



PREVALENCE, TYPES, AND DEGREE OF HEARING LOSS AMONG PATIENTS CONSULTING RWANDA MILITARY HOSPITAL

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Abstract:

Background: Untreated hearing loss or inadequate support for a person's communication requirements can have a substantial negative impact on their quality of life. Despite this, the prevalence, types, and degree of hearing loss in Rwanda are only sparsely documented.

Objectives: The main goal of this study was to assess the prevalence of hearing loss among patients who consulted the RMH ENT department over the period of three years, from 2019 to 2021.

Methods: At the Rwanda Military Hospital, a three-year retrospective study was conducted with a focus on information regarding patients who consulted for hearing loss complaints between 2019 and 2021. Data were gathered using a user-created questionnaire and were then analyzed using SPSS version 21.0. Numerical data were examined using average and standard deviation whereas categorical and nominal variables were evaluated using frequencies and percentages.

Results: In total, 3823 patients consulted the ENT department at RMH. Of these, 703 (18.4%) were confirmed with hearing loss. The average age of patients with hearing loss was 39.6 ± 23.0 years with 44% of those aged 40 years or above. About 58% of patients with hearing loss were male. Sensorineural hearing loss was the major type for 72%, in addition to conductive hearing loss (15%) and mixed hearing loss (13%). In general, 24% of the patients had profound hearing loss, along with 23% who had moderate hearing loss, 20% who had moderately severe hearing loss, 20% who had severe hearing loss, and 13% who had mild hearing loss. Bilateral hearing loss was reported in 56% of the patients. Chronic suppurative otitis media (CSOM), which was noted in 9% of all patients with hearing loss, despite 72% of the risk factors not being addressed, was followed by trauma (6.5%), presbycusis (4.4%), and acute otitis media (1.7%).

Conclusions: At the Rwanda Military Hospital, hearing loss was prevalent in 18.4% of the cases. About 72% of the patients had sensorineural hearing loss as their primary type of hearing loss. There were 24% and 20% of the patients who had profound and severe hearing loss, respectively. In 56% of the patients, bilateral hearing loss was noted. For 9% of the patients, CSOM was the only significant risk factor. These results indicate that hearing loss is a serious public health concern in Rwanda due to its high prevalence and chronic nature.

Keywords: *hearing loss, audiometry, CSOM*

INTRODUCTION

Hearing loss is a universal problem that can affect everyone. It is ranked as the fourth leading cause of years lived with disability (1,2). Literally, it is said that a person loses his hearing ability if he cannot hear like someone with normal hearing, which means 25 decibels(dB) or less in both ears obtained as an average of the lowest possible hearing level of pure-tone of 500Hz, 1000Hz, 2000Hz, and 4000Hz (1). Disabling hearing loss refers to the hearing loss that is greater than 40 dB in the better-hearing ear in adults and greater than 30 dB in the better-hearing ear in children (3). Nearly 75 % of those who suffer from hearing loss live in low- and middle-income nations (4). Hearing loss becomes more common as people get older; about 40 % of people over the age of 50 have age-related hearing loss (5).

According to recent data, over 1.5 billion people living in the world who account for 20% of the global population live with hearing loss (6). In a 2016 study done in the United States, hearing loss affected 23% of people aged 12 years and above. The majority of these people have mild hearing loss. However, among people aged 80 years and above, moderate hearing loss is more common than mild hearing loss (7). A systemic literature review conducted in Europe to get a picture of the prevalence of age-related hearing loss found that 30% of men and 20% of women had a hearing loss of 30 dB or more at 70 years and 55% of men and 45% of women aged 80 years (8).

Hearing loss appears to be more common in sub-Saharan Africa where Rwanda is located than in the most affluent parts of the world. WHO estimates suggest that the prevalence of disabling hearing loss (defined as hearing loss >35 dB) among adults aged >15 years was 15.7% in sub-Saharan Africa, compared to 4.9% in high-income countries (9). There are not many studies conducted on hearing loss prevalence in Rwanda, but data from the 2012 Rwanda Census and Household Census estimates the prevalence of hearing impairment to be 0.4% in the country. In addition, 16% of all people with disabilities in Rwanda have a hearing impairment (10).

In 2009, a cross-sectional descriptive study conducted on 1073 school children aged 6-13 years from 11 elementary schools in Kigali found hearing loss prevalence of 13.3%, with 11.4% being conductive hearing loss, 1.2% being sensorineural hearing loss and 0.9% being due to combined hearing loss. The prevalence of disabling hearing loss was 1.4%. The most common ear condition was ear wax compaction, found in 18% of children, followed by otitis media with effusion, accounting for 6.7% (11). A 2014 study at the University Teaching Hospital of Kigali (CHUK) of 394 patients suffering from hearing loss found that 58% had mild hearing loss, 29.4% had moderate hearing loss, 6% had severe hearing loss, while 1% had profound hearing loss, and identified the most common cause was CSOM (35%) (4). In 2019, Bukuru et al. conducted a cross-sectional study in Gakiriro in the city of Kigali among 200 wood and metal workers and the overall prevalence of hearing loss was 36% with 35.5% who had occupational noise-induced hearing loss (ONIHL) (12).

