

CHAPTER ONE: BACKGROUND

1.1. Introduction

This chapter provides the context, the purpose of the research, definition of terms used within the context of the research, elaboration of the abbreviations used, and lastly, it provides an outline of each of the chapters.

1.2. Background

A child with a hearing loss may introduce numerous and frequent challenges to parents and professionals, when the child presents with a co-morbidity or disorder/delay in addition to the hearing loss. Resources, access to healthcare, financial costs, rehabilitation, special educational placement and high quality service-care provision, are just some of the possible challenges that are intertwined in the dynamic decision-making and management process. Despite these challenges, an improved quality of life and the best outcomes should be the intended goal of intervention for these children.

There is growing evidence from a study conducted by Conelly (2008), that hearing loss can negatively affect health-related quality of life. The objective of clinicians, and the professionals involved, should therefore be to capture and systematize the practices that lead to the best outcomes, and eliminate those that result in less than optimal results (Abrams, McArdle & Chisolm, 2005). An interdisciplinary team approach that incorporates continuous collaboration amongst the professionals involved could provide a more optimal approach. Findings from a research study conducted by Roush, Holcomb, Roush and Escolar (2004), suggest that an interdisciplinary team approach reduces the logistical challenges that confront families as they seek developmental assessments from specialists in multiple settings. Other than the advantage

of the necessary services being provided collaboratively, this approach reduces the time, travel and cost factors for families since the services are usually provided in one setting.

Evidence-based practise demonstrates that professionals working in a collaborative manner in an interdisciplinary setting should be able to provide co-ordinated services from a holistic perspective. This can only occur if there is evidence on the conditions that co-occur with a hearing loss. Research documents containing statistical information, like the prevalence of co-morbidities, are measures that can provide such evidence.

The educational placement of a child presenting with co-morbidities of hearing loss is a complicated process. The goal should be to find a suitable, educational setting that will meet the needs of the child and the family. Disparities exist, although inconsistent, across medical and educational settings for children with therapeutic and support services needs, including those diagnosed with hearing loss (Benedict, 2006). Findings from other research indicated that about 30% of physicians do not refer children with potential hearing loss to the relevant support services by 18 months of age (Sices, Freudtner, Mclaughlin, Drotar & Williams, 2004). This has impact on their quality of life, educational placement and academic achievement . The physician is usually the first professional that families come into contact with when a hearing loss is suspected. Thus, the appropriate collaboration and referral system between health care professionals working in the medical and educational settings should be established.

The researcher chose to conduct the present study at a centre that implements an interdisciplinary team approach. The Centre for Language and Hearing Impaired Children (CLAHIC) is a clinical preschool staffed with professionals who implement an interdisciplinary team approach in working with children diagnosed with a hearing loss. The CLAHIC is also

affiliated to the University of Witwatersrand and is a source of research for the university. Due to the aforementioned factors, the researcher chose the CLAHIC as the site in which to conduct this research, and collect statistical evidence of the co-morbidities of hearing loss in pre-school children.

The purpose of this study was to therefore identify and determine the prevalence of co-morbidities of hearing loss in a preschool population, and to describe its implications for management. This study also investigated whether any relationship existed between the degrees of hearing loss and co-morbidities. Chapter 2 reviews current literature, highlighting some of these key points, and variables of studies conducted in various contexts.

1.3. Explanation of Terminology

Clinical Pre-school Setting: A clinical setting in a school that incorporates programmes that were developed because educators recognised that speech and hearing problems affected performance in the classroom, and deemed it appropriate to provide services onsite (Plante & Beeson, 2004).

Co-morbidity: The presence of more than one distinct condition in an individual (Valderas, Starfield, Sibbald, Salisbury & Roland, 2009).

Conductive Hearing Loss: A conductive hearing loss is a problem in the outer or middle ear, and is often medically or surgically treatable (*American Speech-Language-Hearing Association [ASHA]*, 2010).

Early Intervention: The purpose of early intervention for infants and children with hearing loss is to build communication skills that will facilitate social and cognitive development (Brown, Holstrum & Ringwalt, 2008).

Hearing loss: A simple definition refers to both, a partial or complete loss of the ability to hear (ASHA, 2010).

ICF Framework: The International Classification of Functioning and Disability (ICF) offer a universally accepted framework for a comprehensive understanding of health and health-related states (*World Health Organisation [WHO]*, 2001).

Interdisciplinary team: A team approach in which team members integrate their goals to produce a collaborative intervention plan (Diller, 1990).

Mixed Hearing Loss: Has both a conductive and sensory-neural component (Tharpe, 2004, p. 267).

Sensory-Neural Hearing Loss: Defined as a problem with the inner ear or with the auditory nerve (Tharpe, 2004, p. 267).

1.4. List of Abbreviations

ABR – auditory brainstem response

ADHD – attention deficit hyperactivity disorder

AOS – apraxia of speech

ASD – autism spectrum disorder

BI – bilateral integration

CI – cochlear implant

CHL – conductive hearing loss

CLAHIC – The Centre for Language and Hearing Impaired Children

EcochG – electrocochleography

ENT – ear, nose and throat specialist

FM – fine motor

GM – gross motor

HL – hearing loss

ICF – International Classification of Functioning

LE – left ear

LD – learning disability/disorder

OAE – otoacoustic emission

OT – occupational therapy

PT – physiotherapy

PTA – pure tone average

RE – right ear

SI – sensory integration

SNHL – sensory-neural hearing loss

ST – speech therapy

SLP – speech language pathologist

VMI – visual motor integration

1.5. Outline of Chapters

This research report is presented in six chapters.

Chapter 1 presents an overview of the contextual information of the research and the main aim of the study.

Chapter 2 focuses on international and national research studies that relate to the context of this study. A further elaboration on the rationale for this research is highlighted at the end of this literature review.

Chapter 3 provides the aims and describes the procedures for data collection of the study.

Chapter 4 presents the results in relation to the aims of the study.

Chapter 5 is an in-depth discussion on the findings of this research in comparison to other research findings. It then describes the implications of the research that informs professionals working with children diagnosed with a hearing loss.

Chapter 6 is a summation of the research report and provides a brief description on the strengths and limitations of the study as well as the implications for further research to be conducted.

The appendices supply important information for the understanding of the data collection and analysis procedures, and thus the replication of the study.

1.6. Summary

The first chapter provided an introduction to the research study to assist in understanding the context of the study and the development towards the research question.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

In this chapter, a critical discussion of the literature is presented, that highlights key aspects of this study. It begins with a definition of hearing loss that is explained within the framework of the International Classification of Functioning (ICF) followed by statistics on the prevalence of hearing loss and then examines the causes of hearing loss. Thereafter, the term “co-morbidities of hearing loss” is explained, followed by a discussion of the prevalence and the implications for assessment and management of children with co-morbidities of hearing loss. Finally the chapter concludes with a rationale for this study.

2.2. The ICF Framework

The International Classification of Functioning and Disability (ICF) was adopted by the *World Health Organization* in 2001, (WHO, 2001). The ICF offers a universally accepted framework for a comprehensive understanding of health and health-related states (WHO, 2001). The ICF makes it possible to link data across conditions or interventions for an efficient, transparent, and cost-effective approach to health care services (Cieza et al., 2004). In rehabilitation, the ICF is used to describe the impairments, activity limitations, and participation restrictions, as well as relevant environmental factors associated with persons with health conditions (Cieza & Stucki, 2004). Danermark, Cieza, Gange et al., (2010) state that to successfully describe the level of functioning of people with hearing loss, it is necessary to understand the relationship between selected target problems within the direct assessment of a person’s impairments, limitations and restrictions, and the relevant contextual factors which might either exacerbate or reduce disability.

The ICF framework is based on the bio-psycho-social model that covers functioning and disability with its component body structures, body functions, activities and participation, as well as personal and environmental factors. One of the main goals of the ICF is to provide a conceptual framework of health that can be applied both clinically and for research purposes (Granberg & Danermark, 2010). Hence, the researcher has chosen this framework as reference for the implications for assessment and management of children with hearing loss.

2.3. Hearing Loss

There are various definitions of hearing loss and therefore, comparisons among studies in the literature are difficult. A simple definition of hearing loss refers to both a partial or complete loss of the ability to hear (ASHA, 2010).

The degrees of hearing loss for children are: normal hearing = <15dB, slight hearing loss = 16dB to 25dB, mild hearing loss = 26dB to 40dB, moderate hearing loss = 41dB to 55dB, moderately severe hearing loss = 56dB to 70dB, severe hearing loss = 71dB to 90dB and profound hearing loss = >90dB (Tharpe, 2004, p. 268).

Hearing loss can be acquired or congenital. Congenital hearing loss is defined as hearing loss that may occur secondary to peri-natal infection or developmental disorders that are sometimes related to syndromes (Katz, 2002, p. 23-26). Types of acquired hearing loss include: noise-induced hearing loss which shows a characteristic notch at 4000Hz on the audiogram; a drug-induced hearing loss that is caused by ototoxic drugs; presbycusis which refers to cochlear degeneration as part of the natural process of ageing; infectious-hearing loss that may cause a bilateral moderate to severe hearing loss induced by viral or bacterial infections ; and a sudden-

sensory neural hearing loss that could be a medical emergency as the potential result of trauma but other causes are also possible for this type of hearing loss (Katz, 2002).

There are predominantly three different types of hearing loss that are defined by the configuration of the audiogram and etiology, namely, sensory-neural hearing loss, a conductive hearing loss and a mixed hearing loss. A sensory-neural hearing loss is defined as a problem with the inner ear or with the auditory nerve (Tharpe, 2004, p. 267). A sensory-neural hearing loss is usually permanent and requires rehabilitation such as the use of a hearing aid. According to the *American Speech-Language and Hearing Association* ([ASHA], 2010), a conductive hearing loss is a problem in the outer or middle ear and is often medically or surgically treatable. Finally, a mixed hearing loss has both a conductive and sensory-neural component (Tharpe, 2004, p267).

2.4. Prevalence of Hearing Loss

Global statistics indicate that hearing loss is the most prevalent sensory deficit in human populations, affecting more than 250 million people in the world (Mathers, Smith & Concha, 2000). ASHA (2010) revealed that in 2005, about 278 million people had moderate to profound hearing loss with 80% of them living in developing countries.

In South Africa (SA), it is estimated that 6116 infants will be born annually with or acquire permanent bilateral hearing loss within the first few weeks of life (Swanepoel, Storbeck & Friedland, 2009). It is estimated that, approximately 92% of these children are born in the public health sector whilst in the private health sector, it is estimated to be 3 in every 1000 babies born with a hearing loss. These statistics indicate the high occurrence of hearing loss in SA.

2.5. Etiology of Hearing Loss

The causes of hearing loss may have a significant impact on the medical and audiological management and care of individuals with a hearing loss. The identification of the cause of a hearing loss could have implications for the type and number of referrals for specialised services that may be required. A study on family data and epidemiology of genetic hearing loss demonstrated that both genetic and environmental factors contribute to the etiology of hearing loss (Keats, Berlin & Gregory, 2006). A review on genetic factors of hearing loss is discussed in the next section and thereafter, environmental factors that contribute towards hearing loss are explored.

It is postulated 30% of genetic hearing loss is syndromic, meaning that it is associated with specific abnormalities (Keats et al., 2006). It can thus be assumed that hearing loss associated with a syndrome is congenital. Syndromes that are commonly associated with hearing loss and which were specifically identified for this study included Goldenhar Syndrome, Waardenburg Syndrome and Connexin 26 mutation.

Goldenhar Syndrome is a “congenital malformation syndrome predominantly affecting facial appearance” (WHO, 2006, Q87.0). There are four major characteristics that are indicative of Goldenhar Syndrome: eye, ear and vertebral anomalies, and facial asymmetry (Bayraktar, Bayraktar, Ataoglu, Ayaz & Elevli, 2005; Cousley & Calvert, 1997; Strömmland et al., 2007; Tasse et al., 2005). Children with Goldenhar Syndrome usually exhibit conductive hearing loss due to malformations of the conductive mechanism of the ear (Cousley & Calvert, 1997; Scholtz et al., 2001; Wang, Martinez-Frias & Graham, 2002) with patients showing about 40-60 dB of hearing loss (Stewart & Downs, 1993; Van Meter & Weaver, 1996).

Waardenburg syndrome (WS) is an autosomal dominant disorder characterized by sensory-neural hearing loss (SNHL), pigmentation anomalies of neural crest-derived tissues and, in some cases, dystopia canthorum, (Schultz, 2006). It is also described as a clinically and genetically heterogeneous disorder affecting the auditory system and pigmentation of the hair, skin, and eyes. The findings of a study conducted by Reynolds et al., (1995), suggest that the severity of the hearing loss in an individual with WS positively correlates with the number of skin and hair pigmentary anomalies. In another study, 34% of WS patients with hearing loss were found to have a severe bilateral hearing loss, while other WS patients showed variable expressivity of the hearing loss (Newton, 1990).

Connexin 26 mutation syndrome is described as mutations that occur in the Connexin 26 gene (GJB2) and are associated with autosomal, non-syndromic, sensory-neural hearing loss and pre-lingual hearing loss (Shi et al, 2004).

Environmental causes of hearing loss as described by the *WHO* (2010) include excessive cerumen, noise exposure, infectious diseases, exposure to ototoxic medication and trauma. It is well known that cerumen and foreign bodies blocking the ear canal can occur at any age and result in a mild conductive hearing loss.

Hearing impairment may also be caused by problems during pregnancy and childbirth (ASHA, 2010). These include premature birth, conditions during birth in which a baby lacks enough oxygen to breathe, infections in a woman during pregnancy, ototoxic drugs during pregnancy and jaundice. Ototoxicity refers to the harmful effect of a drug such as aminoglycosides, chemical substances or heavy metal on the organ of hearing or balance, which may lead to a hearing loss, and/or balance problems (Mackenzie, 2006).

2.6. Co-morbidities of Hearing Loss

Co-morbidity is most often defined as the presence of additional conditions in relation to a specific index condition, which is hearing loss in this study, or the presence of more than one distinct condition in an individual (Valderas et al., 2009; Van den Akker, Buntinx & Knottnerus, 1996). The nature of the conditions that co-occur have variously included diseases, disorders, conditions, illnesses, or health problems (Valderas et al., 2009). In the present study a co-morbidity will refer to a disorder that is in addition to hearing loss. These include cognitive or learning difficulties (LD), global developmental delay, sensory integration impairment, communication disorders such as verbal apraxia, attention deficit-hyperactivity disorder and other medical, physical, or emotional problems.

