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# Moderators of Fidelity to Praziquantel Dispensing Guidelines in Zimbabwean Retail Pharmacists

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**UNIVERSITY OF THE WITWATERSRAND**




FACULTY OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

# MODERATORS OF FIDELITY TO PRAZIQUANTEL DISPENSING GUIDELINES IN ZIMBABWEAN RETAIL PHARMACISTS

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment of the requirement for the degree of Master of Science in Epidemiology (Implementation Science)

August 2023

**DECLARATION**

I, Victor Ndanda, declare that this research report is my work. It is being submitted for the award of a Master of Science degree in Epidemiology in the field of Implementation Science to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination of degree at this or any other University.



(Candidate signature)

I declare this on the 21st of August 2023 in Harare, Zimbabwe.

**DEDICATION**

To you, ‘Sunshine’, because knowledge begins at the inception of life.

## ABSTRACT

**Background:** Globally, 260 million people live with *schistosomiases,* with 90% of these cases found in sub-Saharan countries, with Zimbabwe also facing a high prevalence of heavy infection. The treatment of choice for *schistosomiasis* is praziquantel and fidelity to the correct dosage is integral to compliance and treatment outcomes. The study sought to investigate the relationship between the implementation fidelity to praziquantel dispensing guidelines and their moderating factors, in retail pharmacists in Zimbabwe registered in the year 2021. This was done by; finding the implementation fidelity to praziquantel dispensing guidelines, describing the moderating factors of the implementation fidelity, and investigating the relationship between the moderating factors and the implementation fidelity of Zimbabwe retail pharmacists.

**Method**: A cross-sectional, analytical study design was employed on 301 participants who were selected from retail pharmacists in Zimbabwe registered in 2021. Carroll's framework for implementation fidelity was adapted and developed for the data collection tool, data analysis, and interpretation. Fidelity scores were computed from the aspects of adherence (content, coverage, and frequency), and the corresponding moderating factors. Logistic regressions were used to determine how the moderating factors related to implementation fidelity.

**Results**: The study comprised 51.8% females and 48.2% males. The median implementation fidelity score (IQR) was 53.3% (43.33, 66.67). The results indicated that the implementation fidelity was significantly associated with the following moderating factors showing the significance ($p < 0.05$), facilitation strategies (cOR: 2.70; 95% CI: 1.50-486), quality of delivery ($p = 0.053$) and dosing practice ($p < 0.001$). However, after adjusting for socio-demographic factors, only facilitation strategies (cOR: 3.35; 95% CI: 1.58-7.05), participants' responsiveness (cOR: 1.83; 95% CI: 1.06-3.16), and the dosing practice ($p = 0.002$) were significant with implementation fidelity.

**Conclusion:** The low implementation fidelity to the WHO recommended guidelines for praziquantel dosing adherence (compliance > 75%) would suggest that treatment could be compromised, and highlights poor compliance with the guidelines. Thus, negatively impacting the required health outcomes of patients. Effective and efficient communication methods can be used to improve the implementation fidelity of the recommended guidelines.

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To friends and family, your support is always noted and appreciated.

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## NOMENCLATURE

| | |
|---|---|
| BNF | British National Formulary |
| CDC | Centre of Diseases Control |
| DALYS | Disability Adjusted Life Years |
| EBI | Evidence-Based Intervention |
| EDLIZ | Essential Drug List of Zimbabwe |
| IS | Implementation Science |
| MASCA | Medicines and Allied Substances Control Act |
| MCAZ | Medicines Control Authority of Zimbabwe |
| MOHCC | ministry of health and child care |
| PCZ | Pharmacists Council of Zimbabwe |
| PIM | Pharmacist Initiated Medicine |
| PP | Prescription Preparation |
| RADAR | Royal Association for Disability and Rehabilitation |
| STH | Soil Transmittable Helminths |
| WASH | Water Sanitation and Hygiene |
| WHO | World Health Organization |
| BNF | British National Formulary |

## DEFINITION OF TERMS

| | |
|---|---|
| Content | The cognitive knowledge base for the determination of praziquantel dosage |
| Coverage | The different textbooks available to a practitioner for the determination of praziquantel dosage |
| Interventional Complexity | The magnitude to which the practitioner perceives the difficulties in comprehending the recommended guidelines. |
| Participants' response | The immensity to which a practitioner is willing to engage concerning the distribution of knowledge on the recommended WHO guidelines |
| Quality of delivery | The perception of the visibility of the package insert accompanying praziquantel in communicating the recommended WHO dosage. |

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# CHAPTER 1: INTRODUCTION

This chapter (background and literature review) will launch and define key terms and concepts on the researched subject matter. The flow of the chapter aimed to give a simplified version of the keywords, concepts, epidemiology, and a walkthrough of the practices and processes of *schistosomiasis*, praziquantel dispensing, and its fidelity in the Zimbabwean retail pharmacists' community; to then narrow on the problems identified, their justification of being researched, and leading to the research questions, aims and objectives of the whole report.

## 1.1.1 The burden of *schistosomiases*

Globally, a conservative estimation of more than 260 million people live with *schistosomiasis* (Baan et al., 2016), making it the second most prevalent infection after malaria (Toledo and Fried, 2019). The World Health Organization (WHO) also puts over 700 million people at risk of potentially contracting the disease and estimates that more than 280 thousand people die annually after infection (Muhammad, 2019), with an estimated burden of 3.31 million disability-adjusted life-years (DALYs) per year (Cucchetto et al., 2019). Of the global *schistosomiasis* cases, more than 90% have been found to occur in sub-Saharan Africa (Adenowo et al., 2015).

The WHO defines heavy infection intensity as any disease prevalence above 5.8% of the population. An estimated point prevalence in Zimbabwe showed the average prevalence of S. *mansoni* at 7.2% and S. *haematobium* at 18% in areas where *schistosomiasis* is endemic (Midzi et al.,2014). Despite the paucity of health effects of *schistosomiasis* in Zimbabwe, Van der Werf et al. 2003's quantification of clinical morbidity associated with *schistosome* infection in sub-Saharan Africa revealed high magnitudes of *schistosomiasis*-related mortality and morbidity-making it a significant public health problem. Health Data Zimbabwe, 2022, reported that approximately 40% of the country's mortality and morbidity risk is due to Water, Sanitation, and Hygiene (WaSH) sources, with *schistosomiases* being one of them. Mbabazi et al. 2011, also cite that in women with pre-existing *S haematobium*, the risk of acquiring HIV (one of Zimbabwe's significant health burdens) could be as much as three to four times.

### 1.1.2 The treatment of *schistosomiases*

Praziquantel is a drug classified as an antihelminth agent. It is effective against all forms of human *schistosomes*. Furthermore, its low toxicity, tolerability, and extensive spectrum activity enable it to be the treatment of choice (Committee, 2021).

### 1.1.3 Implementation gaps in *schistosomiases* treatment

Over time, the recommended praziquantel dosage has changed due to balancing its efficacy and side effects; before the WHO 2018 guidelines, the recommended dosing was 40mg/kg taken as a single dose. However, in the newest praziquantel product information, the WHO, and various other pharmacopoeias now recommend an alternative dosage regimen of 3 doses of praziquantel, 20 mg/kg, given 4 hours apart. (Committee, 2019). Further to support this, a 2017 study by Munisi et al. that compared the efficacy and long-term outcomes of administering praziquantel in a single dose versus in divided doses revealed that the latter had better cure rates and long-term egg reduction in the host individual, with cure rates of 68.68% versus 93.10% (p 0.000) and egg reduction rates of 87.27% versus 97.54% (p = 0.006).

### 1.1.4 The Zimbabwean implementation gap in *schistosomiases* treatment

Through its licensing and enforcement division, the Medicines Control Authority of Zimbabwe (MCAZ) requires that every registered pharmacy have reference textbooks for dosage referral and confirmation. According to March 2021 Licensing and Enforcement 56 (the latest published online document), the required reference texts for dispensing are the BNF, Martindale, and Essential Drugs List of Zimbabwe (EDLIZ). Other reference texts can also meet this requirement as long as they are of verifiable international standards (Inspection of a New Pharmacy, 2021). However, due to the non-availability and costs of some international reference texts, pharmacies are allowed to have older versions of reference texts even though these may have outdated recommended praziquantel dosage information.

## 1.2 Problem statement

Fidelity can mediate the relationship between interventions and their intended outcomes, hence the support for adherence to prescribing and dispensing protocols cannot be overemphasized (Kardas, 2002). The new revised WHO guidelines for the dosing of praziquantel recommends an initial dose of 20mg/kg, followed by three more does of 20mg/kg after every 4-6 hours. The Medicines Control Authority of Zimbabwe stipulates that all registered pharmacies have at least two recommended texts for dosage referencing; however, sometimes, the texts provide different dosing for praziquantel. The British National Formulary, 2021 recommends dosing of Praziquantel for adult *Schistosomiases* at 20mg/kg, followed by three more doses of 20mg/kg after 4-6 hours, *S. Haematobium* and *S. Mansoni*, whilst the Essential Drug List of Zimbabwe, 2021 gives dosing of Praziquantel for adult *Schistosomiases* at 40mg/kg as a single dose, for *S. Haematobium* and *S. Mansoni* 60mg/kg, once a day for three days.

### 1.2.2 Justification

Anthelmintic treatment coverage and effectiveness are crucial to the WHO's target of controlling and eradicating soil-transmitted helminthiasis by 2030 (Becker et al., 2018). The implementation fidelity to the advised optimal praziquantel dose recommendations among retail pharmacists has to be studied to objectively assess the quality of its implementation and the potential factors influencing this fidelity (Adenowo et al., 2015).

Administering more than one dose of praziquantel, rather than one, has been found to increase cure rates and reduce the prevalence of schistosomiasis (Munisi et al., 2017). King et al., 2011 further corroborate this notion and suggest that this practice can reduce both direct and indirect costs associated with the transmission, and can be quantified in terms of a life-path model. This model predicts that multiple-dosing strategies in typically high-risk communities are cost-effective, as they limit the total number of years spent infected, as well as the number of years spent with heavy infection, leading to improved quality of life.

Treatment fidelity monitoring enables the early detection of errors, which helps to prevent protocol deviations from becoming widespread and long-lasting. Through monitoring fidelity to recommended treatment guidelines, implementation fidelity can be improved, leading to higher rates of patient retention and lower attrition (Borelli, 2011).

Therefore, the study assessed Zimbabwe's pharmacists' current knowledge and practices regarding Praziquantel dispensing practices and recommended optimum protocols and potential moderators to the guidelines.

## 1.3 Literature review

### 1.3.1 Schistosomiasis

Neglected tropical diseases (NTDs) are a group of treatable infections that affect 1.5 billion people, 40% of whom live in Africa, primarily among the poor and vulnerable. NTDs cause disability and disfigurement, leading to economic unproductivity and school absenteeism (Zimbabwe and Neglected Tropical Diseases, 2018). These diseases, including *schistosomiasis,* continue to pose a major global health challenge, leading to both acute and chronic debility. *Schistosomiasis* was first described by Dr. Bilharz in 1851 and is an ancient disease caused by various *Schistosoma* species found in tropical regions, with evidence of its existence dating back as far as 1200 BC in tropical countries, and 2100 years ago in China (Toledo and Fried, 2019). These species (*S. Haematobium, S. Jupeci, and S. Mansoni*) can inhabit the human body and manifest as a protozoan infection. Infected individuals can present with symptoms such as chronic anaemia, diarrhea, impaired cognitive function, haematuria, bladder carcinoma, hepato-intestinal symptoms, and death (Colley et al., 2014). Over the years, however, management and treatment of *schistosomiasis* have advanced, leading to a decreased mortality and morbidity to a point where *schistosomiasis* eradication is seen as achievable

### 1.3.2 *Schistosomiasis* in Zimbabwe

Zimbabwe is a lower–middle–income country in sub-Saharan Africa and lies within the tropics. It comprises approximately 15 million people, two-thirds of the population in rural areas. The health status in Zimbabwe falls short on several fronts, and the treatment of *schistosomiases* is no exception. (Bradley, Clyde, and Kenneth, 2020). Table 1.1 shows each province by size, population, and *schistosomiasis* distribution.

Table 1.1: *Schistosomiases* distribution by province and population in Zimbabwe (Midzi et al., 2014)

| **Province** | **Percentage by size of province** | **Population percentage** | ***Schistosomiasis* Distribution** |
|---|---|---|---|
| Bulawayo | 8.8% | 0.2% | 3.3% |
| Harare | 15.6% | 0.2% | 14.8 |
| Manicaland | 12.9% | 9.8% | 23.8% |
| Mashonaland central | 8.5% | 7.6% | 31.2% |
| Mashonaland east | 9.9% | 3.4% | 39.3% |
| Mashonaland west | 11.0% | 15.5% | 22.8% |
| Masvingo | 10.9% | 15.2% | 37.0% |
| Matebeleland North | 5.5% | 20.2% | 3.8% |
| Matebeleland South | 5.0% | 14.6% | 8.8% |
| Midlands | 11.9% | 13.2% | 30.4% |

### 1.3.3 Treatment of *schistosomiasis*

In finding the optimum treatment for *schistosomiases,* extensive research, which is still ongoing, has been done, spanning several years of exploits. Early efforts focused on agents that were easy to tolerate and their effectiveness. Some of the problems rife with earlier agents include; varying degrees of gastrointestinal side effects in some cases leading to the death of some patients, mode of drug delivery with some agents only being deliverable to the patient(s) only as injectables, and cost. These factors rendered some of these agents inefficient for optimum treatment and accessibility to patients. Further advancements in development led to orally administrable agents and agents with reduced potential side effects profiles. However, problems encountered included the efficaciousness of some of the agents against the whole *schistosomiases* species spectrum, some existing and exacerbated side effects, concerns for drug resistance, and the cost-effectiveness of the agents (Chala, 2023). The most significant advancement to date in the treatment of *schistosomiases* has been Praziquantel, developed in 1970 and by 1985, being reported by the WHO as the drug of choice for both treatment and control, with over 150 million people having been treated over a period of only ten years (2007-2017) (WHO, 2018). Characteristics of Praziquantel that make it the treatment of choice include and are not limited to its effectiveness against all forms of *schistosomiases* species, its

tolerability (as it is taken orally and has the least side effect profile range in comparison with other agents to date), its cost-effectiveness, its use both as a curative and prophylactic agent and in its ability to suppress and prevent re-infection. Studies are still being conducted to optimize and complement Praziquantel in treating *schistosomiases* (BNF, 2022)

### 1.3.4 Praziquantel's mechanism of action

To understand praziquantel's mechanism of action, Figure 1.3 gives the life cycle of *schistosomiasis* from the existence of the various *schistosomiases* species eggs.

