Chigomezyo Kawonga	064 016 6940	1629583@students.wits.ac.za

Appendix 11: Participant Audio Recording Consent Form (Interview)

Research Interview Audio Recording Consent Form

Study title: Experiences, Challenges, and Practices of Visually Impaired Patients and Pharmacists Within the South African Pharmacy Healthcare System

I, hereby, confirm that I have read and understood the information sheet provided and I understand the following:

- I give consent to be voice recorded during the interview.
- I have given consent willingly and may withdraw from this study at any time without any negative consequences.
- I may mention if there are any answers I would not like to be recorded or used in the study.
- My responses will be kept confidential i.e., only the researcher and her supervisor will have access to my responses.
- Anonymity will be maintained in the study write up/results using pseudonyms.
- I give the researcher permission to use the recordings for his research project.
- I give the researcher permission to use direct quotes from the recording.

I hereby agree that I have understood the requirements of this study, and I am willing to participate.

Participant Initials: _____

Participant Signature: _____

For further queries please feel free to get in touch with us using the following contact details:

	Name	Contact Number	Email Address
Supervisor	Rubina Shaikh	011 717 2578	*Rubina.Shaikh@wits.ac.za*
Research team	Chigomezyo Kawonga	064 0166 940	*1629583@students.wits.ac.za*

Appendix 12: Table of descriptive statistics of knowledge statement responses

Knowledge Statements	Responses	
	Yes (n (%))	No (n (%))
Do you know the percentage of blind/visually impaired persons in South Africa?	10 (3)	288 (97)
Are you aware of some of the specific challenges that visually impaired patients experience in relation to pharmaceutical services access and their medicine compliance?	210 (70)	90 (30)
Have you received any training on how to care for blind/visually impaired patients?	13 (4)	286 (96)
Are you familiar with any techniques to apply should you need to assist a blind/visually impaired patient presenting at your facility?	68 (23)	228 (77)
Do you know of any techniques or practices employed by blind/visually impaired patients to assist in medicine compliance in the absence of a caregiver?	58 (19)	240 (81)
Are you aware of national or provincial policies or guidelines relating to the care of blind/visually impaired patients in a pharmacy setting?	8 (3)	288 (97)

Appendix 13: Table of descriptive statistics of attitude statement responses

Attitude Statements	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
Blindness/visual impairment is a disability that needs to be addressed in South Africa.	210 (73)	79 (27)	0 (0)	0 (0)	0 (0)
I believe that as a pharmacist it is essential to develop the necessary skills to care for blind/visually impaired patients.	210 (70)	78 (26)	9 (3)	1 (0)	2 (1)
I believe that my pharmacy has sufficient resources to assist VIB impaired patients with their medication management needs	13 (4)	17 (6)	83 (28)	121 (41)	64 (21)
I am satisfied with the current system used to counsel VIB impaired patients on the use of their medicines.	7 (2)	11 (4)	73 (24)	131 (44)	77 (26)
I would dedicate additional time in the dispensing cycle when dispensing medicine to blind/visually impaired patients.	162 (55)	118 (40)	12 (4)	3 (1)	2 (1)
I am confident that VIB impaired patients that I counsel would be able to remember all the information that I provide to them when they return home.	27 (9)	74 (25)	110 (37)	68 (23)	20 (7)
I am keen to try new technologies that would aid blind/visually impaired individuals with their medication management needs.	186 (62)	104 (35)	8 (3)	0 (0)	1 (0.3)
I am interested and willing to incorporate new technologies that would assist VIB.	185 (62)	104 (35)	8 (3)	0 (0)	2 (1)
Current general pharmacy standards and practices in relation to blind/visually impaired patients' needs improvement	174 (58)	97 (32)	21 (7)	3 (1)	4 (1)
Healthcare authorities and policy makers should develop policies that improve the current state of health care services for blind/visually impaired patients.	179 (60)	105 (35)	12 (4)	1 (0,3)	2 (0.7)
Pharmacists should proactively develop ways to ensure patient compliance in the blind/visually impaired community.	157 (53)	128 (43)	12 (4)	0 (0)	2 (1)
Information about medicine should be made available in different formats (e.g., Braille) to cater to the needs of blind/visually impaired patients.	193 (65)	92 (31)	10 (3)	1 (0)	1 (0)
Devices that use innovative technology could be a good way to assist VIB impaired patients in taking their medication without assistance from a caregiver.	176 (59)	111 (38)	8 (3)	1 (0)	0 (0)

