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EXISTENCE OF LEARNERS WITH HEARING IMPAIRMENT WHO CAN BENEFIT FROM AUDIOLOGICAL REHABILITATION FOR IMPROVEMENT OF ORAL/AURAL COMMUNICATION IN PRIMARY SCHOOLS FOR THE DEAF IN WESTERN REGION OF KENYA

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ABSTRACT

Hearing impairment is significantly unidentified disability in young children. National statistics of learners with hearing loss show the incidence of concomitant disabilities as a common problem. Some estimates of the occurrence of additional disabilities in children with hearing impairments are as high as 35% and vary between 40% and 70% for those with visual impairments alone. Children who have mild or unilateral permanent hearing loss may experience difficulties with speech understanding, especially in a noisy environment. Such children require audiological rehabilitation (AR), which is a non - medical therapeutic technique that aims at reducing communication deficits secondary to hearing impairment. To identify learners with hearing impairment who can benefit from audiological rehabilitation requires early detection and hearing assessments. Early detection, hearing assessment and intervention strategies are essential for successful AR among children with hearing impairments. Despite this, the services are not being provided effectively by special education and other relevant services in most developing countries (Kristensen, Baine, and Thorburn, 1987). In Kenya, Children with hearing impairments had been going through assessment services initiated by Ministry of Education, assisted by Non Governmental Organization such as Danish International Development Aid (DANIDA) since 1984. To date there has been no study on establishment of the existence of learners for AR services. The objective of this study was to establish the existence of learners with hearing impairment who can benefit from AR for improvement of oral/aural communication in schools for the deaf in Western Kenya. Audiological rehabilitation model advanced by Stephens and Kramer (2011) was adapted for this study as a conceptual model., Descriptive survey and correlational research design were adopted for this study. Target population comprised 18 head teachers, 188 teachers, and 318 learners with hearing impairments in class three. Saturated sampling technique was used to select 15 head teachers, leaving out 3 for piloting, and 318 Children with hearing impairment in class three (for pure tone audiometry) that purposive sampling technique was used to select 56 teachers. Data was collected using questionnaires, and pure tone audiometry (Hearing Test) for children. Validity of the instruments was established by experts in the area of the study. Reliability was determined through a pilot study using test re-test method. Reliability coefficient for teachers' questionnaires was .87, and head teachers' questionnaires was .89, all significant at $p<.01$indicating that the instruments were reliable. Data analysis was done using descriptive and inferential statistics. Quantitative data was analyzed using descriptive statistics involving frequency counts, percentages, graphs, charts and tables. The findings of this study showed that children who can benefit from audiological rehabilitation do exist in the schools. The study is significant because the findings are expected to contribute to improvement of skills of identifying and auditorily assess children with hearing impairments. Based on research findings, the researcher recommends that the Ministry of Education, Science and Technology through training institutions should provide pre-service and in-service training programs for teachers, particularly in modern methods identifying assess children with hearing impairments.

INTRODUCTION

Hearing impairment is significantly unidentified disability in young children. National statistics of learners with hearing loss show the incidence of concomitant disabilities as a common problem. Chen (2000) reported that some estimates of the occurrence of additional disabilities in children with hearing impairments are as high as 35% and vary between 40% and 70% for those with visual impairments alone. Children who have mild or unilateral permanent hearing loss may experience difficulties with speech understanding, especially in a noisy environment.

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Such children require audiological rehabilitation which is a non - medical therapeutic technique that aims at reducing communication deficits secondary to hearing impairment. To find existence of learners who can benefit from audiological rehabilitation generally requires early detection and hearing assessment. Children with hearing impairment are a population that is too challenging to educate and serve. Most learning take place through visual and auditory channels and when all or anyone of these sensory channels is impaired, incidental and direct learning is reduced. While the impact of hearing impairment may not always be the primary impediment to learning, it is a factor that has a significant impact on a child's ability to learn (Fillenger, Holzinger, Dirmhirn, Van Dijk, and Goldberg, 2009).

