(RESEARCH ARTICLE)

Prevalence and associated factors of hearing loss among patients visiting St. Paul's Hospital Millennium Medical College, Ethiopia

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Abstract

Background: Globally, 5% of the population is estimated to have disabling hearing loss (HL) requiring rehabilitation. By 2050, over 700 million people, or 1 in 10 people, will have HL. HL can happen during different lifetimes, but the prevalence of HL increases with age. Over 25% of people older than 60 are affected by disabling HL. WHO estimates that 1.1 billion young people are at risk of HL due to unsafe hearing practices. Objective: To assess the prevalence and associated factors of HL among patients visiting St. Paul's Hospital and Millennium Medical College. Materials and Method: a descriptive cross-sectional study conducted from August 1st to 30th, 2023. Data was collected from 352 participants using an interviewer-administered questionnaire by systematic sampling technique. Data was checked for completeness, cleared, entered into Epi-Info, and exported to Statistical Package for Social Science (SPSS) version 25. Bivariate and multivariate logistic regression analyses were conducted, and the statistical association between variables was described using a p-value of < 0.05. Result: Of all study participants, 213 (60.5%) were male; the mean age and standard deviation were 35.36 + 17.03 years; and 199 (56.5%) had a different degree of hearing loss. Mild, moderate, severe, and profound hearing loss were recorded among 17%, 20%, 15%, and 4% of the respondents, respectively. Factors of hearing loss were age group, occupation, hearing difficulty, noisy work exposure, drinking alcohol, and Khat chewing. Conclusion: The overall prevalence of hearing loss was very high, and preventive interventions like improving knowledge on risk factors, ensuring a safe working environment, and avoiding chewing Khat for the at-risk population were recommended.

Keywords: Audiometry, Hearing loss; Prevalence; Associated Factors; St. Paul Hospital Millennium Medical College

1. Introduction

The World Health Organization (WHO) defines hearing loss as "a person who is not able to hear as well as someone with normal hearing—hearing thresholds of 20 decibels (dB) or better in both ears" is said to have hearing loss. It can affect one ear or both ears [1]. Based on the cause and location of the ear involved, it can be: Conductive hearing loss This is caused by a problem in the outer or middle ear, and sound is having difficulty traveling to the inner ear. Some causes are fluid in the middle ear, wax in the ear canal, or a hole in the eardrum. Sensorineural hearing loss is caused by a problem in the inner ear. Sensorineural hearing loss in young children can occur with certain infections before birth, from a lack of oxygen during birth, or from genetic syndromes. Mixed hearing loss occurs when both conductive and sensorineural hearing loss occur together. Based on its degree or severity, hearing loss can be categorized as mild (26–40 dB), moderate (41–70 dB), severe (71–90 dB), or profound (above 90 dB) [1, 2].

Globally, 5% of the population is estimated to have disabling hearing loss and require rehabilitation, and it is estimated that by 2050, over 700 million people, or 1 in 10 people, will have hearing loss. The prevalence of hearing loss increases

with age, and among those aged greater than 60 years, it is estimated that over 25% are affected by disabling hearing loss. Hearing loss can happen during different lifetimes: prenatal period, childhood, adolescence, adulthood, and old age [1]. According to a WHO estimate, 1.1 billion young people globally could be at risk of hearing loss due to unsafe hearing practices. Nearly half of all teenagers and young adults (12–35 years old) in middle- and high-income countries are exposed to unsafe levels of sound from the use of personal audio devices, and some 40% of them are exposed to potentially damaging sound levels at clubs, discotheques, and bars [3].

Globally, hearing loss ranks as the fourth leading cause of disability, with estimated costs of over 750 billion dollars, and unless action is taken, there will be 630 million people living with disabling hearing loss by the year 2030. Among the risk factors for hearing loss globally, communicable diseases such as rubella and meningitis, noise-induced hearing loss (occupational noise exposure, recreational noise exposure), ototoxic hearing loss, ear infections, and other risk factors are common attributes. In 2018, around 466 million people had disabling hearing loss (DHL), corresponding to a global prevalence of 6.12%. Around half of them are in the South Asia and East Asia regions. The highest prevalence is observed in the Central/Eastern Europe and Central Asia region (8.36%), followed closely by South Asia (7.37%) and the Asia Pacific (6.90%) [1- 4].