Estimates from both clinical judgments and surveys of educators reveal that from 3% to more than 60% of children, and adolescents who have a hearing loss manifest specific LDs not attributed to cognitive impairment, emotional or behavioral problems, or other sensory/health impairments (e.g., Elliot, Powers & Funderburg, 1988; Schildroth & Hotto, 1994). Rush, Blennerhassett, Epstein, and Alexander (1991) asserted that, although these learners represent the largest segment of students with co-morbidities of hearing loss, there are no discrete definitions or consentaneous criteria to identify this population. However, Rush et al. (1991) noted that educators and related services personnel who have worked with learners with co-morbidities of hearing loss report the presence of certain learning characteristics that include: (a) discrepancy between potential and achievement; (b) inconsistent scholastic performance; (c) difficulties with memory; (d) sequencing and organizational skills; (e) sensory integration; (f) fine and gross motor coordination; (g) visual, tactile, and kinesthetic processing; (h) attention and (i) acquisition of nonverbal and verbal language (Elliot et al., 1988; Funderberg, 1982; Rowell, 1987).

Funderburg (1982) has stated that many problems generally attributed to the sensory impairment of the child or adolescent who has a hearing loss are in fact characteristic of LD.

Global developmental delay is described as occurring when there is significant delay in two or more developmental domains (gross motor, fine motor, cognition, speech/ language, and personal/social) (Cleary & Green, 2005). The term global developmental delay is defined as performance at least two standard deviations below the mean of age appropriate in standardised norm referenced developmental testing (Shevell, Ashwal & Donley, 2003). Generalized developmental delay frequently entails some degree of cognitive or learning delay particularly, in those with limited language skills such as children with hearing loss (Edwards, 2007). It is therefore difficult to accurately determine the level of cognitive functioning using traditional standardized assessments. Consequently, a global index of development is a more suitable measure of additional difficulties in young children with hearing loss (Edwards, 2007).

Bundy, Lane and Murray (2002), described sensory integration (SI) as the neurological process that organizes sensation from the body and the environment. A sensory integration disorder therefore, occurs when there is a disruption to the behavioural manifestation of adequate sensory reception, registration, synthesis and integration that leads to the production of adaptive environmental interactions (Dunn, 2001).

Developmental verbal apraxia is a term that refers to children with articulation errors who also have difficulty imitating production of speech sounds and sequences (Bernthal & Bankson, 1998, p. 203). In addition, some children with hearing loss may exhibit difficulties that are more psychological in nature, for example, behavioural or emotional disorders, which may equally prevent normal development and functioning (Edwards, 2007).

Attention-deficit hyperactivity disorder (ADHD) is the current term for a specific developmental disorder that is comprised of deficits in behavioral inhibition, sustained attention and resistance to distraction, and the regulation of one's activity level to the demands of a situation i.e. hyperactivity or restlessness (Barkley, 2006). The common features of ADHD in this group may include aggressiveness, non-compliance, inappropriate and demanding behaviors, a high level of negative social behavior, less adaptive behavior, poor co-operation, dislike by other children, and self-reported friendship difficulties (Vierhile, Robb & Ryan-Krause, 2009). Preschool children with ADHD also are likely to have co-morbid oppositional defiant disorder and language delays (Armstrong & Nettleton, 2004). Therefore, diagnosis of ADHD in the preschool child may be difficult (Vierhile et al., 2009).

Other medical, physical, social and emotional co-morbidities of hearing loss mentioned in international literature included conditions such as blindness, cerebral palsy, autism and psychosocial factors. The term deaf-blindness is mostly used when the severity of hearing loss and blindness could result in severe communication difficulties and educational challenges that may not be accommodated for in special education programs (Roush, 2004). The most common cause of 'deaf-blindness' is Usher Syndrome. This refers to a group of autosomal recessive inherited disorder that features sensory-neural hearing loss and retinitis pigmentosa that results in night blindness and worsening tunnel vision (Kimberling & Lindenmuth, 2006).

Cerebral palsy (CP) is referred to as a non-progressive disorder of neuro-motor function caused by damage to the motor cortex of the brain and is characterised by involuntary and uncontrolled movements (Roush et al., 2004). Symptoms of CP may include fine and gross motor difficulties, a vestibular disorder, and an overall lack of co-ordination (Shafer & Moss, 2012). Interestingly, research in this area is limited as it mostly highlights that hearing loss

associated with CP is usually sensory-neural but there is no information of the relationship between hearing loss and CP.

Based on literature review findings, it appears that a person with autism and hearing loss poses unique challenges to the professionals involved for assessment and management. Research suggests that there is no correlation between the occurrence of hearing loss and the severity of the autism diagnosis (Jure et al., 1991; Rosenhall et al., 1999). The difficulty in identifying and separating the affects in individuals with autism and hearing loss may have minimised research in this area.

Research on the psycho-social functioning of children with hearing loss has been mainly conducted in the USA in educational settings. Findings have indicated that hearing impaired children did not seem to feel lonely or have lower self-esteem as compared to their hearing peers (Kluwin, 1999; Nunes, Pretzlik & Olsson, 2001). However, Nunes et al. (2001), found deaf or hard-of-hearing children to be neglected more often than their hearing peers and to have less friends in the classroom. Calderon (2000) argues that parents of children with hearing loss influence a child's academic, language and social-emotional development and each domain affects each other. Hence, the professionals involved with a child diagnosed with hearing loss should play a vital role in supporting and guiding parents.

2.7. Prevalence of Co-morbidities

It has been found that nearly 40% of children with hearing loss in the United States of America (USA) have one or more disabilities in addition to hearing loss (*The Gallaudet Research Institute*, 2003). This finding was supported by Edwards (2007), who reported that a

figure of 30%-40% of deaf children is consistently quoted with co-morbidities of hearing loss, although definitions of what constitutes of a co-morbidity vary.

Interestingly, although in 60% of children with hearing loss there are no co-morbid conditions; learning and intellectual difficulties, and attention disorders seem to be the most prevalent co-morbidities (See Table 1 below).

Table 1

*Distribution of Co-morbidities**

Condition	% of Children
No condition in addition to deafness	60.1
Learning disability	10.7
Intellectual disability	9.8
Attention deficit disorder	6.6
Blindness and low vision	3.9
Cerebral palsy	3.4
Emotional Disturbance	3.4
Other Conditions	12.1

*Based on the Gallaudet Research Institute. Regional and National Summary Report of Data from the 2001–2002 Annual Survey of Deaf and Hard of Hearing Children and Youth. Washington DC: GRI, Gallaudet University; 2003. (N=442,361; 11.9%, not reported).

It is evident from Table 1 above that learning difficulties are frequently associated with hearing loss and affect approximately 11% of children and youth with hearing loss. This evidence correlates with the findings of a study conducted by Evenhuis, Thrunissen, Denkers, Vershuure and Kemme (2001), that the incidence of hearing loss amongst individuals with learning disabilities is recognised as being significantly higher than amongst the general population. In the United Kingdom (UK), formal assessment indicated that 89% of the individuals with learning problems had hearing outside normal limits (Kerr et al., 2003).

A retrospective study by McCracken, Ravichandran and Laoide-Kemp (2008) revealed that the age of reported detection of permanent deafness in children with learning disabilities ranged from 5 months to 7 years. These researchers highlighted that incomplete audiological information amongst children with learning disabilities is common. The lack of audiological information for this population poses an obstacle to gathering data. This becomes even more difficult to conduct in a developing country like South Africa, where access to audiology services is possibly limited (Swanepoel, 2006). Roush et al., (2004) explained that there could be limitations of applying traditional research designs for this population due to the uniqueness of each child. Furthermore, standardized cognitive tests are of little benefit because they lack norms for children with hearing loss and learning difficulties.

The other prevalent co-morbidities of hearing loss have been evidenced in the field of occupational therapy. A study conducted by Suarez et al., (2007) demonstrated that sensory-motor concerns are also noted in children with hearing loss ($n= 116$) who attended mainstream schools and used spoken language in their communication. This study further elaborated that children with sensory-neural hearing loss appear to experience higher rates of difficulty with vestibular processing when compared with the typical development of peers. This may result in delays and/or compensatory strategies in their development of gross motor skills, such as balance, coordination, body and spatial awareness. They deliberately excluded children with cognitive developmental problems, cerebral palsy and orthopaedic disorders. For the same reasons, the CLAHIC was observed to not admit children with the above mentioned problems and promotes spoken language for children with hearing loss.

In a review of 33 studies published after 1980, Kluwin, Stinson, and Colarossi (2002) identified four main areas of concern for children with hearing loss that are related to

psychological and emotional well-being when compared with hearing peers. These include: social skills, interaction/participation, socio-metric status/acceptance and affective functioning. It is beyond the scope of this study to explore these areas of concern as possible co-morbidities of hearing loss, since there was limited documentation found in the CLAHIC files during the pilot study.

2.8. Implications for the Assessment and Management Approach

Consequences of hearing loss could include the inability to interpret speech sounds, often producing a reduced ability to communicate, delay in language acquisition, economic and educational disadvantage, social isolation and stigmatisation (Mathers et al., 2000). The following section first describes the approach used by professionals in working with children with co-morbidities of hearing loss for the assessment and management of this population. For the purpose of this research report the assessment and management sections are first described in terms of audiological services and then described in the context of other services. Long-term management includes educational placement of these children, which is discussed in the last section.

2.8.1. The approach used by professionals

To meet the needs of the child that presents with co-morbidities of hearing loss, it is critical for a holistic and collaborative team approach to be implemented. In the interdisciplinary team approach, team members collaborate their goals to produce a collaborative intervention plan (Diller, 1990). The interdisciplinary team approach promotes work interdependence, increases self-management, and increases responsibility on the part of team members for group performance and the child's outcomes (Crow & Pounder, 2000).

The *Audit Commission of England* (2003) provides guidelines and ideas that professionals in each locality can explore to establish effective partnerships and teamwork. These include:

- Professionals (audiologists, speech and language therapists, teachers of children with hearing loss, social workers) need to have contact with each other and they should be working together.
- The goal of working together will be to coordinate their efforts in the development, evaluation and dissemination of information on services such as referrals, assessments and client allocations.

In a research study conducted by Ray (2002, p. 564), he refers to *ASHA's* statement on the interdisciplinary team members working with a child with hearing loss. These include the physician, audiologist, nurses, psychologists, speech-language pathologists, occupational therapists, physiotherapists, direct care givers, teachers, social workers etc. Furthermore, audiological assessment and management of children, who present with co-morbidities of hearing loss, may require additional services depending on their specific diagnosis. For example, a child with Goldenhar Syndrome, in which many bodily systems such as vision and balance, would need various professionals to manage the difficulties. Some of the disciplines that could be integrated into the management of a child with Goldenhar Syndrome are audiology, genetics, neurology, orthodontics, otolaryngology, psychology, reconstructive surgery, and speech-language pathology (Cousley & Calvert, 1997).

There are different perspectives on which model an interdisciplinary team could integrate into their treatment approach. The medical model allows for multiple diagnoses and multiple causes with emphasis on the cure by possibly eliminating the cause to improve the patient's health (Duchan, 2004). Professionals and their clients (i.e. the child and family) could understand

the impact of hearing loss differently. Duchan (2004) highlighted that for the professionals involved, the impact of the hearing loss could revolve around the planning and management of service's to improve the child's quality of life. He then argued that the diagnosis of the hearing loss may be far more emotionally impacting for the child and family, compared to the professionals involved, which is influenced by the families understanding of hearing loss.

Based on the findings of his study, professionals, and especially the audiologist should incorporate multiple models in the approach to assessment, management and educational placement. The use of traditional institution based models of service delivery in the field of audiology and speech-language pathology has proved to be ineffective in reaching the majority of vulnerable and disadvantaged communities in South Africa (Moodley, Louw & Hugo, 2000). The resultant transformation, therefore, has been towards a community-based service delivery model for audiology and speech-language pathology services to meet the unique needs of the broader South African community (Uys & Hugo, 1997). The best outcomes are more likely achieved with a collaborative model that ensures well coordinated and integrated planning, placement, and intervention (Roush et al., 2004).

In 'Aiming High for Disabled Children: Better Support for Families' (*Department of Education and Skills*, 2007) it was suggested that underpinning better support and improved provision of specific services for children with hearing loss or other special needs and their families is needed, and information underpinning this will ensure:

- Clear entitlements that allow for local flexibility and innovation, but will ensure these children are not disadvantaged by how well local areas are accommodating both national standards and local priorities.

- Children with special needs, young people and their families need to feel empowered and supported in the choices they make.
- Co-ordinated planning and commissioning to ensure best use of finite resources across traditional healthcare, social services and education boundaries.
- Focused, effective support early in life and at key transition points, with early support for these children and their families, which will promote emotional and social development for the children and their families, to help to improve outcomes for all.

Throughout the process of assessment, management and educational placement, professionals should regard the parents/caregivers as the most important members of the team. Their needs and goals are to be met in conjunction with those of the professionals. It is the family who knows their child best as they spend the most time with them and become the ‘specialist’ of the child. A study conducted by Fitzpatrick, Angus, Durieux-Smith and Graham (2008) indicated that parents want to be recognized as active partners in providing the optimal system of care for their child. These findings support the need to include parents in decision making when designing programmes.

In the South African context, there could be many challenges to providing specialised medical and especially, audiological services. Cultural perceptions of disabilities may result in inaction because, African families, for example, often exhibit a fatalistic outlook of impairment. It is this perception that possibly leads to a passive, accepting attitude toward hearing loss (Louw & Avenant, 2002). In addition, delivering services that are linguistically and culturally appropriate to the vast majority of the population may also be a significant challenge to the audiologists in SA (Swanepoel, 2006). Hence, the incorporation of various models should enable

a culturally and linguistically appropriate approach for use by professionals in SA working with children with hearing loss.

