EVALUATION OF EDUCATIONAL AUDIOLOGICAL ASSESSMENT PROCESS: A CASE STUDY OF AUDIOLOGY SECTION AT KENYATTA NATIONAL HOSPITAL, KENYA

BY

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MAY, 2011
DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

I dedicate this thesis to the Almighty God for giving me strength and courage to complete it. It is also dedicated to my children, Adrian and Shirleen, and the entire Muriithi family for their encouragement and support.
ACKNOWLEDGEMENTS

I acknowledge my sincere gratitude to my supervisors Dr. Nelly Otube and Dr. Levi Libese for their guidance in writing this thesis. I am also grateful to all my lecturers and friends who helped me, guided and advised me to move on.

Lastly I cannot forget Mash Enterprises for providing quality typesetting and printing of this work.
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<td>ABR</td>
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ABSTRACT

Audiological assessment forms the basis for habilitation and rehabilitation for children and persons with hearing impairment in enabling them to become more productive to the society and lead an independent life. It is only through effective audiological assessment that their hearing acuity can be ascertained and early intervention initiated. This study evaluated audiological assessment process at audiology section of Kenyatta National Hospital. The objectives of the study were to find out how different variables like human resources (professionals) audiological facilities and equipments and audiological procedures interrelate during the entire assessment process. The literature reviewed in this study reveals that the earlier the assessment, by qualified professionals using the right audiological procedures and right audiological facilities and equipments, the better the outcomes. The study adopted a case study design utilizing both qualitative and quantitative approaches. The independent variables in the study were factors which lead to effective audiological assessment hence appropriate intervention while the dependent variable was educational audiological assessment. The target population was made up of 48 respondents who comprised 3 audiologists, 2 assessment teachers, 2 speech therapists, one (1) ear mould technician and 40 parents (clients) of children with hearing impairment. All the respondents were sampled using convenience sampling technique. Data was collected using researcher – made questionnaire, parents (client) interview guide and participant observation technique by the researcher. Piloting was done at Embu Educational Assessment and Resource Centre which collaborates with Ear Nose and Throat department of Embu Provincial General Hospital. The data was analyzed using simple frequency tables and percentages. The findings of the study revealed that there was inadequacy of professionals in the audiology section, audiological facilities and equipments which limit the audiological procedures and services provided in the hospital. The available professionals collaborated quite well though the major challenge they encountered was funding. The study recommended more funding of the section, training and availing more professionals, more collaboration of professionals and creation of advocacy and awareness. Further, similar research has been recommended in other hospitals and for assessment of other types of disabilities like visual impairment and mental challenges.
CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter focuses on background to the study, statement of the problem, purpose of the study, objectives of the study, research questions and significance of the study. It also deals with limitations of the study, delimitations of the study, assumptions of the study, theoretical framework, conceptual framework and operational definition of terms.

1.1 Background to the Study

According to Gearheart, and Gearheart, (1990) assessment is a process that involves the systematic collection and interpretation of a wide variety of information on which to base instructional/ intervention decisions and, when appropriate, classification or placement decisions. Assessment is primarily a problem – solving process. Educators who work with young children may focus on assessment of readiness or development of basic skills, at secondary level, they may be more interested in what has been learned through the use of basic skills.

According to Katz (1994), audiology just means the study of hearing, but the profession of audiology is so much more than that. Audiology is an exciting health care profession that assists those who have hearing impairments. Audiology is also an educational field, teaching about hearing, as well as caring for the needs of children so that they can benefit maximally in school. Audiology is a preventive health field, screening the hearing of newborns and young children and monitoring the hearing of those at risk for hearing loss. Audiology often involves counseling people to understand their problems and options and to avoid potential hearing problems in the future. Taken together, audiology is a helping profession, concerned with prevention, diagnosis and rehabilitation of auditory problems.
In the regular educational institutions assessment is done in form of tests to measure learner’s scholastic aptitude or intelligence or to evaluate the extent to which a learner has profited from instructions. According to White (1988), this assessment is mainly for, selection into various educational and training programmes, for certification, for monitoring learner’s progress and for research purposes among others. Children with hearing impairment may be assessed for the same reasons as their hearing peers. However, they are also assessed for identification in order to determine the percentage of children with hearing impairment in a given population.

This identification if done early enough can help the relevant government ministries such as ministries of education, health, culture and social services to plan suitable intervention programmes for this category of children. They are also assessed in order to refer children with hearing impairment who may need medical and psychological attention to professionals such as educational psychologists, pediatricians, ears, nose and throat (ENT) specialists, teachers and counselors, social workers and special schools and units among others. Hearing impairment is particularly serious in infants and young children because it can lead to communication difficulties, delayed educational progress, social isolation and stigmatization. This is made worse by late diagnosis. Christoffel Blinden Mission (2005) says that early intervention provides the largest opportunity to reduce the lifetime burden of deafness and hearing impairment. Wilson (1995) suggests that irrespective of the definition used, the number of disabled people in the world is likely to be from 350 million to 500 million. Out of this number 120 million is estimated to have a disabling degree of hearing impairment and speech disorders. Scott (2002) claims that, this estimate is rather conservative and suggests a worldwide estimate of over 200 million persons with hearing impairment.

According to WHO (2001) there is an estimated 250 million people with hearing loss in the world of whom approximately 30 million are deaf. These figures do not include people with mild
hearing loss. There are few reliable statistics on the number of deaf, hard of hearing and deaf – blind children being served in the world particularly in the developing countries. Based on available figures, less than 1% percent of children with hearing impairment in developing countries have access to any form of education. People with disabilities make up 10% of the total population of Kenya, approximately 3.5 million people (WHO 2006). According to statistics from the Kenya society for the deaf children (1992), there were an estimated 15,180 deaf children including the hard of hearing between 5 to 14 years in Kenya. Out of these children, only 2690 (18%) were placed in schools for the deaf.

There are more than 650 million people with disability around the world and in Kenya more than 2 million have various forms of impairments (Sunday Nation, August 10, 2008:1). In Kenya, the deaf with speech disorders constitute about 65,000 but very few of them ever achieve their life’s ambitions (Ndurumo, August 23, 2008:1). In their survey on the cost of financing of special education in Kenya, Karugu, Mbithi, Kangethe and Ndaba (1995) reported 3170 children with hearing impairment and speech disorders identified by the Educational Assessment and Resource Services (EARS) centres in 12 sampled districts. Out of these, 1681 were reported placed in special schools. The authors noted that there were a large number of children with disabilities who needed to be identified for placement or intervention. According to the report of the Task force on Special Needs Education SNE) (2003), there were 5,241 children with hearing impairment of which 2,919 were boys and 2,322 were girls in special schools, units and in integrated programmes in Kenya as of August 2003. According to Kenya National Bureau of Statistics (2009), there were 187818 persons with hearing impairments comprising 89840 males and 97978 females.

1.2 Kenyatta National Hospital
Kenyatta National Hospital was established in 1901 as a native civil hospital, with a two-ward bed facility. It was later relocated to the present Kenya Medical Training College in 1922 during which it offered inpatient services only and had a bed capacity of 423 for Africans and 41 for Asians. The hospital was renamed King George the VI in 1963, the King George Hospital was renamed Kenyatta National Hospital in honour of the first president of republic of Kenya Mzee Jomo Kenyatta. As a national referral facility, the hospital receives referral cases from all over the country and within the eastern, central and southern Africa region. In addition, it provides primary and secondary health care to Nairobi and its environs. The average bed occupancy rate goes to 300%. At any given day, the hospital hosts in its ward between 2,500 and 3,000 patients. On average, it caters for over 89,000 in-patients and over 600,000 out-patients annually (KNH annual report, 2009)

The ENT Department is among many of the departments in the hospital, which offer highly specialized services. Within the department, there are filtering section, records section, minor theatre, audiology section and treatment section. Available records show that in 2003 the audiology section applied formally to the Teachers Service Commission (TSC) for an assessment teacher in its effort to meet the diverse needs of children with hearing impairments. The TSC responded by posting an assessment teacher in 2003 and thereby started what is currently known as Kenyatta Hospital Assessment Centre. Currently, there are 2 teachers in the center who cater mostly for educational needs of children with hearing impairment and also offer guidance and counseling services to their parents among other services. Audiological assessment of children with hearing and speech impairments at Kenyatta National Hospital (KNH) is carried out at the audiology section of the ENT Department. In its endeavor to provide basic intervention, the section houses the audiologists, speech therapists, assessment teachers and ear mould technician who provide various inputs during the assessment process. According to the available records, the section screens an average of 2,000 children with hearing impairments and speech disorder
annually and provides diagnostic assessment to an average of 1,000 children annually. This study intended to establish how audiologists, assessment teachers, speech therapists and ear mould technicians collaborate in meeting various needs of children with hearing impairments during assessment process mainly for educational intervention.

1.3 Statement of the Problem

Hearing impairment is a hidden handicap and children with the impairment tend to be neglected particularly in developing countries. Chege, Mugwe, Kamau, Mwangi and Mucheru (1998) say that compared to other more visible handicaps like visual and physical impairments, it is less likely to arouse sympathy from the general public. Hearing and speech impairments can only be ascertained through proper audiological assessment. The assessment provides room for early identification and management of hearing loss and speech disorders. According to Buttress, Gearhart and Peck (1995) this process should start early so that intervention begins early to give the child a chance to develop maximum potential.

Hearing loss has grave implications for the educational process, success of the individual child and for the educational system. Audiology services for the support of children with hearing loss were mandated in the public schools as early as 1975 in United Kingdom. Although clinical diagnostic audiology services are essential in the schools, it is clear that educational audiology services also involve planning and delivery of (re)habilitation services following diagnosis. Unique to educational audiology are skills such as analyzing instructional listening dynamics and recommending modifications for the school environment or programs. School personnel and parents are assisted to help make instruction accessible to students with hearing impairments for their academic and social success. The services of the educational audiologist are numerous and may vary considerably depending on the needs of the student.
Despite the comprehensive objectives of the entire special needs education in various sessional papers, none of these objectives focuses on educational audiological assessment process in Kenya. Sometimes this process is carried out in hospitals and other times by Education Assessment and Resource Centres (EARCs). It is not clear how health and education professions interrelate in educational audiological assessment and their contribution to the welfare of a child with hearing impairment. For example, the task force on the special needs education appraisal exercise of 2003 focused on general assessment of all children with special needs at district EARCs. No particular attention was paid to educational audiological assessment of children with hearing impairments and speech disorders. It was silent on audiological assessment carried out in hospitals such as KNH yet such assessment lead to children’s placement in schools.