Shemesh (2011) also asserted that Hearing impairment is a more prevalent congenital abnormality in young children than other conditions. Since it is a silent handicap, greater emphasis is placed on early identification, reliable diagnosis, and timely intervention. Identification of children who are deaf and hard of hearing depends on reliable information obtained from assessment. The purpose of hearing assessment is to serve as the basis for intervention i.e. planning the learner's daily learning program, establishing a baseline of performance, determining an appropriate placement or change in placement, and suggesting habilitation or rehabilitation process in order to find solutions to the identified problems. Hearing evaluation gives information regarding the potentials of a learner to benefit from his/her residual hearing with or without amplification as well as other assistive listening devices.

Studies have demonstrated that hearing impairment is significantly unidentified in young children. For example, a recent study by Fellinger *et al*. (2009) on an institutionalized population reported percentage of children with hearing impairments as 46%. Chen (2000) also reported national statistics for children with hearing loss as the incidence of concomitant disabilities as a significant problem. The complexities within the population of deaf and hard of hearing children make identification and assessment of deaf children quite challenging.

Attias, Al-Masri, Abukader, Cohen, Merlov, Pratt, Orthman-Jabera, Aber,Read, and Noyek (2006) in their research on identification and assessment of deaf children reported that the prevalence of congenital and early onset hearing loss in most developed countries is estimated to range between 2 – 4 children with moderate - severe hearing loss in every 1000 births. In contrast, limited information is available in developing countries. In Middle East, especially Arab countries for example, the prevalence of hearing impairment are only estimated to be markedly higher than that in Israel or European and North American countries. Their study further revealed that in developing countries, more than 10 children in every 1000 birth are estimated to be affected by a severe – profound hearing loss. Of the 62 million deaf children from the age of 15 and below worldwide, two-thirds reside in developing countries. Smith and Hatcher (1992) also conducted few population based studies in Gambia on identification of deaf children in Sub-Saharan Africa, focusing on deaf children aged 2 – 10 years attending schools for the deaf or special clinics in all villages of 8 districts of Gambia. Findings of this study revealed 27 out of 1000 prevalence of severe to profound hearing impaired children with significant speech problems and therefore required special education programs.

In Kenya, a study on detection of hearing impairment and evaluation of hearing loss in pre-school children revealed lack of qualified personnel and inadequate testing equipment to assess the actual hearing loss in children. This study mainly focused on identification and prevention of hearing impairment, and did not point out reasons for failure to perform appropriate assessment and identification of hearing impairment in children. Unfortunately, the study also failed to provide the number of children with hearing impairment in various categories of hearing loss who can benefit from AR process (Maston, Macharia, Mugwe, Ototo, and Kan, 2001). Skills that teachers require for identification of children with hearing impairment involve screening at an early age, followed by hearing test (pure tone audiometry). National Institute on Deafness and other Communication Disorders [NIDCD] (2013) reported that newborn hearing screening has become the standard of care in the United States. National data suggest that almost half of the babies who do not pass their new born hearing screens are considered lost to follow-up. A multisite team of NIDCD supported scientists has been working to understand the capacity of young children with hearing loss to develop auditory communication skills. It has also been working to develop tools for assessing auditory capacity in these children. Another investigative team carried out a study of young children who were diagnosed with mild – severe hearing loss to determine factors supporting early development of speech, language, cognitive, and psychosocial skills (NIDCD, 2013).

Identifying hearing loss as early as possible according to NIDCD (2013) is important as it enables parents and teachers pursue interactive options to enable a child learn to orally communicate comparably with his/her hearing peers. On the average, hearing impaired children are first identified when they reach 2½ to 3 years old. However, many children with hearing impairment are not identified until they reach 5 or 6 years of age, long after the critical period for speech and language had ended. Modern screening techniques, according to Sokol and Hyde (2002) include automated auditory brainstem response (AABR), transient evoked otoacoustic emisions (TEOAE), and distortion product otoacoustic emisions (DPOAE). These are the modern screening techniques that have replaced the old screening tests such as distraction tests, performance tests etc. Such modern screening devices objectively and automatically detect the responses to sound either on evoked potential or otoacoustic emissions, and the outcome is designed as "pass" or "fail" ("refer") by the automated analyzer. A subject who fails screening test is referred for pure tone diagnostic test.