The global burden of hearing loss is increasing from time to time and affects all ages and both sexes across countries with different magnitudes. The current magnitude of hearing loss globally is estimated to be 5% (430 million) of the total population, and it is estimated that 466 million, 630 million, and 700 to 900 million people will have disabling hearing loss in 2018, 2030, and 2050, respectively [1,3,4].

Hearing loss affects approximately one third of adults over the age of 55 and three in every four people aged over 70 years. Hearing loss also associated with several other health conditions such as diabetes, dementia, and heart disease. Impacts of hearing loss differ from person to person and include emotional, physical, economic, health and social effects. It can also affect interpersonal communication, relationship, access to education, employment opportunity and economic independency which leads to distress, frustration, anger, embarrassment, inferiority etc. various coping mechanism can be used by person having hearing problem. Consequently, untreated hearing loss can lead to reduced social activity, social isolation, lower levels of self-esteem, loneliness, and reduced quality of life [2, 5].

There is a discrepancy among countries and regions in the prevalence of hearing loss. The highest prevalence of hearing loss is recorded in central and eastern Europe and Central Asia, with a prevalence of 8.6%, followed by South Asia and Asia Pacific with prevalence of 7.37% and 6.9%, respectively, which is higher than the global prevalence of hearing loss of 6.12% [3, 4]. The prevalence of hearing loss in Africa is estimated to be 17% and 31%, with cut-offs of 25 dB and 30 dB, respectively, in community-based studies. For school-based studies, it was 7.7% and 6.6%, with cut-offs of 25 and 30 dB, respectively [6].

1.1. Prevalence and Factors of Hearing Loss

A study conducted in England on socioeconomic and lifestyle factors associated with hearing loss in older adults identified that 32.1% and 22.3% of men and women aged 50 to 89, respectively, had hearing loss, and the level of education, sex, occupation, income, and lifestyle of the study participants were strongly associated with hearing loss [9]. A cross-sectional study conducted in South Korea among civilians on the prevalence of hearing loss and associated factors in subjects with normal otoscopy found that 21.9% of study participants had hearing loss with the worse ear and 12.5% with the better ear. Factors that had a significant association with hearing loss in the study were smoking, noise exposure at the workplace, stroke, depressive mood, and anemia [10]. In Brazil, a study conducted on hearing impairment and its determinants found that 24.9% of the study participants had some level of hearing impairment, of which 18.9%, 5.1%, and 1.9% had mild, moderate, or severe hearing loss, respectively. The study also found that increased age, family history of hearing loss, comorbidities like diabetes and hypertension, chronic otitis media, otosclerosis, and papilloma of the outer ear canal were the determinants of hearing loss among the study participants at various degrees [11].

The prevalence of hearing loss in Africa is estimated to be 17% and 31%, with cut-offs of 25 dB and 30 dB, respectively, in community-based studies. For school-based studies, it is 7.7% and 6.6%, with cut-offs of 25 and 30 dB, respectively. The most common cause of hearing impairment identified by the study was cryptogenic deafness (50%), followed by infectious causes (43%). In mainstream schools and the general population, the most common cause of hearing impairment was middle ear disease (36%), followed by undetermined causes (35%), and cerumen impaction (24%) [6]. A meta-analysis on the prevalence of hearing loss among adolescents and young adults because of social noise exposure indicated the mean prevalence of hearing loss was 12% and self-reported hearing loss was less than 2%, ranging from 11.5% to 15.8% among those carrying out audiometric measurement. Among those involved in the

analysis, adolescents were at higher risk for hearing loss because of frequent and long-term use of earphones as a luxury and technology adaptation [12]. The findings of a study conducted in Ghana on the prevalence and determinants of hearing loss among primary school children in selected schools indicated that 36.5% of children with cerumen impaction had hearing loss, 2% had otitis externa and media, and another 1% had foreign bodies [13]. One of the major causes of hearing loss among children is bacterial infection. Following bacterial meningitis, the overall prevalence of hearing loss was 43.4% and 44.4% of affected children had at least a unilateral mild sensorineural hearing loss, and again, of the children with hearing losses, 26.6% and 14.9% had mild, moderate, severe, or profound sensorineural hearing loss, respectively [14]. The prevalence of hearing loss among steel and metal workers as cases and primary school teachers as controls in Tanzania was found to be 48% and 31%, respectively. The determinants of hearing loss in study participants that were significantly related to hearing loss were age group, duration of work, previous noisy work, and history of ear-related medical conditions [15].