Hearing loss is common and can significantly affect a person's life if left unattended or if their communication needs are not adequately supported. The consequences of hearing loss are numerous and can be serious. These include loss of the ability to communicate with other people, and language delay in children, which can lead to stigma, rejection, and frustration, especially in older people with hearing loss (5,11,12). It is estimated that 1.57 billion people worldwide had hearing loss in 2019(13). The prevalence of hearing loss continues to increase worldwide, and it is estimated that by 2050, it will be 2.56 billion people (14). Hearing impairment is on the rise in low-income countries such as Rwanda, where it is more common among active population (8).

This study intended to provide a clear image of the prevalence of hearing loss in patients of all ages who consulted the ENT department at Rwanda Military Hospital. As Rwanda military hospital's catchment area is mainly the eastern province, which is more populated among others, and also RMH owns the Audiology Centre of Excellence in the whole country, we hope that this study provides information about hearing loss in the Eastern province. The results of this study will contribute much to the awareness of hearing loss at Rwanda Military Hospital, and will play an important role in future studies on hearing loss in Rwanda.

Objectives of the Study

The general objective of this study was to evaluate the prevalence of hearing loss among patients who consulted the RMH ENT department during a period of three years, from 2019–2021.

- [1.] To determine the types and degree of hearing loss at RMH
- [2.] To evaluate the predisposing conditions of hearing loss among patients consulting RMH

Research Questions

- [1.] What is the prevalence of hearing loss at RMH over the three-year study period?
- [2.] What are the types and degrees of hearing loss at RMH?
- [3.] What are the predisposing conditions to hearing loss at RMH?

STUDY METHODS

This study was conducted within 8 months duration at RMH. RMH is one of the teaching hospitals in Rwanda located in Kigali city, Kicukiro district, Nyarugenge sector, Busanza cell. It owns Audiology Unity which is the Audiology Center of Excellence in Rwanda. This study was retrospective, descriptive, and cross-sectional. It involved the review of patients files who presented with hearing loss complaints at RMH from January 2019 to December 2021. The sample size included all patients with complaints and confirmed cases of hearing loss at RMH Audiology Unity from 1st January 2019 to 31st December 2021. We collected data using a preset questionnaire and relevant data were collected to respond to the objectives and research questions of our study from the archive kept by the RMH ENT department. After collection, data were entered into Microsoft Excel data form and analyzed using SPSS. Before conducting the study, the research proposal was submitted to the RMH ethical research committee to get the ethical approval, and the permission to collect data from hospital archives was granted. To maintain confidentiality, the data collected in this study were only used for this research. The names as well as hospital identification numbers of the patients were not used. As the study did not involve patients, except for the use of the patients' records and results, there was no need for the consent form.

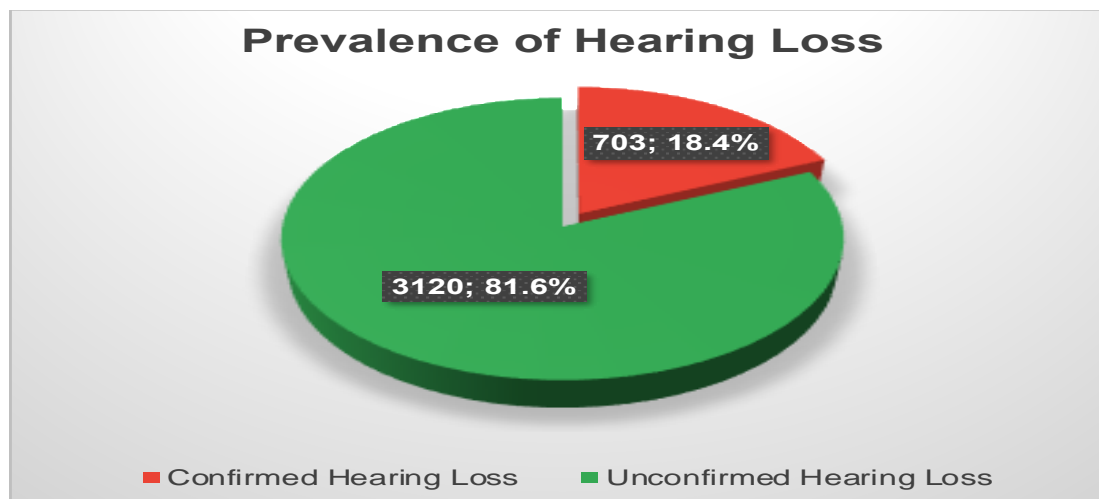
RESULTS

Between 2019 and 2021, 3823 patients consulted the audiology unit at Rwanda Military Hospital with hearing loss complaints. The prevalence of hearing loss in this current study was drawn from these patients who attended RMH for hearing loss complaints. After the prevalence, a special analysis of the patient's data with confirmed hearing loss was performed. Therefore, the analysis of types, risk factors, and degree of hearing loss was performed using data from patients with confirmed hearing loss.