Pure tone audiometry is a behavioral test used for measuring hearing sensitivity for each ear in the speech frequency range ideally from 250 Hz through to 8000 Hz. The measure involves peripheral and central auditory systems. Pure tone thresholds (PTTs) indicate the softest sound audible to an individual ear at least 50% of the time. To get accurate test outcome, hearing test equipment (the audiometer) must be recalibrated, made to function properly, and used in an acceptable test environment (acoustically treated room). The gold standard of hearing evaluation is behavioral assessment, whose goal is to establish hearing thresholds across speech frequencies for each ear, and to assess, when possible, speech perception at a supra – threshold level. The actual initial test gives the average of hearing sensitivity at 500Hz, 1000Hz and 2000Hz. This average should approximate speech perception threshold (SRT) within 5 dB,and speech detection threshiold (SDT), within 6 – 8 dB (Kutz and Meyers, 2015).

According to McGrath (2014), pure tone audiometry, when conducted according to the right procedure is easy to obtain and often provides information about peripheral hearing acuity across the frequencies used in speech. It also allows for a quick review of how well or poorly an individual can hear specific frequencies. Pure tone audiometric testing provides an excellent overview of an individual's ability to hear and respond to auditory stimuli. Furthermore, the test is widely accepted as the gold standard assessment of peripheral auditory function. Although pure tone test is easy to perform, there are a number of potential challenges to obtaining reliable hearing thresholds. Hearing test can be performed by anyone with knowledge of the basic principles of audiology, nonetheless, a comprehensive hearing evaluation needs to be performed by an audiologist who has acquired skills with the nuances alluded to it. In addition, pure tone thresholds reflect an individual's ability to hear 'beeping' sounds; clearly the ability to hear and comprehend complex sounds such as speech needs to be more specifically tested (McGrath, 2014).

Hearing test requires test instructions presented in a language appropriate to the subject and the interpreters (oral or manual) should be used where necessary. ASHA (2004) gave the following sequential procedure of conducting hearing test (pure tone audiometry):

- Establishes rapport with the subject.
- Take case history of the subject and otoscopy (This will remove any anxieties and set the subject free to give information).
- Instruct the subject to be ready for the test by removing anything that may interfere with proper positioning of headphones on the ears.
- Do thorough examination of the ear,
- Place the headphones on the subject in the most comfortable manner.
- Test on various frequencies and intensities (when appropriate information is available, the better ear should be tested first).

- Plot hearing sensitivity on the audiogram (a graph displaying intensity as a function of frequency which shows the subject's hearing thresholds for pure tones).
- Interpret the audiogram.
- Do a report writing (Information which is necessary when making decisions regarding amplification, oral/aural rehabilitation and education).

During pure tone audiometry, a number of inconsistent mechanical/technical conditions may affect the test outcome. With regard to this, head teachers provided factors that are likely to influence audiometric tests in their various schools. Frequency table was run and presented below:

Table 1. Factors Influencing Pure Tone Audiometry (N = 15)

Factors	f	%
Appropriate testing equipment	14	93.3
Availability of equipment for ear check	14	93.3
Appropriate testing room	14	93.3
Regular recalibration of testing equipment	0	0.0
Client ability to understand the tester's language	14	93.3
Tester ability to understand language of the client	14	93.3

Source: Data 2014

Table 1 shows factors influencing pure tone audiometry. From the findings, it can be observed that majority of the head teachers 14 (98.3%) rated pure tone audiometry as positively influenced by; adequate testing equipment; availability of equipment for ear check; appropriate testing room; client ability to understand the tester's language and tester ability to understand language of the client. Surprisingly, technological factor such as recalibration of testing equipment was not mentioned by any head teacher.

Investigation in this section was aimed at exploring factors influencing pure tone audiometry. On the basis of findings from other studies, the current study did not conform to recommended procedure or steps for effective pure tone audiometry. Balasubramanyan (2013) for example, conducted a study on hearing test with a recalibrated audiometer in a sound proof room involving 215 children with hearing impairments. Recalibration of the audiometer involves pre-setting the audiometer, earphones and bone vibrators, thereby defining audiometric zero. Balasubramanyan conducted workable test techniques and protocols for better results which involved assessing hearing threshold using air conduction by moving from inaudible to audible stimulus intensity; 'ascending' method of threshold estimation of hearing. Interchangeably, he conducted assessment of threshold of air conduction by moving form audible to inaudible; 'descending' method of threshold estimation of hearing. Findings revealed varying levels ranging from slightly moderate to profound hearing loss.