In Ethiopia, the prevalence of hearing loss varies across regional states, ages, and occupations of the study participants. It is found to be 2.7% for children 0 to 14 years of age, and 71.2% reported having at least one form of hearing impairment. The prevalence is higher among boys than girls, with prevalence of 2.98% and 2.44%, respectively. The common problems following hearing impairment found in the study were learning problems, visual impairment, hampered mobility, and seizures. Among the factors statistically associated with hearing impairment among study participants were age, sex, and economic status [7]. The risk of hearing loss is highly associated with high noise exposure in the workplace and prolonged exposure to noise. Among occupations related to high noise exposure, metal workers can be mentioned on the first line. A cross-sectional study conducted in Northwest Ethiopia, Gondor City, found that the prevalence of hearing loss among metal workers was 30.7%. Advanced age, cigarette smoking, increased working area noise level, and working experiences increase the risk of hearing loss, and proper utilization of ear protection devices reduces the risk of hearing loss among metal workers [16]. A school-based cross-sectional study conducted in Addis Ababa, Ethiopia, on elementary school students found that the prevalence of disabling hearing impairment was 32.1%, with 30.2% of students having abnormal otoscopic findings, 22.8% having ear wax, 4% having pus discharge and a dull tympanic membrane, and 2.8% having foreign bodies as causes for hearing impairment among the study participants. Among the causes of hearing impairment during multi-variate analysis, only abnormal otoscopic findings had a significant association with hearing loss, while others did not have an association [8].

Objective

The general objective of the study was to assess the prevalence and associated factors of hearing loss among patients visiting St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia, in 2023.

2. Methods and materials

2.1. Study area and period

The study was conducted in the Ear Nose and Throat (ENT) department of St. Poulos Hospital Millennium Medical College, located in Addis Ababa, the capital city of Ethiopia, located in the Gulale sub-city.

2.2. Study design

A descriptive cross-sectional study design was conducted from August 1st to 30th, 2023.

2.3. Source and study population

All patients who visited the St. PHMMC-ENT Outpatient Department were the source population, and all age groups and both sexes fulfilling inclusion criteria were the study population.

2.4. Eligibility criteria

- **Inclusion criteria:** Any patient complaining of hearing impairment and having any ear signs was included in the study.
- **Exclusion criteria:** patients with profound mental health problems, patients with severe health problems, and those who were unable to respond to the questionnaire were excluded from the study.

2.5. Sample Size Determination

Sample size was calculated using a single population proportion formula with the assumption of a prevalence of hearing impairment in Addis Ababa elementary school of 32.1% [8], a 95% confidence interval (CI), and a 5% degree of freedom (precision). The sample size was calculated as follows:

$$n = \frac{Z^2\, P(1-P)}{d^2} \quad n = \frac{1.96^2 * 0.321(1-0.321)}{0.05^2} = n = 334.92 \quad \underline{\mathbf{= 335}}$$

Where: -
n = the total sample size
P = prevalence of hearing impairment in Addis Ababa (32.1% [0.321])
Z = $Z_{a/2}$ at 95% CI (1.96)
d = The desired precision of the estimate/ margin of error (5%: 0.05)

Using 5% non-respondent rate (17), the final sample size was <u>**352.**</u>

2.6. Sampling technique, data collection tool and procedure

A systematic sampling technique was used to collect data from selected patients visiting ENT-OPD. A pre-tested interviewer-administered structured questionnaire was used. The study consisted of all age groups recruited using systematic sampling techniques. Questionnaire-based interviews were conducted after obtaining informed consent from the individual participant, who was at least 18 years old, and assent from their family for patients under 18 years old, and their confidentiality and anonymity were maintained. Demographic and socio-economic characteristics of the respondents were collected, and a physical examination was done for all study participants by an experienced physician using inspection, otoscopy, and checking with a tuning fork for identification of hearing loss. Finally, audiometer measurements were done to classify the level of hearing loss among patients identified as having hearing loss.