A study by Chege, Mugwe, Kamau and Mwangi (1998) dealt with prevention of deafness in children in Kenya. They did not focus on how deafness and speech disorders are ascertained. The records available in the EARCs indicate that very few children with hearing impairments and communication disorders are assessed compared to other disabilities. According to Brush (1999), parents rush to hospital once they suspect any hearing and speech impairment with their children. They consider educational intervention later. A conference of deaf professionals held by Christoffel Blinden Mission (CBM) in 2005 in Holland noted that most developing countries lack primary ear and hearing care activities, adequate screening programmes, referral and rehabilitation services, audiology services, and sufficient numbers of trained personnel at all levels. These factors were said to contribute to poor quality assessment of learners with hearing impairment and speech disorders which in turn lead to inappropriate school placement of these learners. When they are wrongly placed, such learners are disadvantaged due to lack of appropriate educational intervention measures.

There is urgent need for information on how educational audiological assessment is conducted. How is audiological assessment conducted at KNH? Such information will hopefully contribute
towards more effective assessment which incorporates both health and education professionals. The current study sought to evaluate educational audiological assessment process at the ENT department of KNH, which is also the largest in the country comprising specialists including audiologists, speech therapists, assessment teachers and ear mould technicians.

1.3.1 Purpose of the Study
The purpose of the study was to conduct a comprehensive evaluation of educational audiological assessment process at audiology section of ENT Department in Kenyatta National Hospital.

1.4 Objectives of the Study
The following objectives guided the study:

i. Determine the opinions of the professionals in audiology section on the audiological assessment process.

ii. Identify the condition of audiological assessment facilities and equipment available at the section.

iii. Ascertain the collaborative structures among various professionals during assessment process.

iv. Gather views of the professionals on how audiological assessment can be enhanced in the country.

v. Establish the views of the clients on audiological assessment services.

1.5 Research Questions
The study intended to answer the following research questions:

i. What are the opinions of the professionals in audiology section on audiological assessment process?

ii. What facilities are available in the section for audiological assessment?
iii. How do different professionals collaborate in the assessment process?

iv. What are the views of the professionals on how audiological assessment can be enhanced in the country?

v. What are the views of the clients on audiological assessment services?

1.6 Significance of the Study

The findings of the proposed study have both theoretical and practical implications for the future of audiological assessment in the country. Theoretically, the study is expected to contribute to the advancement of knowledge about assessment of hearing and speech disorders in Kenya. It would also highlight factors that influence this assessment and the important role it plays in the life of a person with hearing and speech impairments.

The study has also practical significance because it may lead to the improvement of strategies for the assessment of hearing and speech impairment by identifying the strengths and constraints in the assessment process. The study may be of immediate benefit to the ministries of education and health in the formulation of future educational audiological assessment policies aimed at enhancing both human and material resources for the assessment. In a similar vein, results of this study would enlighten the stakeholders in this area on the achievement of outlined goals for audiological assessment for early medical and educational intervention. This would delve into appropriate development and implementation of guidelines for audiological assessment in the country for persons with hearing
impairment. The study would finally form a base on which others can develop their studies.

1.7 Limitations of the Study

The following were the limitations of the study.

- As a case study, this study limited itself to only one hospital, KNH in Nairobi.
- There was scarcity of local literature and data with respect to assessment of hearing and its accessibility by clients. The review was basically drawn within and outside Kenya.
- It was not possible to cover the opinions of all the clients with hearing impairment at KNH because it would have required considerable time, resources and other logistics. Only those clients who were seeking assessment services during the period of study were covered.

1.8 Delimitations of the Study

The following were the delimitations of the study:

- The study confined itself to the parents of children with hearing impairment, audiologists, speech therapists, assessment teachers and ear mould technicians in the audiology section.
- Other sections of the ENT Department were precluded, as they do not offer direct audiological services to the clients.
- The clients and professionals included in the sample were those in session by the time of the study. Those clients who had been assessed before and professionals who were on leave were not included in the sample even though they could have interesting inputs.

1.9 Assumptions of Study

In the study, the following assumptions were made:

- That the parents of children with hearing impairment were willing to divulge in to how they view the assessment conducted at KNH.
• That the professionals at the audiology section collaborated in offering assessment services.

• Being the largest referral hospital in Kenya, KNH offers comprehensive audiological assessment.

1.10 Theoretical Framework

The focus of this study was to investigate and evaluate educational audiological assessment process for children with hearing impairment. The study was based on the Systems Theory which was developed by Ludwig Von Bertalanffy. According to Schemerhorn (1993), a system is made of interrelated parts that function together to achieve a common purpose. It is a set of objects or elements in interaction to achieve a specific goal. More than 50 years since its inception, the effort in understanding systems theory has evolved to the point that many concepts have been incorporated in our every day life. We talk of healthcare system, a family system, body system, schools system etc. The theory attempts to explain and predict behaviour of the complete organization: its people, structure, environment and technology.

The function of any system is to convert or process energy, information, or materials into a product or outcome for use within the system or outside the system (environment) or both. All systems have common elements, which include input, output, process, feedback, control, environment and goal. Feedback information about some aspects of a system can be used to evaluate and monitor the system and to guide it to more effective performance.

Audiology section of KNH can be viewed as an open system. It receives its resources (inputs) from the environment in form of children with hearing impairment, finances, equipments and raw materials, which it utilizes during audiological assessment process in order to produce products. These products are then released back into the larger society. The output from the section is children with hearing and speech impairments who have been assessed and appropriate intervention recommended while the environment is the larger society.
A system is composed of sub-systems or sub-units that work together in a division of labour so that the entire organization can achieve its goal. The ultimate goal is for all sub-systems to perform in ways that facilitate high productivity for the whole organization. According to the systems theory, if one subsystem fails, the whole system is put in jeopardy.

In this study, audiology section of the ENT Department in KNH is an organizational arrangement in which several actors are combined with various rehabilitation procedures and coordinated in a process to provide intervention possible. As a whole, they achieve greatly in the improvement of quality of life of persons with hearing and communication impairment than they would if they acted separately. Standard systems must agree with the use of labour competence standards in order to set the grounds for the drawing up of the assessment programmes, actual assessment and placement. Actual assessment represents a mechanism that joins, articulates and regulates the various procedures and levels of quality that exist.

In relation to this study, audiology section of KNH is an open system organization - sub-systems are the variables that may influence the success of audiological assessment of hearing impairment. The variables required to enhance assessment are: human resources, physical resources and audiological assessment procedures. Harmonious integration of these variables may lead to relevant audiological assessment outcomes hence contribute in making the children with hearing and communication impairments productive members of the society. This study therefore sought to investigate how these sub-systems are combined and coordinated in audiological assessment process at KNH.
1.11 Conceptual Framework showing Audiological Assessment Process

**Assessment procedures**
- Behavioural procedures
- Physiological procedures

**Human Resources**
- Well trained
- Collaborative
- Experienced

**Physical Facilities e.g.**
- Sound proof room
- Sound booth

**Audiological Equipment**
- Audiometer
- Tympanometer
- Otoscope

**Audiological Assessment process of Children with Hearing Impairment**
Outcomes

- Early intervention
- Relevant placement
- Effect of disability minimized
- Guidance and counseling

Fig. 1:1 Researcher’s self made framework.

The conceptual framework presents the frame of reference for this study. The major concepts underlying this study are: audiological assessment, human resources, physical facilities, audiological equipments and audiological assessment procedures. The arrows show how different variables (sub-systems) integrate harmoniously during the assessment process leading to audiological assessment outcomes shown. The conceptual framework therefore attempts to show the relationship between the independent and dependent variables in the proposed study and illustrates the outcomes of assessment of children with hearing impairment. The human resources, physical facilities and audiological equipments available at the section combined with use of recommended audiological assessment procedures are presumed to be significant in regard to provision of audiological assessment services. When these variables are well combined and co-ordinated, they constitute effective audiological assessment. From this assessment outcome, hearing loss can be managed, early intervention can be initiated like provision of assistive devices e.g. hearing aids, and relevant educational placement can be done among other outcomes. In long term, all these outcomes are aimed at empowering the person with hearing impairment to become self-reliant and hence participate fully in individual and national development.
1.12 **Operational Definition of Terms**

**Assistive Devices** - Equipment aimed at reducing effects of disabilities resulting from impairments to enhance functional abilities of persons with special needs e.g. hearing aids.

**Audiology** - The study of hearing comprising both health and education professions to provide health care and educational needs of children with hearing impairment so they can benefit maximally in and out of school.

**Decibel (dB)** - Unit used for measuring hearing intensity.

**Diagnosis** - An intensive process of determining not only the presence of hearing loss but also degree and type of the loss.

**Disability** - The reduced abilities of an individual in auditory tasks, e.g. in orienting correctly to sounds, in perceiving speech in quiet and noisy places.

**Early intervention** - An action taken at the earliest possible age once a child has been identified to have hearing loss.

**Educational Assessment and Resource Centre** - A centre established by the government where children suspected to have special educational needs are referred for assessment to determine the nature and degree of their handicaps.

**Educational Audiological Assessment** - Measurement of hearing at both screening and diagnostic levels to determine a child’s degree of hearing for the purpose of educational intervention.
**Frequency** - Number of complete cycles of sound pressure fluctuations per second.

**Handicap** - A disadvantage for a given individual, resulting from impairment or a disability, that limits or prevents the fulfillment of a role that is normal for that individual.

**Hearing Aid** - Hearing device that amplifies the sound to a level such that person with hearing impairment can both detect and, most importantly, make effective use of the acoustic signal.

**Hearing impairment** - A hearing difficulty resulting from a reduction in auditory sensitivity at varying degrees i.e. mild, moderate, severe and profound.

**Otoscope** - A hand held instrument providing illumination and magnification for examining the external ear canal.

**Pure Tone** - The simplest sort of sound, in which the sound pressure varies sinusoidally with time.

**Screening** - A rapid process that identifies, in a defined population, a subgroup with a high probability of having a hearing impairment.

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**CHAPTER TWO**

**LITERATURE REVIEW**

**2.0 Introduction**

The literature in this chapter focused on the following areas: Prevalence of hearing impairment in children, early diagnosis of hearing impairment, audiological facilities and equipment, audiological assessment procedures and qualifications of the assessment personnel.
2.1 Prevalence of Hearing Impairment in Children

Tucker and Nolan (1995) in their study on risk factors for hearing disorders and epidemiologic evidence of change over time in the United Kingdom reported a prevalence of bilateral sensorineural hearing impairment of at least 40 dB to be about 1.2/1000 birth per annum, over the period 1983 – 1988. In addition, they reported prevalence variations over years and across regions of the study. Profound hearing loss (at least 95 dB) prevalence was found to be 1 in 2703 (0.4/1000) children per birth cohort.

Al-Muhaimed (1996) reports that community based study on prevalence of hearing impairment among “at risk” children in Saudi Arabia. In the survey, a sample size of 6421 children was examined. 1256 (19.6%) were found to be “at risk” for hearing impairment. Among those “at risk”, 494 children were found to have hearing impairment. This gives a prevalence rate of 39.3% of those “at risk” and an overall prevalence rate of 7.7%. Most (66%) of the hearing impairment was conductive and mild. The main (71.2%) cause of this type of hearing impairment was found to be Secretary Otitis Media.