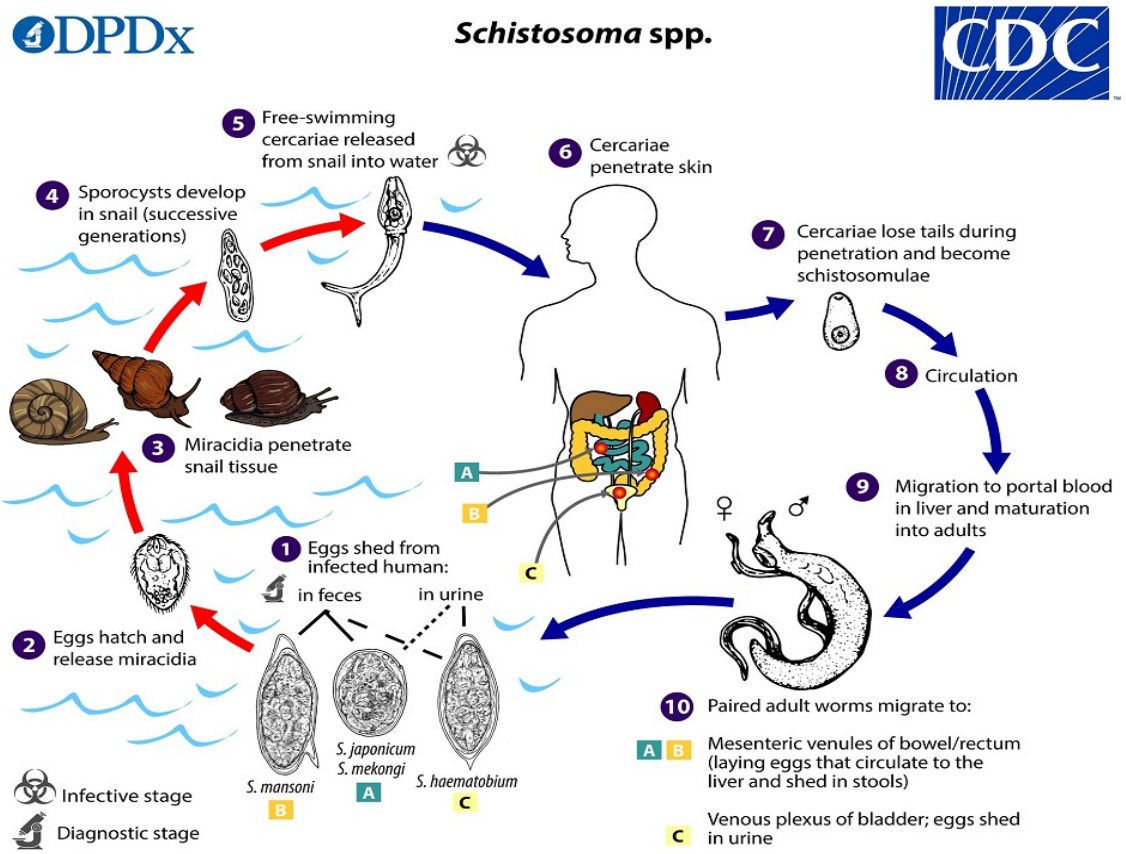



*Figure 1.2: Schistosomiasis life cycle (adapted from CDC, 2019)*

*Schistosoma* eggs are eliminated with faeces or urine (1). When optimum conditions arise, the hatching of eggs into miracidia happens (2). These swim into snails regarded as intermediate hosts (3). In the snails, two *sporocyst* stages exist (4), leading to *cercariae* production (5). The snails release the cercariae, which swim and enter the mammalian host (including humans) (6); in the mammalian host, these further develop into the state of change *schistosomula* (7). The

*schistosomula* then travels through the blood to various organs and the liver, where they mature (8) (9). Sexual reproduction of the protozoans occurs in the liver, where they multiply (10). Depending on the *Schistosoma* species, they move and inhabit different body organs, leading to the pronunciation of their effects. Praziquantel has been shown to act on adult worms by vacuolation and blebbing the worm's subsegmental structures and reducing the production of eggs in mammalian hosts (Nelwan, 2019).

### 1.3.5 The Preamble to Implementation Science (IS)

Implementation science is a discipline that systematically promotes the adoption, scale-up, and adaptation of evidence-based interventions (EBIs) to improve the effectiveness and quality of the interventions' delivery. The business focus of IS research in healthcare is to allow for the optimum delivery of interventions, improve public health and maximize care (Bauer et al., 2015). Implementation science studies seek to assess implementation outcomes meant to provide for an EBI, its acceptability, adaptation, appropriateness, costing, feasibility, penetration, sustainability, and adherence or fidelity (Wensing and Grol, 2019).

### 1.3.6 Fidelity and Moderating Factors in Implementation Science

Proctor et al., 2010 defined implementation fidelity as the extent to which an intervention follows the original protocol's instructions or the program's designers' intentions. It, therefore, follows that the magnitude of the adherence to a given intervention will likely increase the attainment of its intended effect(s). However, in most cases, this commitment is also affected by other external factors, the moderating factors, for example, the facilitation strategies and quality of delivery of the invention. For this reason, an understanding of the fidelity to intervention must have some knowledge of factors that may moderate this commitment and attain its outcomes (Ridde, Pérez, and Robert, 2022). Mihalic, Fagan, and Argamaso, 2018, denote that the determination of implementation fidelity to intervention allows its viability and is essential in evidence-based practice. They also state other key advantages like ruling out errors that can be inherent to intervention and imperative in the provision of primary data, which can be used for future studies and to confer heterogeneity which is essential in internal validity. Prudence is critical in the use of antimicrobials for numerous reasons; the nature and the roles of pharmacists allow for this prudence, the correct provision of medicaments, and as

a source of advice to prescribers on effective, rational, practical, and safe drug usage (Wiffen, 2021).

Moderating factors to implementation fidelity can have an impact on the successful implementation of interventions. They can impact the uptake and use of interventions, and influence policies and funding which can influence the ability to implement interventions. Socio-cultural factors, such as attitudes and beliefs, can also affect the implementation process. Understanding these moderating factors is essential for the successful implementation of interventions, as well as the development of effective strategies to address challenges (Kirigia et al., 2019). In addition, developing partnerships between policymakers, funders, and practitioners can help to ensure interventions are effectively implemented (Taylor et al., 2016). Understanding moderating factors is therefore essential for the successful implementation of interventions.

### 1.3.7 Assessing implementation fidelity

To establish fidelity, several processes must be followed. Firstly, potential indicators or critical elements must be identified, along with data sources for each indicator, and operational definitions for the indicators or critical components must be developed. In the second stage, data collection is done using multi-informant techniques. In the third phase, the indicators are examined for validity and reliability. Finally, the collected data is analyzed to draw implementation fidelity conclusions (JMU, 2022).

The data collection process should include measures of reliability, such as interrater reliability, to ensure that the data collected are consistent and valid. Additionally, measures of validity, such as concurrent and predictive validity, can be used to ensure that the data collected are meaningful and representative of the intervention or program. Furthermore, measures of internal consistency can be used to assess the reliability of the data collected.

Overall, data collected for implementation fidelity should be analyzed in order to draw valid and meaningful conclusions from the data. This involves assessing factors such as dosage, adherence, and quality, as well as fidelity criteria, and adherence. Dosage involves assessing the amount of time providers spend implementing the core components of the program,

compared with the time recommended in the program model. Quality involves assessing the extent to which the program model components are implemented using strong practices. Adherence involves assessing the percentage of program model components implemented as intended (Emshoff (2008), Fixsen, Blase, Timmons (2005) and Wisconsin RTI Center (2015).

### 1.3.9 Modeling to assess fidelity as an outcome

Fidelity is key to the success of an intervention, which could explain treatment outcomes vis-a-vis the integrity of their implementation. A suitable balance of fidelity and its moderating factors is needed to provide the highest possible implementation fidelity (An et al., 2020). Carroll's conceptual framework for implementation fidelity depicts implementation fidelity, its elements, and how these are interconnected *(Figure 1.4).* Fidelity (adherence, faithfulness, integrity, or commitment) to a given intervention is key to maximizing its potential outcomes. However, the devotion to the intervention can be modified by other factors external to the intervention itself. Moderators are factors that may influence or affect the degree of fidelity with which an intervention is implemented. The evaluation of implementation fidelity is intended to predict the success of the outcome of the intervention. Furthermore, this assessment is essential in giving feedback on the intervention's effectiveness and adaptation.

Carroll's conceptual framework for implementation fidelity is a model that emphasizes the importance of adhering to the delivery system of an evidence-based intervention (EBI) to achieve the intended outcome. The framework consists of four main components that influence implementation fidelity, which is content, coverage, frequency, and duration. The outcome gives a measurable effect of the EBI implementation. The comprehensiveness of policy description, facilitation strategies, quality of the delivery system, and participant responsiveness are potential moderators that can positively or negatively affect implementation fidelity. The relationships between these moderators can also influence the fidelity of the EBIs. Fixsen et al. 2019 suggest that the moderating factors are compensatory.

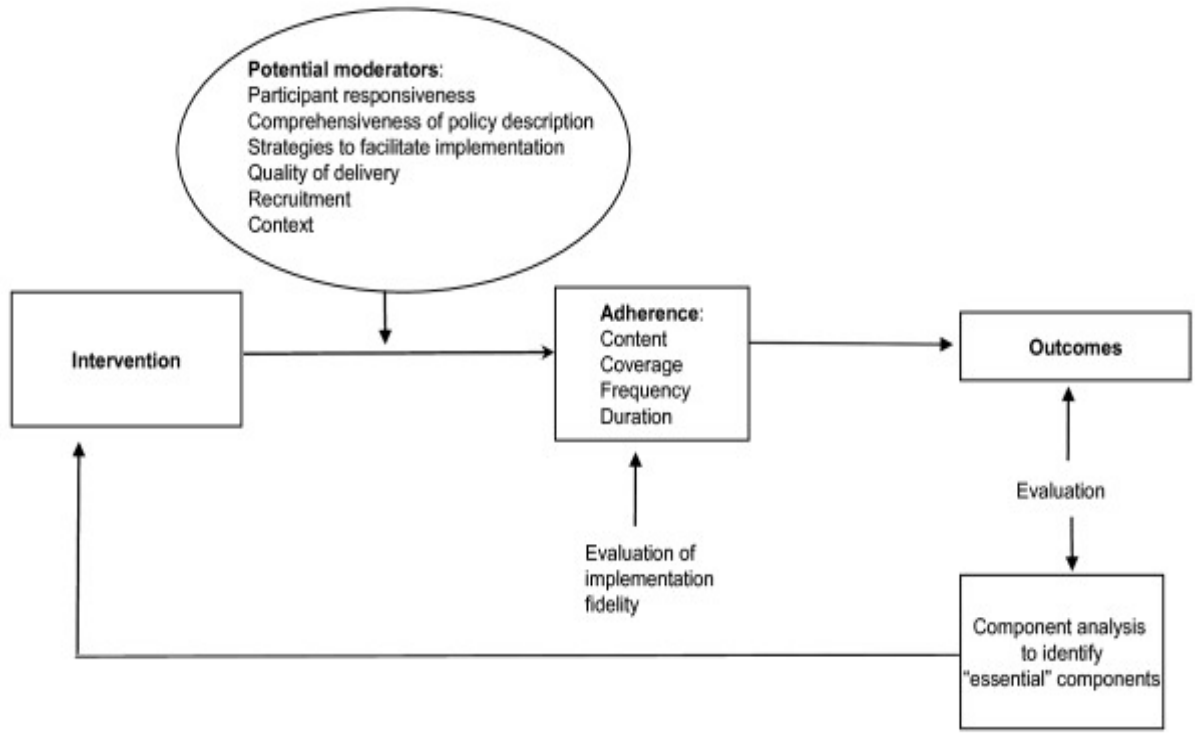



*Figure 1.4: Carroll's. et.al Conceptual framework for implementation fidelity, 2007*

### 1.3.11 *Schistosomiasis* treatment by pharmacists in Zimbabwe.

In 2009 the Zimbabwe Ministry of Health and Child Care enlisted *schistosomiasis* in its National Health Strategy based on being recognized as one of the country's major health burdens. (Ministry of Health and Child Care - National Health Strategy 2020 - 2025, 2021). Furthermore, in collaboration with the MCAZ, pharmacists were entrusted to prescribe and dispense praziquantel to patients directly to enhance *schistosomiases* treatment approaches and options by reaching a more extensive pool of potential patients requiring treatment.

### 1.3.12 Fidelity to the treatment of *schistosomiasis* in Zimbabwe

Praziquantel is a drug classified under the eleventh schedule or as a Pharmacist Initiated Medicine (PIM). This implies that pharmacists can diagnose and prescribe praziquantel to patients without a prescription. However, it is essential to note that prescriptions for the drug can also come from other healthcare providers, rendering the pharmacist responsible for any

possible dosage errors from different prescribers. Below is a swimlane diagram of how praziquantel is dispensed to a patient (Medicines and Allied Substances Control, 1991).

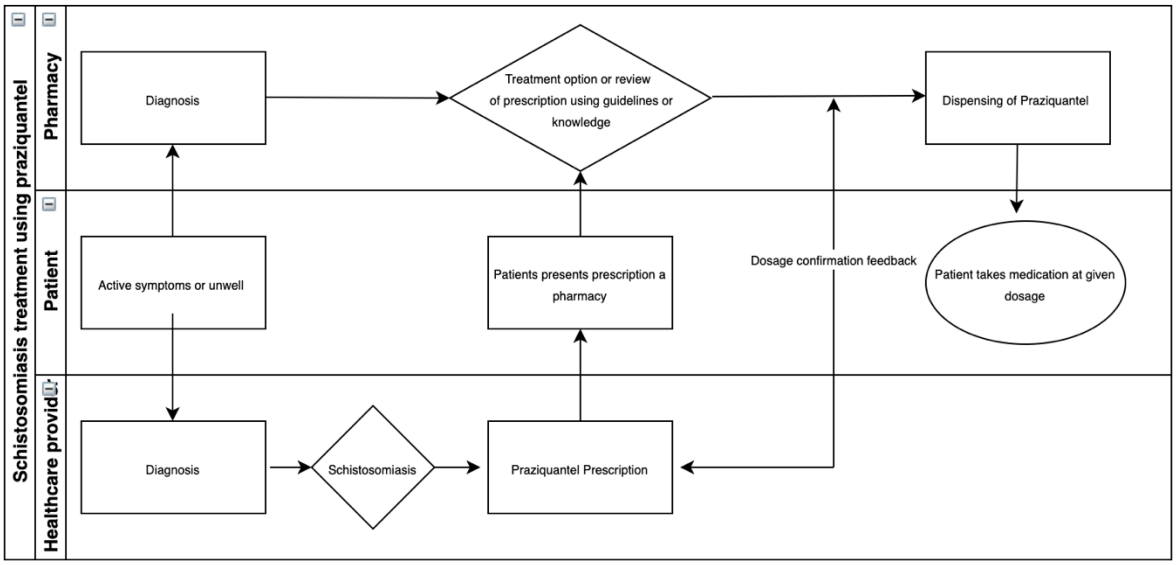



*Figure 1.5: Schematic flow of "the praziquantel dispensing system" in Zimbabwe*

### 1.3.13 Registration of retail pharmacists in Zimbabwe

The distribution of registered human medicines in Zimbabwe is enforced by the Medicines and Allied Substances Control Regulations (MASCA) SI 150 of 1991 and promulgated by the MCAZ through their registration of approved premises, human medication, and registered persons (including pharmacists) and the PCZ through their registration of premises and registered persons (Medicines and Allied Substances Control, 1991).

## 1.4 Research question

What is the implementation fidelity to praziquantel dispensing guidelines, the moderating factors, and their link in Zimbabwean retail pharmacists?

## 1.5 Aim

To assess the implementation fidelity to praziquantel dispensing guidelines, and investigate the relationship between the implementation fidelity and their moderating factors in Zimbabwe retail pharmacists.

## 1.6 Overall research objective

To investigate the relationship between the implementation fidelity to praziquantel dispensing guidelines and their moderating factors in retail pharmacists in Zimbabwe registered in 2021.

## 1.7 Specific research objectives

(1a) To describe the implementation fidelity and the moderating factors to implementing praziquantel dispensing guidelines in retail pharmacists in Zimbabwe registered in 2021.

(1b) To test for associations/relationships between moderating factors and the implementing fidelity to dispensing guidelines in retail pharmacists in Zimbabwe registered in 2021.

# CHAPTER 2: METHODOLOGY

The chapter focuses on how the objectives identified from the contextual problems were researched. The chapter gives how the methodology work breakdown structure was analyzed; the study design, study population, sampling technique, sample size calculation, data collection tools, the study variables, and their analysis, and the data management and the ethics components of the study.

## 2.1 Study design

Using the Saunders research onion approach; a positivism philosophy approach was adopted as the investigation detailed scrutiny of practices and process evaluation in the determination of implementation fidelity of praziquantel. Furthermore, in support of this philosophy, the study sought to explore possible causal and effect relationship(s) between implementation fidelity and its moderating factors. Following the positivism philosophy, a deductive approach was employed with the research using both quantitative and qualitative techniques, and the choice of a survey was used as a research strategy. A proportion of the population was regarded as representative and a cross-sectional time horizon was employed as data was collected simultaneously.

## 2.2 Study population

Retail pharmacists in Zimbabwe registered in 2021 were considered. Registration had to be by the Pharmacists Council of Zimbabwe and the Medicines Control Authority of Zimbabwe, both Zimbabwean pharmacists' licensing and enforcement agents.