2.7. Data quality control method

To ensure data quality, the questioner pretested on 5% of the sample population, training for dta collectors was provided, and collected data was checked for completeness, accuracy, clarity, and consistency by the supervisor on a daily basis.

2.8. Data processing and analysis

The collected data was entered in the Epi-Info version 7.2 software package and exported to SPSS version 25 for analysis. Before data analysis, the data was cleaned and coded. A detailed explanation and interpretation of the data were presented in the form of percentages using tables and graphs. The prevalence of hearing loss is determined by the proportion of study participants with hearing loss to the total number of participants involved in the study. Associated risk factors for hearing loss are assessed by calculating the crude and adjusted odds ratios. P-value less than 0.05 from the crude odds ratio used for transferring variables to the adjusted odds ratio. The final model p-value of 0.05 at a 95% confidence interval was considered a significant factor in hearing loss.

2.9. Ethical consideration

Ethical clearance was obtained from the ethical review board of the Addis Ababa Medical and Business College of Postgraduate Study, Department of Public Health. The purpose of the study was clearly explained to study participants and obtained consent and assent according to the age category. To maintain the confidentiality of any information provided regarding the study subjects, the data collection procedure was anonymous. Those patients with hearing loss were linked to treatment at the hospital.

3. Results

Data was collected from 352 respondents (100% response rate), and the results of the study were categorized into socio-economic and demographic characteristics, personal and environmental factors, different examinations, and factors associated with hearing loss among the respondents.

3.1. Socio-Economic and Demographic characteristics of the respondents

From all participants involved in the study, 213 (60.50%) were male, and the mean age and SD of the respondents were 35.36 + 17.03 years, with a minimum and maximum age of 2 and 76 years, respectively. The majority, 248 (70.50%),

were urban residents, and more than half, 194 (55.1%), were Orthodox religion followers. Nearly half, 161 (45.7%) of the respondents were Oromo, 146 (41.6%) were single in marital status, almost one-third, 111 (31.50%), were private employees, and 102 (29.00%) attended college or higher education. The average family sizes of the respondents were 4.74 + 1.65 SD, and the average monthly income of the respondents' families was 5,158.52 (SD + 3,830.16) ETB.

Table 1 Socio-economic and demographic characteristics of respondents Addis Ababa, St. PHMMC, August 2023 (n =352)

Variables	Response	Number	Percent
Sex	Male	213	60.5
	Female	139	39.5
Age group of the respondents	0 to 10 Years	24	6.8
	11 to 20 Years	39	11.1
	21 to 30 Years	101	28.7
	31 to 40 Years	59	16.8
	41 to 50 Years	61	17.3
	51 to 60 Years	36	10.2
	61 to 70 Years	22	6.3
	> or = 71 Years	10	2.8
Educational status	No formal education	99	28.1
	Primary school (1 - 8 grade)	56	15.9
	Secondary School (9 -12 grade)	95	27.0
	College and above	102	29.0
Occupation	Farmer	30	8.5
	Government employee	40	11.4
	Private employee	111	31.5
	Students	94	26.7
	Housewife	37	10.5
	Other	40	11.4
Family size	Small family size (1-3)	74	21.0
	Medium family size (4-6)	219	62.2
	Large family size (7 – 9)	59	16.8
Average monthly income	Low SES (< 5000 ETB)	232	65.9
	Medium SES (5000 to 10000ETB)	85	24.1
	High SES (> 10000ETB)	35	9.9

3.2. Personal and Environmental Factors of Hearing Loss Among Respondents

From a total of 352 study participants, 65 (18.5%) had a history of head injury, 37 (10.5%) had a current or history of meningitis infection, and 191 (54.3%) had a recurrent ear infection. More than half (193) (54.8%), around one-third 123 (34.9%), and 36 (10.2%) of the participants never used, used sometimes, or always used earphones respectively. Many of respondents, 314 (89.2%), never smoked cigarettes, and 71 (20.2%) and 133, (37.8%) had a history of hearing loss and had currently hearing difficulty, respectively. More than two-thirds 248 (70.5%), 81(23.0%) and 23 (6.50%) of the respondents never had, sometimes had and always had exposure to passive smoking respectively. Most of the

respondents, 268 (76.1%), had a history of Khat chewing or are currently chewing Khat, and 210 (59.6%) had used or are currently using alcohol.