Prevalence of Hearing Loss

The prevalence of hearing loss refers to the proportion of individuals within a specific population who have a hearing impairment. It is often expressed as a percentage or a ratio and is a critical measure in understanding the impact of hearing loss on a given population. Several factors contribute to variations in prevalence rates, including age, gender, geographic location, and the criteria used for defining hearing loss. It is important to note that prevalence rates can be influenced by the criteria used for diagnosis, the methodologies employed in studies, and the specific populations under investigation. Regular monitoring and updated prevalence data contribute to informed public health policies and targeted interventions to address hearing loss on a global scale.

Figure 1: Cases of Hearing Loss Consulted at RMH ENT



Of all 3823 patients consulted Rwanda Military Hospital for hearing loss between 2019 and 2021, 703 (18.4%) were confirmed for hearing loss. Thus, the hospital-based prevalence of hearing loss was 18.4%.

Table 1: General Description of Patients Confirmed for Hearing Loss

Variable	Number of Patients	Percentage
Gender		
Female	294	41.8
Male	409	58.2
Total	703	100.0
Age (mean=39.6, SD=23.0)		
Under 20 years	160	22.8
20 – 39 years	234	33.3
40 – 59 years	157	22.3
60 years and above	152	21.6
Total	703	100.0
Province of Residence		
Kigali	351	49.9
East	211	30.0
West	64	9.1
South	49	7.0
North	28	4.0
Total	703	100.0

The majority (58%) of the patients confirmed for hearing loss were males. On average, patients with confirmed hearing loss was 39.6 (approximately 40) years old with a standard deviation of 23 years. Patients under the age of 20 made up 23% of those with confirmed hearing loss, those between the ages of 20 and 39 made up 33%, those between the ages of 40 and 59 made up 22%, and the other 22% represented those aged 60 and over. The majority (50%) of patients admitted at RMH for hearing loss and confirmed for hearing loss were habitants of Kigali city. The remaining 50% resided outside of Kigali, comprising 30% from East, 9% from West, 7% from South, and 4% from North.

Table 2: Types and Degree of Hearing Loss at RMH

Degree	Conductive Hearing Loss (CHL)	Sensorineural Hearing Loss (SNHL)	Mixed Hearing Loss (MHL)	Total
	N (%)	N (%)	N (%)	N (%)
Mild	25 (23.4)	57 (11.2)	10 (11.4)	92 (13.1)
Moderate	25 (23.4)	123 (24.2)	16 (18.2)	164 (23.3)
Moderately Severe	24 (22.4)	93 (18.3)	25 (28.4)	142 (20.2)
Severe	15 (14.0)	106 (20.9)	18 (20.5)	139 (19.8)
Profound	18 (16.8)	129 (25.4)	19 (21.6)	166 (23.6)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)

Approximately, 72% of patients confirmed for hearing loss had sensorineural hearing loss (SNHL), 15% had conductive hearing loss (CHL), and 13% had mixed hearing loss (MHL). Generally, profound hearing loss was observed in 24% of the patients, in addition to 23% with moderate hearing loss, 20% with moderately severe hearing loss, 20% with severe hearing loss, and 13% with mild hearing loss. Only 11% of the 508 patients with sensorineural hearing loss (SNHL) had mild hearing loss, whereas 25% had profound hearing loss, 24% had moderate hearing loss, 21% had severe hearing loss, and 18% had moderately severe hearing loss. Similar to moderate conductive hearing loss, 23% of patients had mild conductive hearing loss (CHL). A total of 107 individuals had conductive hearing loss, with the severity ranging from moderately severe in 22% of cases to severe in 14% and profound in 17%. In 88 patients with mixed hearing loss, the severity varied from mild in 11% to moderate in 18% to moderately severe in 28% to severe in 21% to profound in 22%.