## 2.3 Sampling technique

The MCAZ register for “registered persons” was used. The register was sorted and filtered according to the type of pharmacy the practitioner supervised, and the pharmacy’s location. Contact details for the selected participants were obtained from the PCZ registrar. A probability sampling method was employed to attain the desired sample representative of the population. Stratified random sampling was used to select participants for the study. The Pharmacist’s

Council of Zimbabwe register was used as the sampling frame. The data was sorted by province and grouped into strata; each province was taken as a unique stratum. The proportion of each stratum in the sampling frame was computed, and systematic random sampling was employed to select participants.

## 2.4 Sample size

This was done using Fischer et al. (1998) at a 95% confidence interval. Due to a lack of published information on the subject matter, a prevalence of 50% was assumed as those pharmacists adhering to the proper guidelines.

Therefore $n = (z/\Delta)^2 p(1-p)$

Where: n = Minimum sample required

$\Delta$ = Absolute precision (5%)

$\alpha$ = Level of significance (5%)

Z = Standard normal deviate corresponding to 95%, CI (1.96)

P = Proposition of pharmacies using WHO guidelines (assumed at 50%)

Therefore $n = (1.96/ 0.05)^2 \times 0.5 (1 - 0.5) = 384$

It was assumed that 5% of the selected sample would potentially not complete the survey or incomplete the questionnaire. Therefore, an adjusted figure of 406 pharmacists was then used.

## 2.5 Framework for Analysis and Measurement of Fidelity

Carroll and colleagues' conceptual framework for implementation fidelity was adopted and then adapted to suit the investigated subject matter. The four pillars of the framework were still adopted, and modification was done to enable the framework's suitability to collect and analyze health data.

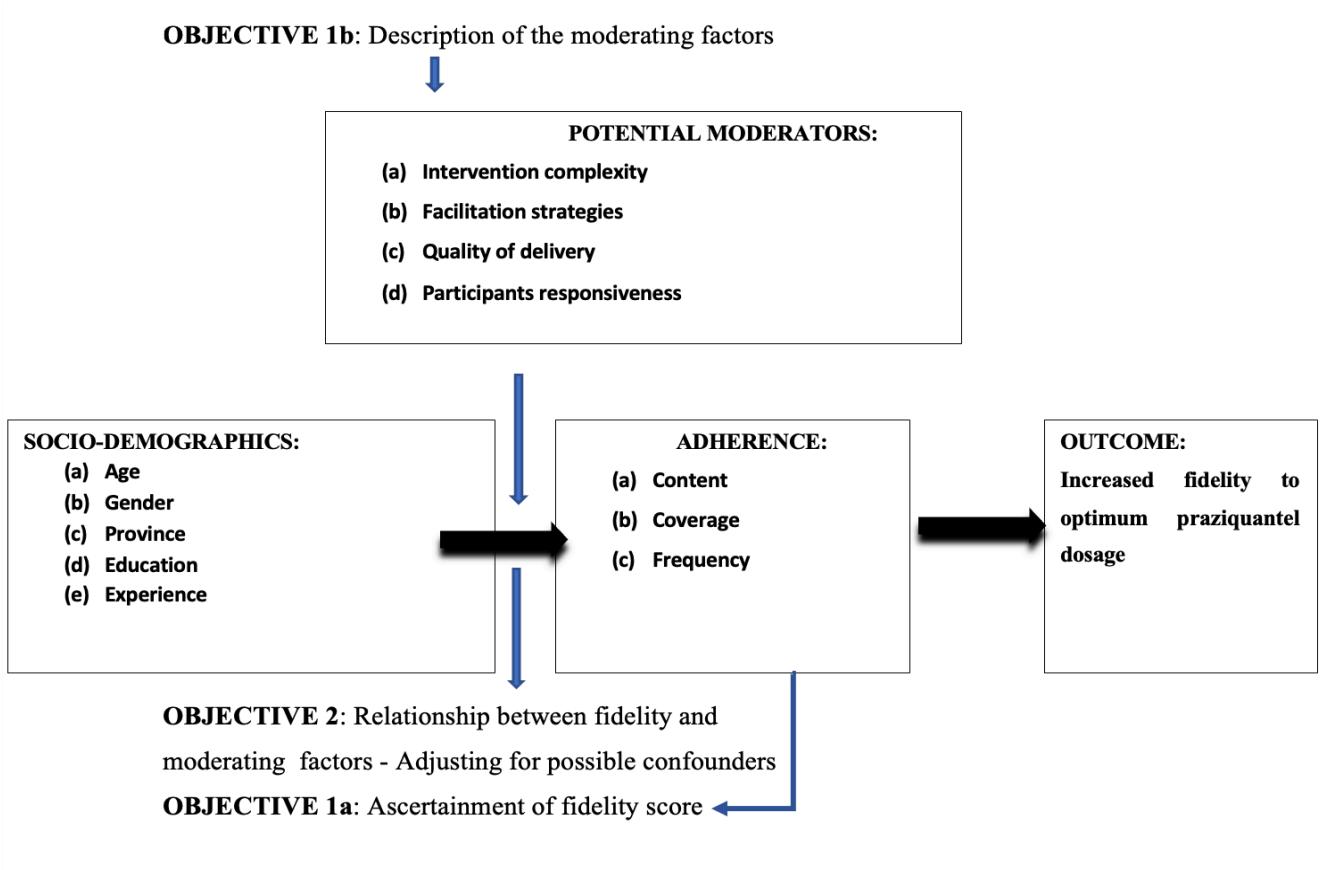



*Figure 2.1: Framework for implementation fidelity – Adapted from Carroll's framework, 2007*

## 2.6 Data collection tool:

Primary data was collected using parameters from the adapted framework from Carroll's conceptual framework for implementation fidelity. A provider-report survey (Appendix 2) was employed electronically online using REDCap to the selected sample, using a pre-tested survey form. Closed-ended, single-answer multiple-choice questions were primarily used, employing Likert scale ratings, ranking, and dropdown choices. The questions included socio-demographics, adherence, and moderating factors to fidelity. Data mainly comprised a combination of quantitative and categorical nominal and categorical ordinal data. The pretesting and modification of the survey tool were done using a cross-sectional study, over two weeks, which also ensured the tool's validity. The population selected were board members of the Retail Pharmacists Association of Zimbabwe (RPA), and purposive sampling was employed. All five board members were chosen to participate as they were more accessible for feedback and enabled a higher response rate. Two-day sequential evaluation of the survey tool was done until no new input could be made to the collection tool. Data was then collected over

one month, over which a weekly reminder was sent to the selected participants to remind them to complete the data collection tool.

## 2.7 Data management

Data was exported in its CSV format into Microsoft Excel for cleaning and computation of fidelity scores using a logical framework. The cleaned data was imported into Stata SE version 17 (Stata Corporation, College Station, TX, USA) for further statistical data analysis and inference.

## 2.8 Study variables

The outcome variable was implementation fidelity. The explanatory variables were grouped into either sample characteristics or moderating factors.

## 2.9 Outcome variable and its analysis

In determining the outcome variable, Feely et al., 2017's method was considered for calculating a fidelity score. Factors considered included; the structure of intervention, in this case, a set of skills or techniques mastered in delivering a concept (knowledge), which was taken in the study as the content. The structure around the skill, and reinforcement, were the reference textbooks for implementing the guidelines (coverage) (Cross and West, 2011).

The adherence components from the adapted framework (content, coverage, and frequency), and the potential moderating factors (intervention's complexity, facilitation strategies, quality of delivery, and participants' response) were used to compute the fidelity. Implementation fidelity was computed as an aggregate of the participants' scores. The scoring of implementation fidelity score also followed how the practitioners practiced when dispensing praziquantel, that is, their dosing practice. For each of the constructs, 5 points were awarded for issuing the correct dose or using the reference that gave the correct dosing.

**Moderating factors contribution.**

**Interventional complexity (IC):** Here, the participants were asked about their perception of the complexity of the latest WHO guidelines which recommend dosing praziquantel at 20mg/kg in three doses.

**Facilitation strategies (FS):** This was done to find the participants' perception of the effectiveness of the method used in the communication used to deliver the guidelines.

**Quality of delivery (QD):** This was to find the participants' perception of the efficiency of communicating the WHO guidelines in the package insert that came with the praziquantel.

**Participants' responsiveness (PR):** this was meant to view the position of the participants regarding the provision of these guidelines, given the magnitude of the problem of *schistosomiasis* in their area of practice,

Scoring of the moderating factors was based on the 5-point Likert scale: ranging from 1 point to 5 points with higher scores influencing increased fidelity, as shown in Table 2.1.

Table 2.1: Scores for Moderating factors per response per each participant

| **Moderating Factor** | **Strongly Disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly Agree** | **Max Score** |
|---|---|---|---|---|---|---|
| Interventional complexity (IC) | 5 | 4 | 3 | 2 | 1 | 5 |
| Facilitation strategies (FS) | 1 | 2 | 3 | 4 | 5 | 5 |
| Quality of delivery (QD) | 1 | 2 | 3 | 4 | 5 | 5 |
| Participants' responsiveness (PR) | 5 | 4 | 3 | 2 | 1 | 5 |
| Total Score for all Moderating factors per participant | | | | | | 20 |

**Adherence contribution**

For participants who responded that they used their knowledge only when dispensing praziquantel **(content)**: a score of 10 (the extra 5 points were awarded for the coverage component which was inapplicable when dispensing this way) was given for participants whose response provided dosing of 20mg/kg in three divided doses and 0 for participants who offered any other dosage.

For participants who responded that they used reference texts only when dispensing praziquantel **(coverage)**: a score of 10 (the extra 5 points were awarded for the content component which was inapplicable when dispensing this way) was given for participants who

used reference textbooks for dispensing, which provided PZQ dosing at 20mg/kg in divided doses. A score of 0 was assigned for participants who used reference textbooks that did not offer this dosing regimen. A combination that used reference texts providing for PZQ dosing at 20mg/kg in divided doses only was given a score of 10. A combination of reference texts with any that provided the wrong dosing contributed negatively to adherence. Hence, a score of 0 was assigned to that combination.

For participants who responded that they used both their knowledge and reference texts when practicing **(content, coverage, and frequency)**: 50% was assigned to the use of knowledge (content), and the other 50% was assigned to the use of both the practitioners' reference texts and their frequencies; as such, a score of 5 was given for participants whose response provided dosing of 20mg/kg in divided doses, and 0 for participants who offered any other dosage. A score of 5 was given for participants who used reference textbooks for dispensing, which provided PZQ dosing at 20mg/kg in divided doses. A score of 0 was assigned for participants who used reference textbooks that did not offer this dosing regimen. A combination of reference texts with any that provided for the wrong dosing was taken to contribute to the adherence negatively. Hence, a score of 0 was assigned to that combination.

Composite scores for implementation fidelity were derived for each respondent by summing up the weighted scores for all the constructs (minimum score = 0, maximum score = 30). The final implementation fidelity score was given as a percentage and obtained by multiplying the aggregate score by a factor of 100/30.

### 2.10 Explanatory variables

The explanatory variables were potential factors associated with implementation fidelity. They were grouped broadly as sample characteristics of the participants and moderating factors of implementation fidelity.

Sex was categorized into male and female; age group was categorized into early age (24-34 years), middle ages (35 years – 43 years), and the elderly ( > 44 years). Retail years' experience was categorized into, early years, middle-level experience, and late-career level. The variable education was categorized into either having attained a postgraduate qualification post-

registration as a pharmacist or not having done so. Provinces were categorized as city provinces and non-city provinces. Praziquantel availability was categorized into those that had no stock at all over the whole of 2021, and those that had stock at least over a calendar month of 2021. Of those that had stock in 2021, the stock availability was categorized into those that had stock for over 6 months of the year and those that had stock for less than 6 months of the year. The dispensing practice was categorized into how practitioners would mainly dispense praziquantel, either as a pharmacist-initiated medicine, or dispensing on the presentation of a prescription, or both. The dosing practice was categorized into how the practitioner would determine the dose of the praziquantel in practice, either by using their knowledge base only, by referring to references for the determination of the dose, or by using both. The moderating factors to implementing praziquantel guidelines were treated as continuous quantitative variables.

### 2.11 Data analysis

Univariate analysis was used to give descriptive summary statistics for the outcome and explanatory variables.

Inferential statistics were used to get reasonable data on the larger population. Analysis of the implementation fidelity score was done to see if the outcome variable could conform to parametric tests. A frequency normal curve was plotted on the fidelity score frequency histogram. A skewness kurtosis test was also run to determine the fidelity score's normality, both the skewness and kurtosis did not satisfy the conditions of normality ($p < 0,05$). Hence the choice for non-parametrical statistical tests.

Various statistical test methods were used to test the association of the explanatory variables with the outcome variable ($p < 0.2$). The Chi2 test was chosen for; the age, age range, retail years' experience, further education post-registration as a pharmacist, the province of practice, availability of praziquantel, stock out months of praziquantel, dispensing practice, and the dosing practice of praziquantel. Chi2 test was also used on the moderating factors; intervention complexity and quality of delivery, as they had been recategorization into meaningful categories for analysis, where appropriate the Fischer's exact test was used. The Kruskal-Wallis test was chosen for the moderating factors; facilitation strategies, and participants'

responsiveness after the categorization resulted in multicollinearity when performing logistic regressions.

To describe the moderating factors for implementing praziquantel dispensing guidelines in 2021, registered pharmacists in Zimbabwe; measures of the central tendency of the implementation fidelity score by each moderating factor were given. The median (IQR) was used as a measure of the variability of implementation fidelity.

To compute a predictive model, regression analysis of the participants' fidelity scores, the sample characteristics, and the moderating factors for the implementation of the proper guideline was sort. The 'gladder' command in STATA was used to explore possible transformations that could convert the fidelity score variable to normal data. Shapiro Wilks tests, after each transformation, were then used to check if the fidelity score would be normally distributed. Since all the data transformations did not yield satisfactory p values after running the Shapiro-Wilks tests on them; a logistic regression model was chosen. A logical dichotomization method was employed, using a WHO standard on the optimum fidelity that is required in the treatment of *schistosomiases* using praziquantel, which requires the fidelity to praziquantel compliance to be above 75% for optimum treatment, Category two then became any implementation fidelity score below 75%. Unadjusted and adjusted logistic regressions were run considering the significant sample characteristics until a model of best fit could be found. After regression diagnostics, post-estimation tests were computed to assess model fit using the Hosmer–Lemeshow to assess how well the regression model fits the data

## 2.12 Data Management

The Principal Investigator (PI) collected, managed, and analyzed the data. For participants' privacy and confidentiality, personal identifiers were not required. The data collected was only accessible to the PI and the supervisors. Data responsibility lay with the PI and was stored in their computer, backed up on Google Drive. All data collected, measured, and analyzed was password protected. Data is envisaged to be kept for two years maximum, within which the PI will seek to publish research data.

## 2.13 Ethical considerations

Ethical clearance was obtained from the University of Witwatersrand Human Research Ethics Committee (ref: M220274), the Medical Research Council of Zimbabwe (ref: MRCZ/B/2/2193), the Pharmacists Council of Zimbabwe, and the Medicines Control Authority of Zimbabwe (ref: B279/33/62/2021). Consent was sought from all study participants completing the survey. Participation in the study was voluntary and personal identifiers were not asked to keep respondents anonymous. The data collected was solely for this study and was intended to reinforce implementation fidelity to the recommended guidelines for praziquantel dosing. There was no known harm from participating in the study.

## CHAPTER 3: RESULTS

The current chapter will present the findings in line with the objectives. It comprises descriptive tables with a summary of the participant's characteristics, the implementation fidelity findings, the description of the moderating factors, and the possible association between moderating factors and implementation fidelity.

A total of 301 responses were gathered from the 406 questionnaires that were sent out. The response rate was 74.1% and the inclusion criterion was satisfied by each and every respondent.

### 3.2 Sample characteristics according to implementation fidelity

The descriptive statistics of the sample characteristics fidelity were summarized and given in Table 3.1.