2.8.2. Assessment

Of all sensory disabilities in early childhood, permanent hearing loss that originates from birth or in the neonatal period, is of special interest because of its adverse consequences on speech, language, cognitive and psychosocial development and the subsequent impact on educational and vocational attainment when detected late (Olusanya, Parving & Ruben, 2006). Detection and intervention within the first year of life is crucial for and often associated with favourable developmental outcomes (Kennedy et al., 2006). There is evidence that many audiologists have failed in practise to adopt the recommended paediatric protocols (Hedley-Williams, Tharpe & Bess, 1996; Uus, Bamford, Young & McCracken, 2005). For children with learning disabilities such standard protocols may have significant advantages but must be interpreted with care as each child has individualistic needs and challenges.

For the assessment of children with hearing loss who are diagnosed with one or more other conditions there is greater emphasis on a comprehensive test battery approach to be used by the audiologist. Children with hearing loss and co-morbidities are more likely, than typically developing children to require the use of physiological measures to define the type and degree of hearing loss (Roush et al. 2004). Ideally, a battery of physiological measurements that include immittance measures (tympanometry and acoustic reflexes), otoacoustic emissions (OAEs), pure tone and speech audiometry, auditory brainstem response (ABR) and electrocochleography (EcochG) should be obtained for each patient. This will more likely allow for the categorization of the hearing loss phenotype accurately and determine the most effective management (Keats et al., 2006). Retrospective studies have gathered a range of information by also looking at (i) the

cause of the hearing loss and any identified additional needs; (ii) the age at which the possibility of hearing loss was initially identified; (iii) the range and number of audiological assessments undertaken; (iv) the action recommended following these assessments; (v) the hearing aid fitting protocols used; and (vi) the history of subsequent use of hearing aids (McCracken et al., 2008).

Referrals to service providers outside of the audiology field may become relevant after the diagnosis of a hearing loss as the child may need additional assessments, such as a speech and language developmental assessment. For the child with multiple disabilities, a comprehensive team evaluation is especially critical (Roush et al, 2004).

Brown, Holstrum and Ringwalt (2008) explained that an interdisciplinary team has the responsibility to assess the skills, abilities, and early intervention needs of a child. They also emphasised that the interdisciplinary assessment should include norm-referenced tests that measure all developmental domains including cognition, communication and language, behavior, social-emotional skills, and motor skills. Concern of the child's developmental skills may warrant referrals to the relevant specialists, such as: a speech-language therapist, an occupational therapist, physiotherapist, a psychologist and ear-nose-throat (ENT) specialist.

The role of the audiologist becomes more critical as they are one of the first professionals to come into contact with the patient and therefore, need to make referrals appropriately. Research by Zocoli, Riechel, Ziegelboim and Marques (2006) found that the approach of paediatricians towards early detection of hearing loss, showed that over 50% of the physicians surveyed, responded positively on their knowledge on the different types of hearing losses. However, only one of the paediatricians actually used the audiological terms of conductive, sensory-neural and

mixed hearing loss correctly. They observed that a low number of paediatricians had actual knowledge regarding the classification of the different degrees of hearing loss.

When a referral needs to be made for genetic testing researchers found that audiologists need to be sensitive to parent's personal and socio-cultural contexts when discussing the testing (Lalwani, 2002). They should tailor information and emotional support for the parents' requirements when confronting parents with the possibility of their child having a genetic hearing loss (Steinberg et al., 2007). Genetic consultation should be reserved for children with developmental delay, dysmorphic features, or parental reproductive issues and this should be within the scope of the otolaryngologist's practice (Lalwani, 2002).

2.8.3. Management

Amplification remains as an option for the audiologic management for children that have co-morbidities of hearing loss. Best practise provides parents (and where appropriate, children) with the information they need to make an informed choice about the most effective interventions for children requiring additional support to achieve their potential (Edwards, 2007). There is evidence that early support can provide significant benefits to both the families and the child with a hearing loss and learning disability (Brett, 2002; Case, 2000; Fisher, Pumpian & Sax, 1998).

Special considerations may be necessary as in the case with children who are more prone to ear infections, particularly otitis media. This can seriously compromise the benefits of amplification, given that hearing aid fitting is usually based on the degree of sensory-neural hearing loss (Roush et al., 2004) and otitis media typically results in conductive hearing loss. Amplification could be in the form of a hearing aid or a cochlear implant. Hearing aids can be

defined as any devices that amplify the acoustic signals to a degree that enables individuals with hearing loss to use their remaining hearing in a useful and efficient manner (Kimball, 2011).

Hearing-care intervention is a category that hearing aids can fall into and a lot of the research regarding hearing aids is based on determining their success as an intervention (Meuller, 2006).

Research findings by Tharpe (2004) recommended that the pre-selection process for the fitting of hearing aids in children with co-morbidities of hearing loss, should include input from parents and all professionals working with the child to provide information about home and school environments, physical limitations that could affect the use of hearing aids and behavioral difficulties relevant to hearing aid use.

Cochlear implants are surgically implanted electronic devices, coupled to external components that provide useful hearing and improved communication to adults and children with severe-to-profound hearing loss (Zwolan, 2002). The presence of co-morbidities of hearing loss is not a contraindication for cochlear implantation. Not all children with co-morbidities of hearing loss are to be considered good candidates and parents must be advised on realistic expectations by providing them with appropriate counselling from an interdisciplinary team (Berrettini et al., 2008). Waltzman, Scalchunes, and Cohen (2000) concluded that children with developmental delays in addition to hearing loss obtain demonstrable benefit from cochlear implantation, but the rate of development of auditory perceptual skills is slower for deaf children with implants who have multiple impairments than children who only have a hearing loss.

Although these results are encouraging, unfortunately these results tell us little about whether the children have been able to use their improved auditory perceptual abilities to develop their communication and language skills (Edwards, 2007). Despite the fact that many key variables, such as socioeconomic status and the existence of additional disabilities, are

outside of the control of schools, there is emerging evidence that access to and use of the sounds of English and oral language are important for children with hearing loss in learning to read (Geers & Moog, 1989; Harris & Moreno, 2004; Perfetti & Sandak, 2000).

Soon after the diagnosis and first amplification fitting, parents can opt for support and guidance from an early intervention programme (Bruder, 2000; Dunst, 2002). Although there is no legislation currently mandating early intervention of hearing loss in SA, the *White Paper* (2007) on the “Integrated National Disability Strategy” supports the principles of Early Hearing and Detection Intervention (EHDI). The *White Paper* prioritizes prevention of secondary developmental complications through early intervention and mandates identification of disabilities followed by, appropriate interventions with free access to assistive devices and rehabilitation service to all children under the age of six.

Research shows that early diagnosis, appropriate fitting of amplification and prompt entry into early intervention are factors that potentially affect the auditory and spoken language outcomes of children with severe and profound hearing loss (Samson-Fang, Simons-McCandless & Shelton, 2000; Yoshinaga-Itano et al., 1998). The purpose of early intervention for infants and children with hearing loss is to build communication skills that will facilitate social and cognitive development (Brown et al., 2008). Marschark (2007), adds that

early intervention must be to foster effective parent-child communication starting soon after the diagnosis of hearing loss. Effective parent child communication is the best single predictor of success in virtually all areas of development of children with hearing loss, including academic achievement

The principles and strategies of early intervention include: (a) providing information to the families so they understand the implications of the hearing loss and can become knowledgeable

and skilled at observing and communicating with their child, (b) facilitating family decision making, (c) creating an environment that encourages learning, (d) using the child's cues to facilitate reciprocal interactions between the provider and child, and (e) adjusting the intervention activity to accommodate the child's interests (Brown et al., 2008).

In the early intervention process, adaptability is an essential component of the individualistic therapy provided to children with co-morbidities of hearing loss (Ray, 2002). An example is that the only real changes in the aural rehabilitation therapy aspect that need to be made when working with the developmentally disabled population are that the steps may need to be smaller, the instructions may need to be simpler and the direct caregivers will need to be involved.

Early intervention programmes for children with hearing loss have now generally adopted the philosophy and practises of a family centred model (Bruder, 2000; Dunst, 2002). In this model, the three components of child, parents and family are inextricably linked and the child is seen as a unique member of a family (Brown & Baker, 2006). Furthermore, understanding the development and needs of the child may only be achieved if the professional understands the family, its culture, values, structure and day to day experiences.

2.8.4. Educational placement

The educational placement of a child presenting with co-morbidities of hearing loss requires the careful selection of a setting that will meet the needs of the child and their family. The findings of a study ($n = 21$) conducted by Brown and Bakar (2006) in Australia found that parents' assessment of how their family functions is dependent on many factors such as coping mechanisms and confidence. Early intervention professionals therefore need to be sensitive to the family's individual needs, strengths and priorities with regards to school placement. Further

to the findings of Brown and Baker's study it was found that language development outcomes for the children were not associated with any of the ratings of family functioning or with the ratings of quality of early intervention support.

Mellon, Ouellette, Greer and Gates-Ulanet (2009), stated that educational programmes must provide children with access to the full range of basic skills necessary for academic and social achievement. In addition to an integrated curriculum that nurtures speech, language, and literacy development, innovations in the areas of auditory perception, social emotional learning, motor development, and vestibular function can enhance student outcomes.

There could be a number of challenges in the educational setting for children with hearing loss. These include the availability of services, designation of responsibility for their payment and provision, and conflicting legal imperatives (*American Academy of Paediatrics [AAP]*, 2007). These challenges may result in inequity across the different services in various communities.

In the South African context similar challenges exist. However, the multilingual and multicultural nature of South Africa is possibly one of the most challenging aspects. In this country there are 11 official languages which have implications for the profession of speech-pathology and audiology since the scope of practice is to facilitate the development of language and communication skills. The minority of the South African population are mother tongue speakers of English and Afrikaans. This is a considerable barrier to a profession with only a small percentage of professionals who speak a South African native language (Uys & Hugo, 1997).

Linguistically based assessment tools are generally standardised tests that are developed internationally with normative data ‘developed from a population that is primarily middle class, English speaking and of European background’ (Kayser, 2001). Thus, SA audiologists and speech therapists should adapt and modify instruments so that they are more culturally and linguistically sensitive. In addition, limited transportation access and financial resources could be obstacles to providing the child with a hearing loss, access to the appropriate education system.

The AAP (2007), proposed the inclusive classroom as an optimal placement for some young children with hearing loss to maximize outcomes across developmental domains. Ideally, inclusive classrooms will have the following elements in place to help ensure developmental synchrony:

- Consistent access to a classroom majority of typically developing peers,
- small class size and acoustical modifications,
- well-trained motivated educators who hold high expectations for students,
- a co-teaching model that includes a full-time speech and language pathologist (SLP) in the classroom,
- interdisciplinary support teams, including occupational therapists, psychologists, and an audiologist, who can support teachers and children,
- a play-based, developmentally appropriate approach in the classroom,
- the use of thematic curriculum to promote vocabulary and language development,
- a focus on social emotional learning, support for sensory-motor development,
- and language and literacy programmes beginning at 18 months.

Inclusive programmes that maintain small class sizes and use a co-teaching model can provide differentiated instruction. The play-based approach provides an environment that supports this educational ideal. In toddler and preschool programmes, many of the activities and learning opportunities are child driven and teacher facilitated and is therefore more naturally individualized to each child's developmental level.

In SA, children with hearing loss have primarily been placed in special schools for the deaf of which, there are 35 primary and secondary schools nationwide (Van Dijk, 2003). Government policy stresses more inclusive practises to allow accommodation of children with hearing loss into mainstream schools (*South Africa: Department of Education*, 2001). A change of focus in South African education toward more inclusive practises is a positive change for children with hearing loss (Swanepoel, 2005). However, these research studies have focused on primary and secondary schools, hence the current study adds to the body of literature by providing statistics of the hearing loss population in a preschool.

Audiologists and speech language pathologists (SLP) providing services in a school setting allows for a holistic approach to management that includes assessment, amplification, rehabilitation, education, in-service training and counselling. Mellon et al. (2009) proposed a model of 'developmental synchrony' in young children with hearing loss. In this model the role of the SLP is to facilitate and foster foundational and pragmatic skills to develop quality social relationships. This is done using clinical expertise to provide ongoing assessment, both formally and informally for guiding oral motor, phonological awareness, and reading development. Furthermore, the SLP is involved in promoting the development of vocabulary and concepts through thematic curriculum-generalizing newly learned concepts into a variety of settings, and using rich, nondirective language. Other areas targeted by the SLP are commenting and

expanding, posing open-ended questions that elicit thinking and creative problem solving, acoustic highlighting, repetition of key information and allowing wait time.

The promise of early identification and intervention can be realized when intervention programmes take a broad, multifaceted view of child development, and provide individualized supports to ensure successful integration into the classroom (Mellon et al., 2009).

2.9. Summary and Rationale of the Study

A competency document accepted by the Professional Board for Speech Language and Hearing Professions of the *Health Professions Council of South Africa (HPCSA)* in 2003, describes best practise for the profession of audiology in South Africa as a healthcare and educational profession. This is primarily concerned with service delivery in the form of prevention, identification, evaluation, diagnostic treatment, and intervention for individuals with the hearing loss. To ensure effective management of children with co-morbidities of hearing loss it is essential for a holistic and collaborative team approach to be implemented such as the interdisciplinary team approach that facilitates work interdependence and the child's outcomes (Crow & Pounder, 2000). Professionals should regard the parents/caregivers as the members who play the most pivotal role within the interdisciplinary team. Their needs and goals are to be met in conjunction with those of the professionals.

For professionals to achieve best practise it is only through clinical practise and experience, leading to audit and research that a sufficiently large body of evidence may be accumulated in order to develop guidelines for best practise. Although a number of small-scale studies have been performed, there has been no large-scale study to establish accurate data of the prevalence of childhood hearing loss or to determine the status of services for the hearing-impaired in South

Africa. Another possible challenge to the profession of audiology is the severe dearth of contextual data regarding the prevalence and etiology of hearing loss as well as the status of hearing healthcare in South Africa.