The use of hearing aids and ear protection devices was found that, 325 (92.30%) didn't use any hearing aids or ear protection devices. Noisy work exposure and exposure to recreational noise are expected to be factors in hearing loss when exposed in different quantities and at different times. Thus, in this study, 289 (82.10%) and 298 (84.70%), had noisy work exposure and recreational noise exposure, respectively.

More than two-thirds of the participants, 282 (80.1%), didn't do regular physical exercise. The chronic medical condition of the respondents, hypertension and diabetes assessed and identified 39 (11.1%) and 58 (16.5%) of the study participants had diagnosed hypertension and diabetes respectively at the time of data collection. The study also found that 294 (83.50%) of respondents reported a history or current depressive mood disorder. In addition, ototoxic drug use among the participants was limited; only 28 (8.0%) used any of the ototoxic drugs like streptomycin, neomycin, kanamycin, gentamycin, chemotherapy, large doses of aspirin, and diuretics, while the remaining participants didn't use any of the ototoxic drugs.

Table 2 Personal and environmental factors of hearing loss among study participants, St. PHMMC, August 2023

Variables	Response	#	%
History of head injury	Yes	65	18.5
	No	287	81.5
History/current meningitis infection	Yes	37	10.5
	No	315	89.5
Recurrent ear infection	Yes	191	54.3
	No	161	45.7
Frequently of earphone use	Never used	193	54.8
	Sometimes	123	34.9
	Always	36	10.2
Hearing difficulty	Yes	133	37.8
	No	219	62.2
Smoke cigarette	Current	21	6
	Former	17	4.8
	Never	314	89.2
History/current alcohol use	Yes	210	59.6
	No	142	40.3
Use of hearing aid	Yes	27	7.7
	No	325	92.3
Use of ear protection devices	Yes	27	7.7
	No	325	92.3
History of/current noisy work exposure	Yes	289	82.1
	No	63	17.9
Exposure to recreational noise	Yes	298	84.7
	No	54	15.3
Regular physical exercise	Yes	70	19.9

	No	282	80.1
History/Current chew Khat	Yes	268	76.1
	No	84	23.9
Diagnosed hypertension	Yes	39	11.1
	No	313	88.9
Diagnosed diabetics	Yes	58	16.5
	No	294	83.5
History of/current depressive mood disorder	Yes	294	83.5
	No	58	83.5

3.3. Ear Examination Results of study Participants

A pure-tone audiogram, tympanogram, otoscopic examination, and audiometry test diagnostic ear examinations were conducted to identify the presence or absence and degree of hearing loss for all study participants. The pure tone audiogram and tympanogram were performed separately for both ears, while the otoscopic examination and audiometry results were summarized for both. Accordingly, ear examination results are summarized in the table below.

Table 3 Ear examination result of study participants St. PHMMC August 2023

Ear Examination Type	Result	Number	Percent
Pure Tone Audiogram - Right Ear	Pass	200	56.8
	Failed	152	43.2
Pure Tone Audiogram - Left Ear	Pass	205	58.2
	Failed	147	41.8
Tympanogram of Right Ear	A	187	53.1
	B	99	28.1
	C	66	18.8
Tympanogram of Left Ear	A	208	59.1
	B	82	23.3
	C	62	17.6
Otoscopic examination result	Normal	117	33.2
	Ear Wax	66	18.8
	Perforation	161	45.7
	Foreign body	8	2.3