Table 3: Distribution of types of hearing loss by gender and age groups

Variable	Conductive Hearing Loss (CHL)	Sensorineural Hearing Loss (SNHL)	Mixed Hearing Loss (MHL)	Total
	N (%)	N (%)	N (%)	N (%)
Gender				
Female	47 (43.9)	217 (42.7)	30 (34.1)	294 (41.8)
Male	60 (56.1)	291 (57.3)	58 (65.9)	409 (58.2)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)
Age				
Under 20 years	31 (29.0)	119 (23.4)	10 (11.4)	160 (22.8)
20 – 39 years	41 (38.3)	148 (29.1)	45 (51.1)	234 (33.3)
40 – 59 years	21 (19.6)	118 (23.2)	18 (20.5)	157 (22.3)
60 years and above	14 (13.1)	123 (24.2)	15 (17.0)	152 (21.6)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)

Male patients outnumbered female patients for all categories of hearing loss. Male patients made up 66% of those with mixed hearing loss, 57% of those with sensorineural hearing loss, and 56% of those with conductive hearing loss. Most patients with conductive hearing loss (67%) were under 40 years old, with 20% being under 20 and 38% being between 20 and 39. The remaining 33% were 40 years of age or older, with 13% being 60 years of age or older, and 20% being between the age of 40 and 59. About 53% of patients with sensorineural hearing loss were under 40 years old, including 29.1% who were between the age of 20 and 39, and 23.4% who were under 20. Another 23% were between the age of 40 and 49, and 24% were 60 years or older, making up the remaining 47% the SNHL patients. Only 11% of individuals with mixed hearing loss were under 20, while the majority (51%) were in the 20 to 39 age range. Furthermore, 17% of these patients were 60 years of age or older, and 20% of the patients were between the age of 40 and 59.

Predisposing Conditions to Hearing Loss

Recognizing the predisposing conditions to hearing loss is crucial for implementing effective preventive measures, facilitating early detection, and tailoring interventions to improve the overall outcomes for individuals with hearing impairment. It plays a vital role in both individual healthcare and broader public health efforts aimed at reducing the burden of hearing loss in society

Table 4: Onset of Hearing Loss and Conditions Predisposing Patients to HL

Variable	Conductive Hearing Loss (CHL)	Sensorineural Hearing Loss (SNHL)	Mixed Hearing Loss (MHL)	Total
	N (%)	N (%)	N (%)	N (%)
Onset				
Congenital	3 (2.8)	46 (9.1)	0 (0.0)	49 (7.0)
Progressive	59 (55.1)	220 (43.3)	59 (67.0)	338 (48.1)
Sudden	11 (10.3)	17 (3.3)	17 (19.3)	45 (6.4)
Unknown	34 (31.8)	225 (44.3)	12 (13.6)	271 (38.5)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)
Factors				
Chronic Suppurative Otitis Media (CSOM)	12 (11.2)	11 (2.2)	41 (46.6)	64 (9.1)
Trauma	13 (12.1)	15 (3.0)	18 (20.5)	46 (6.5)
Presbycusis	2 (1.9)	26 (5.1)	3 (3.4)	31 (4.4)
Acute Otitis Media (AOM)	4 (3.7)	7 (1.4)	1 (1.1)	12 (1.7)
Otitis Media with Effusion (OME)	5 (4.7)	2 (0.4)	1 (1.1)	8 (1.1)
Congenital Anomalies	0 (0.0)	7 (1.4)	1 (1.1)	8 (1.1)
Otitis Externa (OE)	7 (6.5)	0 (0.0)	1 (1.1)	8 (1.1)
Autism	0 (0.0)	8 (1.6)	0 (0.0)	8 (1.1)
Use of Ototoxic Drugs	0 (0.0)	5 (1.0)	0 (0.0)	5 (0.7)
Allergic Rhinitis	1 (0.9)	3 (0.6)	0 (0.0)	4 (0.6)
Otitis Media (OM)	0 (0.0)	0 (0.0)	1 (1.1)	1 (0.1)
Severe Malaria	1 (0.9)	0 (0.0)	0 (0.0)	1 (0.1)
Other	62 (57.9)	424 (83.5)	21 (23.9)	507 (72.1)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)

For 48% of the patients, the onset of hearing loss was progressive; for 7%, it was congenital; for 6%, it was sudden; and for 39%, it was unknown. The chances that patients confirmed for hearing loss would have a progressive onset were 55% for those with conductive hearing loss, 43% for those with sensorineural hearing loss, and 67% for those with mixed hearing loss. Patients with conductive hearing loss experienced congenital onset to hearing loss 3% of the time, patients with sensorineural hearing loss experienced it 9% of the time, and no patient with mixed hearing loss experienced it. Those with conductive hearing loss experienced sudden hearing loss 10% of the time, those with sensorineural hearing loss 3% of the time, and those with mixed hearing loss 19% of the time. Unknown onset of hearing loss was prevalent in 32% of patients with conductive hearing loss, 44% of patients with sensorineural hearing loss, and 14% of patients with mixed hearing loss. Chronic suppurative otitis media (CSOM), which was reported in 9% of all patients with hearing loss that had been confirmed, was followed by trauma (6.5%), presbycusis (aging) (4.4%), and acute otitis media (1.7%) even though the majority (72%) of the risk factors were not mentioned.