Seely, Gloyd, Wright and Norton (1995) conducted a community-based study on hearing impairment in children in Eastern Province of Sierra Leone, West Africa. A sample of 2015 children aged between 5 to 15 years was examined. A total of 184 (9.1%) children were found to have mild or greater hearing impairment. Bilateral profound hearing impairment was found to be 4/1000.

White (1988) through the Liverpool School of Tropical Medicine conducted an extensive study on prevalence of hearing impairment in children aged 5 – 14 years in Swaziland using 95% confidence limits, the study found prevalence rates to be 17 to 28 per 1000 for mild defects and 2 to 6 per 1000 for severe defects (threshold 73dB at 1, 2 or 4KHz consequently). Overall, mild
hearing impairment prevalence rate was estimated at 33/1000 while the estimate for moderate to more severe hearing impairment was 10/1000. The overall prevalence rate was 5.5% (Hatcher, Smith, Mackenzie, Thompson, Bal, Macharia and Mugwe1995).

Hatcher, Smith, Mackenzie, Thompson, Bal, Macharia and Mugwe (1995) report the findings of a prevalence study of ear problems in school children in Kiambu district in Kenya. A hearing impairment of 5.6% was found in these children. Unilateral hearing impairment was found to be more frequent than bilateral hearing impairment. Similarly, the left ear had more hearing impairment than the right ear. In the Kenya National survey for persons with Disabilities preliminary report of 2008, the prevalence rate for hearing impairment was 0.5%. In terms of residence the report puts prevalence of hearing impairment in rural and urban areas as 0.6% and 0.3% respectively. In provinces, the prevalence of hearing impairment in Nairobi is 0.3%, Central 0.5%, Coast 0.8%, Eastern 0.5%, North Eastern 0.4%, Nyanza 0.8%, Rift Valley 0.4% and Western 0.7%. In terms of sex, the report puts the prevalence of hearing impairment for male as 0.6% while that of female as 0.5%.

From the foregoing studies, a number of observations can be made. First, it is evident that hearing impairment prevalence rate varies across regions and studies. Variations are also reported on type, degree and laterality of hearing impairments. These variations could be due to, differences in etiologies of hearing impairments across regions and methodological approaches. Second, there are relatively few published community based prevalence studies. Lastly, audiological assessment plays a crucial role in ascertaining the prevalence rate in order to guide the relevant authorities in planning and initiating intervention strategies.

2.2 Early Diagnosis of Hearing Impairment
Hearing loss that goes undetected in infants and young children compromises optimal development and personal achievement. Because language and communication serve as the foundation for normal child development, delays in the acquisition of these skills affect literacy (reading and writing), academic achievement, and social and personal development. Therefore, early detection of hearing loss in children has been a longstanding clinical priority in audiology. The earlier the detection occurs, the earlier intervention can begin, and thereby increasing the likelihood of optimizing a child’s potential in all developmental areas.

The main problem with hearing impairment is that it may have adverse communication and other effects on the person afflicted. If people with hearing impairment are to be assisted, there is need to evolve appropriate intervention strategies for the hearing impairment problem (White 1988). Appropriate audiological assessment forms the bases of any intervention strategy whether medical, educational, social or any other. Unfortunately, there is a general lack of information on the problem resulting to its being ill understood. As white (1988: 1-2) observes:

Deafness and hearing impairment are among the least understood and least socially acceptable disabilities. They are less likely than other handicaps, for example, visual impairment and blindness to attract public concern or to be the object of official attention, especially when there are multitudes of demands on scarce resources. But hearing loss can be prevented and where this is not possible, many of those affected can be helped by medical or surgical treatment, education and rehabilitation, particularly when the impairment is detected in early childhood.

There is a strong link between language delays and hearing impairment, it seems obvious then that if we
are going to ease this delay then we need to detect and diagnose hearing loss as early as possible so that appropriate measurers can be taken. These measurers may include medical intervention and/or the provision of suitable hearing aids. According to Lenneberg (1967), whether there is a critical period for language acquisition is a question, which has taxed psycholinguists for a number of years. The balance of opinion seems to be that there may well be a period during which the child is especially “sensitive” to language but this is not so critical that language cannot be acquired outside it. Brush (1999) opines that it does seem clear that language is not acquired so efficiently once this period is passed.

There is evidence that the foetus will respond to loud sounds during the later stages of pregnancy. According to Tanaka and Arayama (1969), Hackman and Bench, (1972), normally this does not occur until the seventh month after conception. No reliable method of testing for hearing loss in the human foetus has evolved from experiments, though occasionally mothers themselves have voiced anxiety as to their babies hearing at this time and have also provided much evidence as to the responsiveness of the foetus to music, environmental sounds and voice. It is, however, possible to test for hearing loss in the first few days of life and a number of techniques have been developed in relation to this (Brush 1999).
Hearing plays a vital role in the acquisition of speech and language and the achievement of other developmental milestones in young children. American Speech Language – Hearing Association (ASHA), (2004), ruled that when there are concerns regarding a child’s hearing or when hearing status is unknown, a comprehensive pediatric audiological assessment is essential. The ASHA working group on audiological assessment of children recognizes the complex and multidimensional nature of the auditory system, human hearing, and hearing loss. The committee also recognized that the success of Universal Newborn Hearing Screening (UNHS) has resulted in a rapidly growing need for audiological care for the pediatric population. Moreover, the committee recognized the growing number of infants with multiple developmental disabilities and the resulting challenge of accurately delineating their hearing status.

To achieve improved outcomes from early intervention, audiological practice patterns must bridge UNHS programs and early intervention programs. Specifically, the Joint Committee on Infant Hearing (JCIH) (2000) recommended that all infants who do not pass the newborn hearing screening and any subsequent rescreening should begin appropriate audiological evaluations to confirm the presence of hearing loss before 3 months of age. Furthermore, regardless of prior hearing screening outcomes, all infants who demonstrate delays in speech-language development or present with a risk factor associated with hearing loss, or for whom there is parental concern regarding communication development or hearing, should receive immediate audiological evaluation. JCIH (2000) suggested that this practice is important for the identification of infants with delayed onset, progressive, or mild forms of hearing loss that have passed screening in the newborn period. It is in line with this that the study sought to find out how early in life children with hearing impairment are assessed to enable early intervention to be initiated.
2.3 Audiological Equipment and Facilities

2.3.1 Audiological Equipments

According to American National Standards Institute (ANSI) standards, all measurements of auditory function (behavioural and physiological) must be completed in a test environment that meets current ANSI standards for background noise levels. Equipment must be maintained according to the manufacturers’ specifications and recommendations and calibrated to comply with current ANSI standards. Daily listening checks are particularly important when working with children with hearing impairment. Documentation of listening checks and periodic electro acoustic calibration should be consistently maintained. Scotts (2002) recommends that when national standards do not exist, as in the case with transient signals used in evoked potential testing or in sound-field audiometry, calibration may be referenced to other published standards, to published data, or to values established by the body performing the audiological tests.

Some of the instruments used in audiological testing include, tuning fork which is applied to the head, in the midline (forehead or vertex) and it helps to detect whether the client has a greater hearing loss in the left or right ear. The tuning fork is used to administer tuning fork tests which include weber and bing test which help to differentiate between conductive and sensorineural hearing loss, and rinne test for distinguishing conductive from sensorineural hearing losses.

Otoscope is used in performing visual inspection of hearing called otoscopy. Brush (1999) advises that this visual inspection should be done before performing any hearing test to check whether the ear canal is blocked or not. The warbler and chime bar are used during distraction test. They present sound in different frequencies. McCormick (1996) recommends the frequency be ascertained by use of a sound level meter.

The audiometer, which is used in pure tone audiometry, is an instrument for measuring hearing acuity and specifically the threshold of audibility. Rupani (2006) asserts that audiometer is the most important instrument in an audiologist’s clinic and therefore proper installation, maintenance and calibration of the audiometer is a must in order to get valid and reliable test results. Pure tone
audiometry uses a pure tone audiometer which presents sounds of different pure tone frequency at different levels of loudness and consists of two principal modes of stimulus delivery, i.e. by air conduction via calibrated headphones and by bone conduction via a bone vibrator.

Tympanometer is an instrument used in measuring the sound flowing through the middle ear in response to changes in pressure. Tympanometry or impedance test is now a well established as a diagnostic tool, and widely used to monitor middle ear problems in young children. It measures the hindrance or impedance to flow of acoustic energy offered by the conductive mechanism, i.e. the tympanic membrane and the ossicles and supporting muscles (Brush 1999). The test, which requires no patient co-operation, and is therefore an objective test, can be carried out in a few seconds. Middle ear conditions such as otitis media with effusion usually offer increased hindrance to sound flow and this is measured and indicated by the machine. Clinically then the machine assesses the mobility of the middle ear system and expresses it as compliance in cubic centimetres.

2.3.2 Room Requirement for Audiometry

Background noise can have a significant effect on audiometric results, particularly those obtained by bone conduction. It is, therefore, necessary to reduce background noise to a level that will not elevate the hearing thresholds of the person under test. Ideally, the room is specially constructed, but often-audiometric tests are undertaken in less than ideal conditions, for example in the home situation. Background noise should be reduced as far as is practicable and the use of specially designed earphones or of insert receivers may further assist in its reduction. Where background noise is sufficiently high to have a possible effect on the thresholds, this information should be recorded on the audiogram. A soundproof room is not necessary for audiometry, but the noise level should be below that which would cause masking and threshold shift in someone with normal hearing.
Department of Health and Social Security (1974), gives design recommendations that should be followed wherever possible. The room should have an ambient noise level below 30dB. A prefabricated sound booth is sometimes used to guarantee a particular degree of sound attenuation. The booth must, however, be situated within a quiet room since it ensures only certain degree of attenuation, not a particular sound level. A booth that is to be used only for adults should be a minimum size of 1.2m by 1m with a height of 2m, but preferably the room size should be at least 2.4m by 2.4m, with a height of 2m. If children are to be tested, a room that is a minimum of 6.3m by 4.8m, with a height of 2m is required. This allows space for free-field testing, and also for parents or other adults to be present.

A sound-treated room should be situated away from obvious sources of noise and should be isolated from the rest of the building. This can be achieved by building the room of brick with a concrete skin and cavity, thus using the effect of mass and of dead-air space. Vibrations from the building can be deadened by mounting the whole interior on rubber shock absorbers. Solid double doors should be used to exclude noise. Preferably, the doors should be lead-lined and should close with magnetic seals. Ventilation will be needed because the room will rapidly become hot and airless, but the noise from the ventilation system must be minimized using acoustic filters to act as baffles.