More investment and research should be devoted to the development and science of innovating new ways to assist people who are blind/visually impaired.	172 (58)	113 (38)	12 (4)	0 (0)	0 (0)

Appendix 14: Table of descriptive statistics of practice statement responses

Practice Statements	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
I keep up to date with the latest developments in the therapeutic care of VIB patients.	26 (9)	32 (11)	137 (47)	75 (26)	23 (8)
I seek to alleviate the challenges that VIB patients face with respect to their healthcare needs.	103 (35)	141 (48)	43 (15)	4 (1)	2 (1)
If I was to encounter a VIB patient, I would spend more time counselling them as compared to non-visually impaired patients.	134 (46)	139 (47)	18 (6)	1 (0)	1 (0)
I implement national and provincial guidelines that seek to help people who are VIB in my practice.	18 (6)	32 (11)	114 (39)	101 (34)	28 10)

Appendix 15: Detailed demographic information on the pharmacist participants interviewed in Phase 2 of the study

Name	Consent	Sex	Age	YoE	Province	Bpharm	Other Qualification	Sector	Pub/Private
P1	Yes	Male	76	55	Gauteng	Yes	Homeopathy	Retail	Private
P2	Yes	Male	80	52	Gauteng	Yes	Mpharm	Retail	Private
P3	Yes	Male	45	20	Gauteng	Yes		Retail	Private
P4	Yes	Male	30	8	Gauteng	Yes		Retail	Private
P5	Yes	Female	29	6	Gauteng	Yes		Retail	Private
P6	Yes	Male	48	18	Gauteng	Yes		Retail	Private
P7	Yes	Female	60	40	Gauteng	Yes		Retail	Private
P8	Yes	Male	28	4	Kwa-Zulu Natal	Yes		Hospital	Public
P9	Yes	Female	35	13	Gauteng	Yes		Retail	Private
P10	Yes	Female	27	4	Mpumalanga	Yes		Hospital	Private
P11	Yes	Female	41	15	Gauteng	Yes		Retail	Private
P12	Yes	Male	27	3	Limpopo	Yes		Hospital	Private

Appendix 16: Detailed demographic information on the VIB participants interviewed in Phase 2 of the study

Participant	Gender	Age	Province	Highest Education	Degree of VIB	Cause of VIB	VIB date
1	Male	49	Limpopo	Dip Business	Severe VI	Diabetes	2022
2	Female	45	Gauteng	Cert Contact Centre support	Total Blindness	Congenital	-
3	Male	51	Gauteng	Dip Tourism	Moderate VI	Optical Nerve Damage	2018
4	Female	45	Gauteng	BA – Procurement	Moderate VI	Brain Tumour	2018
5	Female	42	North-West	Secondary	Total Blindness	Congenital	-
6	Male	46	Kwa-Zulu Natal	BA – Sociology	Total Blindness	Congenital	-
7	Male	31	Mpumalanga	Secondary	Total Blindness	Hydrocephalus	2017
8	Female	44	Gauteng	Adv Dip. Tourism	Total Blindness	Criminal Assault	2011
9	Female	46	Eastern Cape	Dip. Library Studies	Total Blindness	Diabetes	2018
10	Male	50	Gauteng	Pg Dip. Management	Total Blindness	Congenital	-
11	Female	47	Western Cape	Secondary	Total Blindness	Congenital	-
12	Female	34	Western Cape	Secondary	Total Blindness	Congenital	-

Appendix 17: Plagiarism Report – Turnitin

Kawonga Dissertation Final Draft

ORIGINALITY REPORT

12%	9%	9%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	wiredspace.wits.ac.za Internet Source	2%
2	Submitted to University of Witwatersrand Student Paper	1%
3	Masilana, Masocha Vusi. "Running-Related Injuries and Risk Factors Among Runners in Soweto Township Clubs, Johannesburg.", University of the Witwatersrand, Johannesburg (South Africa) Publication	<1%
4	Submitted to South African Pharmacy Council Student Paper	<1%
5	www.mdpi.com Internet Source	<1%
6	researchspace.ukzn.ac.za Internet Source	<1%
7	Submitted to London School of Hygiene and Tropical Medicine Student Paper	<1%
8	e-space.mmu.ac.uk Internet Source	<1%
9	etd.uwc.ac.za Internet Source	<1%
10	worldwidescience.org Internet Source	<1%
	ir-library.ku.ac.ke	