In order to provide data and literature on multiple diagnosis with hearing loss in preschool children that could add to the field of audiology in SA, the current study asked the question: “What are the co-morbidities of hearing loss that preschool children present with and its’ implications for management?” The results from this study should therefore contribute valuable statistics for professionals working with the hearing impaired population in the South African context. This will further provide information that could guide the development of a protocol for the management of this population group within an interdisciplinary setting. This study also aimed to supplement current literature with regards to further describing the co-morbidities of hearing loss and the assessment, management and educational placement of these children. Recently reported priorities for EHDI in Sub-Saharan Africa include pilot studies as an important part of the way forward and this is especially relevant for the current South African situation (Olusanya, 2008).

CHAPTER THREE: METHODOLOGY

3.1. Introduction

In this chapter the researcher describes the various aspects of how the research was conducted, beginning with the aims of the study, followed by an explanation of the research design and participant description. The measures, data collection procedures, ethical considerations, reliability and validity factors, and data analysis procedure are then presented.

3.2. Aims of the study

The primary aim of the study was to describe the co-morbidities that pre-school children with hearing loss at CLAHIC present with, and its implications for their management.

In order to achieve the primary aim, three objectives were outlined as the sub-aims, namely:

1. To identify and determine the prevalence of the different types of co-morbidities that pre-school children with hearing loss present with.
2. To determine whether there is a relationship between the degrees of hearing loss and the co-morbidities identified.
3. To describe the services currently provided to children who present with co-morbidities of hearing loss at CLAHIC.

3.3. Research Design

A quantitative, descriptive, retrospective research design was implemented in this study. Quantitative research is described as a formal, objective, systematic process in which numerical data are used to obtain information about the world (Burns & Grove, 2005). The advantages of

using quantitative research, particularly in this study, is that it provides results that can be condensed into statistics and it measures level of occurrence (Sukamolson, 1996), that can answer the question of the prevalence of the co-morbidities.

Descriptive research is used to observe group differences, developmental trends, or relationship among variables that can be measured by the researcher (Schiavetti & Metz, 2002). An advantage of using research of this type is that the researcher is a passive observer causing minimal alteration of the naturalness of the phenomena under investigation (Shaughnessy, Zechmeister & Zechmeister, 2000). In this study the researcher was a ‘passive observer’ by collecting data from the participants’ files and did not interact with the children directly.

Retrospective research is designed to examine data that was already on file before the formulation of the problem and descriptive research allows the researcher to observe group differences, developmental trends, or relationships among variables that can be measured by the researcher (Schiavetti & Metz, 2002). This retrospective study design was chosen as it allowed the researcher to provide professionals, working with hearing impaired children, with statistics and valuable information that could lead to better practise and management. As described by Schiavetti and Metz (2002), a limitation of this design is that the researcher depends on classifications of the participants and criteria measurements that could be performed by different people.

3.4. Context

The Centre for Language and Hearing Impaired Children (CLAHIC) is a registered non-profit organisation and clinical preschool that is situated in Johannesburg. A clinical setting in a school incorporates programmes that were developed because educators recognised that speech

and hearing problems affected performance in the classroom and deemed it appropriate to provide services onsite (Plante & Beeson, 2004). The CLAHIC preschool provides a language enriched learning environment for children with delayed language development and/or hearing loss. The most common modes of communication that may be used by schools who include children diagnosed with a hearing loss are auditory-oral/verbal, total communication and manual modes (Tharpe, p. 281). The auditory-oral/verbal approach emphasizes listening and oral communication whilst total communication encompasses listening, speech reading, signing and oral expression. The manual mode refers to one of the sign languages, usually without oral speech. At CLAHIC, the auditory-oral approach is utilised to promote the development of listening and verbal skills.

CLAHIC has six classes in the school with eight children in each class, except the grade naught class that has ten learners. In every class there is a teacher and an assistant. The CLAHIC provides the following services to children:

- learning support that is, teaching with a focus on a language enriched programme in the classroom,
- audiology (screening, assessment, diagnosis, rehabilitation, management of assistive listening devices and follow-ups),
- ear-nose-throat specialist services,
- speech therapy (assessment, diagnosis and remediation),
- physiotherapy (assessment, diagnosis and remediation),
- occupational therapy (assessment, diagnosis and remediation) and
- educational psychology (educational assessments and play-therapy).

The various professionals providing these essential services work in a collaborative interdisciplinary team approach. Case discussions and meetings occur once a week but there is ongoing communication amongst the team members to provide holistic management for the child. The Speech Therapist is the case manager and therefore also plays the role of mediator and manager for the child.

The CLAHIC is a non-profit organisation (NPO) and therefore relies on the school fees and donations for the running costs of the institute. The fees are not always affordable for many of the families of the language/hearing impaired children and the services provided by the allied professionals are at additional costs. Bursaries are offered but are limited to very few numbers per year to allow access of services for underprivileged children.

3.5. Participants

3.5.1. Sampling strategy

A non-probability, purposive sampling strategy was implemented for this study. The probability that any element will be included in a non-probability sample cannot be specified and in some instances certain members may not be included in such a sample (Welman & Kruger, 2001). An advantage of using this sampling strategy for the current study was that it was less complicated due to the selection and exclusion criteria, and it was also useful in determining the categories to be included in the data collection form/checklist. However, a limitation to this type of sampling strategy is that the researcher has to be cautious in evaluating the sample obtained as it has to be representative of the population (Schiavetti & Metz, 2002).

3.5.2. Participant description and sample size

The participants were selected from the archived clinic files at CLAHIC. The inclusion criteria for the participants were (i) a diagnosis of a hearing loss (ii) attendance at the CLAHIC between 1999 and 2010; and (iii) aged between 3.0 to 7.11 years. These criteria assisted the researcher in reaching the aim of determining the prevalence of co-morbidities of hearing loss amongst the preschool population. The study reviewed data of a time period of eleven years and this allowed for a bigger sample size to be selected. Initially, the researcher selected files from 2005 until 2010 but this formed an undersized sample. The age range of the participants was based on the admission criteria of CLAHIC where children are accepted from the age of 3 years. If children are over 6 years old and require another year at CLAHIC, they apply for exemptions to remain. The exclusion criteria of the current study were; (i) files that had missing data; and (ii) files of children who were diagnosed with only a language delay. These exclusion criteria allowed for specificity of the sample in achieving the aim of this study. A total of 200 files were reviewed. Of these, 131 were of children diagnosed with language impairment. Therefore, only 69 files were further reviewed in greater detail. Eleven percent of these records ($n=7$) reviewed had to be further excluded, as there was missing information. The final sample in the current study included the records of sixty-two children ($N=62$) diagnosed with hearing loss.

3.6. Measures

3.6.1. Development of the checklist

A checklist (See Appendix A) was developed for the purposes of this study. The aims of the study as well as the time constraints in the particular setting underscored the need for a data collection instrument that could collect large volumes of quantitative data from a large number of participants in the shortest time span and the most standardised way possible (Leedy & Ormrod,

2005). An advantage of using a checklist is that the researcher gains the data first-hand and the researcher does not have to depend on the participants' possibly misleading reports about the relevant behaviour to the study (Welman & Kruger, 2001). They also emphasise the limitation of using this data measurement as the researcher's prejudices may affect their observation and consequentially the validity of findings.

The researcher compiled the checklist based on the literature reviewed. The checklist consisted of fourteen relevant areas that included the twelve co-morbidities (See Table 2).

Table 2

Description of the Structure of the Checklist

Section	Description	Explanation and Rationale
Biographical information	Age, gender	Provides demographical and background information to reach the first aim of the study.
Hearing status	Laterality, type and degree	Forms the variables in determining if there is any relationship between the degrees of hearing loss and co-morbidities to achieve the second aim of the study.
Medical history	Medical diagnoses or chronic illness	May provide etiology or association of hearing loss and co-morbidities, and the need to refer to specialised services. This provides information for the 1 st and 3 rd sub-aims of the study.
Physiotherapy	Specialised intervention	Identify presence of gross-motor delay as co-morbidity if hearing loss (Suarez, Angeli and Suarez, 2007).
Occupational therapy	Specialised intervention	Identify presence of co-morbidities of FM delay, GM delay, vestibular disorder, VMI disorder, SI disorder and BI disorder (Horn, Pisoni, and Miyamoto, 2006)
Speech Therapy	Specialised intervention	Identify presence of the co-morbidity of verbal apraxia (Fortnum, H. M., Marshall, D. H. & Summerfield, A.Q. (2002).
ADHD	Diagnosed condition	Identify presence of co-morbidities of inattention, impulsivity, hyperactivity

Learning disorder	Diagnosed condition	and distractibility (Roush et al., 2004). Identify presence of co-morbidities of learning difficulties (Rush, Blennerhassett, Epstein, and Alexander, 1991).
Visual impairment	Diagnosed condition by eye-specialist	Identify presence of co-morbidities of visual difficulties (Roush et al., 2004).
Psychologist	Referral	Determines services not offered at the CLAHIC and the need for referral as in the 3 rd sub-aim of this study.
Geneticist	Referral	Determines services not offered at the CLAHIC and the need for referral as in the 3 rd sub-aim of this study.
Developmental specialist	Referral	Determines services not offered at the CLAHIC and the need for referral as in the 3 rd sub-aim of this study.
Educational placement	Mainstream, remedial, LSEN, sign language and CLAHIC	Provides information on the management of where the child's needs were met within a particular school environment that provides information for the main of the study.
Missing information	Exclusion criteria	Indicated lack of reporting in management of a child.

Note: FM – fine motor; GM – gross motor; VMI – visual motor integration; SI – sensory integration; BI – bilateral integration; LSEN – learners with special educational needs

3.7. Pilot Study

A pilot study is a version of the main study that is run to test whether the components of the main study are feasible (Arain, Campbell, Looper & Lancaster, 2010). Data from the pilot study may contribute to the final analysis and this can be referred to as the internal pilot (Arain et al.,

2010). The aims of the pilot study were to determine if the proposed checklist was feasible to implement and whether the sections included in the checklist were relevant as per the aims of the study.

The checklist was piloted on a review of participants' files from 2009, who met the inclusion criteria. The data collected were used in the final analysis of the main study to add to the sample size, and it can therefore be referred to as an internal pilot (Arain et al., 2010). The researcher converted the information from the pilot study into numerical data that were collated onto a MS Excel spreadsheet for analysis.

Fourteen participants, who met the inclusion criteria as for the main study, were included in the pilot study. The average age of the participants was 4.6 years (range: 3.4 years to 6.7 years, SD: 0.98). Thirteen participants were diagnosed with a bilateral hearing loss. The recommendations stemming from the pilot study were implemented in the main study. These recommended changes were to include gender for the overall data collection to provide demographical information. In addition, the type of hearing loss had to be included in the study as this related to the possible etiology of the hearing loss and the co-morbidities. VMI disorder and educational placement for children requiring sign language as an educational option was added.

The segments to be included in the checklist were then finalised. The areas of language delay and auditory perceptual skills delay were not considered as categories for the checklist as these are delays that occur as a result of the hearing loss and not in addition to the hearing loss hence, in the present study they are not considered as co-morbidities (Plante & Beeson, 2004).

3.8. Data Collection Procedures

Ethical clearance was obtained from the Non-medical Research and Ethics Committee (refer to Appendix B) and the Department of Speech Pathology and Audiology of the University of the Witwatersrand (Protocol number: H100 813).

In addition, consent was obtained from the departmental heads of CLAHIC to conduct the research at their centre (Appendix C). The parents' of the participants were made aware of the possibility of information being used from their child's file for research purposes. They signed and provided consent for this upon admission of their child into CLAHIC (refer to Appendix D). Once ethical clearance and permission had been obtained, the systematic record reviewing process began by obtaining data from the case history information of each child that provided biographical data and risk factors. Reports by the paediatrician, ENT specialist, speech therapist and audiologist were examined to determine medical and audiological diagnoses. Case history information that was completed by parents prior to the admission of the child into CLAHIC and was based on assessment findings provided the medical diagnosis where applicable.

Further information was acquired from reports of other health care professionals such as the occupational therapist or physiotherapist to indicate other conditions the child may have presented with. The teachers' reports also provided valuable information that indicated challenges faced by children who presented with other conditions of hearing loss. The data was gathered and documented for each child and then collated to the checklist formulated on a MS Excel spread sheet using manual coding strategies for statistical analysis (See Appendix A).

3.9. Ethical considerations

The ethical considerations for the current study were guided by the principles of the “Declaration of Helsinki” that was developed by the *World Medical Association (WMA)* and last revised in 2008. These principles can be adopted for medical research involving human subjects, including research on identifiable human material, such as records/files and data.

The Helsinki Principles indicate that the research protocol must be submitted for consideration, comment, guidance and approval to a research ethics committee before the study begins. For medical research using identifiable human data, the researcher must seek consent for the collection of data. In section 3.8. the process for ethical clearance and attainment of consent was described. The Helsinki principles also indicate that it is the duty of the researcher to protect the life, health, dignity integrity and confidentiality of personal information of research subjects.

Furthermore, the principles postulate that the research involving human subjects must be conducted by individuals with the appropriate scientific training and qualification. In this research study no harm was done to any of the participants, as there was no direct contact with them, or to the environment at which the research took place. To ensure integrity of the participant information, none of the data from any of the files were modified and no participant/child’s information was compromised by the researcher. In the current study, the researcher, who is a qualified speech pathologist and audiologist, ensured that anonymity and confidentiality were maintained by omitting any identifying characteristics of the participants in the research report. The results obtained from the research may be published in peer-reviewed academic journals and CLAHIC will be informed of this possibility.

3.10. Reliability and Validity

3.10.1. Reliability

The use of the term reliability in communication disorders research is related to the general trustworthiness of the data and is synonymous with dependability, consistency, predictability and stability (Cordes, 1994).

In descriptive research, researchers are essentially passive observers (Schiavetti & Metz, 2002). In this study there was no direct contact with participants, hence there was less observer bias and increased reliability. To ensure reliability of record information, the researcher, who is familiar with the settings of the CLAHIC, had complete administrative control of the data collection. This allowed the researcher to identify unreliable information and place it in a separate category. Thus, caution was also exerted when interpreting the results of this study.

3.10.2. Validity

The validity of a measurement can be defined as the degree to which it measures what it purports to measure (Kerlinger & Lee, 2000; Thorndike, Cunningham, Thorndike & Hagen, 1991). A comprehensive literature review was conducted and served as an underpinning for the measurement instrument of this study, the checklist. The validity of the study was increased by conducting a pilot study to identify the categories to include in the checklist as shown in Appendix A.