Tungsten lighting is preferable to fluorescent, which produces a hum, and if the latter is used the choke and starter should be mounted away from the room. If there are windows, double-glazing should be used to reduce noise from outside. A much larger gap between the panes of glass is necessary than is required for heat retention. If the glass is 3mm thick, the gap should be at least 100mm, and if the glass is 6mm the gap should be at least 50mm. In addition, where there is more than one window in the room, these should not be positioned opposite each other, as the creation of standing waves is more likely. This is important where free-field testing is carried out. A room for audiometry must not only be quiet, but also have a low reverberation time, that is, there must be very little “echo.” Rooms in which reverberation is exceptionally low are called anechoic
chambers, these are very quiet and unnaturally “dead”, and are used only for research purposes. For audiometric purposes, a reverberation time between 0.2 and 0.25 seconds is ideal. This should be achieved by covering the walls and floor with soft, sound-absorbent materials, such as acoustic tiles fixed on battens to the walls and ceiling and a thick foam backed carpet on the floor. These will absorb sound and limit reverberation. It is in this view that the study intended to find out the audiological facilities available and the environment under which audiological assessment is done at KNH.

2.4  Audiological Assessment Procedures

2.4.1  Behavioural Assessment for Children with Hearing Impairment

Behavioural assessment procedures include all subjective tests of hearing. The majority of tests of hearing applied to children require them to cooperate to some degree in the responses which they are asked to make. Their responses are therefore subjective. It is important that the responses required are not beyond the capabilities of the child. Clearly the level of sophistication of responses demanded will depend upon the age and developmental level of the child. Very young children cannot be expected to respond in the same way as adolescents. For this reason, different tests have been developed for different ages of children.

Behavioural assessment of hearing sensitivity in children is complicated by developmental and maturational factors. It is now known that unconditioned behavioural observation techniques with infants are confounded by poor test- retest reliability, and high inter-aid intra subject variability (Bench, 1978). According to Thompson and Wilson (1984), several studies have shown that once an infant reaches a developmental age of 5-6 months, it is possible to elicit reliable conditioned auditory responses using an operant, visually reinforced behaviour response technique. Typically, developing children as young as 5 months of age may be conditioned to produce a motor response contingent on the presence of an auditory stimulus (Thompson and Wilson, 1984). The behaviour
usually a head turn, is reinforced by an appealing visual display. King (1992) says that more recent studies confirm that frequency – specific thresholds may be obtained from infants at developmental levels of 5-6 months, enabling an accurate evaluation of hearing sensitivity regardless of type, degree or audiometric configuration.

Testing the hearing of pre-school children demands considerable skill. This is not simply skill in administering the tests, although clearly this is important, but a special skill in handling young children. This, in turn, requires a first rate knowledge of early child development. Many test sessions are less successful than they should be because of inadequate child management skills on the part of the tester. Such inadequacies will often lead to heightened levels of anxiety and frustration in parents (Brush 1999). Parents are also sometimes required to participate in the testing of the children, but this is on a carefully controlled level with tester manipulating their involvement in the interest of obtaining the desired test results. Skills in managing adults are therefore also important.

Most of the pre-school test, both screening and diagnostic, were originally developed after having taken into account the stages of development of the child. It was found convenient in practice to divide the pre-school period into three stages and a test for each of these stages has been developed. They are distraction test, co-operative test and performance test. These are part of behavioural assessment as they are subjective in nature (Buttress, Gearhart and Peck 1995). From the age of 3 years, the child can be exposed to puretone audiometry. This study therefore, sought to establish behavioural procedures included during assessment in the audiology section of KNH.

2.4.2 Physiological Assessment for Children with Hearing Impairment

Physiological assessment procedures include all objective tests of hearing. Tests requiring a subjective response will be difficult or impossible for some children (Brush, 1999). This group of children include the very young infant at risk for congenital hearing loss who due to their age, are
Physically and developmentally incapable of a subjective response, and the child who is too impaired physically or mentally to cooperate responsively in subjective tests. These children will need to be tested by objective tests which do not rely on their cooperation. Electric Response Audiometry (ERA) which include Electrocochleography (E coch G / ECOG) and Auditory Brainstem Response (ABR) tests and Oto-acoustic Emissions testing (OAEs), fall into the objective test category.

Physiological assessment procedures are of particular importance in the audiological assessment of young children. According to ASHA (2004), measurement of auditory evoked potentials, especially the ABR, can provide accurate estimates of threshold sensitivity. According to Wilson (1995), consequently, ABR plays an important role in both identification and assessment, particularly with children too young or too developmentally delayed for reliable assessment using conditioned behavioural techniques. Any diagnostic battery of tests or hearing aid evaluation procedures usually includes a range of tests, which require the co-operation of the child both in attending and response, (i.e. subjective tests). Such tests are often pivotal, both in diagnosis and in the evaluation of amplification systems as they reveal the responsiveness of children to sound at any point in time. They are, of course, at certain stages also indicators of disposition to listen. For some children, disposition to listen, attending behaviour, extreme youth or indeed the presence of additional disabilities may render the use of co-operative and behavioural tests very difficult, inappropriate or impossible (Brush 1999). For these children, objective or physiological tests are the only ones that can be used. The study aimed to find out physiological procedures applied during assessment in the audiology section of KNH.

2.5 Qualifications of the Assessment Personnel

According to White (1988), extensive survey on educational diagnostic services indicates that educational diagnosticians in different places with varying years of
experience view competence in the same way. According to the survey, the most highly ranked competencies that the assessment team should have include:

- ability to recognize the limits of one’s knowledge of expertise and refer to other professionals when necessary.
- ability to report test results in meaningful and useful language to professional and lay people.
- proficiency in the administration, scoring and interpretation of assessment instruments.
- ability to perform, interpret and integrate informal assessment into the total diagnostic process.
- proficiency in integrating the results of intellectual and educational testing.

Gearheart and Gearheart (1990) clearly points out that psycho educational testing and assessment are guided by principles of ethics. He further states that there are ethical standards of conducting an educational assessment of young handicapped children. The parent and the child should be prepared before assessment. The assessor should establish rapport to make both the child and parent comfortable. The assessor should carefully explain the procedure of the testing and the parent/guardian should acknowledge it. In administering the test, the assessor should have the appropriate techniques in handling the tools, which should be age appropriate. Assessor should put into consideration the nature of the handicapping conditions.

The assessment personnel must be thoroughly familiar with procedures and be capable of using them as intended, ethically and humanistically. Different specialists should handle their areas of specializations to enhance effectiveness and efficiency. Such
specialists include speech therapists, audiologists, ophthalmologists, and educators among others. White (1988) further said that the assessment environment should be conducive and thorough. Preparation should be done before the actual assessment is carried out. The length of testing should be governed by the child’s endurance. The assessors should not rely on one assessment technique to make judgement or decisions. Several tests should be administered before making conclusions. For young children it is not easy to make developmental predictions based on the assessment. He further said that the assessor should communicate the results of the assessment to the parents in a language they can understand and describe the child’s behaviour rather than label it. Emotionally loaded words and professional jargons should be avoided by assessors to reduce parents’ anxiety and confusion. However, results should not be released without the consent of the parents/legal guardians.

When preparing the report of the assessment, the strengths and weaknesses of the child should be clearly put to enable appropriate placement as well as proper preparations of an educational programme, medical and other programmes for the child. The results of the assessment should be communicated to parents in the absence of the child, if the child can read and understand. The results should be kept confidential by the assessment personnel and should not be released to anybody without the parent’s consent.
According to Gearheart and Gearheart (1990), qualified examiners are essential to meaningful results in the administration of psychological/psycho educational tests. He argues that in a similar manner, teachers who conduct informal assessment must know what to do and how to do it. If examiners are well qualified, problems related to testing/assessment conditions, validity and reliability of measurements, test anxiety among others are less likely to be experienced.

Apart from academic and professional qualifications, there are other attributes related to the assessor, which may affect the results of an assessment. These factors include attitude and personality of an assessor, assessor’s competency, his ability to establish rapport with the child and parents and ability to keep proper records.

According to task force on SNE (2003), assessment is supposed to be carried out by trained multidisciplinary personnel comprising the assessment teachers, paramedics, medics, social workers and counselors among others. Public law 195:17 (the amendments to individuals with disabilities, Education Act, 1997), a discretionary programme to ensure appropriate services for children with special needs from birth through 2 years of age and their parents/caregiver, emphasizes the importance of appropriate assessments provided by qualified personnel.

Mounting evidence on the impact of hearing loss on speech-language, social-emotional, cognitive development, and academic achievement supports the need for early identification, complete assessment and rehabilitation of children with hearing loss (Bess, 1982). That is, once a child is suspected of having hearing loss, the diagnostic process, including medical and audiological assessment, must proceed on a timely basis by well-qualified service providers. When hearing loss is diagnosed, family members must be notified and informed of intervention options. A family centred and culturally sensitive approach that advocates involvement of the family to the fullest extent desire must be maintained throughout the process. It is in this view, that
this study sought to establish the competence of the assessment personnel with regard to hearing impairment and to what extent other professionals are involved.

2.6 Summary of the Literature Review

From the foregoing studies, it is evident that hearing impairment prevalence rate varies across regions and studies. Variations are also reported on type, degree and laterality of hearing impairments. These variations could be due to differences in etiologies of hearing impairments across regions and methodological approaches. There are relatively few published community based prevalence studies. Audiological assessment plays a crucial role in ascertaining the prevalence rate in order to guide the relevant authorities in planning and intervention strategies.

Hearing plays a vital role in the acquisition of speech and language and the achievement of other developmental milestones in young children. From the reviewed literature, there is a strong link between language delays and hearing impairment. Then it seems obvious that if we are going to ease this delay, we need to detect and diagnose hearing loss as early as possible so that appropriate measures can be taken. These measures may include medical intervention, school placement and/or the provision of suitable hearing aids. Different audiological equipments and instruments play crucial role in any audiological assessment process. Their availability determines different tests of hearing which can be used to ascertain hearing acuity. In addition, proper installation of equipments, maintenance and calibration are a must in order
to get valid and reliable test results. Background noise can have a significant effect on audiometric results, particularly those obtained by bone conduction. It is therefore, necessary to reduce background noise to a level that will not elevate the hearing thresholds of the person under test. Ideally, audiological assessment room is specially constructed with sound absorbers and other specifications, but often audiometric tests are undertaken in less than ideal conditions, for example home situation.

Majority of hearing tests applied to children require them to cooperate to some degree in the responses which they are asked to make. These are behavioural assessment test procedures which include distraction test, cooperative test and performance test among others. Very young children cannot be expected to respond in the same way as adolescents. Therefore different tests have been developed for different ages of children. Tests requiring a subjective response will be difficult or impossible for some children. These children include the very young infant at risk for congenital hearing loss who due to their age, are physically and developmentally incapable of a subjective response. This group of children also includes a child who is too impaired physically or mentally to cooperate responsively in subjective tests. These children need to be tested by objective tests of hearing which do not rely on their cooperation. These are physiological assessment procedures which include Electric Response Audiometry (ERA) and
Brainstem Evoked Response Audiometry (BERA) among others. Testing the hearing, especially of pre-school children demands considerable skill. Among the competencies that the assessment team should have include ability to recognize the limits of one’s knowledge of expertise and refer to other professionals. In addition the personnel must be thoroughly familiar with procedures and be capable of using them as intended, ethically and humanistically

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter outlines the methods and procedures that were used to collect, analyze and present data required in the study on the evaluation of educational audiological assessment process of
children with hearing impairment at KNH. They included research design, location of the study, target population, sampling techniques and sample size, the research instrument, piloting of the instruments, procedures for analysis and presenting data and the logistical and ethical considerations.