Balasubramanian (2013) further employed testing techniques involving use of short duration signals sent during pure tone audiometry in the order of up by 5 and down by 10 methods until all the frequencies are covered. The final hearing threshold was then plotted on an audiogram. ASHA (2004) in a hearing test suggested factors that are likely to affect reliability of pure tone audiometric test such as poor testing instructions, improper headphones placement, rhythmic tone presentations, excessive background noise, poor ventilation, poor lighting and failure to recalibrate testing equipment.

In developing countries, assessment of deaf children involves screening provided at an early age with a screening audiometer at school entry. Early detection and management of hearing impairment are essential for optimal communication, speech and language development. The purpose of hearing screening is also to detect individuals who have significant or potential significant hearing problems so as to be referred for further diagnostic evaluation and appropriate intervention strategies. The outcome of screening is also one of two possibilities; pass or refer without carrying out a diagnostic test to reveal actual degree of hearing loss and possible site of lesion (Rao, Sumbramanyan, Nair & Rajashekhar, 2002). According to World Health Organization [WHO] (2008), assessment of hearing loss among children in developing countries is provided either at assessment centers or schools. However, acoustically treated rooms for hearing tests are often challenging to pure tone audiometric tests in most schools. Many countries in Africa have various organizations, health services, hospitals, and community based programs that assess learners for hearing loss.

Although identification, early detection and intervention procedures are essential for successful habilitation and rehabilitation of learners with hearing impairments, they are not being covered adequately by special education and other related services in most developing countries. In addition, detection of hearing disabilities is usually done in an uncoordinated manner. Studies conducted in developing countries on assessment and early intervention reveals a number of challanges. Kristensen, Baine, and Thorburn, (1987) for example, reported that Ghana established in the mid 1970's a central assessment and resource centre in Accra whose function was to assess deaf children who failed to cope with school work as well as young hard of hearing children who were referred to the centre by hospitals and parents. Findings revealed that due to assessment which was conducted in uncontrolled manner leading to wrong decisions, the centre could not meet the needs of deaf and hard of hearing in the whole country despite its location in Accra - the country's capital city.

On the contrary, another example of assessment and support services to parents and teachers of children with special needs was also reported by Kristensen et al (1987). Zimbabwe, having its headquarter at the Ministry of Education and Culture; operating from five centers spread throughout the country was able to provide school psychological and assessment services. This spread ensured that all schools are covered, a smooth referral system is established and rehabilitation services are developed. Kristensen et al (1987), in their study recommendations, suggested the following facilities for successful assessment of deaf children: a quiet assessment room furnished with light, proper ventilation, tables, chairs, a mat or mattress for activities requiring the use of floor such as when testing babies, screening materials such as free field audiometer, whistle, tunic fork, rattle, drum, cap and spoon, and finally screening audiometer.

It should be noted that most of these screening materials were developed for use in developed countries, but not available in developing countries with exception for African children, with the exception of hearing and vision tests. For each country or groups of countries, a screening test should be devised to cater for children of 0 – 6 years and school age so as to allow assessment for hearing, sight, motor, language and social problems.

Of the above mentioned studies, there was inadequate information concerning degree of hearing loss for children who face the stigma of deafness. Danish International Development Aid (DANIDA) funded project established a total of 73 EARC across the country to carry out assessment of all handicapped children. Awareness raising initiatives and Community Based Rehabilitation (CBR) programs referred parents to EARCs for assessment of children suspected to be deaf in the community. Kenya government through the Ministry of Education recommended that each EARC should be equipped with four special education teachers; one for each of the four types of disability (hearing, visual, physical, and learning disability) (MOE, 2008).