Table 3.1: Descriptive statistics of the explanatory factors to the implementation fidelity

| **Variable** | **Frequency (percentage)** |
|---|---|
| **Sex** | **301 (100)** |
| Female | 156 (51.8) |
| Male | 145 (48.2) |
| **Age range** | **301 (100)** |
| Early age (24- 34 years) | 116 (38.55) |
| Middle ages (35 years – 43 years) | 116 (55.2) |
| Elderly ( > 44 years) | 19 (6.3) |
| **Retail years' experience** | **301 (100)** |
| Early-career Level | 80 (26.6) |
| Middle Level | 104 (34.6) |
| Late-career Level | 117 (38.9) |

| | |
|---|---|
| **Further education** | **301 (100)** |
| No postgraduate qualification | 164 (54.5) |
| Postgraduate qualification attained | 137 (45.5) |
| **Province of practice** | **301 (100)** |
| City provinces (Harare and Bulawayo) | 136 (45.2) |
| Non city provinces | 165 (54.2)) |
| **Praziquantel availability (over 12 months)** | **301 (100)** |
| No stock | 100 (33.2) |
| Available | 201 ( 66. 8) |
| **Stock out of praziquantel (in months)** | **201 (100)** |
| Below 6 months | 164 (81.6) |
| Above 6 months | 37 (18.4) |
| **Dispensing practice for praziquantel** | **301 (100)** |
| Pharmacist Initiated Medicine only (PIM) | 87 (28.9) |
| On Prescription presentation only (PP) | 92 (30.6) |
| Both | 122 (40.5) |
| **Dosing practice** | **301 (100)** |
| Knowledge only | 63 (20.9) |
| Reference textbooks only | 76 (25.3) |
| Both | 16 (3.8) |

As shown in Table 3.1, the study comprised 301 participants. The analysis of the dataset shows that among the participating retail pharmacists, more than half (51.8%) were female and 48.2% were male. The majority of the participants fell in the middle-age category 55.2% with most having had enough experience to be at the late-career level (38.9%). The study revealed that the majority 54.5% of the participants had not acquired any postgraduate qualification, post their registration. Regarding the province of practice, they seemed to be more pharmacists

(54.2%), practicing in 'noncity provinces". In terms of dispensing practice, 40.53% of participants used both pharmacist-initiated and prescription presentation to issue out praziquantel, while almost a third, 28.90%, dispensed praziquantel on the presentation of a prescription. Findings on the dosing practice revealed that 25.3% of participants relied on reference textbooks only, while 20.90% relied on knowledge only.

### 3.3 Overview of IF to PZQ dispensing guidelines among registered retail pharmacists in Zimbabwe

Table 3.2: Summary of descriptive statistics of the implementation fidelity score

| | |
|---|---|
| **Minimum score** | 14.0% |
| **Maximum score** | 97.0% |
| **Modal score** | 15.0% |
| **Median score** | 53.3% |
| **IQR** | (43.3, 66.7) |
| **Skewness** | 0.5 |
| **Kurtosis** | 2.6 |

Table 3.2, above, shows the descriptive statistics for the implementation fidelity score of a minimum score of 14.0%, a maximum score of 97.0%, a mode of 15.0%, and a median of 53.3%. The interquartile range (IQR) is 23.3%, indicating moderate variability in the scores. The distribution of the implementation fidelity score in the sample is skewed to the right, with a skewness coefficient is 0.5, suggesting a slight asymmetry in the distribution, with a long tail on the right. The kurtosis coefficient is 2.6, indicating a non-normal distribution, of thinner tails and a lower peak.

**Implementation fidelity score variability**

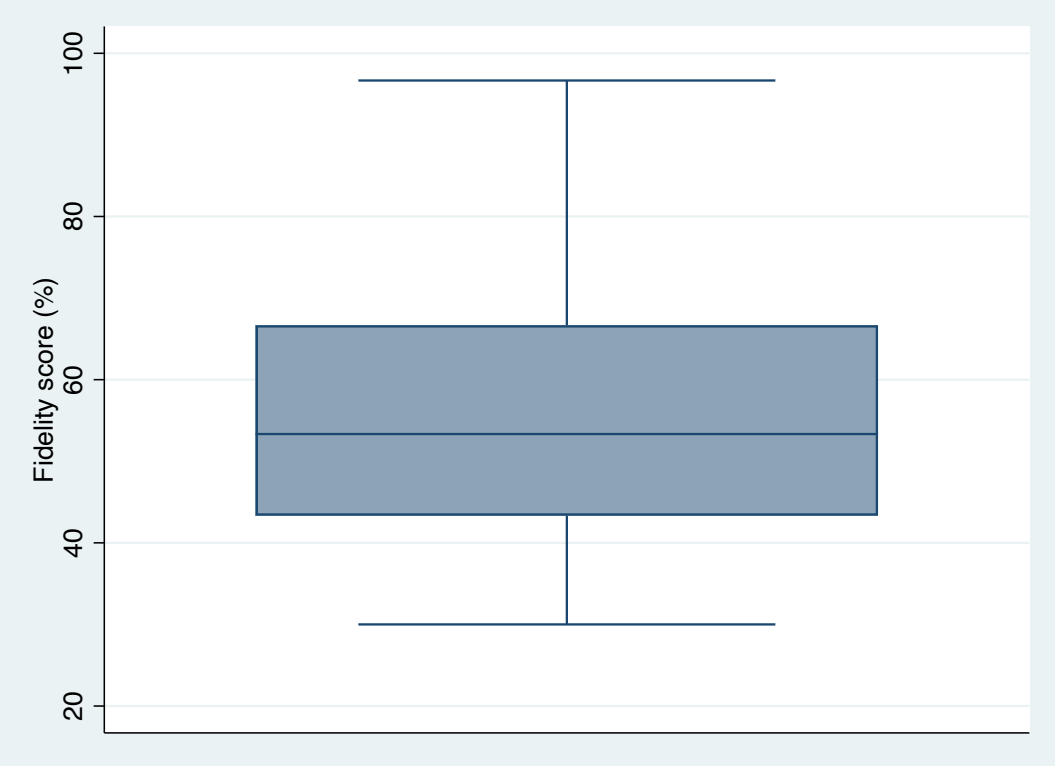



*Figure 3.1 Implementation fidelity score variability*

Figure 3.1 shows the implementation fidelity scores variability on a box and whisker plot. The median (IQR) implementation fidelity score was 53.33% (43.33, 66.67).

Table 3.3, shows the frequency (percentage) distribution after sorting by the WHO-recommended optimum implementation fidelity score of greater than 75%. The variable has two categories: "Below Optimum Fidelity" and "Optimum Fidelity.". The table shows that 265 (88.0%) had implementation fidelity scores below the optimum. On the other hand, 36(12.0%) participants had implementation fidelity scores at or above the optimum level.

Table 3.3: Frequency distribution of optimum implementation fidelity score

| **Variable** | **Frequency (percentage)** |
|---|---|
| Below optimum fidelity (IF<75%) | 265 (88.0) |
| Optimum fidelity (IF>75%) | 36 (12.0) |

### 3.4 The contributory factor of references on coverage to the fidelity score

Table 3.4 Percentage distribution of use of dosing references

| Name of reference used | Yes (percentage) | No (percentage) | N/A (percentage) |
|---|---|---|---|
| **EDLIZ** | 161 (53.5) | 77 (25.6) | 63 (20.9) |
| **BNF** | 107 (35.6) | 131 (43.5) | 63 (20.9) |
| **MARTINDALE** | 59 (19.6) | 203 (67.4) | 39 (13.0) |
| **OTHER** | 43 (14.3) | 195 (64.8) | 63 (20.9) |

Table 3.4, shows a distribution of dosing references used in practice by the participants who indicated they used them. The reference text used the most was the EDLIZ (53.5%). The BNF was the second most frequently used reference textbook (35.56%); the Martindale was the least used of the reference textbooks (19.6%) enlisted on the recommended MCAZ's list. A small proportion of the participants indicated they used other references; mainly online sources, the MIMS, WHO guidelines, and the USP Pharmacopeia. The negative contributory factor of coverage to the implementation fidelity score could be attributed to the majority of those practitioners who rely on reference textbooks for dosing using the EDLIZ which does not have the WHO-recommended praziquantel dosing.

### 3.5 Objective 1b: Description of perceptions of moderating factors of praziquantel dispensing guidelines

Table 3.5: Description of perceptions of moderating factors of praziquantel dispensing guidelines

| Variable | Mean score (out of 5) | Modal score (out of 5) ( % frequency) | Median (IQR) score (out of 5) |
|---|---|---|---|
| **Interventional complexity** | 3.8 | 4 (40.5) | 4 (3, 5) |
| **Facilitation strategies** | 3.1 | 3 (86.4) | 3 (3, 3) |
| **Quality of delivery** | 2.7 | 2 (55.5) | 2 (2, 3) |
| **Participants responsiveness** | 3.9 | 4 (38.9) | 4 (3, 5) |

Table 3.6, above, gives the descriptive statistics of how the moderating factors scores were observed as they contributed to the final implementation fidelity scores. Participants scored highest in their perception of the interventional complexity and participants' responsiveness median (IQR), 4(3, 5). The facilitation strategies and quality of response scored comparatively lower mean (IQR), of 3(3, 3) and 2 (2,3) respectively. The variability of the median (IQR) scores were given using box and whiskey plots below:

**Interventional complexity**

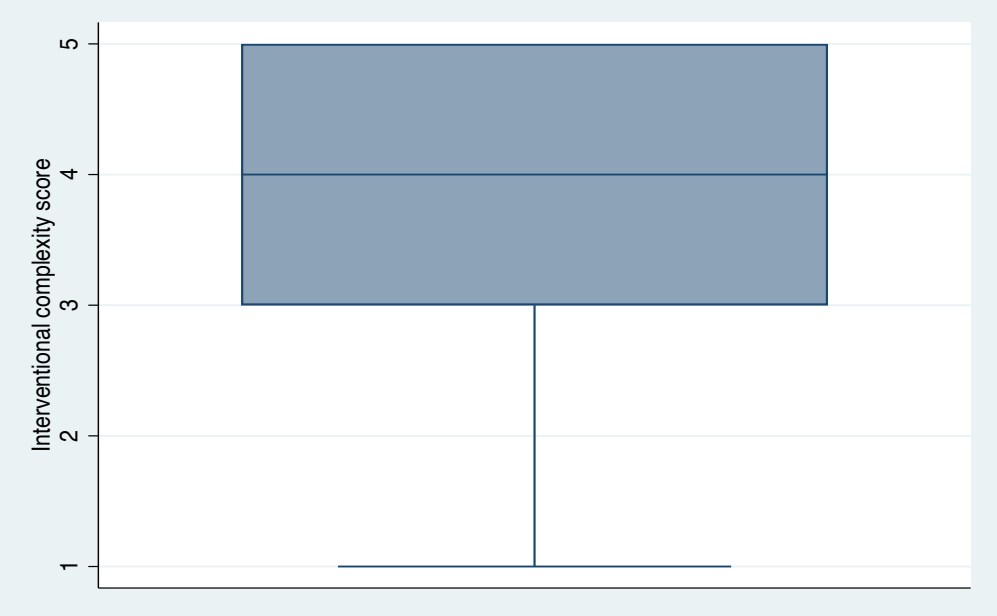



*Figure 3.2: Interventional complexity variability of scores*

The median score (IQR) for this moderating factor was a score of 3 (3 5); these showed that most participants were of the perception that the new WHO praziquantel dosing guidelines were not complex to comprehend.

**Facilitation strategies**

The median score (IQR) for this moderating factor was a score of 3 (3 3). These showed that most participants were in the range neutral to strongly agreeable, on the effectiveness of the deliverance of the new WHO praziquantel dosing guidelines using drug information banners that can be found displayed in retail pharmacies.

**Quality of delivery**

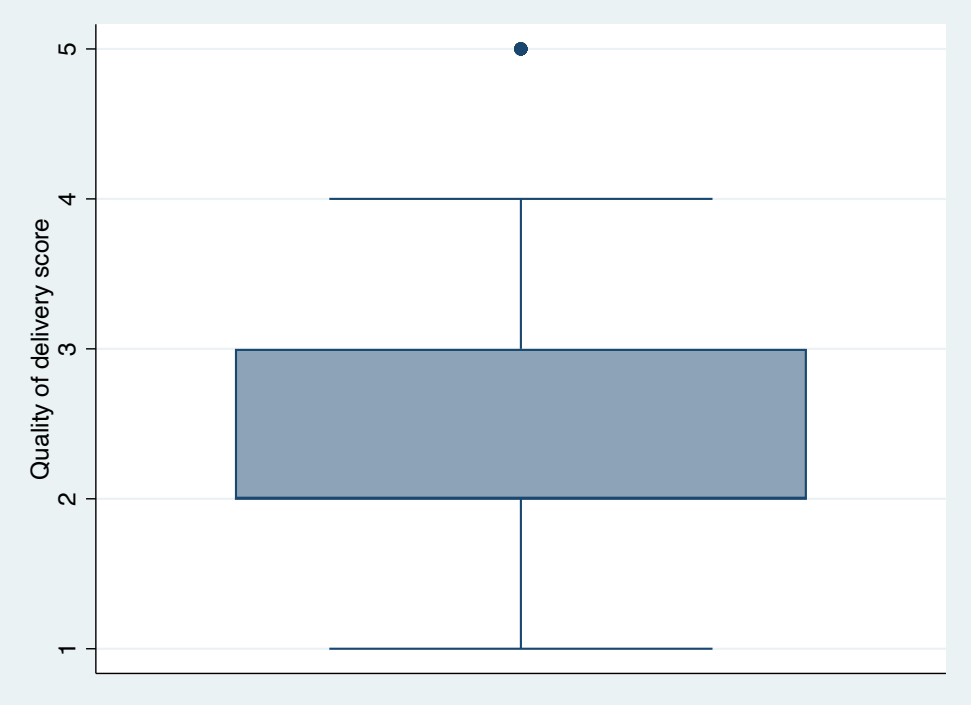



*Figure 3.3: Quality of delivery variability of scores*

The median score (IQR) for this moderating factor was, a score of 2 (2 3); these showed that most participants were of the perception that the package insert accompanying praziquantel was just effective as a communication method to convey the new WHO praziquantel dosing guidelines.

**Participants' responsiveness**

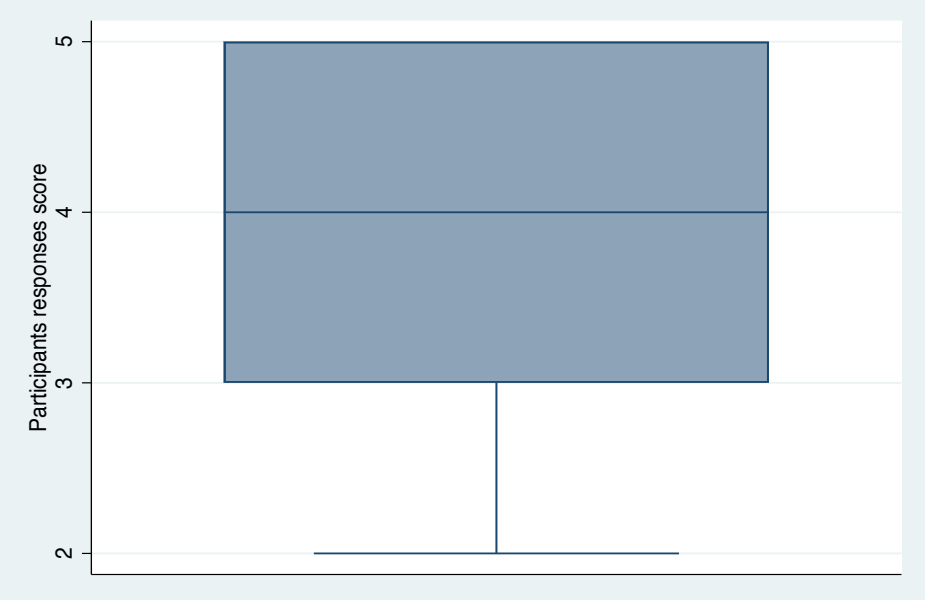



*Figure 3.4: Participants' responsiveness variability of scores*

The median score (IQR) was 4 (3 5) these showed that most participants agreed, with the notion that the provision of the new WHO praziquantel guidelines was necessary for healthcare delivery, in light of the problem of schistosomiases in their area of practice.