3.11. Data Analysis

The aim of the study was to determine prevalence of co-morbidities of hearing loss in the preschool population. In order to establish prevalence, the researcher had to determine the frequencies of the co-morbidities. Therefore, the information gathered for the study was converted into numerical data for analysis to assist the researcher in reaching its aim. The data were organised according to the last

year that the child had spent at the CLAHIC as this would have allowed for analysis over a longer time that the child would have spent at the preschool and thus gain the most amount of information, such as identification of co-morbidities of the child. This may have also reduced the probability of overlooking/missing information as a child might have only been identified with a co-morbidity if hearing loss at a later stage rather than earlier whilst schooling at CLAHIC.

The data collected were coded by assigning numbers randomly to the participants' information. The data was then captured onto a MS Excel spread sheet. Thereafter it was tabulated into ordinal categories for statistical analysis. In the case of ordinal measurement people are classified into a sequence of ordered categories such that, all of those falling into a particular category are alike with respect to the attribute being measured and the cases in successive categories possess progressively more or less of that attribute (Welman & Kruger, 2001). In this study the data were categorized into the various degrees of hearing loss that served as the progressive attribute. Based on the aims of the study, the frequencies, percentages and averages were the most commonly used statistical calculations. Further statistical measures, such as multi-variant techniques like ANOVAs, were not conducted as there were too many variables within the small sample size to have yielded results that could have provided possible patterns of associations. Pivot tables were created to interrogate the data as well as perform calculations within the various sets of data.

3.12. Summary

The researcher aimed at selecting a research design that could allow effective implementation of the study. This also allowed the researcher to develop a systematic approach to gathering the information required. The feasibility and validity of the study were consolidated

by the use of a pilot study and the data were collated into a numerical coding strategy for analysis in the main study.

CHAPTER FOUR: RESULTS

4.1. Introduction

The aim of this chapter is to document and highlight the prevalence of co-morbidities identified in this sample of preschool children with hearing loss. The various degrees of hearing loss and the co-morbidities are presented with the purpose of identifying relationships between the degrees of hearing loss and co-morbidities. The medical diagnoses are described to provide possible etiology of the hearing loss in some children as well as to provide information of services that these children require at CLAHIC.

4.2. Child data

In order to gain a comprehensive understanding of the research data, it is necessary to describe the chronological age, gender and hearing status of the participants, which forms the background information.

4.2.1. Chronological age and gender

Table 3 provides a summary of the biographical details of the participants.

Table 3

Biographical Data of Participants

Age range (in years)	Percentage and Number (n) of males	Percentage and Number (n) of females	Total (n)
3.0 – 3.11	44 (n=4)	56 (n=5)	9
4.0 – 4.11	50 (n=11)	50 (n=11)	22
5.0 – 5.11	40 (n=4)	60 (n=6)	10
6.0 – 6.11	69 (n=11)	31 (n=5)	16
7.0 – 7.11	20 (n=1)	80 (n=4)	5
Total	50 (n=31)	50 (n=31)	2

The table above demonstrates that half of the participants ($n= 31$) were male and the other half were female ($n= 31$). The average age of the participants was 5.0 years (Range 3.0 to 7.7; standard deviation [SD] = 1). The greatest number of participants ($n= 22$) were in the age range of 4.0 to 4.11 years whilst children within the age range of 7.0 to 7.11 years ($n= 5$) years formed the smallest portion of the sample.

4.2.2. Hearing status

The hearing status is described in terms of laterality, type of hearing loss and the degree of hearing loss.

One participant from the entire sample presented with a unilateral hearing loss. Therefore, 98% ($n= 61$) of the children had a bilateral hearing loss. From the total sample ($n= 62$), eighty-nine percent ($n= 55$) had a sensory-neural hearing loss (SNHL) whilst six percent ($n= 4$) had a

conductive hearing loss (CHL) and 5% ($n= 3$) had a mixed hearing loss (MHL). It is therefore evident that the majority of the participants presented with a SNHL.

4.2.3. Degrees of hearing loss

The degrees of hearing loss were classified according to the norms for children that were referenced in chapter 2, p. 8. The degrees were first calculated as percentages for each ear of the participants (See Figure 1). The sample size for the total number of ears in this study was $n= 124$. The percentages were calculated by dividing the number of ears affected by the relevant hearing loss, by the total number of ears in the study. The product was then multiplied by one hundred to gain a percentage.

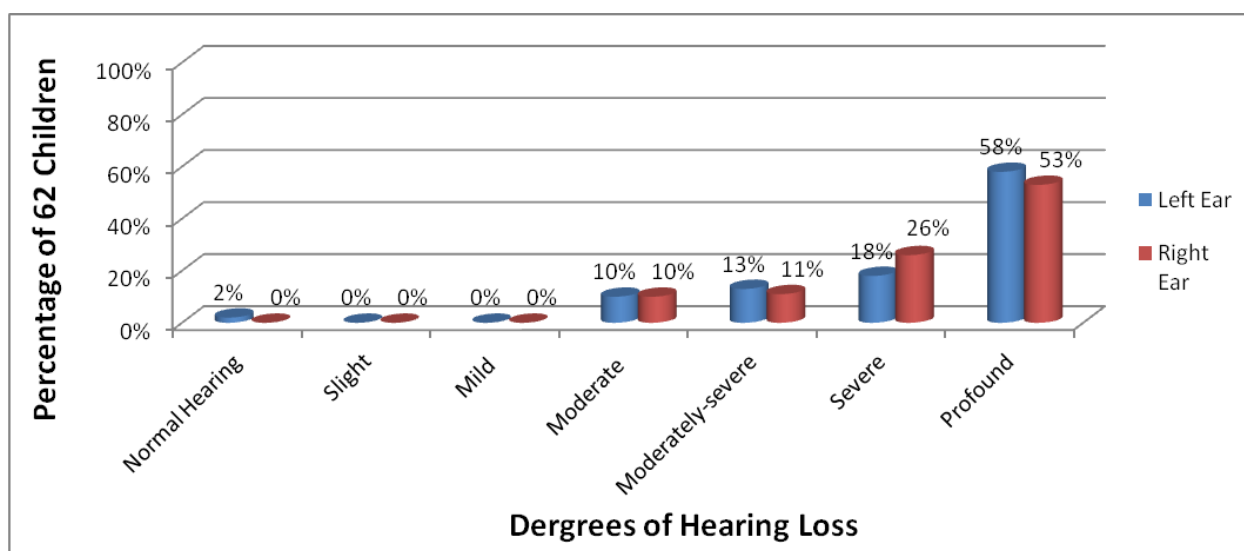


Figure 1: *Degrees of hearing loss: Left and Right Ear*

As evidenced in figure 1, fifty-eight percent ($n=36$) of the total sample for the left ear, more than half of the participants, had a profound loss and 12% ($n= 8$) had a moderately severe hearing loss. One child (2%) of all the participants had normal hearing in the left ear. This rare occurrence was the result of a child who had Goldenhar Syndrome (described in Chapter 2, p. 10), with a microtia/atresia in the right ear and normal development of the left ear. For the right

ear, most of the children in the population presented with a profound hearing loss (53%, $n = 33$), whilst 26% ($n = 16$) had a severe hearing loss.

Eight percent ($n = 5$) of children had a bilateral moderate hearing loss, 6% ($n = 4$) had a bilateral moderately severe hearing loss whilst 15% ($n = 9$) had a bilateral severe hearing loss. Profound hearing loss was the most prevalent degree of hearing loss found bilaterally in 47% ($n = 29$) of the population.

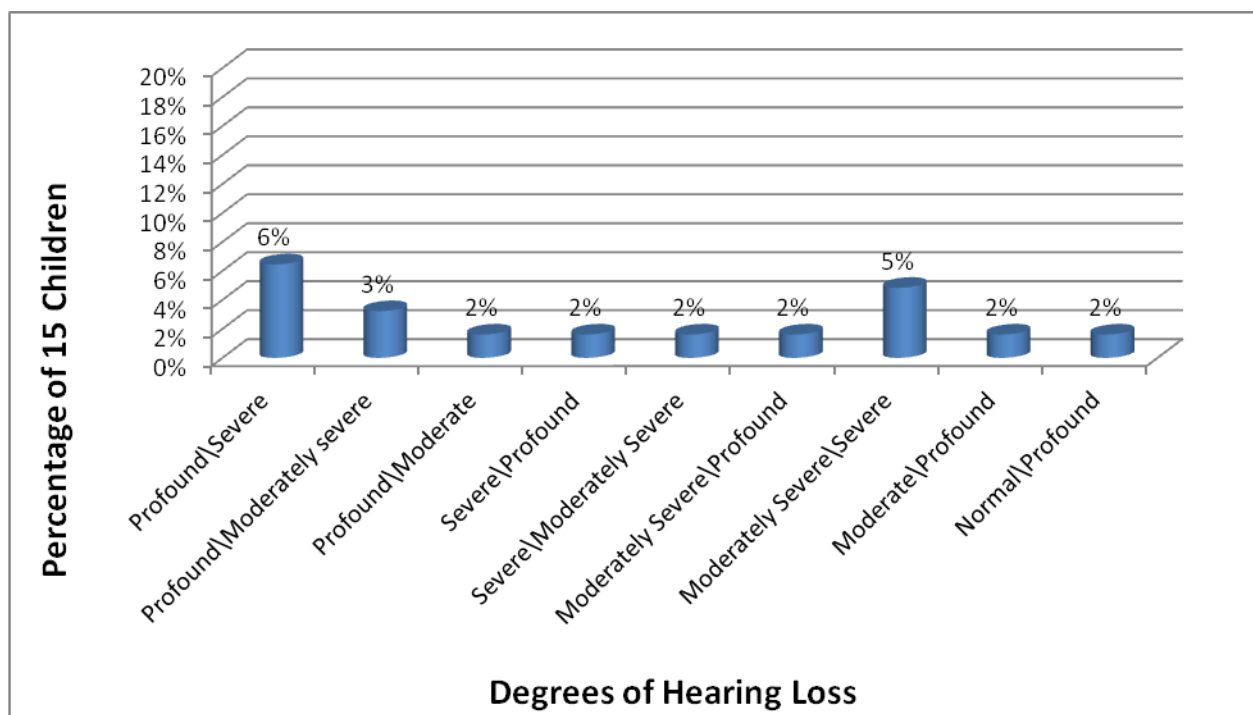


Figure 2: *Degrees of Hearing Loss per Ear*

Finally, the degrees of hearing loss of the left and right ear for each child were compared. Figure 2 demonstrates the small percentages of the sample that these children made up based on the degree of hearing loss they had in each ear.

4.2.3. Medical Diagnoses

Details of the medical histories assisted the researcher in determining possible etiologies of the hearing loss that would also provide associations to co-morbidities. Furthermore, by examining the medical problems that these children present with, it provided insight into the services they may have required at CLAHIC in comparison to the services currently provided. These were all diagnoses made before the child was admitted into CLAHIC.

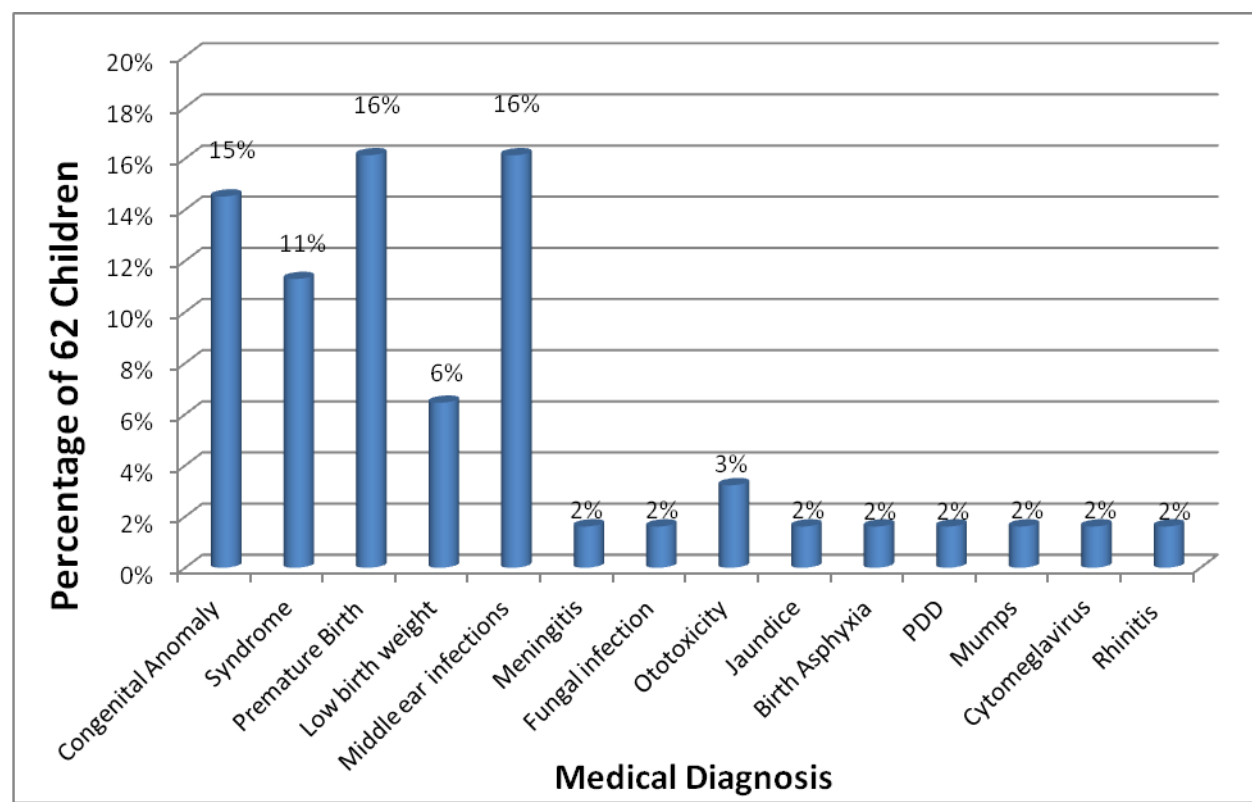


Figure 3: *Participants Diagnosed with a Medical Problem*

It was found that more than 50% ($n=37$) of the children were reported as having a medically related condition (See Figure 3). Fifteen percent ($n=9$) had a congenital anomaly (such as a cleft-lip and palate, respiratory condition, dysmorphic features). Eleven percent ($n=7$) of these participants were diagnosed with a syndrome before being admitted into CLAHIC including

Goldenhar syndrome, Waardenburg Syndrome, and Connexin 26 mutation. Sixteen percent ($n=10$) were born prematurely and 6% ($n=4$) of the participants had very low birth weights.