Kenya Society for Deaf Children (KSDC) carried out an extensive statistical research from 1994 – 1998 in an attempt to determine the number of deaf children in Kenya. Findings revealed a prevalence of 63 people in every 1000 with various forms of hearing losses and the estimated number of deaf children was 230,000. It was noted that 80% of the hearing loss was acquired and therefore preventable. In Kenya, stigma prevents children from being identified at an early age, and many are identified when they are 5 – 6 - 7 years old. The study by KSDC did not include categories of deaf children in terms of age and severity of deafness.

Kenya and Uganda have also established Educational Assessment and Resource Centers (EARC) that provide assessment service programs. In Kenya, there are more than 73 EARC having identified more than 8,000 children with hearing impairment since the establishment of assessment services in September 1984. The staff at the centers was recommended to comprise assessment committee that includes representatives from local administration (education, health, social welfare etc.). In addition to assessment and consequent school placement, the centers also provide hearing aids to hearing impaired learners after assessment (Wilson, 2006).

The centers according to Wilson (2006) were also expected to perform other functions such as guidance and counseling to parents, in-service training to teachers, production of assessment materials, and providing support services to other special schools for the deaf. The centers also provide the much needed peripatetic services for schools with integrated children. Although early detection and intervention are essential for successful rehabilitation of learners with hearing impairments, they are not being provided effectively by special education and other relevant services in most developing countries (Kristensen, Baine, and Thorburn, 1987). Despite the current initiatives by the Kenya government to train teachers on assessment skills, Wamocho Karugu, and Nwoye (2008) in their survey on assessment of children with special needs in Kenya reported inadequate and limited audiometric assessment services provided to learners with hearing impairments. However, their study did not suggest intervention strategies for learners with hearing impairments after assessment. The Ministry of Education, Science and Technology [MOEST] (2009) in its review also reported various challenges encountered at the assessment centers countrywide. The challenges include lack of reliable data about the learners, lack of adequate tools for assessment, lack of skills for identification and assessment tailored to specific disabilities among others.

Furthermore, educational assessment and resource centers in Kenya still practice old screening tests and techniques such as distraction tests, performance tests etc. The centers have no access to new screening and assessment techniques as well as modern devices used to objectively and automatically detect responses to sound either on evoked potential or otoacoustic emissions, and the outcome is designed as “pass” or “fail” (“refer”) by the automated analyzer. Based on this background, the current study was set to establish, through assessment and hearing tests the existence of learners with hearing impairment in class three who are presumed to be 6 – 12 years old and whose hearing loss range between 16 - 55 dB HL. This group of learners is referred to as hard of hearing (HoH). Their primary mode of communication is spoken language and lip-reading and can benefit from AR process.

MATERIALS AND METHODS

The study used both descriptive survey and correlational research design. It was carried out in 9 counties in Western region of Kenya. The study population comprised of 18 head teachers, 188 teachers, and 318 hearing learners within the hearing threshold of 16 - 55 dB HL. Sampling frame comprised of 15 head teachers (83%), leaving 3 out for piloting, and 318 learners with hearing impairment selected through saturated sampling technique. Purposive sampling technique was used to select 56 (30%) teachers.

The teachers were selected because they fulfilled the definition of a true case stated by their responsibilities and specialized training in audiology and audiological rehabilitation process. Questionnaires and pure tone audiometry (hearing test) were used as data collection instruments. Content and face validity of the instruments were determined by experts in the area of the study. Reliability of the instruments was determined through pilot study using a test re-test (coefficient of stability) method to estimate the degree of reliability of the instruments.

Data obtained from the respondents was collated, put into excel spread sheet and imported into statistical package for social sciences (SPSS) version 19. Quantitative data obtained through questionnaires and hearing test was analysed by using descriptive statistics and presented using descriptive statistical tools which entails frequency counts, means, graphs, and percentages.

RESULTS AND DISCUSSION

Focus was made on the establishment of existence of hard of hearing learners who can benefit from AR process. To achieve this objective, the number of children in class three from all the schools selected according to their hearing threshold ranging from 16 – 55 dB HL (i.e. from slight to moderate hearing loss) was determined through pure tone audiometry. Analysis was done and the frequency tables were run as shown below:

This accounted for 318 across frequencies ranging from 250 Hz to 4000 Hz with corresponding intensities from 16 – 90+ dB HL. Findings further showed that children who fall between slight to moderate (i.e. from 16 – 55 dB HL) were 95.