3.1 Research Design
The researcher conducted a case study of the educational audiological assessment process at KNH. This methodology focuses on individual instances rather than a wide spectrum and enables studying of things in depth. Case study offers to the researcher a chance to get into sufficient details and unravel complexities of a given situation (Orodho, 2004). This design was suitable for this study because it enabled the researcher to establish and investigate in detail the services offered by audiology section and the factors that facilitate assessment of children with hearing impairment at KNH. A case study seeks to describe a unit in detail, in context and holistically. Being the biggest national referral hospital, the researcher expected to find complicated cases of children with hearing impairment referred there hence the choice for the hospital.

3.1.1 Variables
In this research, the dependent variable was the audiological assessment services provided by the hospital. The independent variables included those factors, which influence the assessment process of children with hearing impairment at KNH. They comprised the human resources, audiological facilities and equipments, and procedures used during the assessment.

3.2 The Locale of the Study
This study was conducted at the Audiology Section, ENT Department of KNH in Nairobi. The hospital is the biggest referral hospital in the country. It serves as the main government funded hospital and university hospital, which is located two kilometers from the city centre. The
audiology section is within the ENT department and offers audiological testing of the hearing loss, speech therapy, educational assessment and placement and ear mould technology.

3.3. Target Population

The target population for this study comprised 3 audiologists, 2 special education teachers, 2 speech therapists, 1 ear mould technician and 40 parents of children with hearing impairment. The 40 parents included 30 parents whose children had been booked for assessment for the period the researcher was carrying out the study and 10 parents who walked in without prior booking.

3.4 Sampling Techniques and Sample Size

3.4.1. Sampling Techniques

The researcher used convenience-sampling technique to select both the professionals and the parents. This technique was chosen for the audiologists, speech therapists, assessment teachers, and the ear mould technicians because they were the only professionals attached to the section. The researcher consulted the booking records at section to determine the number of children booked, out of which a convenience sampling technique was used to select 30 parents booked and 10 who walked in randomly during the period.

3.4.2. Sample Size

The total sample size constituted 48 subjects. The sample comprised 3 audiologists, 2 assessment teachers, 2 speech therapists, 1 ear mould technician and 40 parents. The sample was very ideal because it enabled the researcher to gather sufficient details.

3.5 Research Instruments
The instruments were a combination of the researcher made questionnaires for professionals, interview guide for parents and a participant observation checklist. The checklist guided the researcher to observe the assessment personnel, facilities and equipments. Use of combined instruments is recommended by Kane (1995), who points out that use of complementary methods reviews discrepancies that a single method cannot.

3.5.1 Questionnaires for Professionals

Researcher – made questionnaire was used to collect data from the professionals in the audiology section. The questionnaire (Appendix A) was administered to the audiologists, speech therapists, assessment teachers’ and ear-mould technician. It was divided into three parts A, B, and C. Part A collected information on Bio data, part B gathered data on human and material resources, while part C was seeking opinion on ways of improving audiological service provision in the country. The items of the questionnaire were structured (close ended) and unstructured (open-ended). The structured questions measured the objective responses while the unstructured questions measured the subjective responses. The questionnaire comprised 9 structured items and 2 unstructured items.

3.5.2 Interview Guide for Parents

Parents of children with hearing impairment being the direct recipients of audiological services were interviewed on different aspects of audiological assessment process in relation to the professionals and services offered.

3.5.3 Participant Observation Technique

According to Orodho (2004), participant observation refers to an approach whereby the investigator becomes an active, functioning member of the culture under study. He/she
participates in activities appropriate for a person of the status assumed, observes what others do, and attempts to see through the eyes of a member of the culture rather than through those of an outsider. The researcher in this study was attached to the audiology section on the days when the audiological assessment of children was carried out. There was an observation checklist to guide the researcher to observe the process and participate in the assessment process. The researcher observed the professionals as they gathered case history, how they carried out audiological procedures, how they related with the parents and children during assessment, recording of the results and how referrals and placements were made among other aspects. The checklist also guided the researcher to observe the available equipments and facilities in the section.

3.6 Pilot Study

Piloting of the research instruments was done in Embu EARC because the centre carries out educational audiological assessment, which collaborates to a great extent with the ENT department of Embu Provincial Hospital. The EARC relies heavily on the ENT personnel when conducting audiological assessment. 2 assessment teachers, 2 audiologist and 10 parents of children with hearing impairment were used for piloting. Piloting the instruments enhances the dependability, accuracy and adequacy of the instruments. This is because the responses from respondents indicate whether the instruments measure what they purport to measure. The purpose of the piloting was to find out whether the items in the instruments were clear to the respondents, precise and comprehensive enough to provide the anticipated type of data, and determine whether the research objectives were fulfilled.

3.6.1 Validity of Instruments

Validity seeks to establish whether the questionnaires content is measuring what it is supposed to measure (Orodho, 2004). The content validity was ascertained by three professionals from special needs education department competent in the area of study. Their recommendations were
incorporated in the final questionnaire. The feedback given enabled the researcher to assess the content the instruments were measuring and improved the accuracy of items under study. Validity was further enhanced by making necessary adjustments to the questionnaires based on the findings of the pilot study.

3.6.2 Reliability of the Instruments
Reliability is a measure of the degree to which a research instrument yields consistent results after repeated measurements are taken of the same subjects under similar conditions (Gay, 1992). The test, re-test technique of evaluating reliability of the questionnaire was employed. The instruments were given to professionals at Embu EARC and ENT department of Embu Provincial Hospital twice in a range of two weeks to test the similarity of responses. The two scores of each respondent were analyzed to check for consistency of responses. A Pearson’s product moment formula for test re-test was employed to compute the correlation co-efficient in order to establish the extent to which the content of the questionnaire was consistent in eliciting the same responses every time the instrument was administered. If the results of the correlation co-efficient were 0.7 or above, the tool was to be deemed reliable. But if the results showed a correlation co-efficient of below 0.7, then the tool was to be declared unreliable and be reconstructed. The final results of the correlation co-efficient were 0.710 and hence deemed reliable.

3.7 Data Collection Technique
The researcher obtained permission to conduct the study from the department of research and ethics of KNH and National Council for Science and Technology. Since participant observation was one of the instruments used, the researcher participated during assessment of children with hearing impairment while observing facilities and equipments used. In the course of the attachment he distributed the questionnaires to the professionals and collected them on completion
for analysis. The parents gave their opinions on the process after receiving the services in the presence of the researcher. In total, the data collection period lasted one month.

3.8 Data Analysis Techniques

The data collected was analyzed using descriptive statistics and thematic analysis. The analysis of qualitative data varies from simple descriptive analysis to more elaborate data reduction techniques (Orodho, 2005). He further says that one of the analytical techniques which can be used is thematic analysis. Responses received from the questionnaires were organized, tabulated and analyzed using simple frequencies and percentages and presented in form of frequency and percentage tables and figures. Items from the questionnaires were arranged and grouped according to individual research questions. The information from interview guide and observation checklist was analyzed qualitatively by sorting out data into various themes according to the objectives of the study. This information was discussed and this aided in drawing of conclusions and recommendations.

3.9 Logistical and Ethical Considerations

The researcher considered various logistical and ethical issues. Logistical considerations focused on the preparation that was done before embarking on data collection, analysis and interpretation. Logistical consideration included pre-field activities, field logistics and post-field activities. Pre-field activities were concerned with the general preparation of research tools, obtaining research permit, organizing research work plan (timetable) and making a research budget. In field logistics, the researcher tried to predict the problems likely to occur while in the field, such as language barrier, uncooperative subjects and so on. Post-field activities dealt with aspects concerning data categorizing, ordering, coding and tabulation in readiness for analysis. Ethical considerations involved explaining to the respondents the purpose of the study and requested their willingness to participate in it. Under ethical considerations, the researcher assured the respondents of
CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter is divided into two main sections. Section one presents demographic data for the subjects. The second section presents the results of the study, which are organized along the research questions of the study. In this case, the results of the study are presented by research questions. As such, the research questions are first posed and then the data relating to that research question is presented. This is followed by a conclusion and discussion of the study in regard to the question.

4.1 Demographic Data of the Respondents

Analysis of respondents’ demographic data is important since it provides the description on the nature of the subjects in the sample with regard to their gender, age, professional qualifications and experience among others.
4.1.1 Gender of the Respondents

It was necessary to understand the gender of the respondents to find out whether it was representing both male and female.

Figure 4.1 Gender of the respondents

In the study majority of the respondents were females 36(75%) while males were 12(25%).

4.1.2 Age Characteristics of the Respondents

The ages of the respondents were categorized into various groups. The first group was 21 – 25 years followed by those between 26 – 30 years. The other
groups were those between 31 – 35 years followed by those between 36 – 40 years then those between 41 – 45 years. The rest were those between 46 – 50 years and finally those above 50 years. The age characteristics of the respondents are presented in the figure below.

**Figure 4.2 Age and number characteristics of the respondents**

As shown in figure 4.2 above respondents aged between 21-25 years were 2 (4.17%), 26-30 years 3 (6.25%), 31-35 years 12 (25%), 36-40 years 15 (31.25%), 41-45 years 10 (20.83%) and 46 – 50 years 6 (12.5%). The largest proportion of respondents was of ages 36-40 years 15 (31.25%) while the smallest proportion was between 21-25 years 2 (4.17%).

### 4.1.3 Professional Qualifications of the Personnel

There was need to establish professional qualifications for the personnel working in the audiology section as
it plays a crucial role in educational audiological assessment process

Figure 4.3 Professional qualifications of the personnel

The results of the current study as shown in figure 4.3 above clearly indicate that half of the professional 50% who serve clients in the audiology section are diploma holders, 37.5% are graduates while 12.5% are certificate holders. These qualifications are not adequate bearing that all audiological assessment complications from all district and provincial hospitals and others from neighbouring countries are referred to KNH. One would expect that KNH being a referral hospital to have professionals of higher qualifications compared to other hospitals at district or provincial level. Bess (1982) asserts that once a child is suspected of having hearing loss, the diagnostic process, including medical and audiological assessment, must proceed on a timely basis by well-qualified service providers. One of the challenges in provision of audiological assessment services is lack of enough trained manpower 25%. To overcome this challenge, the study found that more funds should be availed for training of more professionals 25%.
In U.S.A, audiological assessment is performed by qualified audiologists who possess a current ASHA certificate of competence where required and/or valid state license is required by law (ASHA 2004). Assessors designated to provide assessment and management of infants and children with hearing loss must have the commensurate knowledge, skill, and instrumentation necessary for use with current paediatric hearing assessment methods and hearing aid selection and evaluation procedures (The paediatric working group, 1996). The study established that in Kenya, apart from academic qualifications in form of certificates, diplomas and degrees, there is no professional body like ASHA concerned with certification of competency. Licensing is also not a pre-requisite in offering audiological assessment services in our country.