3.4. Prevalence of Hearing Loss Among Study Participants

The presence and prevalence of hearing loss among the study participants were determined by using audiometer results. All study participants were tested with an audiometer by trained and experienced audiometers. The result of the audiometry showed that 153 (43.5%) of the respondents had a normal result, while the rest of the study participants, 199 (56.5%), had any level of hearing loss currently. The result is summarized in the figure below.
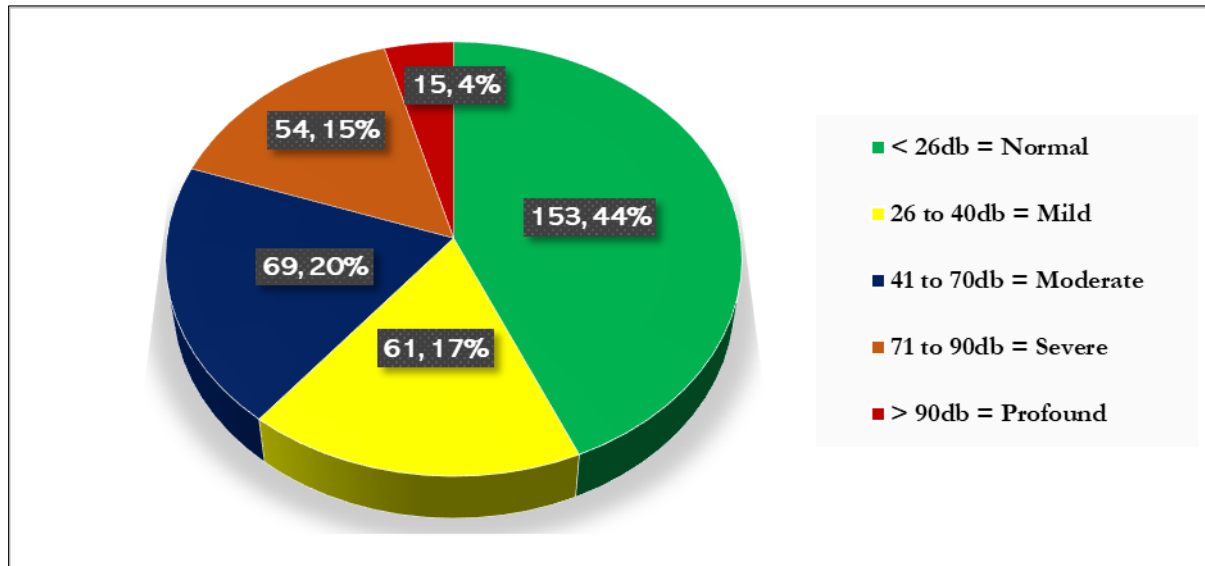
Figure 1 Prevalence and level of hearing loss among the study participants St. PHMMC, August 2023

3.5. Factors of Hearing Loss Among Study Participants

Different variables were assessed to identify factors associated with hearing loss among study participants in the study area. On binary logistic regression analysis Age group, occupation, education status, family size, recurrent ear infection, hearing difficulty, alcohol use, noisy work exposure, exposure to recreational noise, use of a hearing aid, chewing Khat, and history or current depression were significantly associated with hearing loss in study participants.

Factors significantly associated with hearing loss of study participants in bivariate analysis were taken to multivariate regression analysis. After running a multivariate analysis, factors significantly associated with hearing loss in respondents were age group, occupation, hearing difficulty, history of or current noisy work exposure, chewing Khat, and alcohol use (Table 4).

Table 4 Factors associated with hearing loss among study participants, St. PHMMC, August 2023

Variables	Response	Hearing Loss		COR (95% CI)	AOR (95% CI)
		No	Yes		
Age group	0 to 10 Years	15 (4.3%)	9 (2.6%)	1	1
	11 to 20 Years	33 (9.4%)	6 (1.7%)	0.30 (0.09, 1.00)	0.26 (0.05, 1.41)
	21 to 30 Years	77 (21.9%)	24 (6.8%)	051 (0.20, 1.33)	0.93 (0.20, 4.19)
	31 to 40 Years	30 (8.5%)	29 (8.2%)	1.61 (0.61, 4.25)	5.95 (1.11, 31.74)
	41 to 50 Years	16 (4.5%)	45 (12.8%)	4.68 (1.71, 12.79)	21.20 (3.78, 118.6)
	51 to 60 Years	13 (3.7%)	23 (6.5%)	2.94 (1.01, 8.59)	12.01 (2.15, 66.97)
	61 to 70 Years	10(2.8%)	12 (3.4%)	2.00 (0.61, 6.49)	16.53 (2.50, 109.1)
	> or = 71 Years	5 (1.4%)	5 (1.4%)	1.66 (0.37, 7.39)	19.92 (1.93, 205.9)
Occupation	Farmer	23 (6.5%)	7(2.0%)	1	1