Diagnosis of Hearing Loss

Once the diagnosis is established, the healthcare team can develop an appropriate treatment plan, which may include medical interventions, hearing aids, cochlear implants, or other rehabilitative services. Early diagnosis and intervention are crucial for managing hearing loss effectively and improving overall outcomes.

Table 5: Diagnosis of Hearing Loss

Variable	CHL	SNHL	MHL	Total
	N (%)	N (%)	N (%)	N (%)
Tests				
Pure-tone Audiometry (PTA)	66 (61.7)	334 (65.7)	62 (70.5)	462 (65.7)
Audiometry	31 (29.0)	105 (20.7)	24 (27.3)	160 (22.8)
Auditory Brainstem Response (ABR)	1 (0.9)	43 (8.5)	0 (0.0)	44 (6.3)
PTA, Otoacoustic Emissions (OAE), and Tympanometry	2 (1.9)	8 (1.6)	2 (2.3)	12 (1.7)
PTA and Tympanometry	3 (2.8)	6 (1.2)	0 (0.0)	9 (1.3)
ABR and OAE	1 (0.9)	6 (1.2)	0 (0.0)	7 (1.0)
ABR, Tympanometry, and OAE	1 (0.9)	4 (0.8)	0 (0.0)	5 (0.7)
Tympanometry	2 (1.9)	0 (0.0)	0 (0.0)	2 (0.3)
Visual Reinforcement Audiometry (VRA)	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.1)
VRA, OAE, and Tympanometry	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.1)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)
Affected Ear				
Left Ear	23 (21.5)	86 (16.9)	24 (27.3)	133 (19.0)
Right Ear	32 (29.9)	124 (24.4)	20 (22.7)	176 (25.0)
Bilateral	52 (48.6)	298 (58.7)	44 (50.0)	394 (56.0)
Total	107 (15.2)	508 (72.3)	88 (12.5)	703 (100.0)

For 66% of individuals who had hearing loss confirmed, pure tone audiometry (PTA) was the primary test of hearing loss. ABR (6%), ABR and OAE (1%), combined PTA, otoacoustic emissions, and tympanometry (1.7%), both PTA and tympanometry (1.3%) and audiometry (23%) were other frequently used tests. When hearing loss was detected in a patient, it affected both ears in 56% of cases, the right ear in 25% of cases, and the left ear in 19% of cases. Patients with hearing loss in both ears outnumbered those in one ear for all categories of hearing loss. In 49% of patients who experienced conductive hearing loss, both ears were affected, sensorineural hearing loss affected both ears in 59% of the patients, and 50% of patients with mixed hearing loss experienced symptoms in both ears.

DISCUSSION OF DATA ANALYSIS

The discussion highlights the significance of hearing loss as the fourth leading cause of disability worldwide, contributing significantly to the global burden of disease. Despite its impact, there is a lack of comprehensive statistics on hearing loss in Rwanda. The study focused on assessing the prevalence, types, and degrees of hearing loss using data from the Rwanda Military Hospital (RMH).

The findings revealed the 18.8% prevalence of hearing loss at RMH, comparable to rates in South Africa and within the projected range for sub-Saharan Africa. However, it differed from other global studies, indicating the variability in prevalence across regions. Factors influencing these variations include population-based and educational settings, as well as differences in hearing test methodologies.

The study emphasized the age-related increase in the prevalence of hearing loss, with 44% of patients aged 40 and above. Similar trends were noted in other studies, reinforcing the understanding that aging is a significant risk factor for hearing impairment.

Gender disparities in hearing loss prevalence were observed, with 58% of patients with confirmed hearing loss being male. However, the literature suggests inconsistent patterns in gender-related hearing loss, with variations among populations.

Sensorineural hearing loss (SNHL) was identified as the most prevalent type, followed by conductive and mixed types. The genetic predisposition of SNHL and the association with comorbidities like diabetes and hypertension were discussed as potential explanations for its prevalence.

The study reported a higher prevalence of bilateral hearing loss (56%) compared to unilateral cases (44%). Mild and moderate hearing losses were predominant, differing from some studies but aligning with others, highlighting the influence of study settings.

Predisposing factors for hearing loss were unspecified in 72% of cases. Chronic suppurative otitis media (CSOM) was reported in 9% of cases, followed by trauma, presbycusis, and acute otitis media. Comparisons with studies in Tanzania and Nigeria showed variations in reported causes, suggesting the influence of local factors.