Recurrent middle ear infections were experienced by 16% ($n=10$) of the participants. The rest of the medically related issues included ototoxicity, infections, jaundice, birth asphyxia, rhinitis and pervasive developmental disorders (PDD) occurred minimally.

4.3. Co-morbidities

In this section the results are described to indicate the prevalence of the co-morbidities identified.

4.3.1. Co-morbidities identified

The co-morbidities were identified of the total population to determine prevalence of the co-morbidities. Table 4 depicts the percentages of the co-morbidities identified.

Table 4

Prevalence of Co-morbidities (N= 62)

Co-morbidity	Intervention	Percentage% and number (n)
Gross motor delay	Physiotherapy	18 (n=11)
Gross motor delay	Occupational Therapy	26 (n=16)
Fine motor delay	Occupational Therapy	42 (n=26)
Vestibular disorder	Occupational Therapy	8 (n=5)
Visual Motor Integration disorder	Occupational Therapy	21 (n=13)
Sensory integration disorder	Occupational Therapy	10 (n=6)
Bilateral integration disorder	Occupational Therapy	16 (n=10)
Verbal apraxia	Speech Language Therapy	16 (n=10)
Attention Deficit Hyperactivity Disorder	-	13 (n=8)
Learning disability	-	2 (n=1)
Visual impairment	-	5 (n=3)

The most prevalent co-morbidity was fine-motor delay and was identified in almost half of the total number of children in the sample. This was followed by a gross motor delay and then visual motor integration disorder. These co-morbidities that were more frequently occurring are addressed within the field of occupational therapy. Vestibular disorders, VMI impairment, SI and BI difficulties, verbal apraxia and ADHD were found in small numbers of participants, which was less than 21% of the sample. Learning disorders and visual impairment were the least occurring co-morbidities.

4.3.2 Relationship between degrees of hearing loss and co-morbidities identified (Bilateral degrees of hearing loss and co-morbidities identified)

The prevalence of the co-morbidities was then identified in children with the same degree of hearing loss bilaterally, to determine if there is a relationship between degrees of hearing loss and co-morbidities. Table 5 shows the percentages of co-morbidities found within each group of children with a particular bilateral degree of HL.

Table 5

Degrees of Hearing Loss and Co-morbidities

Co-morbidity	Moderate HL (<i>n</i> = 5)	Moderately Severe HL (<i>n</i> = 4)	Severe HL (<i>n</i> = 9)	Profound HL (<i>n</i> = 29)
GM delay (PT)	1	0	3	5
FM Delay (OT)	2	3	5	10
GM Delay (OT)	1	1	3	7
Vestibular disorder	0	0	1	3
VMI Disorder	3	2	0	5
SI Disorder	0	2	0	3
BI Disorder	0	1	3	5
Verbal apraxia	2	1	2	4
ADHD	1	1	2	2
LD	0	0	0	1
Visual impairment	0	0	1	2

Due to the profound group of hearing loss having the highest number of participants, the greater number of children was found to have a fine-motor delay, which has already been the most frequently occurring co-morbidity. It is evidenced in Table 5 that there is no consistent occurrence or pattern of co-morbidity in relation to the degree of hearing loss.

4.3.3. Analysis of co-morbidities over the time period of the study (determining trends)

In order to determine if there were any trends or patterns of the co-morbidities for the duration of this study, the researcher attempted to analyze the co-morbidities and compare them over the years. This could not be attained as most of the participants for this study were identified in 2004, 2006 and 2009 (See Table 6) and only few participants were identified in the other years. The numbers of participants were disproportionate over the years and therefore, there was no significant information for the purposes of assessment and management that could be yielded by this analysis.

Table 6

Number of children per year and age range

Year	No of Children	Age Range (CA In years)
1999	3	3.1 - 4.4
2000	1	3.2
2001	1	4.5
2002	5	4.8 - 6.6
2003	4	4.0 - 6.4
2004	8	3.0 - 7.8
2005	3	3.4 - 6.4
2006	9	3.2 - 7.2
2007	1	6.6
2008	6	4.6 - 7.0
2009	16	3.4 - 6.7
2010	6	3.11 - 6.4

4.4. Referrals

This section aimed at identifying the services that these children require and to determine if CLAHIC could provide access to these services. Twenty four percent of children ($n= 15$) were referred to a developmental specialist after admission into CLAHIC in the case of where a neurological and psycho-educational assessment was required forming the largest portion of referrals. The second largest referral area was to the psychologist, where 15% ($n= 9$) of children who were referred displayed behavioral/emotional difficulties. Referral to a geneticist for genetic testing after admission to CLAHIC was a small portion of 3% ($n= 2$), since most of the participants with a genetic disorder had undergone testing prior to their admission. There were no other referrals to services outside CLAHIC.

Table 7

Referrals to a psychologist ($n=6$)

Degree of Hearing Loss (Bilateral\LE &RE)	Percentage of Children	Co-morbidities associated with referral
Bilateral Profound	2%	GM1, FM, GM2, SI, apraxia, ADD, LD
Bilateral Severe	3%	GM1, FM, GM2, BI, apraxia, ADD
Bilateral Moderately Severe	2%	FM, VMI, SI BI, apraxia, ADD
Bilateral Moderate	2%	VMI, apraxia, ADD
Profound\Moderate	2%	FM, GM2, vestibular, ADD

All of the co-morbidities, except visual impairment, were found in the group of children who were referred to a psychologist (See Table 7). These children were all diagnosed with ADD.

Majority of this group of children had bilateral degrees of hearing loss who also presented with apraxia.

Both of the children, who had been referred to a geneticist after their admission into CLAHIC, had bilateral degrees of hearing loss and were identified with fine motor difficulties. This was the smallest portion of referrals and hence, there were not many existing co-morbidities.

Table 8

Referrals to a development specialist (n=12)

Degree of Hearing Loss (Bilateral\LE &RE)	Percentage of Children	Co-morbidities associated with referral
Bilateral Profound	5%	GM1, FM, GM2, vestibular, VMI, SI BI, apraxia, ADD, LD
Bilateral Severe	3%	GM1, FM, GM2, apraxia, ADD
Bilateral Moderately Severe	3%	FM, GM2, VMI, SI, BI, apraxia, ADD, LD
Bilateral Moderate	2%	VMI, apraxia, ADD
Profound\Moderately Severe	2%	FM, SI, apraxia
Profound\Moderate	2%	FM, GM2, Vestibular, ADD
Normal\Profound	2%	GM1, FM, GM2,
Moderately Severe\ Severe	2%	ADD

In the group of children who were referred to the developmental specialist, there were varying laterality and degrees of hearing loss (See Table 8). Visual impairment was not found as a co-morbidity within this group whilst all the other co-morbidities were identified. From the total sample, the two children with learning disorders formed part of this group. Half of the children referred to the developmental specialist had presented with ADD.

4.5. Educational placement

School placements of children are determined when the child is about to complete the Grade 0 curriculum at CLAHIC. This could also be the case when the programme offered at the CLAHIC is found to be unsuitable for the child. Educational placement is carefully considered after assessments by the various team members at CLAHIC and a school readiness assessment is conducted where appropriate for the purpose of exiting CLAHIC and admission into a new learning environment.

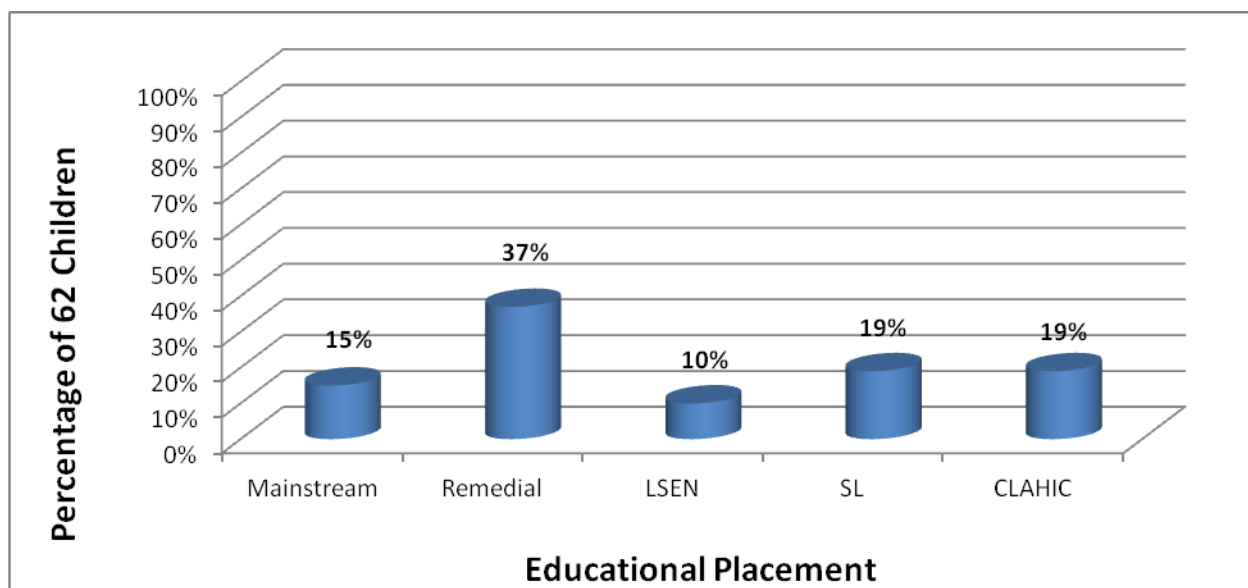


Figure 4: *Placement of Children into Educational Settings*

It is evident the majority of children who attended CLAHIC between 1999 and 2010 were referred to remedial schools for educational placement (See Figure 4). Only a small percentage of children were referred to mainstream schools; schools for learners with special educational needs (LSEN); or schools that implement sign language (SL). Nineteen percent ($n= 12$) of the records reviewed recommended continuation at the CLAHIC.

From the two children who had been referred to mainstream schools after completing the educational curriculum at CLAHIC, they were identified with fine motor difficulties and vestibular disorders.

Table 9

Educational placement at a Remedial School (n=12)

Degree of Hearing Loss (Bilateral\LE &RE)	Percentage of Children	Co-morbidities associated with referral
Bilateral Profound	5%	FM, VMI, BI, apraxia, ADD
Bilateral Severe	2%	FM, BI
Bilateral Moderately Severe	2%	FM, VMI
Bilateral Moderate	2%	FM, VMI
Profound\ Severe	3%	GM1, FM, GM2, VMI, BI
Profound\Moderately Severe	2%	FM, SI, apraxia
Severe\Moderately Severe	2%	FM, VMI
Moderately Severe\ Severe	2%	ADD
Moderate\Profound	2%	FM, VMI

In the larger group of children who were referred to remedial school placement, the most prevalent co-morbidity was fine motor delay (See Table 9). Half of this group of participants were identified with visual motor integration difficulties. There were no vestibular disorders, visual impairments or LDs found in this sample.

The participants that were recommended for educational placement at schools for LSEN had bilateral profound and bilateral severe degrees of hearing loss. They were commonly identified with gross motor (physical difficulties). Three of the children that had bilateral profound hearing loss presented with various co-morbidities whilst the child with bilateral severe hearing loss only had a GM delay.

All of the children, who had been referred to sign language schools, had bilateral degrees of hearing loss with varying severity. The co-morbidity of apraxia was found in all of these participants and two children had ADD.

Table 10

Educational placement at the CLAHIC (n=7)

Degree of Hearing Loss (Bilateral\LE &RE)	Percentage of Children	Co-morbidities associated with referral
Bilateral Profound	3%	GM1, FM, GM2, Vestibular, VMI, SI, apraxia
Bilateral Severe	2%	GM1, FM, GM2, BI, Visual Impairment
Bilateral Moderately Severe	3%	FM, GM2, VMI, SI, BI, apraxia, ADD
Bilateral Moderate	2%	GM1, FM, GM2, VMI, apraxia
Normal\Profound	2%	GM1, FM, GM2

Most of the participants who were to remain at CLAHIC, presented with bilateral degrees of hearing loss and co-morbidities of gross and fine motor delays (See table 10). These were co-morbidities that were also identified as most prevalent for the entire population of the study.

4.6. Summary of Results

This chapter documented the prevalence of co-morbidities identified in this sample of preschool children with hearing loss. The various degrees of hearing loss and the co-morbidities were with the purpose of identifying relationships between the degrees of hearing loss and co-morbidities. The medical diagnoses were then described to provide possible etiology of the hearing loss in some children, as well as to provide information of services that these children require at CLAHIC. Referrals and educational placement information was included to assist in determining services currently provided at CLAHIC and the implications for educational management.

CHAPTER FIVE: DISCUSSION

5.1. Introduction

In this chapter the statistical results depicted in Chapter 4 are discussed in relation to the aims of this research and findings of other existing studies.

5.2. Findings

The purpose of this study was to determine the co-morbidities of hearing loss that pre-school children present with and how this could affect their development and the implications for educational placement.

5.2.1. Co-morbidities identified and the prevalence

The hearing status of the participants were first determined as a starting point to provide background information of the population and to later determine if there is a relationship between the degrees of hearing loss and co-morbidities. In the current study the majority of the sample, 47% ($n= 29$), were diagnosed with a bilateral profound sensory-neural hearing.

Prevalence studies for children in Southern Africa have consistently shown higher rates of severe to profound bilateral hearing loss when compared to those in developed countries (McPherson & Swart, 1997). There is however, still a great lack of prevalence and etiological data for infant hearing loss across the South African population (Swanepoel, 2005).