	Gov't employee	24 (6.8%)	16 (4.5%)	2.19 (0.76, 6.30)		5.42 (1.03, 28.30)	
	Private employee	63 (17.9%)	48 (13.6%)	2.50 (0.99, 6.31)		12.42 (2.77, 55.54)	
	Students	50 (14.2%)	44 (12.5%)	2.89 (1.13, 7.38)		21.57 (3.95, 117.8)	
	Housewife	20 (5.7%)	17 (4.8%)	2.79 (0.96, 8.10)		4.38 (0.94, 20.30)	
	Other	19 (5.4%)	21 (6.0%)	3.63 (1.27, 10.37)		15.3 (2.96, 79.05)	
Education Status	No formal education	56 (15.9%)	43 (12.2%)	0.79 (0.45, 1.39)		1.41 (0.45, 4.43)	
	Primary (1 - 8)	40 (11.4%)	16 (4.5%)	0.41 (0.20, 0.83)		0.47 (0.15, 1.45)	
	Secondary (9 - 12)	51 (14.5%)	44 (12.5%)	0.89 (0.51, 1.57)		0.68 (0.28, 1.65)	
	College and above	52 (14.8%)	50 (14.2%)	1		1	
Family Size	Small family size	40 (11.4%)	34 (9.7%)	1.93 (0.94, 3.97)		1.58 (0.56, 4.44)	
	Medium family size	118 (33.5%)	101 (28.7%)	1.95 (1.05, 3.60)		1.76 (0.75, 4.13)	
	Large family size	41 (11.6%)	18 (5.1%)	1		1	
Recurrent ear infection	Yes	93 (26.4%)	98 (27.8%)	2.03 (1.32, 3.12)		1.02 (0.52, 1.97)	
	No	106 (30.2%)	55 (15.6%)	1		1	
Hearing difficulty	Yes	48 (13.6%)	85 (24.1%)	3.93 (1.32, 3.12)		3.02 (1.51, 6.04)	
	No	151 (42.9%)	68 (19.3%)	1		1	
History/Current Alcohol use	Yes	84 (23.9%)	126 35.8%)	6.38 (3.86, 1055)		0.11 (0.05, 0.23)	
	No	115 (32.7%)	27 (7.7%)	1		1	
History of/ current noisy work exposure	Yes	146 (41.5%)	143 (40.6%)	5.20 (2.54, 10.60)		1.60 (1.02, 4.94)	
	No	53 (15.1%)	10 (2.8%)	1		1	
Exposure to recreational noise	Yes	156 (44.3%)	142 (40.3%)	3.55 (1.76, 7.16)		2.62 (0.83, 8.18)	
	No	43 (12.2%)	11 (3.1%)	1		1	
Use hearing aid	Yes	21 (6.0%)	6 (1.7%)	2.89 (1.13, 7.34)		0.39 (0.07, 2.11)	
	No	178 (50.6%)	147 (41.8%)	1		1	

History of/Current Khat chewing	Yes	128 (36.4%)	140 (39.8%)	5.97 (3.15, 11.30)	3.45 (1.47, 8.09)
	No	71 (20.2%)	13 (3.7%)	1	1
History of/current depression	Yes	159 (45.2%)	135 (38.4%)	1.88 (1.03, 3.44)	0.62 (0.22, 1.71)
	No	40 (11.4%)	18 (5.1%)	1	1

Regarding the age group of the respondents being between 31 and 40 years, 5.95 (95% CI 1.11, 31.74), 41 to 50 years 21.2 (95% CI 3.78, 118.6), 51 to 60 years 12.01 (95% CI 2.15, 66.97), 61 to 70 years 16.53 (95% CI 2.50, 109.1), and > or = 71 years 19.92 (95% CI 1.93, 205.9) were at higher risk compared to the age group of 0 to 10 years. The risk of hearing loss increases with age, with the highest risk recorded among those aged 41 to 50. This could be due to the increased frequency and duration of exposure to noisy environments. Respondent's occupation was among factors associated with hearing loss, and students were more than twenty-one times, other workers (daily laborers, drivers, etc.) were fifteen times, private employees were twelve times, and government employees were more than five times at risk of hearing loss compared to respondents who were farmers. A detailed description is presented in table 4 above.