4.1.4 Experience of the Professionals

Experience may affect directly or indirectly the assessment process on the part of the personnel. The number of years one has worked in the audiology section was categorized into five groups. The first group was those who have worked for less than five years followed by those between 6 – 10 years. The other group was those who have worked between 11 – 15 years then those between 16 – 20 years and finally those who have worked for over 20 years. The experience characteristic of the personnel is presented in the figure below:

Figure 4.4 Experience categories of professionals
As indicated in figure 4.4, the findings of the current study show that most of the professionals 37.5% have worked in audiology section for a period of between 6 and 10 years. An extensive survey conducted by educational diagnosticians in different places rank highly ability to recognize the limits of one’s knowledge of expertise and refer to other professionals when necessary (White 1988). Also ranked highly is proficiency in integrating the results of intellectual and educational testing. Experience contributes greatly to the entire outcome of the assessment process.

4.2 What are opinions of the professionals in audiology section regarding assessment process?

The study sought to answer the above question by analyzing the number of professionals and their adequacy, adequacy of facilities and equipments available and audiological assessment services offered at the section. The services have been divided into audiological procedures included in the assessment and post assessment services. The analysis was made in comparison with participant observation made by the researcher on human resources (professionals), facilities and equipments
in the section and various services offered to the clients. These are the main variables during assessment process.

### 4.2.1 Type and Number of professionals in audiology section

#### Table 4.1 Professionals in audiology section

<table>
<thead>
<tr>
<th>Profession</th>
<th>Number of professionals</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audiologists</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Speech therapists</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Assessment teachers</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Ear mould technician</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The respondents (professionals) were expected to give their opinion on adequacy by stating whether the professionals were more than enough, enough or not enough. Their responses were subjected to frequency analysis as presented in the figure below.

**Figure 4.5 Opinions on number of professionals.**
In the current study as shown in figure 4.5 above, 3 (37.5%) of the professionals felt that they were enough in the section which corresponds to the highest experience of 6 to 10 years. However, 5 (62.5%) were of the opinion that the professionals were not enough. The adequacy of professionals is dictated by the number of clients and for a big referral hospital, the number of professional should be increased to cope with the high number of patients/clients served by the hospital. This may shorten the booking period as some bookings take 3 months of waiting to get a chance to bring the child to be assessed.

4.2.2 Adequacy of audiological facilities and equipments available in the audiology section.

Facilities and equipments play a central role in the entire audiological assessment process. The study sought to answer the research question. What facilities are available for audiological assessment? The response for this question was sought through observation checklist.
Table 4.2 Observation checklist for facilities and equipments.

<table>
<thead>
<tr>
<th>Facility/Equipment</th>
<th>Available</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audiometry room</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Otoscope</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Chime – bar</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Sound level metre</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Tuning fork</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Warbler</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Play audiometry</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Brain evoked response audiometer</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Toys</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Vibrators</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Tympanometer</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Speech test materials</td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>

After establishing the facilities and equipments available and not available the researcher sought to know the opinions of the professionals on adequacy of the available facilities and equipments.
They were to indicate whether facilities and equipments were very adequate, adequate, inadequate or very inadequate.

**Figure 4.6** Opinions of the professionals on adequacy of facilities and equipments.

![Bar chart showing the percentages of professionals' opinions on facilities and equipments adequacy.](image)

As shown in figure 4.6, most of the respondents (75%) felt that facilities and equipments available were inadequate as compared to 2 (25%) who felt they were adequate. This perhaps is due to the fact that KNH is the biggest referral hospital in Kenya and serves the highest population of patients requiring such services.

The current study established that quite a number of facilities and equipments were available at audiology section of KNH. However, some modern equipments especially those required to carry out physiological procedures were not available thereby limiting further the capacity of the hospital to offer specialized audiological assessment services. The opinion on adequacy of audiological assessment facilities and equipments sought from the professionals clearly indicate
that 75% of the respondents felt they are inadequate. Being the biggest referral hospital in the country the findings suggest that other hospitals may even be worse in terms of audiological facilities and equipments. This may limit chances of achieving the main goals of early identification and intervention.

Success of any audiological assessment depends on availability of well-qualified personnel, availability of audiological facilities and equipments and use of the right audiological procedures. To have well trained personnel who are able to use accepted audiological procedures requires more funding. The current study cited lack of enough funds and lack of enough trained personnel as the major challenges in provision of audiological services by 37.5% and 25% respectively. To enhance the provision of these services the respondents suggested provision of more funds 25%, training more professionals 25% and provision of facilities and equipments 25%. The findings tend to agree with ministry of education’s task force on SNE (2003), which found that insufficient funding of assessment services, affects service provision to such an extent that assessors cannot meet their mandate fully. In relation to this, the task force recommended increased funding of assessment services in order to enable the professionals to provide all the services within their mandate.

4.2.3 Audiological Assessment Services Offered at the Audiology Section

The services offered to clients at audiology section involve audiological procedures (behavioural and physiological), and other post assessment services like school placement, counseling and provision of assistive devices to those who can benefit from them. During the study, observation was made to establish which procedures are included and which are not included during the assessment process.

Table 4.3 Observation checklist for audiological procedures during assessment process.
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Included</th>
<th>Not included</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavioural Procedures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distraction test of hearing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Co-operative test of hearing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Performance test of hearing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pure-tone audiometry – air conduction</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pure-tone audiometry – bone conduction</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Cochlear and retrocochlea test</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Clinical masking</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Speech test of hearing</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Visual response audiometry</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Physiological Procedures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neonatal screening</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Acoustic reflex test</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Electrocochleography</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Auditory Brainstem Response (ABR)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Oto – acoustic emissions (OAEs)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Tympanometry</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
As shown in the previous table most of the procedures included in the assessment process are behavioural in nature. Out of eight procedures included in the process 6 (75%) are behavioural compared to 2 (25%), which are physiological.

The study further sought to establish the adequacy of these procedures from the professionals by stating whether they were very adequate, adequate, inadequate or very inadequate.

**Figure 4.7 Opinions of professionals on adequacy of audiological procedures.**

The findings showed that majority 7 (87.5%) felt that the procedures were inadequate as compared to 1 (12.5%) who felt they were adequate. Audiological assessment of children includes a thorough case history, otoscopy, and behavioural as well as physiological measures. Because children undergo rapid sensory, motor, and cognitive development, and because some children will present with multiple developmental problems, it is vital that assessment tools are appropriate for the neuro-developmental state of the young child.

**Table 4.4 Post assessment services offered at audiology section.**

<table>
<thead>
<tr>
<th>Post – assessment service</th>
<th>Offered</th>
<th>Not offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech therapy for children with speech problems</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>Offered</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Provision of assistive devices e.g. hearing aid</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Provision of educational and other placements</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Counselling of parents of children with hearing impairment</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Follow up after placement</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Training on use and care of assistive devices</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Provision of ear – mould technology</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Awareness seminars and workshops</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Provision of outreach services</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Cochlear implantation</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

The study findings show that 7 (70%) of post – assessment services were offered while 3 (30%) were not offered. After this observation by the researcher, the study sought to establish from the professionals their level of satisfaction with the post-assessment services by indicating whether they were very satisfied, satisfied or not satisfied.

Figure 4.8 Level of satisfaction with post – assessment services.
The study findings reveal that 5 (62.5%) of the professionals were satisfied with post-assessment services offered at the section while 3 (37.5%) were not. In addition to the assessment of peripheral hearing status, it is essential for personnel working with infants and young children to consider the functional implications of hearing loss. As feasible within the time constraints of audiological practice, assessment of speech perception ability, and screening for communication skills, cognitive development and social-emotional status should be included as part of the pediatric test battery (ASHA, 2004). Such assessments and screenings are consistent with the objective of formulating recommendations and making additional referrals as needed.

4.3 How do different professionals collaborate in the assessment process?

Collaboration is an integral part of the assessment process. Therefore it was important to ascertain the collaborative structure among different professionals.
during assessment process. Response to this research question was sought through participant observation by the researcher for one month. The study revealed that different sections within the ENT department collaborate directly or indirectly with the audiology section, which conducts the audiological assessment. These sections include Records office, cash office, filter clinic and audiology. The records clerk in this section advices the client on the payment of services as per the client’s needs or prescription. Upon the payment, a file is opened for each client where personal details are recorded. The client is then ushered into the filter clinic by the E.N.T nurse.

Payment is made to the cashier and it varies depending on the service as set by the hospital management. A payment receipt is issued upon the payment and taken back to the records section. The professional here is E.N.T clinical officer who examines and diagnoses the client’s needs. The clients whose hearing levels requires to be ascertained are referred to the Audiology section.

There are four subsection namely audiometry, speech therapy, educational assessment and ear mould technology. Clients are received in audiometry room. The audiologist conducts different tests of hearing and do hearing aid fitting to those who can benefit from them. Clients with speech disorders are referred to speech therapist. Children with hearing impairment but are school ready are referred to educational assessment where assessment teachers provide them with suitable educational placement. They also do counselling to parents whose children have hearing impairments. Before any hearing aid is fitted an ear mould has to be made by the ear mould technician. In some instances the audiologists can refer the client back to the filter clinic for further diagnosis. Also sometimes the section receives clients directly from other hospitals or EARCs.
For the audiological assessment process to run smoothly, different professionals collaborate harmoniously and each performs his or her part before referring to the next one. This collaboration allows different professionals to handle their areas of specializations to enhance effectiveness and efficiency. It also recognizes the limits of one’s knowledge of expertise and refers to other professionals when necessary. Since different sections are under one roof in ENT department, they are easily accessible by the clients and this saves them time and inconveniences of moving from one place to the other.

According to the Task force SNE (2003), assessment is supposed to be carried out by trained multidisciplinary personnel comprising the assessment teachers, paramedics, medics, social workers and counsellors among others. The findings of the current study show that there is a high degree of collaboration of the professionals available though only within the E.N.T department. However some disciplines like social workers and psychologists were not available despite the fact that these experts are vital in any audiological assessment. White (1988) notes that, one of the competencies that the assessment team should have is the ability to recognise the limits of one’s knowledge of expertise and refer to other professionals when necessary. Different specialists should handle their areas of specializations to enhance effectiveness and efficiency. The National special needs Education Policy Framework (2009) observes that the multidisciplinary approach during assessment is only conducted informally since it has not been
formalized. The findings of this study show that some professionals 12.5% and clients 5% support closer collaboration of different ministries in providing audiological assessment services as a way of enhancing these services in the country.