## 3.6 Relationship between IF and socio-demographics and moderating factors

Table 3.6: Associations between the implementation fidelity score and all the explanatory factors using nonparametric tests

| **Variable** | **Frequency (percentage)** | | **p value** |
|---|---|---|---|
| | **Below optimum IF** | **Above optimum IF** | |
| **Moderating factors** | | | |
| **Interventional complexity** | | | **0.067†** |
| Yes | 35 (97.2) | 1 (2.78) | |
| Neutral | 58 (92.1) | 5 (7.9) | |
| No | 172 (85.1) | 30 (14.9) | |
| **Facilitation strategies** | | | **0.001**** |

| | | | |
|---|---|---|---|
| Strongly agree | 2 (100.0) | 0 (0.0) | |
| Agree | 3 (100.0) | 0 (0.0) | |
| Neutral | 234 (90.0) | 26 (10) | |
| Disagree | 21 (77.8) | 6 (22.2) | |
| Strongly disagree | 5 (55.6) | 4 (44.4) | |
| **Quality of delivery** | | | **<0.001†** |
| Yes | 156 (91.2) | 15 (8.8) | |
| Neutral | 61 (100.0) | 0 (0.0) | |
| No | 48 (69.6) | 21 (30.4) | |
| **Participants responsiveness** | | | **0.074**** |
| Strongly agree | **0 (0.0)** | 0 (0.0) | |
| Agree | 9 (100.0) | 0 (0.0) | |
| Neutral | 84 (89.4) | 10 (10.6) | |
| Disagree | 106 (90.6) | 11 (9.4) | |
| Strongly disagree | 66 (81.5) | 15 (18.5) | |
| **Socio characteristics** | | | |
| **Sex** | | | **0.123*** |
| Female | 133 (85.3) | 23(14.7) | |
| Male | 132 (91.0) | 13 (8.9) | |
| **Age range** | **301 (100)** | | **0.642** |
| Young Adult | 102 (87.9) | 14 (12.1) | |
| Middle aged | 145 (87.3) | 21 (12.7) | |
| Elderly | 18 (94.7) | 1 (5.3) | |
| **Retail years' experience** | **301 (100)** | | **0.364** |
| Early career | 73 (91.2) | 7 (8.8) | |
| Middle level experience | 88 (84.6) | 16 (15.4) | |
| Late-career level experience | 104 (88.9) | 13 (11.1) | |
| **Further education** | **301 (100)** | | **0.891** |
| No postgraduate studies | 144 (87.8) | 20 (12.2) | |
| Postgraduate studies | 121 (11.7) | 16(44.4) | |
| **Province of practice** | **301 (100)** | | **0.244** |
| Cities (Harare and Bulawayo) | 123 (90.4) | 13 (9.6) | |
| Non – Cities | 142 (86.1) | 23 (13.9) | |
| **Praziquantel availability ( > 12 months)** | **301 (100)** | | **0.252** |
| No stock | 131 (80.0) | 33 (20.0) | |

| | | | |
|---|---|---|---|
| Available | 180 (89.6) | 21 (10.5) | |
| **Stock out of praziquantel (in months)** | **201 (100)** | | **0.441** |
| Below 6 months | 87 (85.3) | 15 (14.7) | |
| Above 6 months | 34 (91.9) | 3 (8.1) | |
| **Dispensing practice for praziquantel** | **301 (100)** | | **0.290** |
| Pharmacist Initiated Medicine only (PIM) | 79 (90.8) | 8( 9.2) | |
| On Prescription presentation only (PP) | 77 (83.7) | 15 (16.3) | |
| Both | 109 (89.3) | 13(10.7) | |
| **Dosing practice** | **301 (100)** | | **<0.001*** |
| Knowledge only | 47 (74.6) | 16 (25.4) | |
| Reference textbooks only | 65 (85.5)) | 11(14.5) | |
| Both | 153 (94.4) | 9(5.6) | |

* Pearson chi (2) test

† Fisher's exact test

** Kruskal Wallis test

As shown in Table 3.6, all moderating factors were associated with the implementation fidelity score. Gender and dosing practice were also statistically associated with the implementation fidelity score. The sex variable has 85.3% of females and 91.0% of males with above optimum fidelity. In the age range variable, 87.9% of young adults, 87.3% of middle-aged, and 94.7% of old participants had below-optimum fidelity. For retail years' experience, early-career and late-career level participants had above-optimum fidelity at 91.2% and 88.9% respectively. More participants with postgraduate studies had above-optimum fidelity at 44.4%. In the province of practice, cities had 9.6% of participants with above optimum fidelity. In the dosing practice variable, 94.4% of participants used both knowledge and reference textbooks.

## 3.7 Association between moderators and implementation fidelity score

To compute a predictive model a regression analysis of the participants' implementation fidelity scores, the sample characteristics, and the moderating factors to implement the proper guidelines were carried out. After checking and confirming that the assumptions for logistic regression had been satisfied, unadjusted and adjusted logit models were run using the implementation fidelity score as the dependent variable.

Table 3.7 Factors associated with the implementation of WHO-recommended guidelines on praziquantel dosing amongst Zimbabwean retail pharmacists

| **Factors** | **Unadjusted OR (95% CI)** | **P – value** | **Adjusted OR (95% CI)** | **P – value** |
|---|---|---|---|---|
| **Moderating factors** | | | | |
| **Interventional complexity** | | **0.097** | | **0.068** |
| Neutral | 1.00 | | 1.00 | |
| Yes | 0.33 (0.37, 2.95) | 0.322 | 0.39 (0.39, 3.89) | 0.545 |
| No | 2.02 (0.75, 5.46) | 0.164 | 2.72 (0.86, 8.51) | 0.136 |
| **Facilitation strategies** | **2.70 (1.50, 4.86)** | **0.001*** | **3.35 (1.58, 7.05)** | **0.01*** |
| **Quality of delivery** | **1.00** | **0.053*** | | **0.323** |
| Yes | 1.00 | | 1.00 | |
| No | 4.00 (0.99, 4.06) | <0.001 | 1.52 (0.66, 3.48) | 0.323 |
| **Participants responsiveness** | **1.51 (0.97, 2.34)** | **0.065** | **1.83 (1.06, 3.16)** | **0.029*** |
| **Sex** | | **0.126** | | **0.429** |
| Female | 1.00 | 0.126 | 1.00 | |
| Male | 0.57 (0.28, 1.17) | | 0.72 (032, 1.62) | 0.429 |
| **Age range** | | **0.661** | | |
| Young Adult | 1.00 | | | |
| Middle aged | 1.06 (0.51, 2.17) | 0.884 | | |
| Elderly | 0.41 (0.50, 3.27) | 0.396 | | |
| **Retail years' experience** | | **0.370** | | |
| Early career | 1.00 | | | |
| Middle level experience | 1.90 (0.74, 4.86) | 0.183 | | |
| Late-career level experience | 1.30 (0.50, 3.43 | 0.591 | | |
| **Further education** | | **0.891** | | |
| No postgraduate studies | 1.00 | | | |
| Postgraduate studies | 0.95 (0.47, 1.92) | 0.891 | | |
| **Province of practice** | | **0.246** | | |
| Cities (Harare and Bulawayo) | 1.00 | | | |
| Non – Cities | 1.53 (0.74, 3.15) | 0.246 | | |
| **Praziquantel availability (over 12 months)** | | **0.254** | | |
| No stock | 1.00 | | | |
| Available | 0.66 (0.32, 1.35) | 0.254 | | |
| **Stock out of praziquantel (in months)** | | **0.445** | | |
| Below 6 months | 1.00 | | | |
| Above 6 months | 0.62 (0.18, 2.12) | 0.445 | | |

| | | | | |
|---|---|---|---|---|
| **Dispensing practice** | | **0.30** | | |
| Pharmacist Initiated Medicine only (PIM) | 1.00 | | | |
| On Prescription presentation only (PP) | 1.92 (0.77, 4.80) | 0.160 | | |
| Both | 1.18 (0.47, 2.98) | 0.729 | | |
| **Dosing practice** | | **<0.001*** | | **0.002*** |
| Knowledge only | 1.00 | | 1.00 | |
| Reference textbooks only | 0.50 (0.21, 1.17) | 0.109 | 0.53 (0.20, 1.41) | 0.206 |
| Both | 0.17 (0.07, 0.42) | <0.0001 | 0.17 (0.07, 0.46 ) | <0.001 |

* Significant (p < 0.05)

Table 3.7, above, shows the unadjusted and adjusted odds ratios and p values obtained for all the explanatory factors to the implementation fidelity. Findings on the unadjusted model for all the explanatory factors show that the significant ones (p <0.005) were: the moderating factors: facilitation strategies ( p = 0.001) (OR = 2.70; 95% CI: 1.50-4.86), and quality of delivery ( p = 0.053) which was on the borderline, and only the dosing practice proved significant for the socio-demographics ( p = < 0.001).

After adjusting for the sociodemographic factors that were statistically associated with the implementation fidelity, sex, and the dosing practice; findings from model 2, show that the significant factors were; the moderating factor: facilitation strategies (p = 0.010) (OR = 3.35; 95% CI: 1.58-7.05) and participants responsiveness (p = 0.029) (OR = 1.83; 95% CI: 1.06-3.16) and the socio-demographic factor dosing practice (p= 0.002)

Post-estimation tests were computed to assess model fit using the Hosmer–Lemeshow to assess how well the regression model fits the data. The model was found to fit the data reasonably (p = 0.342)

# CHAPTER 4: DISCUSSION

## 4.1 Introduction

The discussion chapter gives a critical introspect into the research and its findings. The focus of the chapter was on the significant findings of the study. An attempt was made to explain these essential findings after which the results of the study were compared to similar research studies that have been done and an attempt to bring out the similarities and differences between them. The researcher also attempted to give alternative explanations of the significant findings that were made in the study. The practical results, the clinical relevance, and implications were given and finally, possible limitations of the study were also provided.

## 4.2 Main findings of the study

The summary of the findings suggests low implementation of fidelity to praziquantel dispensing guidelines amongst 2021 registered retail pharmacists in Zimbabwe in light of the WHO recommended target for praziquantel compliance rates (75% and above). The moderating factors' contribution (out of a possible 5 points) to the implementation fidelity scores were, in their order by magnitude, both the interventional complexity and participants' responsiveness 4; followed by the facilitation strategies 3, and lastly the quality of delivery 2.

Statistically significant predictors of implementation fidelity identified in the study ($p < 0.2$) were: all of the moderating factors; intervention complexity, facilitation strategies, quality of delivery, participant's responsiveness and the socio-characteristic factors, sex, and the dosing practice.

The analysis of the factors associated with the implementation of WHO-recommended guidelines on praziquantel dosing amongst Zimbabwean retail pharmacists, in the unadjusted model; showed the statistical significance of the moderating factors; facilitation strategies, and quality of delivery, and the sociodemographic factor; dosing practice. The findings indicate that the odds of achieving high implementation fidelity to praziquantel dosing are 2.7 times higher in the presence of facilitation strategies compared to their absence. This finding suggests that the use of facilitation strategies can be an effective approach to improve the

implementation fidelity to praziquantel dosing. The odds ratio of 4 times for the quality of delivery, which measured the perception of the efficiency of the package insert accompanying praziquantel, suggests that participants who thought the package insert was inefficient, were four times more likely to have low implementation fidelity to praziquantel dosing compared to those who thought the package insert was efficient. This highlights the importance of providing clear and effective package inserts to ensure proper implementation of medication dosing. The dosing practice was also significant and showed that the odds of achieving high implementation fidelity are 50% lower (odds ratio of 0.5) for those who only use references compared to those who only use knowledge. Moreover, the odds of achieving high implementation fidelity are even lower (odds ratio of 0.17) for those who use both references and knowledge.

The analysis of the factors associated with the implementation of WHO-recommended guidelines on praziquantel dosing amongst Zimbabwean retail pharmacists after adjusting for the statistically significant socio-characteristic factors, sex, and dosing practice showed significance in the moderating factors; facilitation strategies and participants' responsiveness and the socio-characteristic factor dosing practice. There was an increase in the magnitude of the association of facilitation strategies in the adjusted model, showing the validity of the initial findings. The findings on the participant's responsiveness showed that practitioners who perceived guidelines as important are more likely to achieve high implementation fidelity and hence efforts to improve practitioners' responsiveness to guidelines may improve implementation fidelity to praziquantel dosing.

The low fidelity to the recommended dosing can be explained on several fronts. There is a possibility of ineffectiveness in the communication media that could have been employed to either contentious the recommended guidelines; or on the inefficiencies of the package insert, which is supposed to reinforce the recommended dosing, that accompanies praziquantel.

Findings from the dosing practice of practitioners showing that those who used their knowledge base only in dosing praziquantel to patients could show that the use of references could be adversely affecting the implementation fidelity to the recommended guidelines.

During the reporting of the study, there had been no previous studies on the implementation fidelity to praziquantel dosing for the treatment of *schistosomiases*. This consequently restricted how closely the research's results could be compared to other studies. As such

comparison mainly focused on those factors that affected the implementation fidelity as given by other almost similar studies.

Cuccheto et al., 2019 in a systematic review that sought to establish praziquantel dosing; found dosing distortions. Non-standard treatment regimens had been recorded in almost 50% of the records. The percentage found of "alternative" regimens comprised those with higher praziquantel dosages, longer treatment durations, and or doses repeated many days or weeks apart. The reported reasons for the dosing distortions amongst healthcare workers included perceptions that single dosing could be associated with improved compliance, cost of the medication, and similarly as in this study, inadequate facilitation strategies.

Van Der Wer, Bosompem, and De Vlas, 2003 in their study on *schistosomiases* control in Ghana; conclusions were: that there was inadequate treatment of patients due to the non-availability of medication (in this study, 33.22%). They also concluded that proper training of healthcare cadres in the diagnosis and treatment of *schistosomiases* was imperative for the optimum treatment of *schistosomiases.* There were almost similar findings, in this study, which showed the need for proper facilitation strategies to communicate recommended WHO treatment guidelines and the improvement of the package insert of the medication accompanying the medication to increase its visibility and communication of the recommended dosage. Wafula, Miriti, and Goodman, 2012 also concluded that implementing fidelity medication dosing and improved healthcare outcomes could be affected by stocking the stocking levels of the medication and the health shop's location. Similarly, the stocking of praziquantel in Zimbabwean pharmacies was also inconsistent, which could explain the low implementation fidelity observed.

In a study done by Bamulanzeki 2014; on ‘analysis of factors that Influence compliance with Praziquantel for the Control of Intestinal *Schistosomiasis* in some Ugandan communities;’ respondents who had a better understanding of the illness and how to treat it, after training had better compliance to the praziquantel-recommended dosing than the participants who had received no training.

Bawate, Callender-Carter, Nsajju, and Bwayo, 2016 in a study that sort to assess compliance to national treatment guidelines of healthcare workers in the treatment of malaria, found a low overall adherence and concluded that there was a need for continuous education of healthcare

workers to guidelines which they said is key to improving the health care of the population and improving patience treatment outcomes; which could also be identified as possible conclusions to this study.

It could be possible that practitioners could be finding the recommended guidelines to be complex and hence could have not comprehended the intended dosages.

### 4.3 The clinical relevance of this study

As alluded to in the introduction, *schistosomiases* are one of the significant waterborne diseases endemic to Zimbabwe. The low implementation fidelity scores amongst pharmacists could imply underdosing or overdosing of praziquantel, resulting in possible undertreatment or non-treatment of patients. Undertreatment is also associated with microorganisms' resistance to treatment, which could imply the future ineffectiveness of praziquantel. These could worsen the previously mentioned mortality and morbidity issues and have an increased *schistosomiases* burden on the country's healthcare system.

### 4.4 Study limitations

The implementation fidelity amongst pharmacists of giving praziquantel in several dosages to treat *schistosomiases* has not been previously investigated or published; as a consequence, it was difficult to directly compare the research's findings to those of other studies.