In the present study more than fifty percent of this sample at CLAHIC had a medically related condition before being admitted into CLAHIC and fifteen percent had an association with a congenital anomaly. These factors indicate that half of the sample population who had a medically related condition was already at risk for a greater degree of hearing loss. Sixteen

percent of the participants had recurring middle ear infections which is also a risk factor for a hearing loss.

In a research report conducted by Swanepoel (2007), he mentioned that otitis media is the most frequently diagnosed illness in a country like the United States where nine in every ten children at the age of two years have had at least one episode. Swanepoel elaborates that these figures may be even higher in a developing country like South Africa with large sections of disadvantaged communities since otitis media has been associated with poor socioeconomic circumstances, poor hygiene and lack of access to medical care. The lower prevalence of middle ear infections found in the present study could be a result of the limited sample size. Furthermore, majority of the participants had already experienced middle ear infections before entering the CLAHIC and therefore parents of these children would have been aware of the risk factors for their child developing infections.

The prevalence of various co-morbidities had to be established to contribute an understanding towards the implications for management. The co-morbidities identified were found within the allied health professional fields of physiotherapy, occupational therapy, speech therapy, attention deficit disorders (ADHD) and learning disorders (LD).

The most prevalent co-morbidities of the present study were fine motor (42%) and gross motor delays (26%) in the field of occupational therapy. Horn, Pisoni, and Miyamoto (2006) studied fine and gross motor skills in pre-lingual children with hearing loss and concluded that auditory deprivation may lead to atypical development of specific motor and language skills that share common cortical processes. These researchers also warn that one should consider that there are many compounding factors that could influence the motor skills of children with hearing loss

such as type of schooling, age of identification of motor delay, parental involvement and early onset of intervention (Horn, Pisoni, & Miyamoto, 2006).

A study by Rajendran and Roy (2010) indicated that children with hearing loss and motor impairment have shown significantly increased suboptimal levels of function and significantly lower health related quality of life (HRQOL). Their study also suggested that the reduced physical abilities/functioning and diminished health related quality of life of such children must be taken into consideration when making decisions about the appropriate type of service for them. This consideration would apply to the present study since the most frequent co-morbidities were of motor impairment.

Cochlear implantation (CI) may have a positive effect on motor performance because of the auditory input and stimulation obtained from the CI, and the observed positive outcome on self-confidence (Incesulu, Vural, & Erkam, 2003) and language development. The impact of cochlear implantation on the vestibular function and/or motor development of a child with hearing loss is insufficiently investigated and not fully known. Some authors emphasize an improvement in vestibular function and motor development after receiving a cochlear implant whilst other researchers point to the potential risks of cochlear implantation for vestibular deficits, which can have a negative impact on motor development and performance of children diagnosed with a hearing loss (Gheysen, Loots & Van Waevelde, 2007).

Visual motor integration (VMI) disorders were the next more frequently occurring co-morbidity (21%), in the current study. The children who had visual motor integration disorders had hearing losses that ranged from moderate to profound and fine motor difficulties. When visual impairment occurs in combination with hearing loss it can substantially alter the child's

early perceptions of the environment, resulting in lack of responsiveness even to the most basic needs (Roush et al., 2004). Visual motor integration is the ability of the eyes and hands to work together in smooth, efficient patterns and it involves visual perception and eye-hand coordination (Sanghavi & Kelkar, 2005). Therefore, a VMI disorder could have an influence on a child's fine motor development.

Children with hearing loss are more likely than typical peers to experience co-morbid diagnoses, such as verbal apraxia and attention disorders (Mellon et al., 2009).

Verbal apraxia and bilateral integration disorders each occurred in sixteen percent of the population. These children had hearing loss that ranged from moderate to the profound degree. When verbal apraxia occurs in addition to hearing loss, it becomes difficult to determine the causal factor of the verbal apraxia as it could be influenced by the hearing loss and/or motor planning deficits. Findings from this study do not assist in determining whether hearing loss increases the risk for verbal apraxia. This was due to the limited sample size of the current study.

In the next group, 13% percent of participants were diagnosed with ADHD. Within this group of children, the degrees of hearing loss varied from moderate to profound. The majority of these children had fine and gross motor delays. ADHD occurs in 7% of deaf and hard-of-hearing children, with the prevalence being slightly higher than the 3 to 5% rate of occurrence seen in the general population (Roush et al., 2004). Even though the present study shows an occurrence of almost double than that of the study by Roush et al. (2004), it does concur that the prevalence at CLAHIC is higher than the general population. Investigators have shown that learning and social difficulties in children with attention disorders and hearing loss could be linked to disorders of

inattention, distractibility, impulsivity, or a combination of these conditions (Kelly & Aylward, 1992).

Ten percent of the participants had sensory integration (SI) disorders with moderate, severe or profound bilateral hearing loss. This group of children displayed fine motor difficulties and articulation errors. Sensory integration disorders have been associated with specific language impairments especially with the expressive side (Van der Linde, 2008). Findings from the present study correspond to this since all of the children who had SI disorders also had articulation errors.

A vestibular disorder occurred in eight percent of the children who also had bilateral profound hearing loss. Fine motor and gross motor delays were found in all of these children. Since the vestibular system has a link to the visual system, it plays a role in eye movements which could influence perceptual skills, especially spatial awareness and fine motor coordination (Ayres, 2005). This may be linked to, as highlighted by the literature, that difficulties within the vestibular system may contribute to sensory seeking behaviour, hyperactivity and distractibility as this also has an influence on muscle tone (Ayres, 2005). He also found that children that have difficulties with auditory processing, as well as vestibular processing, have difficulties with body movement and motor planning.

Visual impairments and learning disorders were the least prevalent co-morbidities of this study. These participants had either a bilateral severe or profound hearing loss. The reduction of visual function that cannot be fully corrected medically or surgically occurs in 4% of the hearing impaired population (Roush, 2004). When this happens, it may have a significant impact on the child's early perception of the environment, possibly resulting in lack of responsiveness even to

the most basic needs (Bond, 2000). This causes The children at CLAHIC are screened annually for visual impairments. The lower frequency of visual impairment could be linked to the admission criteria of the children into the Centre. Prior to 2005, the CLAHIC rarely admitted children who displayed many co-morbidities of hearing loss, and in particular visual impairments. The low occurrence of learning disorders may be linked to the limited referrals made to the relative specialists for diagnosis. At a pre-school level, the CLAHIC could have focused more on language and holistic development of the child with a hearing loss than compared to other regular preschools. Hence, a child was possibly ‘missed’ as having a learning disorder or the child only shows signs and symptoms for a LD when they are older and/or leaving the CLAHIC.

Eleven percent of the children were diagnosed with a syndrome before entering CLAHIC, of which most of the syndromes are associated with a profound hearing loss. The syndromes that were identified may also provide explanations of links to some of the co-morbidities identified and their prevalence.

Two children in this study were diagnosed with Goldenhar Syndrome where the one child has a severe hearing loss and the other child has a profound hearing loss. The two children from this study with Goldenhar Syndrome were both identified with fine motor and gross motor difficulties. Many patients with Goldenhar Syndrome could have cognition and development levels within the norm unless other disorders are present in combination (Wang et al., 2002). However, cognitive difficulties and developmental delays may be associated in an estimated 5 to 15% of cases (Bayraktar et al., 2005; Scholtz et al., 2001; Strömmland et al., 2007; Tasse et al., 2005). Therefore, as with sensory impairments, any developmental delays, such as the fine and

gross motor delays, should be considered in the management of children with Goldenhar Syndrome.

One child in the study was diagnosed with Waardenburg Syndrome and had a bilateral profound loss, but this participant did not present with any co-morbidities of the hearing loss. Despite the participant not currently presenting with any co-morbidities of the hearing loss, the diagnosis of Waardenburg Syndrome requires that the child should be monitored for the risk factors, such as developmental visual impairment, as a preventative measure. A study evaluating the clinical features of 11 affected families (with a total of 52 individuals) found delayed milestones or poor school performance necessitating special schooling (Edery et al., 1996). There is limited evidence for an association between WS and intellectual difficulties (Kiani, Gangadharan & Miller, 2007). Some researchers have reported that WS does not affect cognition (Smith, Klodziej & Olney, 1998).

One child was diagnosed with Connexin 26 Mutation in this study. This child had a bilateral severe hearing loss and did not have any co-morbidities of the hearing loss. In literature reviewed, possible associations found in children diagnosed with Connexin 26 are specific learning difficulties, apraxia, aphasia, attention deficit disorder, global developmental delay, and gross motor delay (Wiley, Choo, Meinzen-Derr, Hilbert & Greinwald, 2006).

Sixteen percent of participants in this study were born prematurely and 6% of the participants had extreme low birth weights. Substantial evidence suggests that premature infants, particularly those infants under 3.5 pounds, may be at risk for later developmental problems (AAP, 2007; Hille et al., 2001). Neonates with birth weights less than 1,500 grams appear to be at particular risk, with prevalence of moderate to profound hearing loss among these infants

reported between 9% and 17% (Bergman et al., 1985; Duara, Suter, Bessard, & Gutberlet, 1986). All participants in this study who were born prematurely had a bilateral moderate or severe hearing loss and a higher frequency of this group of children presented with fine motor delays.

From this study, two children were diagnosed with a bilateral profound hearing loss due to ototoxic medication. Neither of these children presented with any difficulties in addition to the hearing loss. It is evidenced that the use of aminoglycoside antibiotics carries a risk of damage to the cochlea (Patel, 2006). To date, out of 122 institutions in the Western Cape, South Africa, where aminoglycoside treatment is provided to tuberculosis (TB) sufferers, ototoxicity monitoring takes place at only one of these institutes (*University of Cape Town*, 2006). As the frequency of tuberculosis is increasing in South Africa, there is a real possibility that children may be infected with TB at some stage in the future that could lead to a hearing loss (Gardner et al., 1997). Despite the lack of data on deafness in developing countries, the ototoxic effect of drugs such as aminoglycosides, is evident as it is the cause of hearing loss in 20% of the population (Patel, 2006).

It is well known that jaundice (hyper-bilirubemia) places a child at risk for a hearing loss especially when blood transfusion is necessary. Two children in this study born prematurely experienced jaundice and was later diagnosed with a bilateral moderate hearing loss and moderately severe hearing loss, respectively. The participant with the moderate hearing loss had many difficulties in addition to the hearing loss but this could be influenced by the occurrence of middle-ear infections whilst, the other child did not have any co-morbidities of the hearing loss.

One child had bacterial meningitis that led to a bilateral profound hearing loss. Meningitis continues to be a common cause of postnatal hearing loss in the school-age population

(Karchmer, 1985; Moores, 1987) and may manifest itself in youths physically, cognitively, and behaviorally, including LDs.

5.2.2. Relationship between degrees of hearing loss and co-morbidities

In order to determine if there is a relationship between the degrees of hearing loss and the co-morbidities, bilateral degrees of hearing loss were examined in relation to the co-morbidities. Eight percent ($n= 5$) of children had a bilateral moderate hearing loss whilst 6% ($n= 4$) had a bilateral moderately severe hearing loss, 15% ($n= 9$) had a bilateral severe hearing loss and 47% ($n= 29$) of the population had a bilateral profound hearing loss.

None of the children with bilateral hearing loss (regardless of degree of hearing loss) showed any particular pattern or association with the co-morbidities identified in this study. The bilateral profound degree of hearing loss was most prevalent in this study but there was also no indication of an association of the degree of hearing loss to the co-morbidities. The most common occurring co-morbidity, fine motor difficulties, was more evident in the bilateral profound hearing loss and this could be due to the larger number of children in this group, thus it proportionally increased the co-morbidity. There were no links of the profound degree of hearing loss to any of the co-morbidities as expected as a possibility in this study. This demonstrates that any degree of hearing loss could be accompanied with any co-morbidity or combination of co-morbidities. The findings of this study demonstrate that occurrence of the co-morbidities of hearing loss could be independent of the degree of the hearing loss. However, there may be an increased risk for fine-motor difficulties across the board.

5.2.3. Services provided at the CLAHIC

The services currently provided at the CLAHIC meet many of the needs of the child with a hearing loss and additional difficulties (co-morbidities) however, when there are more severe medically related conditions, learning disorders or ADHD problems present, more intensive services are needed. The most commonly made referrals to professionals outside of the CLAHIC were to paediatric psychiatrists, paediatric neurologists, developmental specialists, psychologists (before 2010) and genetic specialists. The heterogeneous population of the hearing impaired requires that the CLAHIC have a referral system of who to refer to and when to refer to in order to meet diverse needs of the child and their family. This aims to provide services that ensure the best health related quality of life for the child.

Children who were referred to the psychologist were all found to have ADHD and most of them also presented with apraxia. Some of the characterising features of ADHD include aggressiveness, demanding and inappropriate behaviour and the possibility of oppositional defiant disorder (Vierhile, Robb & Ryan-Krause, 2009; Armstrong & Nettleton, 2004). Some children with hearing loss may have difficulties that are more psychological in nature which may equally prevent normal development and functioning (Edwards, 2007). It is therefore more likely that the professionals and parents of these children may seek the support of a psychologist to better manage the behaviours the child may present with.

The two children who had been referred to a geneticist after their admission into CLAHIC, were identified with fine motor difficulties and only a few other co-morbidities were found. This finding is limited and cannot be generalized as it was a minimal portion of participants. It has been recommended by Lalwani (2001) that genetic consultation should be reserved for children with developmental delay, dysmorphic features and parental reproductive issues.

Children who were referred to the developmental specialist had various co-morbidities across the spectrum of participants including LDs, ADD, fine and gross motor delays and apraxia. Funderburg (1982) had stated that many problems generally attributed to the sensory impairment of the child or adolescent who has a hearing loss are in fact characteristic of LD. The features of LDs could include sequencing and organizational skills and fine and gross motor coordination (Elliot et al., 1988; Funderberg, 1982; Rowell, 1987). Similar findings were noted in the present study as apraxia is a result of sequencing and organisational difficulties and the motor delays were also evident.

The educational placement of a child with co-morbidities of hearing loss may be an intricate process. As mentioned in the methodology section, children at CLAHIC are referred to schools (mainstream, remedial, LSEN and SL) when the child has completed the academic curriculum or when the child's needs are not met effectively. Only two children were referred to mainstream schools and had bilateral profound and moderate hearing losses with fine motor delays and vestibular disorders. These co-morbidities are manageable at mainstream schools with the possible support of out-sourced therapeutic services.