Task force on SNE (2003) recommended that ministry of education collaborates with the ministry of health to sensitize the health workers to carry out identification of children with SNE and specifically those with hearing impairment, aged between 0 – 5 years and make a follow up to age six when they start school.

4.4 What are the views of the professionals on how audiological assessment can be enhanced in the country?

There is need to enhance audiological assessment services in the country so that the earliest possible intervention can be initiated. Response for this research question was sought by professionals stating some challenges they encounter in the course of providing audiological assessment services and then giving their suggestions for enhancing those services.

4.4.1 Challenges Encountered by Professionals in Provision of Audiological Services.

Challenges suggested by the respondents include finances, lack of enough trained manpower, lack of awareness by the clients, ignorance by clients, lack of modern equipments and policy issues.

The figure below presents their responses.

**Figure 4.9 Challenges in provision of audiological services**
Among the respondents, 3 (37.5%) were of the opinion that lack of enough funds was the major obstacle in provision of audiological services followed by lack of trained manpower 2 (25%). Lack of awareness by clients, lack of modern audiological equipment and policy issues were minor challenges 1 (12.5%).

4.4.2 Suggestion by Professionals for Enhancing Audiological Services in the Country.

Some of the suggestions given included provision of more funds, training of more professionals especially in educational audiology, provision of more facilities and equipments especially in the educational assessment and resource centers and district hospitals, closer collaboration of ministries of health and education and providing clear policy guidelines. The figure below shows their responses.

**Figure 4.10 Suggestions for enhancing audiological services**
The study reveals that providing more funds 2 (25%), training more professionals 2 (25%) and providing facilities and equipments 2 (25%) would be priority in enhancing audiological services followed by closer collaboration of ministries of health and education 1 (12.5%) and providing clear policy guidelines 1 (12.5%).

4.5 What are the views of clients regarding audiological assessment at KNH?

Children with hearing impairment are the direct recipients of the services provided at the audiology section of KNH. Therefore, there was need to establish how the parents of such children view the general performance of the section. The respondents who were parents of children with hearing impairment were required to rate generally the services provided, state the best sub-section, the services which interested them most, how they obtained knowledge of KNH and their suggestion on how the services can be improved.

4.5.1 General Rating of the Services Provided at Audiology Section by Clients.

This was sought by clients rating the services as, excellent, very good, good, fair, poor or unable to rate. The figure below presents their responses.

**Figure 4.11 Rating of services by clients.**
Out of 40 clients, 24 (60%) rated the services as very good compared to 2 (5%) who rated the services as poor. However none of the clients rated the services as excellent while 2 (5%) were unable to rate.

4.5.2 Clients Choice of Sub-sections Based on Performance

There are four sub-sections in the audiology section namely audiometry, speech therapy, educational assessment and ear mould technology. The study sought to find out which sub-section was chosen as the best by the clients.

Figure 4.12 Choice of subsection by clients based on performance
The study reveals that the choice for most clients was educational assessment 18 (45%) compared to ear mould technology 3 (7.5%). Perhaps this is because any service offered as educational is not charged. Audiometry and speech therapy were chosen by 37.5% and 10% respectively.

4.5.3 Clients’ Areas of Interest

Among different services offered at the section during the assessment process the clients were to state which service interested them most. These services were administration of the hearing test, Revelation of the results, placement after the assessment, counselling after these results, speech therapy and ear mould making.

Table 4.5 Areas of interest by the clients based on efficiency of service delivery

<table>
<thead>
<tr>
<th>Service</th>
<th>Hearing test administration</th>
<th>Revelation of results</th>
<th>Placement after test</th>
<th>Counselling after results</th>
<th>Speech therapy</th>
<th>Ear mould making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data</td>
<td>8</td>
<td>2</td>
<td>10</td>
<td>12</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Percentage</td>
<td>20</td>
<td>5</td>
<td>25</td>
<td>30</td>
<td>7.5</td>
<td>12.5</td>
</tr>
<tr>
<td>------------</td>
<td>----</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-----</td>
<td>------</td>
</tr>
</tbody>
</table>

In the assessment process, the area which interested many clients was counselling after the hearing test results 12 (30%) compared to revelation of the results which very few clients 2 (5%) were interested in. May be this is due to the psychological effects once it is revealed to the parent about the hearing status of the child. The reported reaction of parents of children with hearing impairment range from shock, guilt, embarrassment, inadequacy and on occasions even relief, relief that it is deafness and not something else that they fear even more (Tucker and Nolan, 1995). Many parents feel a great sense of isolation and inadequacy. They feel entirely alone in having to solve what, for them, must seem an enormous, perhaps insoluble problem. Therefore, educational audiologist may be directly involved in both counseling and guidance in the area related to the emotional reactions to handicap and the area related to the management of deafness.

4.5.4 Knowledge about Audiological Services at KNH

The study sought to establish how the clients came to know about the audiological services at KNH. This knowledge could have been obtained from teachers, local administration, EARCs, churches, friends, media, relatives and other hospitals as shown by figure 4.13
From the table most of the clients were informed about the audiological services at KNH by the EARCs 26 (65%), 5 (12.5%) by other hospitals, 4 (10%) by relatives but none obtained this information from the media or local administration. Media, both print and electronic can act as major tool in disseminating important information since they are both visual and audio. Where media cannot reach, it can be supplemented by local administration like chiefs, their assistants and even village elders since they can be found even in the remotest parts of our country.

4.5.5 Clients’ Suggestion on Improvement of Audiological Services

Clients gave suggestions on how audiological services could be improved as presented in the figure below.

Figure 4.14 Clients’ suggestion on improvement of audiological services
The study revealed that most clients would like all Audiological Assessment Services to be made free 23 (57.5%) so that they could be affordable to more clients. In KNH, a fee is levied for any medical service provided, audiological services included. Other suggestions included, audiological services to be made available in all district hospitals 10 (25%), creation of awareness on availability and importance of audiological assessment 3 (7.5%), KNH to offer outreach audiological services 2 (5%) and all ENT departments in district hospitals to have assessment teachers 2 (5%).
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.0 Introduction

This chapter provides the summary, conclusion and recommendations of the study.

5.1 Summary of the Study

The summary in this study has been categorized according to themes drawn from research questions. They present the general findings on each of the variables studied.

5.1.1 Demographic Characteristics of Respondents

Majority of the respondents were females, 36 (75%) compared to males 12 (25%). Most of the respondents were aged between 36-40 years 15 (31.25 %). Half of the professionals in the audiology section were diploma holders 4 (50%) while the other half comprised degree and certificate holders. 3 (37.5%) of the professionals had an experienced of 6-10 years, 0-5 years 2 (25%), 11-15 years 2 (25%) and 16-20years 1 (12.5%).
5.1.2  Professionals in Audiology Section

There were 8 professionals in the section comprising 3 (37.5%) audiologists, 2 (25%) speech therapists, 2 (25%) assessment teachers and 1 (12.5%) ear mould technician. Most of the professionals 5 (62.5 %) felt that they were not enough. This shows that more professionals are needed in the section.

5.1.3  Audiological Facilities and Equipments

There was an audiometry room in the section, which was acoustically treated, otoscope, chime bar, play audiometer, brain evoked response audiometer, toys, vibrators and tympanometer. Majority of the professionals 6 (75 %) were of the opinion that these facilities and equipments were inadequate. 2 (25%) felt that they were adequate. More facilities and equipments are required in the audiology section.

5.1.4 Audiological Assessment Services

Behavioural procedures included in the assessment process were distraction test of hearing, cooperative test, and performance test and pure-tone audiometry while physiological procedures included were Auditory Brainstem Response (ABR) and tympanometry. Most of the procedures included in the entire assessment process are behavioural 6 (75 %) compared to 2 (25 %) physiological procedures. 7 (87.5%) of the professionals said that these were inadequate. Inadequacy of audiological facilities and equipments limits audiological procedures included in the assessment process.
5.1.5 Post Assessment Services

7 (70%) of post assessment services were offered while 3 (30%) were not offered. Some of post assessment services offered were speech therapy, provision of assistive devices and educational placement among others. 5 (62.5%) of the professionals were satisfied compared to 3 (37.5%) who were not satisfied. Without enough professionals it was hard to provide all the services necessary.

5.1.6 Collaboration of Professionals during Assessment Process

Professionals in audiology section collaborated well among themselves and also with others in the E.N.T department. Professionals in audiology section include audiologists, speech therapists, assessment teachers and ear mould technician who collaborate with records clerk, the cashier and E.N.T clinical officer among others.

5.1.7 Challenges Encountered in Provision of Audiological Services

The main challenges encountered by professionals is lack of enough funds 3 (37.5%) % compared to matters pertaining to policy issues 1 (12.5%).

5.1.8 Enhancing Audiological Services in the Country.
Providing more funds towards provision of audiological services 2 (25 %), training and employing more professionals 2 (25%) and provision of more facilities and equipments 2 (25%) would enhance audiological services in the country.

5.1.9 Rating of Audiology Services by Clients

The current study findings indicate that 24 (60%) of the clients rated the services provided at the audiology section as very good and only 2 (5%) felt the services were poor.

5.1.10 Sub-sections in Audiology Section

According to the clients educational assessment subsection is the best 18 (45 %) and ear mould technology subsection was voted by 3 (7.5 %).

5.1.11 Client Choice of Service in Audiology Section

The study shows that more clients 12 (30%) were interested in counselling after results, 10 (25%) placement after hearing test, 8 (20%) administration of hearing test, 5 (12.5%) ear mould making, 3 (7.5%) speech therapy and 2 (5%) revelation of results.

5.1.12 Knowledge about Audiological Services

The study findings indicate that most of the clients 26 (65%) received information about audiological
services at KNH from the EARCs but none from either local administration or the media.

5.1.13 Clients’ views on Improvement of Audiological Services.

Majority of clients 23 (57.5%) recommended that audiological assessment should be free, 10 (25%) recommended that audiological services to be made available in all district hospitals, 3 (7.5%) creation of awareness, 2 (5%) recommended that KNH should offer outreach services and 2 (5%) ENT departments in district hospital to include assessment teachers in their assessment.

5.2 Conclusions

The primary purpose of educational audiological assessment is to ensure early identification, assessment, intervention and placement of children with hearing impairment. Audiology section of KNH aims to improve the growth and quality of life of these children by placing emphasis on assessment and early intervention. Though the policy makers have supported this initiative, still more needs to be done.

5.2.1 Human Resources, Audiological Facilities and Equipments

As the study findings indicate, there is an emerging trend of human resources (professionals) not being enough 62.5%, inadequate audiological facilities and equipments 75% and inadequate audiological procedures 87.5%. Kenyatta National Hospital being the biggest referral hospital in Kenya serves many clients from within and outside Kenya. The number of professionals coupled with their qualifications does
not cope with the status of the institution. The study findings show that 50% of the professionals have diplomas, 37.5% have degrees while 12.5% are certificate holders. Though the study did not establish any standard qualification requirement for the section, the number could be increased as well as their capacity to cope with all referred cases from elsewhere.