The study was conducted as a survey, and data collection could only be done online, mainly due to the COVID-19 epidemic. This could have introduced bias in response. Audiotapes or videotapes for objective delivery verification and evaluation based on predetermined criteria are the gold standards for ensuring that treatments are administered as prescribed. Provider checklists and other techniques of fidelity of delivery monitoring are less trustworthy and have weak associations with objective measurements; hence the study could have employed observations in practice, which could have been more ideal. Using the framework as a tool for analysis could have introduced challenges and bias since the framework had to be adapted to contextualize the investigation at hand.

## CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

In conclusion, this study measured implementation fidelity to Zimbabwean retail pharmacists' recommended praziquantel dispensing guidelines. It provided evidence for the need for process evaluation of interventions to recommended dosage guidelines and, in this case, in measuring the implementation fidelity outcome and its importance in improving healthcare outcomes. The observed low implementation fidelity by pharmacists could negatively affect the expected treatment outcomes, deter the eradication of tropical diseases, and significantly impact the country's healthcare financing and its overall fiscus.

According to O'Neil et al., 2020, there is room for improvement in the adherence to praziquantel treatment implementation in *schistosomiasis* eradication programs. These programs should also include the following elements: (1) strong political will; (2) adequate funding; (3) prudent drug use; (4) efficient training and education; (5) the creation of a national *schistosomiasis* control program; and (6) the development of national legislation and regulations.

There is a need for policymakers to focus on a drive to make the communication effort of the guidelines more visible; there is also a need to rectify the EDLIZ dosage to align with the recommended dosage, the mainly used and visible reference text. Only recent editions of reference textbooks on premises by practitioners could be enforced, which could help reduce non-fidelity due to coverage factors. The regulatory authorities could also increase this by implementing regular inspections of premises to improve general implementation fidelity to guidelines.

Another way of increasing implementation fidelity is by reaching out to the drug manufacturers to make their package inserts visible and efficiently communicate the recommended dosage. This could also be done at a policy-making level by enforcing the visibility of package inserts during drug registration.

Lastly, to ensure that implementation fidelity is or has improved, more implementation evaluation processes can be carried out; Formative evaluation: the assessment process can be designed to identify potential and actual influences on the progress and effectiveness of implementation efforts of the guidelines; the analysis with continuous communication with the

practitioners can be done as an ongoing improvement process to enable the adaptation and improvement of the implementation process. Summative evaluation can also be used to assess the impacts of implementation strategies on the outcomes, for example, the financial consequences of adopting a specific implementation strategy and using the EBI, which could be vital for policymakers in addressing similar issues.

**References:**

Adenowo, A.F. *et al.* (2015) 'Impact of human schistosomiasis in sub-Saharan Africa, *The Brazilian Journal of Infectious Diseases*, 19(2), pp. 196–205. doi:10.1016/j.bjid.2014.11.004.

Aggarwal, R., & Ranganathan, P. (2017). Common pitfalls in statistical analysis: Linear regression analysis. Perspectives in Clinical Research, 8, 100-102. doi: 10.4103/2229-3485.204047

Agyepong, I.A. *et al.* (2021) 'Synergies and fragmentation in country-level policy and program agenda setting, formulation and implementation for global health agendas: A case study of health security, Universal Health Coverage, and Health Promotion in Ghana and Sierra Leone', *BMC Health Services Research*, 21(1). doi:10.1186/s12913-021-06500-6.

An, M. *et al.* (2020) 'What really works in intervention? using fidelity measures to support optimal outcomes', *Physical Therapy*, 100(5), pp. 757–765. doi:10.1093/ptj/pzaa006.

Baan, M., Galappaththi-Arachchige, H., Gagai, S., Aurlund, C., Vennervald, B., Taylor, M., van Lieshout, L., & Kjetland, E. (2016). The accuracy of praziquantel dose poles for mass treatment of schistosomiasis in school girls in KwaZulu-Natal, South Africa. PLOS Neglected Tropical Diseases, 10(5), e0004623. doi: 10.1371/journal.pntd.0004623

Bevans, R. (2022). Choosing the right statistical test | Types & examples. Scribbr. Retrieved December 21, 2022, from https://www.scribbr.com/statistics/statistical-tests/

Borrelli, B. (2011). The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. Journal of Public Health Dentistry, 71. doi: 10.1111/j.1752-7325.2011.00233

Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. Implementation Science, 2(1). doi: 10.1186/1748-5908-2-40

Chala, B. (2023) 'Advances in diagnosis of schistosomiasis: Focus on challenges and future approaches', *International Journal of General Medicine*, Volume 16, pp. 983–995. doi:10.2147/ijgm.s391017.

Colley, D., Bustinduy, A., Secor, W., & King, C. (2014). Human schistosomiasis. The Lancet, 383(9936), 2253-2264. doi: 10.1016/S0140-6736(13)61949-2

Committee, J. (2021). BNF 76 (British National Formulary) September 2018. London: Pharmaceutical Press, 592-596.

Cross, W., & West, J. (2011). Examining implementer fidelity: Conceptualising and measuring adherence and competence. Journal of Children's Services, 6(1), 18-33. doi: 10.1108/17466661111115552

Emshoff, J. (2008). Measuring fidelity of implementation: A review of available tools and practices. Journal of Evidence-Based Social Work, 5(3), 233-250. doi: 10.1080/15433710802154605

Fixsen, D. L., Blase, K. A., Timmons, A. C., & Naoom, S. F. (2005). Implementation research: A synthesis of the literature. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network.

Forgatch, M. S., Patterson, G. R., & DeGarmo, D. S. (2006). Evaluating fidelity: Predictive validity for a measure of competent adherence to the Oregon model of parent management training. Behavior Therapy, 36(1), 3-13. doi: 10.1016/S0005-7894(05)80086

*Implementation fidelity* (2022) *JMU*. Available at: https://www.jmu.edu/assessment/sass/ac-step-four.shtml (Accessed: 21 August 2023).

Kardas, P. (2002). Patient compliance with antibiotic treatment for respiratory tract infections. Journal of Antimicrobial Chemotherapy, 49(6), 897-903. doi: 10.1093/jac/dkf046

King, C., Olbrych, S., Soon, M., Singer, M., Carter, J., & Colley, D. (2011). Utility of repeated praziquantel dosing in the treatment of schistosomiasis in high-risk communities in Africa: A systematic review. PLOS Neglected Tropical Diseases, 5(9), e1321. doi: 10.1371/journal.pntd.0001321

Lee, C., August, G., Realmuto, G., Horowitz, J., Bloomquist, M., & Klimes-Dougan, B. (2008). Fidelity at a distance: Assessing implementation fidelity of the early risers prevention program in a going-to-scale intervention trial. Prevention Science, 9(3), 215-229. doi: 10.1007/s11121-008-0097-0

Medicines and Allied Substances Control. (2017). BNF 76 (British National Formulary) September 2018. London: Pharmaceutical Press, 592-596.

Medicines and Allied Substances Control. 59.

Megan Feely, Kristen D. Seay, Paul Lanier, Wendy Auslander, Patricia L. Kohl. 2017. Measuring Fidelity in Research Studies: A Field Guide to Developing a Comprehensive Fidelity Measurement System. Child Adolesc Soc Work J DOI 10.1007/s10560-017-0512-6. Springer Science+Business Media

Midzi, N., Mduluza, T., Chimbari, M., Tshuma, C., Charimari, L., Mhlanga, G., Manangazira, P., Munyati, S., Phiri, I., Mutambu, S., Midzi, S., Ncube, A., Muranzi, L., Rusakaniko, S. and Mutapi, F.. 2014. Distribution of Schistosomiasis and Soil-Transmitted Helminthiasis in Zimbabwe: Towards a National Plan of Action for Control and Elimination. PLoS Neglected Tropical Diseases. 8(8). p.e3014.

Mihalic, S. Fagan, A. and Argamaso, S.. 2008. Implementing the LifeSkills Training drug prevention program: factors related to implementation fidelity. Implementation Science. 3(1).

Mohcc.gov.zw. 2021. Ministry of Health and Child Care - National Health Strategy 2020-2025 cards. [online] Available at: http://www.mohcc.gov.zw/index.php?option=com_content&view=article&id=343:national-health-strategy-2020-2025-on-the-cards&catid=84&Itemid=435 [Accessed 29 August 2021].

Mowbray, Carol T. et al. “Fidelity Criteria: Development. Measurement. and Validation.” The American Journal of Evaluation. vol. 24. no. 3. 2003. pp. 315–340. https://doi.org/10.1016/s1098-2140(03)00057-2.

Munisi, D., Buza, J., Mpolya, E., Angelo, T. and Kinung’hi, S.. 2017. The Efficacy of Single-Dose versus Double-Dose Praziquantel Treatments on Schistosoma mansoniInfections: Its

Implication on Undernutrition and Anaemia among Primary Schoolchildren in Two On-Shore Communities. Northwestern Tanzania. BioMed Research International. 2017. pp.1-13.

Sahay, A.. 2021. Peeling Saunders's Research Onion. [online] researchgate. Available at: PeelingSaunder'sResearchOnion/links/5813283508aedc7d89609ea8/Peeling-Saunders-Research-Onion.pdf> [Accessed 8 September 2021].

Sanders, M.R. Markie-Dadds, C. and Turner, K. (2001). Practitioner's manual for standard triple P. Brisbane: Triple P International Pty. Ltd. Sanders, M.R. Markie-Dadds, C. and Turner, K. (2003b). Every parent's family workbook. Brisbane: Triple P International Pty. Ltd.

Sanders, M. R. and Pidgeon, A. M. (2005). Practitioner's manual for pathways triple P. Brisbane: Triple P International Pty. Ltd. Sanders, M. R., Pidgeon, A. M., Gravestock, F., Connors, M. D., Brown.

Sanders, M.R & Young, R. W. (2004). Do parental attributional retraining and anger management enhance the triple P-positive parenting program's effects on parents at risk of child maltreatment? Behaviour Therapy. 35(3). 513–535.

Sanders, M. R., Turner, K. M. T. and Markie-Dadds, C. (2002). The development and dissemination of the triple P-positive parenting program: A multilevel, evidence-based system of parenting and family support. Prevention Science. 3(3). 173–189. doi:10.102 3/A:1019942516231

Schoenwald, S. K. (2011). It's a bird, a plane, or fidelity measurement in the real world. Clinical Psychology: Science and Practice. 18(2). 142–147.

Schoenwald, S. K. and Garland, A. F. (2013). A review of treatment adherence measurement methods. Psychological assessment. 25(1). 146.

Schoenwald, S. K., Garland, A. F., Chapman, J. E., Frazier, S. L., Sheidow, A. J. and Southam-Gerow, M. A. (2011). Toward the effective and efficient measurement of implementation fidelity. Administration and Policy in Mental Health and Mental Health Services Research. 38(1). 32–43.

Toledo, R. and Fried, B. (2019) Digenetic Trematodes. 3rd ed. [online] SpringerLink, pp.45-70. Available at: <https://link.springer.com/book/10.1007/978-3-030-17380-1> [Accessed 27 June 2021].

WHO (2021) Schistosomiasis (Bilharzia). [online] Available at: <https://www.who.int/health-topics/schistosomiasis#tab=tab_1> [Accessed 27 June 2021].

World Health Organization (2022) WHO guideline on control and elimination of human schistosomiasis. Geneva: Licence: CC BY-NC-SA 3.0 IGO.

Wisconsin RTI Center (2015) School-Wide Implementation Review. [online] Available at: <http://www.wisconsinrticenter.org/SIR> [Accessed 9 September 2021].

Wiffen, P. (2021) Pharmacists are the gatekeepers to the use of antimicrobials. [online] European Journal of Hospital Pharmacy, 24(6), pp.313. Available at: <https://ejhp.bmj.com/content/24/6/313> [Accessed 9 September 2021]

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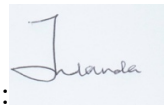

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SENATE PLAGIARISM POLICY: APPENDIX ONE

I **Victor Ndanda** (Student number**: 1149012**) am a student registered for the degree of: **MSc Epidemiology (Implementation Science)** in the academic year **2020 - 2022**

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## APPENDIX 2: Data collection tool



### Fidelity and its moderators to praziquantel dispensing guidelines in Zimbabwe retail pharmacists

1) Kindly indicate your consent to participate in the study by signing below.

◯ Yes
◯ No

1. I have read and understood the study information
2. I understand taking part in the study is voluntary

# SOCIODEMOGRAPHICS

Details about your sociodemographics.

| | | |
|---|---|---|
| 1) | Sex of respondent? | ☐ Female<br>☐ Male |
| 2) | Participants' age group? | ☐ 24 - 34 years<br>☐ 35 - 44 years<br>☐ 44 - 54 year<br>☐ 55 - 64 years<br>☐ 65 years and above |
| 3) | The number of years of practice in retail pharmacy? | ☐ 1- 4 years<br>☐ 5 -9 years<br>☐ 10 - 14 years<br>☐ 15 - 19 years<br>☐ 20 years and above |
| 4) | What is the highest level of qualification(s) you acquired post your registration as a pharmacist? | ◯ Non<br>◯ Certificate / Diploma Level<br>◯ Post Graduate Diploma Level<br>◯ Masters Degree Level<br>◯ Doctorate Level |
| 5) | In which province do you practise? | ☐ Bulawayo Province<br>☐ Harare Province<br>☐ Manicaland Province<br>☐ Mashonaland Central Province<br>☐ Mashonaland East Province<br>☐ Mashonaland West Province<br>☐ Matebeleland North Province<br>☐ Matebeleland South Province<br>☐ Masvingo Province<br>☐ Midlands Province |

# ADHERENCE

This section relates to how you practise when dispensing praziquantel to a patient.

| | |
|---|---|
| Do you dispense praziquantel mostly by prescription or as a pharmacist initiated medicine | ◯ Yes<br>◯ No |
| To the best of your knowledge, on average how many patients have you in the past year seen presented with schistosomiasis or a prescription for praziquantel? | _____ |
| When dispensing praziquantel do you use your knowledge dose or you use reference textbooks in the pharmacy | ◯ I use my knowledge<br>◯ I use reference texts |
| Praziquantel Dose | _____<br>(How have you been or would you give praziquantel in mg/kg) |
| Frequency of dosing | ◯ Given as a single dose<br>◯ Given in divided dose |
| Assuming you were not aware of the praziquantel dose to give, which reference textbook do you currently have at your disposal would you use. | ◯ The British National Formulary (BNF)<br>◯ The Essential Drug List of Zimbabwe<br>◯ Martindale<br>◯ Other |
| Which Edition of the BNF do you have | ☐ 75 Edition and before<br>☐ 76 Edition and above |
| Which Edition of the  Martindale do you have | ◯ 45th Edition and before<br>◯ 45th Edition and after |
| Which other reference textbook do you have | _____<br>(Give Name of Ref and Edition ) |
| Assuming you refer to guidelines every time you dispense pharmacist initiated medicines, how often do you use the reference text you chose in the above question? | ☐ Always<br>☐ Very frequently<br>☐ Occasionally<br>☐ Rarely<br>☐ Never |