Table 2 shows the number of children according their hearing threshold.

Table 2. Learners' Hearing Threshold in dB HL (N = 318)

Hearing threshold	dB HL	F	%
Slight hearing loss	16 - 24 dB	20	6.29
Mild	25 - 40 dB	33	10.38
Moderate	41 - 55 dB	42	13.21
Moderately severe	56 - 70 dB	72	22.64
Severe	71 - 90 dB	112	35.22
Profound	90 + dB	39	12.26
	Total	318	100.00

KEY: N = Approximated number of hearing impaired learners
dB HL = Decibel Hearing Loss

This conforms to approximately 30% of the children in class three who can benefit from AR process. This finding is consistent with findings of other studies. Attias et al (2006) for example, reported that of the 62 million deaf children from the age of 15 and below worldwide, two-thirds reside in developing countries. Out of this number however, more than 10 children in every 1000 birth are estimated to be affected by a severe – profound hearing loss.

Smith and Hatcher (1992), in population based studies with children aged 2 – 10 years, in Gambia also lent support to this finding by reporting that 27 out of 1000 severe to profound hearing impaired children with significant speech problems existed. It can therefore be concluded that hearing impairment, being a silent handicap and significantly unidentified in young children exist. The researcher is of the opinion that greater emphasis should be placed on early identification, reliable diagnosis, and timely intervention. Since detection of hearing impairment and evaluation of hearing loss requires knowledge and skills on the part of teachers and/or audiologists, teachers were asked to rate their skill and competence levels, and the right sequential order of conducting pure tone audiometry respectively. With regard to pure tone audiometry, rating table was run as preliminary analysis of the competence and skills and presented in Table 3:

somewhat competent in identification of learners with hearing impairments yet identification is the starting point of hearing assessment. Summary of the teachers' competence in pure tone audiometry was also done. The overall teachers' competence in pure tone audiometry was established after coding teachers responses on three specific areas namely: audiometric testing (hearing test), identification of hearing impaired learners, audiogram taking and interpretation). Those who indicated their competence in 2 or 3 areas scored 50% and above and were considered competent while those who scored less than 50% were considered incompetent. This was analyzed and reported in Table 4:

Table 4. Teachers competence in Pure Tone audiometry (n =56)

Areas of Competency	Competency Level		
Pure tone audiometry	Competent	Incompetent	None committal
Identification of HI Learners	54(96.4%)	2(3.6%)	0(0.0%)
Audiometric testing	45(80.4%)	11(19.6%)	0(0.0%)
Audiogram interpretation	44(78.6%)	10(17.9)	2(3.6%)

Table 4 shows that generally 54 (96.4%) of the teachers were competent in Identification of hearing impaired learners while only 2(3.6%) were incompetent. 45(80.4%) of the teachers were competent in audiomeric testing (hearing test) while 11(19.6%) were incompetent and 44(78.6%) of the teachers were competent in audiogram interpretation while only 10(17.9%) were incompetent. As a measure of teachers' competence in pure tone audiometry, they were also asked to state the right sequential order of conducting pure tone audiometry.

Those who indicated all the nine steps in the right order were coded as "1", indicating competence while those who missed one or more steps were coded as "0", indicating incompetence. This was tabulated and recorded in Figure 1. Figure 1 shows sequential order of conducting pure tone audiometry. Findings revealed that majority of the teachers 43 (76.8%) failed to indicate the right sequential order of conducting pure tone audiomery, and therefore were rated incompetent.