Admission into a remedial school had been suggested for thirty-seven percent of the participants. Majority of the children had fine motor delays and some had VMI difficulties which can be remediated by occupational therapy. A remedial school should have a team of professionals who could provide the support services that a child may need by working in a collaborative manner in one place.

The children who had been referred to schools that promote sign language had been diagnosed with apraxia. At CLAHIC, when children with hearing loss are unable to respond to

the use of auditory-verbal communication and show more signs of response to a manual code of gestures, they are referred for trials at a SL school. There could be many compounding factors to a lack of response in a hearing impaired child to an auditory-verbal approach and these factors should be considered carefully when making decisions about school placements.

Participants that went to schools for LSEN presented with LDs and gross motor difficulties. The CLAHIC is a clinically based pre-school that implements a language enriched programme but it may not meet the needs of children who had LDs and physical difficulties as it is a more remedial based learning environment. These children would possibly need the services of an individual educational plan whilst the CLAHIC may only provide differential teaching within the small classes.

The approach used by the professionals of the CLAHIC is a collaborative, interdisciplinary team effort to ensure better service delivery. An advantage of the institute's approach is that it is not based on a medical model but rather an integration of various models that appears to be more applicable to the South African context. Furthermore, the parents/caregivers of the children are considered the most important team members. Direct parental involvement enhances parental communication skills with their child and empowers parents to make decisions regarding their child's quality of life.

5.2. Summary

The more prevalent co-morbidities of hearing loss that were found in the present study are disorders or delays in skills that are remediated in the field of occupational therapy. One may have assumed that the more severe a hearing loss is, the more likely a child will have difficulties

in addition to the hearing loss. However, in the current study the findings did not concur to this possibility.

CHAPTER SIX: CONCLUSION

6.1. Introduction

In this final chapter of the report, the most salient findings of the research are summarised. The strengths and limitations of the study and the need for further research are highlighted. The chapter concludes with the implications of the findings from this research.

6.2. Summary of Findings

This study aimed to describe the co-morbidities that pre-school children with hearing loss at the CLAHIC present with and its implications for management. Sixty-two participants who met the selection criteria were included in the study and a quantitative, descriptive and retrospective research design was implemented. The overall findings of the study indicate that the most common occurring co-morbidity of hearing loss in children enrolled at the CLAHIC is fine motor difficulty. This supports findings of other studies that indicated that auditory deprivation, as in the case of a hearing loss, may lead to atypical development of specific motor and language skills that share common cortical processes (Horn et al., 2006). The other two more commonly occurring co-morbidities of hearing loss identified in this study were gross motor delays and VMI disorders that are remediated in the field of occupational therapy.

The investigations from this study did not assist in determining associative factors for verbal apraxia in addition to hearing loss due to the limited sample size. Children who were diagnosed with ADHD also presented with fine and gross motor delays similarly, children with vestibular disorders were identified with fine and gross motor delay. Interestingly, children who were identified with SI disorders also had fine motor difficulties and articulation errors, although sensory integration disorders have been associated with specific language impairments especially

with the expressive side. Visual impairments and learning disorders were the least occurring co-morbidities found in this study.

This study further examined whether a relationship exists between the degrees of hearing loss and co-morbidities identified of this preschool population. The results of this study suggest that children with hearing loss may be at risk for fine motor delays regardless of the degree of hearing loss they may have. There is no evidence of a relationship between the degrees of hearing loss and co-morbidities.

An exploration of the services provided at the CLAHIC was then conducted. The services currently provided meet many of the needs of the child with a hearing loss except when there are more severe medically related conditions, learning disorders or ADHD problems present, then additional services are needed. CLAHIC implements an interdisciplinary team approach that integrates various models which appears to be more suitable to our context and it allows for involvement of the parents/caregivers. As the educational placement of a child with co-morbidities of hearing loss can be a complex process it is imperative that there is effective collaboration between healthcare professionals and those professionals working in the educational setting. The case manager should be a professional who has some qualifications and knowledge of all developmental areas of the child and should be someone who does not see the child for rehabilitation and can thus be the objective manager as well as liaison between families and professionals.

6.3. Strengths

This study has provided valuable information for professionals involved and the families of hearing impaired children at CLAHIC that could guide the management approach of the

difficulties that these children may have. The researcher implemented a research design in which the results could be condensed into statistics, and measure the frequencies of occurrence that answered the question of the prevalence of the co-morbidities. In this study the researcher was a 'passive observer' that created the advantages of not having to interact with the participants directly and the phenomena of the research observed was not altered.

6.4. Limitations

The institute at which the study was conducted has a specific setting which is not common to many other preschools in South Africa hence, the research findings are limited to the context of the CLAHIC and other institutes that might be of similar context. A methodological constraint of this study was the small sample size. This may have influenced the magnitude of the results found in the study and the external validity in terms of generalisation to a larger population.

6.5. Future Research

It is recommended that this study should be conducted on a national level at various preschools that include children with hearing loss, to provide findings that could be generalised to the greater South African context. Further research could be conducted on a larger scale, to examine particular relationships between the degrees of hearing loss and a co-morbidity such as verbal apraxia, that could not be determined in the current study. This study could also guide the development of a protocol that could be implemented at centres such as the CLAHIC to guide the management of pre-school children with co-morbidities of hearing loss.

6.6. Implications of the research

The finding of this research suggest that pre-school children with hearing loss (irrespective of the degree of hearing loss) should be screened and/or monitored for the risk of prevalent co-

morbidities, such as fine and gross motor difficulties. The findings of this study highlighted the need to implement a collaborative, holistic and interdisciplinary team approach should be implemented to ensure that services are provided to improve the life quality, and optimal development of the hearing impaired child.

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Appendix A

Raw data of pilot study

Number	CA			Left Ear	Right Ear	Medical Diagnosis	Physiotherapy		Occupational Therapy			
		Unilateral HL	Bilateral HL	Degree of HL	Degree of HL		Gross Motor Delay	Fine Motor Delay	Gross Motor Delay	Vestibular Disorder	SI Disorder	Bilateral Integration Disorder
1	4.5yrs	0	1	C-D	C-D	URTi, Premature	1	1	1	1	1	0
2	4.5.yrs	0	1	B-C	C	Low -birth weight	0	0	0	0	0	0
3	4.5yrs	0	1	B-C	C	Goldenhar Syndrome	1	1	1	0	0	1
4	4yrs	0	1	D	D	none	0	0	0	0	0	0
5	6.7yrs	-	-	-	-	-	-	-	-	-	-	-
6	6.7yrs	0	1	D	D	none	0	0	0	0	0	0
7	5.10yrs	0	1	D	D	CLP	0	0	0	0	0	0
8	4yrs	0	1	B-D	A-D	none	0	0	0	0	0	0
9	5yrs	0	1	B	B	none	1	0	0	0	0	0
10	4yrs	0	1	A-B	A-B	Jaundice	0	0	0	0	0	0
11	4yrs	0	1	D	D	none	0	0	0	0	0	0
12	4yrs	0	1	D	D	Twin-twin syndrome	0	1	1	0	1	0
13	4.7yrs	0	1	B-D	B-D	Premature	0	1	1	0	0	0
14	4.3yrs	0	1	C-D	C-D	Umbical cord	0	0	0	0	0	0
15	3.4yrs	1	0	B-C		Goldenhar Syndrome, CLP, Heart condition, scoliosis, microtia	1	1	1	0	0	0

Continued

Number	Speech and Language				LD	Optometry	Psychologist	Geneticist	Developmental Specialist	Educational Placement				Other
	Articulation Errors	Apraxia	Language Delay	ADD		Visual Impairment	Referral: Y/N	Referral: Y/N	Referral: Y/N	Mainstream	Remedial	LSEN	CLAHIC	Missing Data
1	1	1	1	0	0	0	N	N	Y	0	0	0	1	0
2	1	0	1	0	0	0	N	N	N	0	0	0	1	0
3	1	0	1	0	0	1	N	N	N	0	0	0	1	0
4	1	0	1	0	0	0	N	N	N	0	0	0	1	0
5	-	-	-	-	-	-	-	-	-	-	-	-	-	1
6	1	0	1	0	0	0	N	N	N	0	0	0	1	0
7	1	1	1	0	0	0	N	N	Y	0	0	0	1	0
8	1	0	1	0	0	0	N	N	N	0	0	0	1	0
9	1	0	1	0	0	0	N	N	Y	0	0	0	1	0
10	1	0	1	0	0	0	N	N	N	0	0	0	1	0
11	1	0	1	0	0	0	N	N	N	0	0	0	1	0
12	1	0	1	0	0	0	N	N	Y	0	0	0	1	0
13	1	0	1	0	0	0	N	N	N	0	0	0	1	0
14	0	0	1	0	0	0	N	N	N	0	0	0	1	0
15	1	0	1	0	0	0	N	N	Y	0	0	0	1	0

Appendix B

Ethical Clearance from the University of the Witwatersrand

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (NON MEDICAL)

R14/49 Sewpersad

CLEARANCE CERTIFICATE

PROTOCOL NUMBER H100 813

PROJECT

Co morbidities of hearing loss in preschool children

INVESTIGATORS

Ms V Sewpersad

DEPARTMENT

speech pathology

DATE CONSIDERED

13.08.2010

DECISION OF THE COMMITTEE*

Approved Unconditionally

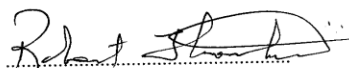
NOTE:

Unless otherwise specified this ethical clearance is valid for 2 years and may be renewed upon application

DATE

05.10.2010

CHAIRPERSON

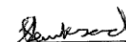

(Professor R Thornton)

cc: Supervisor : Dr K Joubert / Mrs. S Moonsamy

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**


Signature

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix C
Letter of Consent from the CLAHIC

LETTER OF CONSENT

Head of Speech-Language Therapy
Head of Audiology
The Centre for Language and Hearing Impaired Children
University of the Witwatersrand

For Attention: Ms. Kerry dos Santos and Ms. Shireen Govender

CO-MORBIDITIES OF HEARING LOSS IN PRESCHOOL CHILDREN

I am a qualified speech-language therapist and audiologist completing my masters degree in Audiology at the University of the Witwatersrand. As part of the requirements, I am required to conduct a research study. The topic of my research focuses on the conditions, hearing-impaired preschool children present with in addition to hearing loss.

In this study I would like to describe and determine the prevalence of the co-morbidities that these children present with. The results from this study will provide valuable information on multiple diagnoses with hearing loss for professionals working with the hearing impaired population. This will further provide information that could guide the development of a protocol for the management of this population group in a multi-disciplinary setting such as The Centre for Language and Hearing Impaired Children (CLAHIC).

As documented in the admission letter to parents, CLAHIC also serves as a resource for research initiatives. I hereby request permission to conduct my research at the CLAHIC. The research will be conducted by method of record-review. This will

require access to the files and information of hearing-impaired children who have attended the CLAHIC between 1999 and 2009.

In order to ensure confidentiality and anonymity the biographical details obtained from the files will not be included in the research report. The researcher will ensure that no personal information will be made available to anyone. The data is to be kept for a period of five years at the CLAHIC until no longer required, and will then be destroyed. The research will be conducted, with prior arrangements, at times that would not be obstructive or of any hindrance to the working flow of the Centre. There will be no direct contact with the children whose files may be reviewed. They will not be made vulnerable or placed at risk for anything.

I would like to gather the data in this year once ethical clearance from the University has been received. Results of the study will be made available by publication on the University of Witwatersrand's website.

Please do not hesitate to contact me at 071 898 5843 should you require any further information in this regard.

Warm Regards,

Varsha Sewpersad
Student Researcher

Dr. Karin Joubert
Supervisor

Mrs. Sharon Moonsamy
Co-Supervisor

Letter of Consent

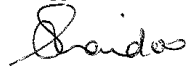
The Head of Speech-Language Therapy and the Head of Audiology hereby, provide consent for Varsha Sewpersad to conduct research at the Centre for Language and Hearing Impaired Children. We have read the information sheet and understand the purpose of the study and that all information obtained by the researcher will be kept confidential.

1) Name: Kerry de Santos
Head of Speech-Language Therapy

Signature: 

Date: 01/07/2010

2) Name: Shireen Naidoo
Head of Audiology

Signature: 

Date: 05/07/2010

Appendix D

Consent from Parents

The Centre for Language & Hearing Impaired Children

Affiliated to the University of the Witwatersrand,
Department of Speech Pathology and Audiology
The Society for Language & Hearing Impaired Children
PBO No. 930006671

5 Jubilee Road Parktown, 2193
PO Box 87177, Houghton, 2041
Tel – 011 484 3408/9
Fax – 011 642 4275
Email – info@speechandhearing4kids.co.za



WELCOME TO THE CENTRE FOR LANGUAGE AND HEARING IMPAIRED CHILDREN

Welcome to all new families at The Centre.

Background Information:

The Centre for Language and Hearing Impaired Children was established in the early 70's by the Department of Speech Pathology and Audiology, University of the Witwatersrand. At that time, it was recognized that there was an increasing need for therapy and appropriate placement for pre-school children with severe language, speech and hearing difficulties. Thirty years on, the need for appropriate services for these children continues, as there are increasing numbers of children showing difficulty integrating into regular pre-primary school programmes.

The Centre operates as a P.B.O. and strives to be a centre of excellence in the identification and management of preschool children with specific speech, language and hearing impairment. Assessments and specialized services are provided through multidisciplinary therapies and a language-rich pre-primary school programme.

There is a close association with the Department of Speech Pathology and Audiology, University of the Witwatersrand. The Centre undertakes training for fourth year Speech and Hearing Therapy students, is an observation centre for students from teaching, medicine and occupational therapy faculties and on an ongoing basis, serves as a resource for research initiatives, while the University provides support and makes its facilities available to the staff.

MISSION STATEMENT

To be a Centre of excellence in the identification and management of pre-school children with specific speech, language and hearing impairment. This is achieved in a multi-disciplinary framework through the provision of:

- A facilitatory, small group, pre-school environment, which is clinically driven.
- Individualised, intensive therapy.
- Early intervention programmes.
- Outreach initiatives.
- Being a resource for research, education and training