Inadequate audiological facilities and equipments had a direct connection with inadequate audiological procedures. This is because most of sophisticated audiological procedures like neonatal screening and electrocochleography require sophisticated facilities and equipments. Being a referral hospital, general expectations are that, what is not available in other hospitals and assessment centers can be found at KNH. Some of these complex facilities and equipment require considerable amount of money and highly trained manpower. Perhaps this explains why more professionals 37.5% were of the view that lack of enough funds was their main challenge and hence suggested that more funds should be provided to enhance audiological assessment services. It is worth noting that most professionals 62.5% were satisfied with post-assessment services like counselling of parents of children with hearing impairment, placement of children after assessment and provision of assistive devices. These post assessment services do not require audiological facilities and equipments as
compared to audiological procedures like oto-acoustic emissions.

5.2.2 Collaboration of Professionals and Systems Theory

Schemerhorn (1993) asserts that, a system is made of interrelated parts that function together to achieve a common purpose. Audiology section of ENT department in KNH is an organizational arrangement in which several actors combined with various rehabilitation procedures are co-ordinated in a process to provide intervention possible. In this study the variables required to enhance audiological assessment were human resources (professionals), audiological facilities and equipments and audiological assessment procedures. Despite that the human resources, facilities and equipment and audiological procedures were inadequate, the study findings established that there was harmonious collaboration among different professional available. This collaboration was realized among professionals within the audiology section and those from other sections within the ENT department like ENT clinical officers. This is probably the reason why most clients rated the services provided at the audiology section as very good 60%. Another type of collaboration noted by the study was between professionals from Ministry of Health like audiologists and speech therapists and professionals from ministry of education like assessment teachers. The National
Special Needs Education policy framework (2009) recommends that assessment of children with special needs should be conducted by multi-disciplinary team for example from ministries of education, health and social services. However, the policy framework is quick to note that this multidisciplinary approach is applied and only conducted informally since it has not been formalized. The current study established that in KNH, assessment teachers employed by the ministry of education and professionals from ministry of health had a cordial collaboration, which ensured the client received different services under one roof. Probably this could have led to 25% of the clients suggesting provision of audiological services in all district hospitals and further 5% suggesting those district ENT departments to be equipped with assessment teachers.

5.2.3 Enhancing of Audiological Assessment Services in the Country

The Task Force on Special Needs Education (2003) had recommended strengthening EARCs through increased budgetary allocation and equipping. In this study, the professionals in audiology section of KNH suggested that more funds should be allocated to audiological services 25% and training of more manpower 25%. Most of clients 57.5% in this study who are parents of children with hearing impairment suggested that audiological assessment services should be made free and made available in all district hospitals. This is due to the fact that most of the
services provided in KNH and other hospitals, audiological assessment included are charged some amount of money. Also not all hospitals provide audiological assessment services due to either lack of facilities and equipments or personnel. Therefore the clients are constrained economically when they are referred to KNH and pay for the service as well as their transport. From this study it seems the biggest barrier to provision of audiological assessment services is lack of enough funds.

5.3 Recommendations of the Study

Following the current study findings the researcher would like to put forward the following recommendations.

5.3.1 Policy Recommendations

This study has established that key dynamics in educational audiological assessment revolve around inadequate funds, personnel, facilities and equipments. This calls for training of more personnel in this area and provision of enough modern facilities subsequently; it is recommended that more funding be set-aside for this purpose. The government should aim at having at least one audiological assessor in every EARC and every government hospital. The National Special Needs Education Policy framework (2009) acknowledges that assessment teachers posted to the
EARCs are either not well trained in assessment or lack necessary facilities to assess learners with special needs and disabilities, among them those with hearing impairment. Therefore more facilities and equipments which are in line with current technology should be provided in every EARC and every public hospital. The government should put in place policy guidelines in regard to educational audiological assessment that ensures children with hearing impairment are identified, assessed and placed the earliest possible in line with early intervention procedures. Other stakeholders related to the field of hearing impairment should supplement government’s effort by forming associations similar to American speech language – Hearing Association (ASHA) which can review and recommend to the government the diverse requirements of assessment process from time to time. Such an association made of professionals in this area should come up with elaborate and clear guidelines on audiological assessment, which can be ratified by the government for practice in all the EARCs and E.N.T departments of public hospitals. It is important to make audiological assessment services free in all government institutions. KNH charges those services though in the EARCs they are offered freely.
Audiology is both Educational and health issue. Therefore there is need for more and structured collaboration among EARCs and E.N.T department of the hospitals. At KNH, assessment teachers and audiologists operate under one section, which enhances quick and efficient service delivery to the clients. The ministries of Education and Health should work out a similar structure at least in all district hospitals. Ideally operations of the EARCs including audiological assessment are supposed to be carried out by multidisciplinary teams made of professionals from different fields like health, education and social services among others. Due to lack of a clear structure these teams rarely function. If all the audiological assessment services (both medical and educational) are provided under one roof, it will ensure maximum utilization of available facilities and equipments and save time.

5.3.3 Advocacy and Awareness Creation

Usually when parents are confronted with a problem of having a child with hearing impairment, they lack information on where to get necessary services. The National Special Needs Education Policy Framework (2009) recognizes that parents and the community are primary in the process of identification. They are the first contact with the child at birth and closely relate with the child during the early development processes. Lack of awareness about issues surrounding children
with hearing impairment by service providers, policy makers and the community at large is a common problem. There is low level of advocacy and lobbying for the rights of children with hearing impairment by parents, communities and disability organizations. Issues relating to hearing impairment should be given prominence in public meetings and the media if the goal of early intervention is to be achieved. All government officers and general public should be fully sensitized on hearing impairment issues.

5.3.4 Recommendations for further Research

Further research is hereby recommended. The dynamics surrounding audiological assessment process for children with hearing impairment need to be fully established for early intervention purposes. This study was done at KNH in Nairobi. A similar study should be replicated in other hospitals in rural Kenya so that the people there could also benefit from the findings. There is also need to conduct such a study among other forms of disabilities such as visual impairments, physical impairments, and mental impairments among others. This is to establish dynamics in assessment process of children with those impairments.
REFERENCES


Bureau of Statistics.


APPENDIX A

QUESTIONNAIRE FOR PERSONNEL IN AUDIOLOGY SECTION

Introduction:
Kindly answer all questions by ticking (✓) the appropriate response box or filling in the blank spaces provided. Do no indicate your name. Any information you give will be treated with total confidentiality and will be used for research purpose only.
Part A. Bio Data

1. Sex: Male ☐ Female ☐

2. Professional qualifications:
   - Certificate ☐
   - Diploma ☐
   - Graduate ☐
   - Other (specify) ………………………………………………………..

3. Are you trained? Yes ☐ No ☐
   (a) If yes, in which area are you trained ………………………………………

4. For how long have you worked in this section after training? ……………

Part B: Human and Material Resources available at Audiology section.

Kindly show your opinion about the human resources and audiological facilities at audiology section by ticking (✓) in the box that matches your answer.

5. What is your feeling about the number of staff/specialists working at the section?
   - More than enough ☐
   - Enough ☐
   - Not enough ☐

6. What is your opinion about audiological procedures included in the assessment process?
   - Very adequate ☐
   - Adequate ☐
7. What do you feel about the facilities and equipment used for assessment in the section?

Very adequate
Adequate
Inadequate
Very inadequate

8. Are the facilities and equipment used in the section suitable for assessment of children of different ages?

Yes
No

9. What is your satisfaction about post-assessment services offered after hearing test?

Very satisfied
Satisfied
Not satisfied

Part C: Opinion on ways of improving audiological service provision in the country

12. What challenges do you encounter during the assessment process related to your profession?

........................................................................................................................................................................
.................................................................................................................................................................

13. In your opinion what should be done in order to improve the audiological services provided by audiology section of KNH and the country at large?

........................................................................................................................................................................
........................................................................................................................................................................
APPENDIX B

OBSERVATION CHECKLIST OF AUDIOLOGY SECTION

1. Audiological assessment procedures

(A) Behavioural procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Available</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Distraction test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) Co-operative test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) Performance test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iv) Pure tone audiometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Air conduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Bone conduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(v) Tympanometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(vi) Speech test of hearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(vii) Visual response audiometry (VRA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(viii) Austropalpebral Reflex (APR)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(B) Physiological procedures

(i) Neo-natal screening

(ii) Electric Response Audiometry (ERA)
- Electocochleography
- Auditory brain stem response (ABR).

(iii) Oto-acoustic emissions (OAEs)
2. **Provision of Assistive device**

<table>
<thead>
<tr>
<th>Device</th>
<th>Available</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Behind the ear BTE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii. Body worn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii. In the canal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv. In the ear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v. Digital hearing aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi. Cochlea implant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii. Surgical services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii. Others (Specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. **Human Resources**

<table>
<thead>
<tr>
<th>Professional</th>
<th>Available</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Audiologists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii. Speech therapists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii. Assessment teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv. Ear mould technician</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **Assessment centre**

   (i) Sound proof audiometry room available

   (ii) If available, is it built according to design recommendations?

   Yes [ ] No. [ ]

5. **Assessment equipment.**
## Equipment Available

<table>
<thead>
<tr>
<th>No.</th>
<th>Equipment</th>
<th>Available</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Otoscope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Chime bar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Sound level meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Tuning fork</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Warbler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Play audiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Brain evoked response audiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Toys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Vibrators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Tympanometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Speech test materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Audiology room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Post assessment services offered at audiology section.

<table>
<thead>
<tr>
<th>Post assessment service</th>
<th>Offered</th>
<th>Not offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech therapy for children with speech problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of assistive devices e.g. hearing aid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of educational and other placements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counselling of parents of children with hearing impairment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow up after placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training on use and care of assistive devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of ear mould technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness seminars and workshops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of outreach services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cochlear implantation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INTERVIEW GUIDE FOR PARENTS

1. How did you come to know about the audiological services of KNH tick (√) where appropriate?
   (a) From teachers
   (b) From local administration
   (c) From EARCs
   (d) From church
   (e) Through friends
   (f) Through relatives
   (g) Others (Specify) ___________________________________

2. How would you rate the various services provided at the audiology section of KNH?
   Tick (√) where appropriate

   Excellent
   Very good
   Good
   Fair
   Poor
   Unable to rate

3. Which sub-section would you choose as the best in audiology section.
   Tick (√) where appropriate.
<table>
<thead>
<tr>
<th>Service</th>
</tr>
</thead>
</table>
| Audiometry                      | [ ]  
| Speech therapy                  | [ ]  
| Educational assessment          | [ ]  
| Ear mould technology            | [ ]  

4. Among the different services offered at the audiology section which service interested you most?

…………………………………………………………………………………………………………………………
…………………………………………………………………………………………………………………………
…………………………………………………………………………………………………………………………
…………………………………………………………………………………………………………………………

5. In your opinion what would you like to be done to improve audiological services in the country?

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