Table 3. Teachers' Competence in pure tone audiometry (n =56)

Areas of Competency	Teachers' rating of their competency					
Pure tone audiometry	HC	C	SWC	SWIC	IC	HIC
Identification of hearing impaired learners	23 (41.1%)	28 (50.0%)	3 (5.4%)	1 (1.8%)	-	1(1.8%)
Audiometric testing	6(10.7%)	27(48.2%)	12 (21.4%)	4 (7.1%)	5 (8.9%)	2 (3.6%)
Audiogram interpretation	10 (17.9%)	20 (35.7%)	16 28.6%)	3 (5.4%)	5 (8.9%)	2(3.6%)

KEY: HC = Highly Competent C = Competent SWC = Somewhat Competent
SWIC = Somewhat Incompetent IC = Incompetent HIC = Highly Incompetent

Table 3 shows competence rating by 56 teachers. Findings revealed that highly competent was rated in the area of identification of hearing impaired learners at 23 (41.1%), while competent was rated by 28(50.0%) of the teachers in the same area. Only 6(10.7%) of the teachers were highly competent in audiometric testing (hearing test) while more teachers 27(48.2%) were competent in the same area. Only 10 (17.9%) of the teachers were highly competent in audiogram interpretation while 20 (35.7%) of the teachers were competent in the same area.

Significant number of teachers, 16 (28.6%) were somewhat competent in audiogram interpretation while 12 (21.4%) of the teachers were somewhat competent in audiometric testing. It was surprising to note that only 3 (5.4%) of the teachers were

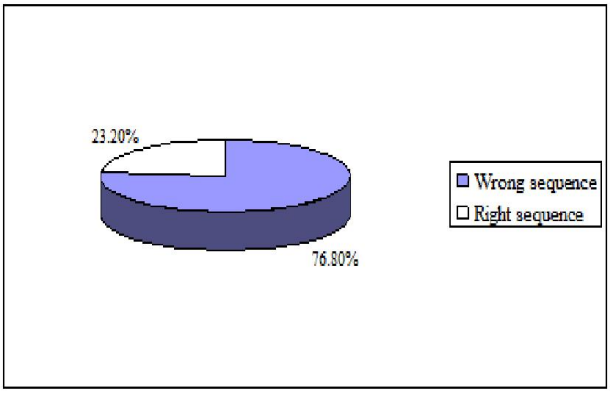

Figure 1. Order of Conducting Pure Tone Audiometry

Only 13 (23.2%) of the teachers stated the right order, indicating that they were competent. Generally, findings in teachers' competence in pure tone audiometry did not measure to the standard sequential order. This was due to challenges such as lack of knowledge and skills by teachers. Earlier studies demonstrated that the right order of conducting pure tone audiometry starts from establishing rapport with the subject to writing a report for proper decision making (ASHA, 2004). The current study finding therefore did not measure to the standard of accepted techniques and procedure for pure tone audiometry.

Finding of the current study are also challenged by Balasubramanian (2013) who conducted a hearing test to 215 hearing impaired children and recorded accurate hearing threshold in various degrees. Based in the findings in the current study, it can be concluded that generally, teachers were not competent in pure tone audiometry. Reasons for the current study was supported by Wamocho, et al, (2008) who reported various challenges relating to identification and assessment of learners with hearing impairments in Kenya.

The challenge which included inappropriate testing rooms, inadequate testing machines etc. eventually resulted to inappropriate placement of the assessed children despite the government initiatives to train more teachers on assessment skills countrywide. Kristensen et al, (1987) also reported similar challenges facing assessment and testing hearing loss for hearing impaired children in developing countries.

Summary, Conclusions and Recommendations

The study focused on the establishment of the existence of hearing impaired learners who can benefit from AR process in schools for deaf in Western Kenya. With regard to this, it can be concluded that there was adequate number of hearing impaired learners who can benefit from audiological rehabilitation process.

With regard to teachers' competence and skills in identification and assessing children with hearing impairments, it can be concluded that generally teachers were incompetent in pure tone audiometry. Rating teachers' competence and skills in pure tone audiometry discovered incorrect standard in the practice of hearing test, implying that teachers' level of competence was below the expected standard**.**

Recommendations

Based on the findings, the researcher recommends that testing rooms in all the schools should be acoustically treated in order to provide accurate test outcome. Furthermore, since aspects that are significantly related to the teachers' lack of knowledge in basic audiology and AR process contribute more to test outcomes, it was recommended that pre-service and in-service training on assessment skills be provided to teachers during their training thereby equipping with modern screening and assessment techniques.

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