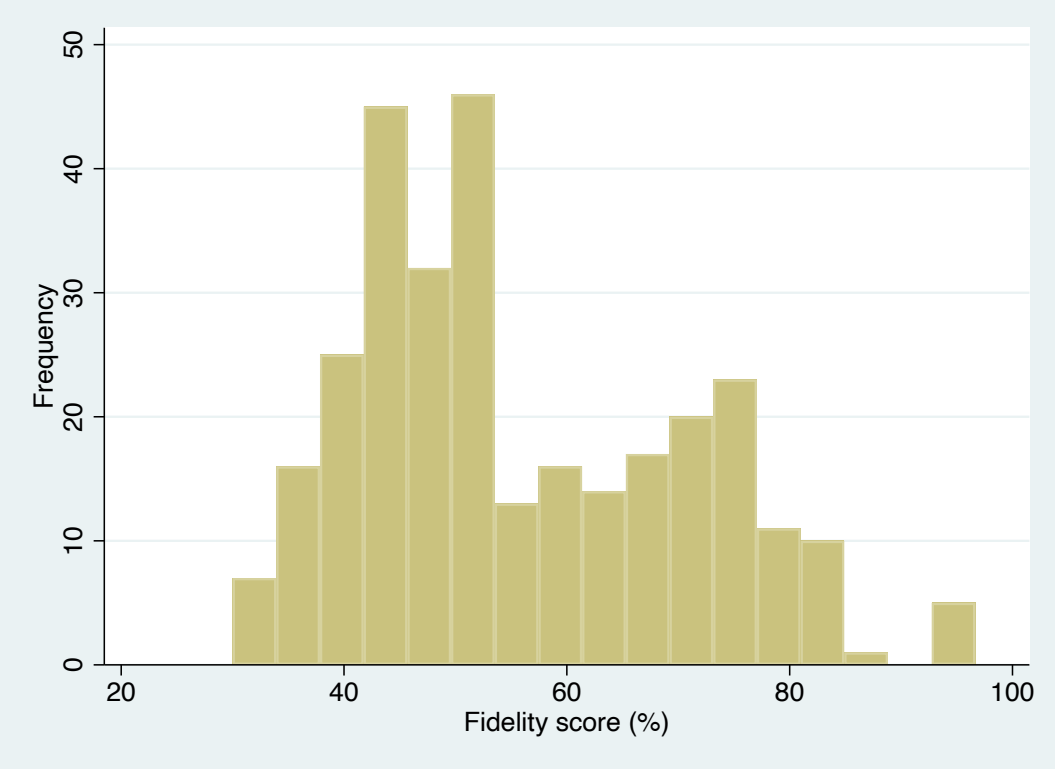
# MODERATORS TO IMPLEMENTATION OF LATEST GUIDELINES

This relates to your views on the latest WHO guidelines on praziquantel dosing, which recommends dosing at 20mg/kg in three divided doses.

| | |
|---|---|
| Are you aware of the current WHO schistosomiasis of dosing praziquantel at 20mg/kg every 6-8 hours for 24 hours | ◯ Yes<br>◯ No<br>(Goes to ascertain knowledge of intervention ) |
| In your opinion, would you regard these interventions as complex? | ◯ Strongly agree<br>◯ Agree<br>◯ Neutral<br>◯ Disagree<br>◯ Strongly disagree<br>(This relates to how you understand the intervention in place, in terms of their complexity. ) |
| Has information about this new dosing regimen been availed to you? | ◯ Yes<br>◯ No<br>(Has there been communication in regards to the new dosing regimen) |
| In your opinion would you say the facilitation strategies used to deliver the new guidelines is effective? | ◯ Strongly agree<br>◯ Agree<br>◯ Neutral/Undecided<br>◯ Disagree<br>◯ Strongly disagree<br>(Efficiency in regards to the communication of new guidelines) |
| Have you ever received any material to consciencetise the new WHO guidelines implemented? For example provisions with product package inlets, pamphlets, fliers, memos? | ◯ Yes<br>◯ No<br>(Effectiveness of communication medium used) |
| In your opinion how would you rate the communication medium used to communicate the new regimen to be effective? | ◯ Strongly agree<br>◯ agree<br>◯ neutral<br>◯ disagree<br>◯ strongly disagree<br>(Opinion on efficiency of communication medium used) |
| do you think the provision of these guidelines are necessary for the delivery of schistosomiases treatment? | ◯ Yes<br>◯ No |
| In your opinion would you say the provision of these guidelines are necessary for healthcare delivery given the magnitude of the problem of schistosomiases in your area? | ◯ Strongly agree<br>◯ Agree<br>◯ Neutral/Undecided<br>◯ Disagree<br>◯ Strongly disagree<br>(This relates to how the participants views the relevance of the intervention.) |

**Appendix 3: Figures and tables of results findings**

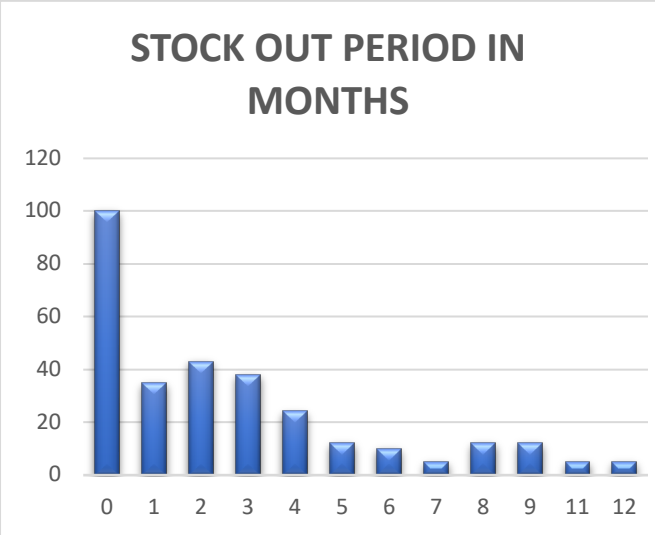
Implementation of fidelity score distribution



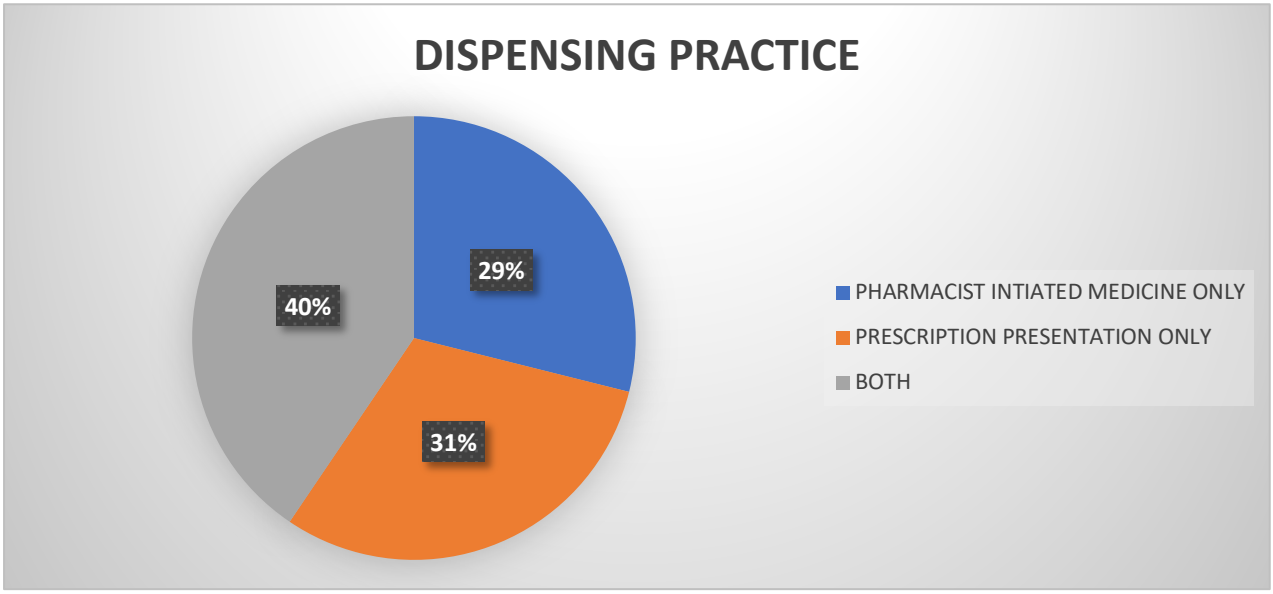

**Pie chart showing PZQ Stocking over 2021 in participants' pharmacies**



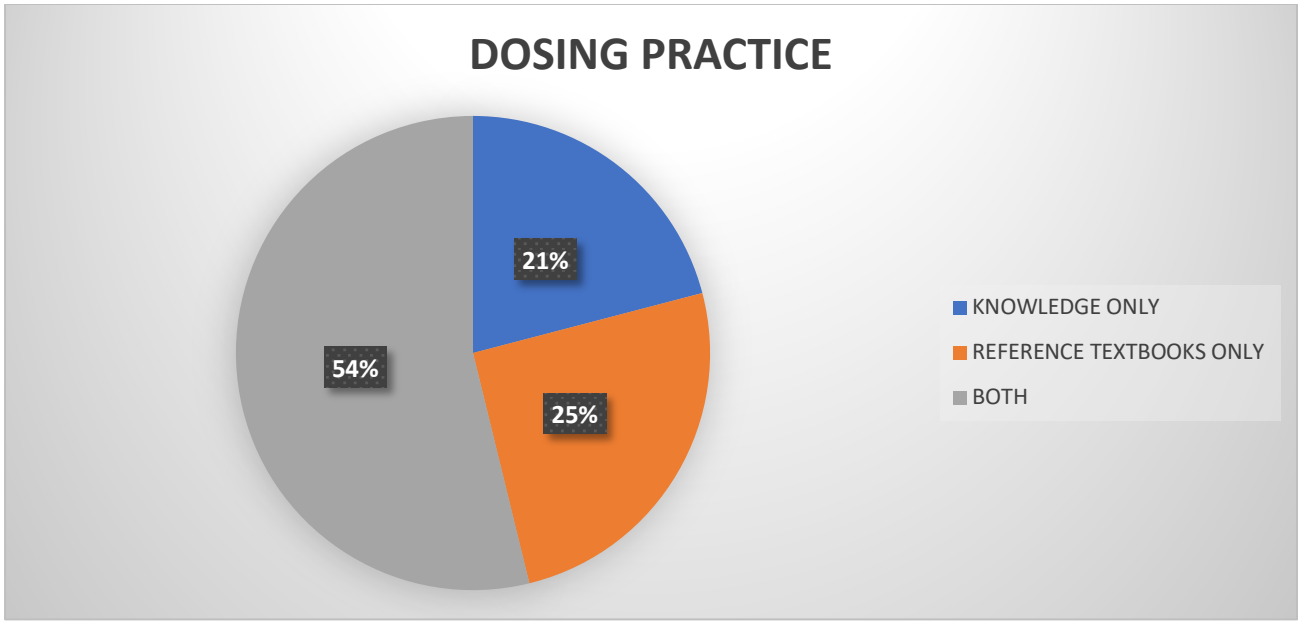
**Praziquantel stock-out distribution variability stock-out levels over 2021 (in months)**



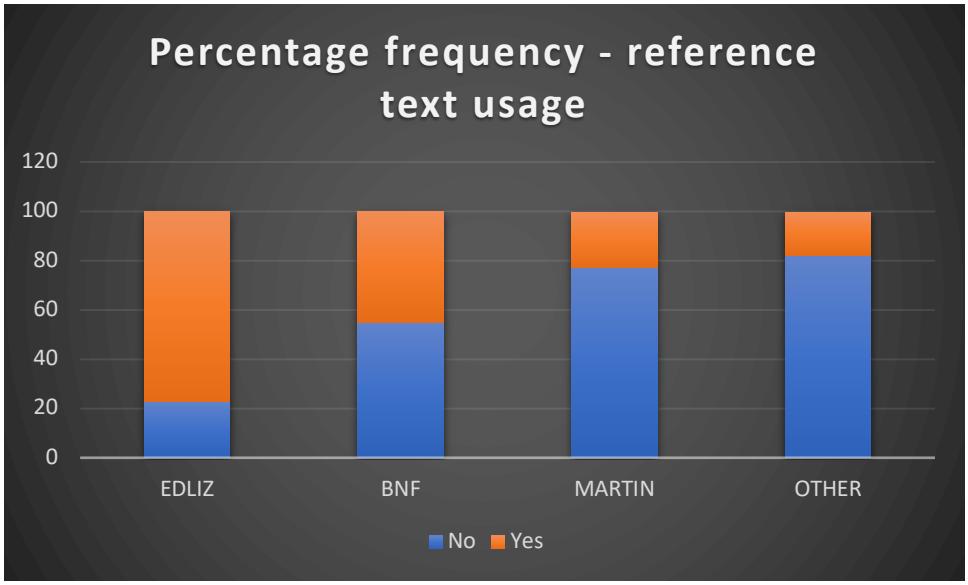

**Pie chart showing the distribution of participants by dispensing practice**



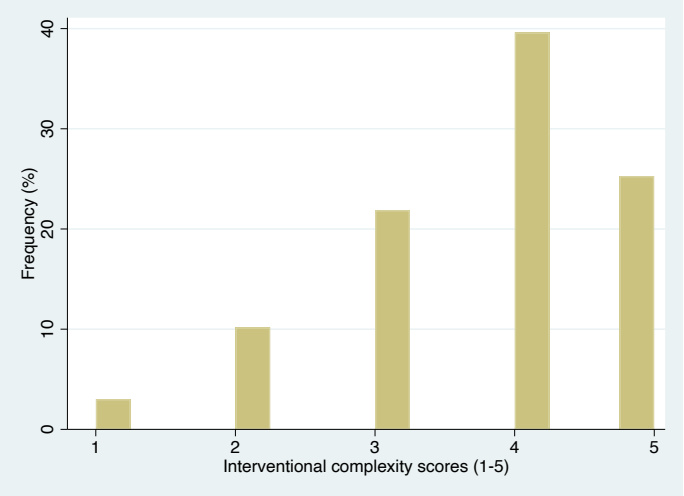
**Pie chart showing the distribution of participants by dosing practice**

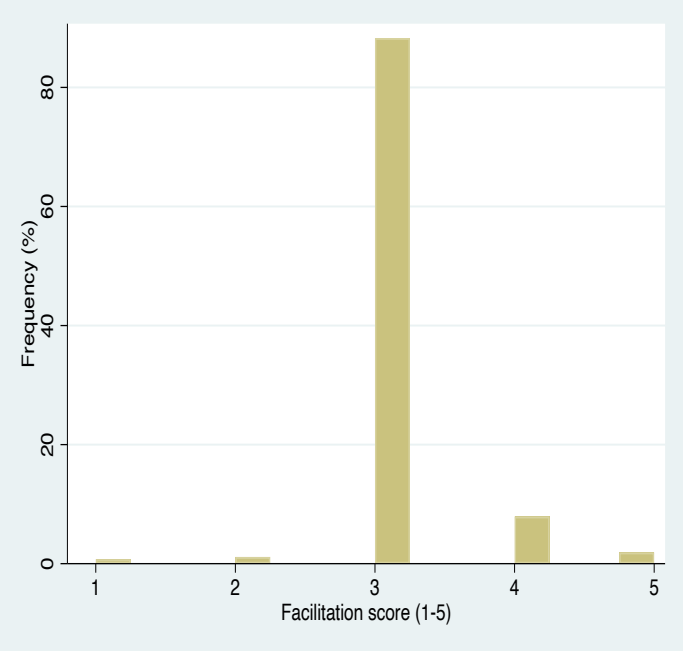


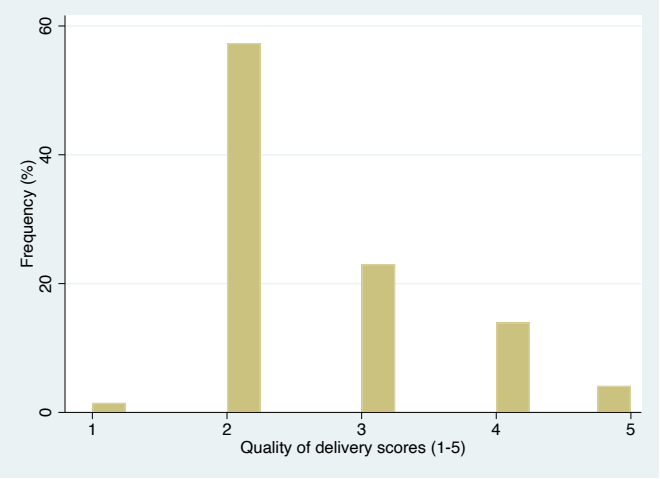

**Percentage frequency of reference textbooks used in practice**

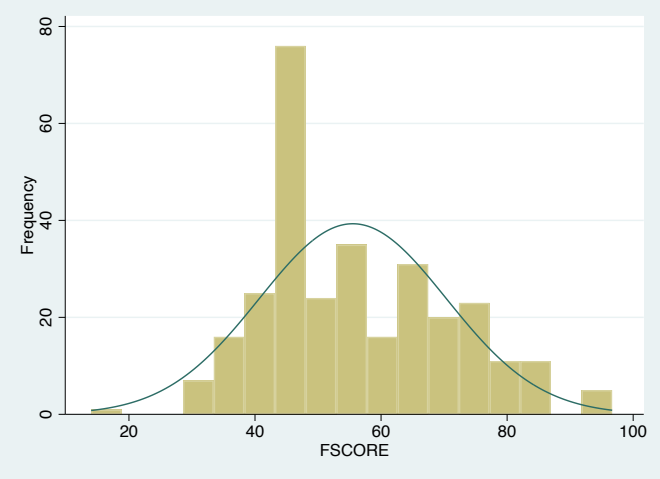


## Distribution of moderating factors by the participant's frequencies






## Skewness and kurtosis tests for normality of the fidelity score distribution

```
. sktest FSCORE

Skewness and kurtosis tests for normality
                                                    ------- Joint test -------
    Variable |       Obs   Pr(skewness)   Pr(kurtosis)   Adj chi2(2)  Prob>chi2
-------------+-------------------------------------------------------------------
      FSCORE |       301         0.0003         0.0818         13.91      0.0010

. histogram FSCORE, frequency normal
(bin=17, start=14, width=4.8627451)
```