In conclusion, the study provides valuable insights into the prevalence, types, and factors associated with hearing loss in Rwanda, emphasizing the need for context-specific understanding and interventions. The findings underscore the importance of early diagnosis for effective treatment and highlight the multifactorial nature of hearing loss.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The hospital-based prevalence of hearing loss at Rwanda Military Hospital was 18.4%. A confirmed hearing loss patient was 39.6 (about 40) years old on average, with a standard variation of 23 years. The majority (58%) of the patients were of male gender. Sensorineural hearing loss (SNHL) affected 72% of patients who had hearing loss confirmed, conductive hearing loss (15%), and mixed hearing loss (MHL) in 13 % of individuals. In general, profound hearing loss was noted in 24% of the patients, in addition to 23% with moderate hearing loss, 20% with moderately severe hearing loss, 20% with severe hearing loss, and 13% with light hearing loss. Bilateral hearing loss was reported in 56% of the cases. Hearing loss was progressive in 48% of patients, congenital in 7%, sudden in 6%, and unknown in 39%.

Confirmed hearing loss was 9% caused by chronic suppurative otitis media (CSOM), 6.5% caused by trauma, 4.4% caused by presbycusis, and 1.7% caused by acute otitis media even though 72% of the risk factors were not mentioned. It is critical to acknowledge the shortage of studies in Africa given the wide diversity in hearing loss prevalence caused by various contexts, screening methods, and age groups. Due to its great prevalence and chronic nature, hearing loss is an important public health concern. The current study represents the initial effort to establish baselines and descriptions of hearing loss prevalence at Rwanda Military Hospital.

Recommendations

Implementing hearing loss interventions at primary and secondary healthcare facilities as well as referral hospitals may lessen the negative effects and financial burden of hearing loss on the community. This will take careful planning, development of precise program goals, and the design of care pathways to implement ear and hearing services at the community level.

It is crucial to screen for hearing impairments. Hearing loss is significantly more common than is thought. Regular hearing examinations should be promptly performed as part of preventative treatment.

REFERENCES

1. Rowe L, John's Newfoundland S, li L. Hearing Loss Management in Acute Care. 2022.
2. Rasiah, Sulakshan. Addressing the rising prevalence of hearing loss. 2018.
3. Katrin Neumann, Shelly Chadha, George Tavartkiladze XB and KRW. International Journal of Neonatal Screening. 2012. Sci-Hub | Newborn and Infant Hearing Screening Facing Globally Growing Numbers of People Suffering from Disabling Hearing Loss. International Journal of Neonatal Screening, 5(1), 7 | 10.3390/ijns5010007.
4. Tucci DL, Merson MH, Wilson BS. A summary of the literature on global hearing impairment: Current status and priorities for action. Otology and Neurotology. 2010 Jan;31(1):31–41.
5. Sarah Bent, Lynzee McShea SB. British journal of learning disability. 2015 [cited 2023 Mar 7]. The importance of hearing: a review of the literature on hearing loss for older people with learning disabilities. British Journal of Learning Disabilities, 43(4), 277–284 | 10.1111/bld.12148. Available from: <https://sci-hub.st/10.1111/bld.12148>
6. Isherwood B, Gonçalves AC, Cousins R, Holme R. The global hearing therapeutic pipeline: 2021. Drug Discovery Today. 2022 Mar 1;27(3):912–22.
7. Goman AM, Lin FR. Prevalence of hearing loss by severity in the United States. American Journal of Public Health. 2016 Oct 1;106(10):1820–2.
8. Niklaus Roth T, Hanebuth D, Probst R. Prevalence of age-related hearing loss in Europe: a review. Eur Arch Otorhinolaryngol. 2011; 268:1101–7.
9. Mulwafu W, Kuper H, Ensink RJH. Prevalence and causes of hearing impairment in Africa. Tropical Medicine & International Health. 2016 Feb 1;21(2):158–65.
10. wwwmohgovrw. Republic of Rwanda Ministry of Health PO. Box 84 Kigali Rwanda Non-communicable Diseases National Strategic Plan. 2014;
11. Mugabo RM. School of Medicine, University of Nairobi. 2009 [cited 2022 Jun 11]. Prevalence of hearing impairment and ear disorders among school children in Kigali, Rwanda. Available from: <http://erepository.uonbi.ac.ke/handle/11295/30632>
12. John B, Fidele B, Kaitezi MB, Eugene T, Christopher S, Eugene N, et al. Prevalence of occupational noise induced hearing loss among wood and metal workers of Gakiriro, Kigali city. Vol. 1, Public Health Bul. 2019.
13. Lin FR, Thorpe R, Gordon-Salant S, Ferrucci L. Hearing Loss Prevalence and Risk Factors Among Older Adults in the United States. The Journals of Gerontology: Series A. 2011 May 1;66A (5):582–90.
14. Collaborators* G 2019 HL. Hearing loss prevalence and years lived with disability, 1990–2019: findings from the Global Burden of Disease Study 2019. 2021.
15. Zahnert T. The Differential Diagnosis of Hearing Loss. Deutsches Ärzteblatt International. 2011 Jun 24;108(25):433.
16. Tingang EW, Noubiap JJ, Fokouo JVF, Oluwole OG, Nguetack S, Chimusa ER, et al. Hearing impairment overview in Africa: The case of Cameroon. Vol. 11, Genes. MDPI AG; 2020.
17. Dhingra P, Dhingra S. Diseases of Ear, Nose and Throat & Head and Neck Surgery (PDFDrive). Vol. 83, Public Health. 1969. 63–67 p.
18. Olusany BO, Neumann KJ, Saunders JE. The global burden of disabling hearing impairment: a call to action. Bulletin of the World Health Organization. 2014 Feb 18;92(5):367–73.
19. Lasak JM, Allen P, McVay T, Lewis D. Hearing loss: Diagnosis and management. Primary Care - Clinics in Office Practice. 2014;41(1):19–31.