## Description of fidelity score frequency distribution graph

| Variable | Pr (skewness) | Pr (kurtosis) |
|---|---|---|
| Fidelity score | 0.00003 | 0.08 |

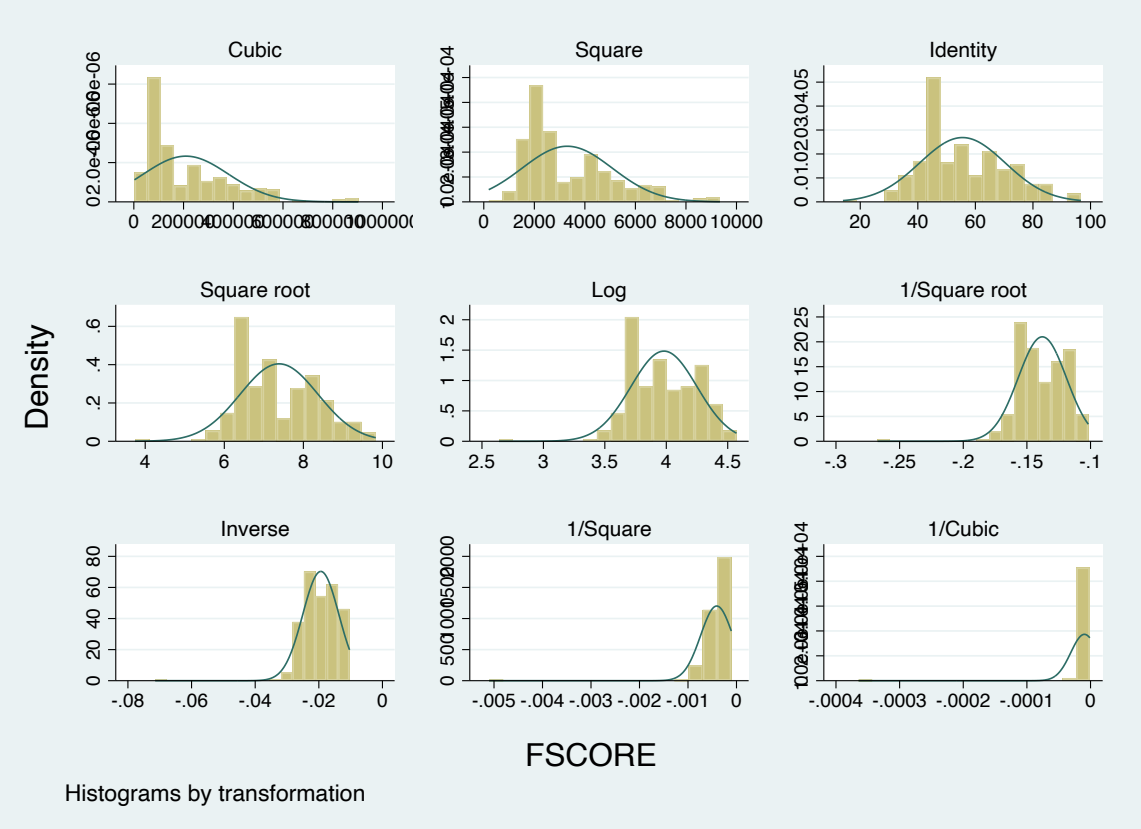
## Shapiro Wilks test probability results for fidelity score

| Variable | Prob>z |
|---|---|
| Fidelity score | 0.00 |

**Ladder FSCORE – Possible transformations for the fidelity score variable**

| Transformation | Formula | Prob> chi2 |
|---|---|---|
| Cubic | FSCORE^3 | 0.000 |
| Square | FSCORE^2 | 0.000 |
| Identity | FSCORE | 0.001 |
| Square root | sqrt(FSCORE) | 0.097 |
| Log | log(FSCORE) | 0.024 |
| 1/(Square root) | 1/sqrt(FSCORE) | 0.000 |
| Inverse | 1/FSCORE | 0.000 |
| 1/Square | 1/(FSCORE^2) | 0.000 |
| 1/Cubic | 1/(FSCORE^3) | 0.000 |

**FSCORE Histograms after possible transformations**



**Shapiro-Wilks probabilities for Log and Square root fidelity score transformations**

| Variable | Prob>z |
|---|---|
| Log fidelity score | 0.00000 |
| Square root fidelity score | 0.00000 |

**Adjusted Logistic regression STATA output of optimum fidelity the moderating factors**

```
. logistic OptFSCORE ib2.dcomplex c.FACILITATION i.dpqual c.PR i.SEX i.DOSING

Logistic regression                                     Number of obs =    301
                                                        LR chi2(8)    =  41.62
                                                        Prob > chi2   = 0.0000
Log likelihood = -89.396787                             Pseudo R2     = 0.1888

------------------------------------------------------------------------------
    OptFSCORE | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
    dcomplex |
        yes |   .3918859     .45884    -0.80   0.424     .0394938    3.888569
    neutral |          1  (base)
         no |   2.720077   1.583484     1.72   0.086     .8690743    8.513446
            |
FACILITATION |   3.344919   1.271252     3.18   0.001     1.588118    7.045123
            |
      dpqual |
        yes |          1  (base)
         no |   1.519111   .6422117     0.99   0.323     .6633457    3.478878
            |
         PR |   1.830721   .5083912     2.18   0.029     1.062291    3.155011
            |
        SEX |
          1 |          1  (base)
          2 |   .7202711   .2985093    -0.79   0.429     .3196862    1.622812
            |
 DOSINGPRACT |
          1 |          1  (base)
          2 |   .5370321   .2642917    -1.26   0.206     .2046893    1.408982
          3 |   .1744255   .0867037    -3.51   0.000     .0658406    .4620899
            |
       _cons |   .0002978   .0006051    -4.00   0.000     5.56e-06    .0159651
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.
```

**The goodness of fit of the adjusted model**

```
. estat gof, group(10)
note: obs collapsed on 10 quantiles of estimated probabilities.

Goodness-of-fit test after logistic model
Variable: OptFSCORE

 Number of observations =    301
       Number of groups =     10
Hosmer-Lemeshow chi2(8) =   9.01
            Prob > chi2 = 0.3419
```

**Appendix 4: Study information for participants.**

**Study title:** Fidelity and its moderators to praziquantel dispensing guidelines in Zimbabwe retail pharmacists

**Greetings:** Hello. My name is Victor Ndanda. I am an MSc Epidemiology student at the University of Witwatersrand, South Africa. As my studies require, I must undertake a research project for my Degree. I am studying the above topic under the supervision of Dr. Juliana Kagura.

**Introduction:** This research project aims to assess implementation fidelity to praziquantel dispensing guidelines; and investigate the relationship between the implementation fidelity and its moderating factors in Zimbabwe retail pharmacists. I invite you to answer a questionnaire as part of my research project. The questionnaire has thirty questions, divided into four sections. and will take around 5 to 10 minutes to complete. This survey will run for a week. Please take note of the following.

**Risks and discomfort:** There are no known risks attached to the research study.

**Benefits:** The study aims to assess implementation fidelity to praziquantel dispensing guidelines and investigate the relationship between implementation fidelity and its moderating factors in Zimbabwe retail pharmacists. It is intended to benefit from adhering to recommended guidelines for praziquantel dosing.

**Compensation:** There are no costs in participating, and you will not be rewarded (or paid) if you participate in the study.

**Confidentiality**: By signing this document, you indicate your willingness to participate in this study. The collected information will be treated with strict confidentiality and only accessible to the Principal Investigator and his supervisor. Personal identifiers will not be sought to keep your anonymity.

**Voluntary participation:** Participation in this study is voluntary and completion of the survey will be considered as consent to participate.

**Contact details of the researcher**

| | | |
|---|---|---|
| **Principal Investigator** | Victor Ndanda | Contact details:<br>victorndanda@yahoo.com<br>+263 771 674 644 |
| **Supervisor** | Dr Juliana Kagura | Contact details:<br>Wits School of Public Health<br>Epidemiology and Biostats Division<br>Juliana.kagura@wits.ac.za<br>+27 (0) 11 717 2605 |

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). 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 concerns over how the study is being conducted, please get in touch with the Chairperson of this Committee, Dr. Clement Penny, who may be contacted by telephone number 011 717 2301 or by e-mail at 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.

**Outputs:** A research study will be produced with findings, analysis, and recommendations. Upon request. a copy can be availed to participants.

**Participation process**

To participate in the study, kindly follow the link below, which will link you to an online survey:

**[SURVEY LINK]**

Thank you for reading this study information sheet.

May 2022

## Appendix 5: Pharmacists Council of Zimbabwe

**Pharmacists Council of Zimbabwe**
No. 2 Cork Road, Belgravia, Harare, P.O. Box CY 2138, Causeway, Harare, Zimbabwe
Tel: 04-740074, 741302, 740157
0772 137 039/ 0772 137 047/ 0712 833 817
Email: admin@pcz.co.zw
Website: www.pcz.co.zw

**All correspondence to be addressed to the Registrar**

**TO WHOM IT MAY CONCERN**

**RE – REQUEST FOR PERMISSION TO CARRY OUT A RESEARCH PROJECT ON " FIDELITY AND ITS MODERATORS TO PRAZIQUANTEL DISPENSING GUIDELINES IN ZIMBABWE RETAIL PHARMACIES"**

The Pharmacists Council of Zimbabwe has no objection for Mr Victor Ndanda, an MSc in Epidemiology student at the University of Witwatersrand in South Africa to carry out the above named study among various pharmacies in Zimbabwe.

Kindly allow him to collect the relevant data for his research project (academic purposes only).

A KARONGA (Mr)
**REGISTRAR**

PHARMACISTS COUNCIL OF ZIMBABWE
22 SEP 2021
2 CORK ROAD BELGRAVIA HARARE
P. O. BOX CY 2138 CAUSEWAY
TEL: 740074, 741302 CELL: 0772 137 039/47

**Council Members:** Mr. R. T Rukwata **(Chairperson),** Mr. P Mwendera **(Vice Chairperson)**
**Other members:** Dr. R. T. J Chigwanda, Mr. G. Mandizvidza, Mr. R. Maveneka, Mr. S. Mawere, Ms. V. Mkudu, Dr.T. G. Monera-Penduka
Ms. T. Moyo, Mrs. V. G. Musere, Mr.L. G. Nyarota, Dr. J . Pedersen, Ms. F. Sinoia, Prof. D. Tagwireyi

## Appendix 6: Medicines Control Authority of Zimbabwe

MCAZ Medicines Control Authority of Zimbabwe

106 Baines Avenue
Tel: +263-4-736981-7
708255/792165, 0772 145 191/2/3
Email: mcaz@mcaz.co.zw
Website: www.mcaz.co.zw

P.O. Box 10559
Harare
Zimbabwe

**Ref:** B/279/33/62/2021

24th September 2021

**University of Witwatersrand**
Faculty of Health Sciences
27 St Andrew's Road
Parktown 2193
Johannesburg
**SOUTH AFRICA**

**To Whom It May Concern**

Dear Sir/Madam,

**RE: REQUEST TO USE PREMISES AND PERSONS REGISTERS FOR RESEARCH PURPOSES – VICTOR NDANDA STUDENT NUMBER 1149012**

Reference is made to the request to use the premises and persons registers for the study titled: Fidelity and its moderators to praziquantel dispensing guidelines in Zimbabwe retail pharmacies.

This letter serves to confirm that the Medicines Control Authority of Zimbabwe (MCAZ) has no objection to the use of the premises and persons registers as these are available in the public domain, on the Authority's website.

Yours faithfully
**MEDICINES CONTROL AUTHORITY OF ZIMBABWE**

.....
Shingai Gwatidzo (Mr)
**PROJECTS AND PUBLIC RELATIONS OFFICER**
For: THE DIRECTOR GENERAL

MEDICINES CONTROL AUTHORITY
OF ZIMBABWE
DIRECTOR GENERAL
24 SEP 2021
P.O BOX 10559
HARARE, ZIMBABWE

## Appendix 7: Medical Research Council of Zimbabwe Approval

Telephone: 08644073772/791193
E-mail: mrcz@mrcz.org.zw
Website: http://www.mrcz.org.zw

Medical Research Council of Zimbabwe
Josiah Tongogara / Mazowe Street
P. O. Box CY 573
Causeway
Harare

**APPROVAL**

**MRCZ/B/2193** **13 October, 2021**

**Victor Ndanda**
12A York Gardens
Highlands
Harare

**RE: - Fidelity and Its Moderators to Praziquantel Dispensing Guidelines in Zimbabwean Retail Pharmacists**

Thank you for the application for review of Research Activity that you submitted to the Medical Research Council of Zimbabwe (MRCZ). Please be advised that the Medical Research Council of Zimbabwe has **reviewed** and **approved** your application to conduct the above titled study.

This approval is based on the review and approval of the following documents that were submitted to MRCZ for review: -

- Full Protocol
- Informed Consent Form
- Data Collection Tools

- **APPROVAL NUMBER : MRCZ/B/2193**

This number should be used on all correspondence, consent forms and documents as appropriate.

- **TYPE OF MEETING : EXPEDITED**
- **APPROVAL DATE : 13 October, 2021**
- **EXPIRATION DATE : 12 October, 2022**

After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ offices should be submitted three months before the expiration date for continuing review.

- **SERIOUS ADVERSE EVENT REPORTING**: All serious problems having to do with subject safety must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 3 working days using standard forms obtainable from the MRCZ Offices or website.
- **MODIFICATIONS**: Prior MRCZ and IERC approval using standard forms obtainable from the MRCZ Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY:** On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Offices or website.
- **QUESTIONS**: Please contact the MRCZ on Telephone No. (0242) 791193, 0864407377203 or by e-mail on mrcz@mrcz.org.zw

**Other**

- Please be reminded to send in copies of your research results for our records as well as for Health Research Database.
- You're also encouraged to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.
- **In addition to this approval, all clinical trials involving drugs, devices and biologics (including other studies focusing on registered drugs) require approval of Medicines Control Authority of Zimbabwe (MCAZ) before commencement**

Yours Faithfully

.....

**MRCZ SECRETARIAT**
**FOR CHAIRPERSON**
**MEDICAL RESEARCH COUNCIL OF ZIMBABWE**

MEDICAL RESEARCH COUNCIL OF ZIMBABWE
2021 -10- 13
APPROVED

**PROMOTING THE ETHICAL CONDUCT OF HEALTH RESEARCH**

Scanned with CamScanner

## Appendix 8: Human Research Ethics Committee Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Mr V Ndanda

**HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)**
**CLEARANCE CERTIFICATE NO. M220274**

| | |
|---|---|
| **NAME:** (Principal Investigator) | Mr V Ndanda |
| **DEPARTMENT:** | School of Public Health<br>Division of Epidemiology and Biostatistics<br>Medical School<br>University |
| **PROJECT TITLE:** | *Fidelity and its moderators to praziquantel dispensing guidelines in Zimbabwean retail pharmacists* |
| **DATE CONSIDERED:** | 2022/02/25 |
| **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:** | Dr J Kagura |
| **APPROVED BY:** | CB Penny<br>Dr CB Penny, Chairperson, HREC (Medical) |
| **DATE OF APPROVAL:** | 2022/04/08 |

**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 **February** and therefore reports and re-certification will be due in the month of **February** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator _____ Date _____