20. Jun HJ, Hwang SY, Lee SH, Lee JE, Song JJ, Chae S. The prevalence of hearing loss in South Korea: Data from a population-based study. *Laryngoscope*. 2015;125(3):690–4.
21. Paper C, Florencio J, Lapena F. "Understanding Audiograms and Types of Hearing Loss." 2014;(May).
22. Fagan J. Open access guide to audiology and hearing aids for otolaryngologists. 2014;(Figure 1):1–9.
23. Alshuaib WB, Al-Kandari JM, Hasan SM. Classification of Hearing Loss. *Update On Hearing Loss*. 2015;
24. Weber PC, Klein AJ. HEARING LOSS. *Medical Clinics of North America*. 1999 Jan 1;83(1):125–37.
25. Eggermont JJ. Types of Hearing Loss. *Hearing Loss*. 2017 Jan 1;129–73.
26. Cassel C, Penhoet E, Saunders R. Policy Solutions for Better Hearing. *JAMA*. 2016 Feb 9;315(6):553–4.
27. Evaluation of hearing loss in adults - UpToDate [Internet]. [cited 2022 Aug 14]. Available from: [https://www.uptodate.com/contents/evaluation-of-hearing-loss-in-adults?search=hearing assessment&source=search_result&selectedTitle=2-150&usage_type=default&display_rank=2](https://www.uptodate.com/contents/evaluation-of-hearing-loss-in-adults?search=hearing%20assessment&source=search_result&selectedTitle=2-150&usage_type=default&display_rank=2)
28. Iacovou E, Vlastarakos P V., Ferekidis E, Nikolopoulos TP. Multi-frequency tympanometry: clinical applications for the assessment of the middle ear status. *Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India*. 2013;65(3):283–7.
29. Verhulst S, Jagadeesh A, Mauermann M, Ernst F. Individual Differences in Auditory Brainstem Response Wave Characteristics. *Trends in Hearing*. 2016; 20:1–20.
30. Bennett SPSYDAD. Australian Family Physician. 2015 [cited 2023 Mar 7]. Ear wax management. Available from: <https://search.informit.org/doi/abs/10.3316/informit.525565717724520>
31. Yueh B, Shapiro N, Maclean CH, Shekelle PG. Screening and Management of Adult Hearing Loss in Primary Care Scientific Review. Vol. 289, *JAMA*. 2003.
32. Schreiber BE, Agrup C, Haskard DO, Luxon LM. Sudden sensorineural hearing loss. *The Lancet*. 2010;375(9721):1203–11.
33. Snik AFM, Mylanus EAM, Proops DW, Wolfaardt JF, Hodgetts WE, Somers T, et al. Consensus statements on the BAHA system: Where do we stand at present? *Annals of Otology, Rhinology and Laryngology*. 2005;114(12 II SUPPL. 1):2–12.
34. Dun CAJ, Faber HT, De Wolf MJF, Cremers CWRJ, Hol MKS. An overview of different systems: The bone-anchored hearing aid. *Advances in Oto-Rhino-Laryngology*. 2011 Mar;71:22–31.
35. Arnold A, Caversaccio MD, Mudry A. Surgery for the bone-anchored hearing aid. *Advances in oto-rhino-laryngology*. 2011 Mar;71:47–55.
36. Dazert S, Thomas JP, Loth A, Zahnert T, Stöver T. Cochlear Implantation: Diagnosis, Indications, and Auditory Rehabilitation Results. *Deutsches Ärzteblatt International*. 2020 Oct 9;117(41):690.
37. Krogmann RJ, Khalili Y Al. Cochlear Implants. *StatPearls* [Internet]. 2022 Jul 21;
38. Naples JG, Ruckenstein MJ. Cochlear Implant. *Otolaryngologic clinics of North America*. 2020 Feb 1;53(1):87–102.
39. Reese JL, Hnath-Chisolm T. Recognition of hearing aid orientation content by first-time users. *American Journal of Audiology*. 2005;14(1):94–104.
40. Van Tasell DJ. Hearing Loss, Speech, and Hearing Aids. *Journal of Speech and Hearing Research*. 1993;36(2):228–44.

41. GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016 Oct 8;388(10053):1545–602.
42. Louw C, Swanepoel DW, Eikelboom RH, Hugo J. Prevalence of hearing loss at primary health care clinics in South Africa. *Afr Health Sci*. 2018 Jun;18(2):313–20.
43. Stevens G, Flaxman S, Brunskill E, Mascarenhas M, Mathers CD, Finucane M. Global and regional hearing impairment prevalence: an analysis of 42 studies in 29 countries. *Eur J Public Health*. 2013 Feb;23(1):146–52.
44. Döge J, Hackenberg B, O'Brien K, Bohnert A, Rader T, Beutel ME, et al. The Prevalence of Hearing Loss and Provision With Hearing Aids in the Gutenberg Health Study. *Dtsch Arztebl Int*. 2023 Feb 17;120(Forthcoming):99–106.
45. Ramma L, Sebothoma B. The prevalence of hearing impairment within the Cape Town Metropolitan area. *S Afr J Commun Disord*. 2016 Apr 8;63(1).
46. Cruickshanks KJ, Wiley TL, Tweed TS, Klein BE, Klein R, Mares-Perlman JA, et al. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin. The Epidemiology of Hearing Loss Study. *Am J Epidemiol*. 1998 Nov 1;148(9):879–86.
47. Lasisi AO, Abiona T, Gureje O. The prevalence and correlates of self-reported hearing impairment in the Ibadan study of ageing. *Trans R Soc Trop Med Hyg*. 2010 Aug;104(8):518–23.
48. Swanepoel DW, Eikelboom RH, Hunter ML, Friedland PL, Atlas MD. Self-reported hearing loss in baby boomers from the Busselton Healthy Ageing Study: audiometric correspondence and predictive value. *J Am Acad Audiol*. 2013 Jun;24(6):514–21; quiz 529.
49. Yousuf Hussein S, Wet Swanepoel D, Biagio de Jager L, Myburgh HC, Eikelboom RH, Hugo J. Smartphone hearing screening in mHealth assisted community-based primary care. *J Telemed Telecare*. 2016 Oct;22(7):405–12.
50. Louw C, Swanepoel DW, Eikelboom RH, Myburgh HC. Smartphone-Based Hearing Screening at Primary Health Care Clinics. *Ear Hear*. 2017 Apr;38(2):e93–100.
51. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. *J Am Coll Cardiol*. 2020 Dec 22;76(25):2982–3021.
52. Arlinger S. Negative consequences of uncorrected hearing loss--a review. *Int J Audiol*. 2003 Jul;42 Suppl 2:2S17–20.
53. Abraham, Kahinga. Characteristics of hearing loss in Dar es Salaam, Tanzania. *South Sudan Medical Journal*. 2022;15(4):143–6.
54. Morton NE. Genetic epidemiology of hearing impairment. *Ann N Y Acad Sci*. 1991;630:16–31.
55. Adobamen PO. The Pattern of Hearing Loss as seen at the University of Benin Teaching Hospital, Benin City, Nigeria. *Gomal Journal of Medical Sciences*. 2014;11.
56. Beigh Z, Malik MA, ul Islam M, Yousuf A, Pampori RA. Clinical and audiological evaluation of hearing impaired children. *Indian Journal of Otology* [Internet]. 2012;18(4). Available from: https://journals.lww.com/ijoo/fulltext/2012/18040/clinical_and_audiological_evaluation_of_hearing.8.aspx
57. Shuaibu I, Chitumu D, Mohammed I, Shofoluwe N, Usman M, Bakari A, et al. Pattern of hearing loss in a tertiary hospital in the North Western Nigeria [Internet]. Vol. 21, *Sahel Medical Journal*. 2018. p. 208–12. Available from: <https://www.smjonline.org/article.asp?issn=1118-8561;year=2018;volume=21;issue=4;spage=208;epage=212;aurlast=Shuaibu>
58. Rabbani S, Chowdhury M, Shumon A, Yasmeen N, Rashid M, Nuruzzaman M, et al. Pattern and Causes of Hearing Loss Among the Patients Attending in an ENT OPD. *Anwer Khan Modern Medical College Journal*. 2014 Dec 3;5.