Study participants who had hearing difficulty were three times 3.02 (95% CI 1.51, 6.04) at risk compared to those who do not have hearing difficulty. This means that respondents having hearing difficulty prior to examination were more likely to be diagnosed with hearing loss. History or current alcohol use was a risk factor in the bi-variate analysis. Respondents who consume alcohol are six times more at risk than their counterparts. But on multi-variate analysis, history or current alcohol use reported as preventive for hearing loss with 0.11 (95% CI 0.05, 0.23). The result could be due to a small number of respondents use alcohol or the response of study participants not replaying the response as a sensitive personal issue. Among study participants, the risk of hearing loss was 3.45 times higher (95% CI 1.47–8.09) for those who had a history of or currently chewed Khat compared to those who never chewed Khat in their lifetime.

Respondents who had a history or current exposure to noise at work had a 1.6 times higher risk of hearing loss compared to their counterparts, and exposure to recreational noise had a more than three times higher risk of hearing loss among exposed respondents in the bi-variate analysis, but it didn't pose a risk to respondents in the multi-variate analysis. This could be attributed to the low frequency or brief duration of recreational noise exposure. In addition, history or current depressive mood disorder had nearly twice the risk of hearing loss among respondents in the bi-variate analysis, but in the multi-variate analysis, it did not had a risk factor for hearing loss among the study participants.

4. Discussion

Among 352 participants involved in the study, 199 (56.5%) had one form of hearing loss. Of those respondents with hearing loss, 61 (17%), 69 (20%), 54 (15%), and 15 (4%) had mild, moderate, severe, and profound hearing loss, respectively. This finding is much higher compared to the global estimate of hearing loss of 5% [1] and the global prevalence of hearing loss of 6.12% [4], the prevalence of hearing loss in England (32.1% male and 22.3% female) among older adults [9], and South Korea (21.5%) among civilians [10]. The identified risk factors for hearing loss that have similarities to those mentioned study were work-place noise exposure and occupation [4, 9, 10]. The increasing prevalence of hearing loss among the study participants in this study goes with the global increase in hearing loss as age advances. Globally identified risk factors for hearing loss directly go with the current study: ear infection and occupational noise exposure [4]. The discrepancy in the prevalence of hearing loss could be due to the age of the respondents, living environment, socio-economic status, and study design conducted in different countries.

The overall prevalence of hearing loss in this study is more than twice the study conducted in Brazil, which was 24.9%, with 18.9%, 5.1%, and 1.9% mild, moderate, and severe hearing loss, respectively. Only mild hearing loss was higher than this study, which was 17% for this study and 18.9% for the study conducted in Brazil [11]. The reason for the difference in prevalence could be due to study design, the development status of the country, and the working environment of the study participants. Similarly, the prevalence of hearing loss in Africa is estimated to be 17% and 7.7% for community and school-based studies, respectively, which is much lower than this study, which was 56.5%. Recurrent ear infection and cerumen impaction were identified as significant risk factors for hearing loss in both studies, which may have a similar environment and socio-economic status to this study [6]. The discrepancy in prevalence could be related to the age group of the study participants, the study period and design, and the differences in the working conditions of the countries among the study participants.

The current study found that the prevalence of hearing loss among children aged 0 to 14 years old was 6.8%, which was still higher than the study conducted in Ethiopia, with 2.7%, and the overall prevalence of hearing loss in the current study was lower than the study conducted in Ethiopia, which found it to be 71.2%. Furthermore, there was a similarity in the prevalence of hearing loss with the sex of the respondents, which was higher for males than females in both studies [7]. Another study conducted in Addis Ababa, Ethiopia, revealed that prevalence of hearing loss was 32.1%, which is much lower than the current study. The otoscopic result of the current study showed that 34.0% and 5.6% of the study participants who had hearing loss had perforation and ear wax, respectively, which is higher than that of the study conducted in Addis Ababa with 22.8% ear wax and 2.8% dull tympanic membrane. The variation in prevalence of hearing loss was estimated to be the difference in study population, age of the study participants, study period, and study design [8].

On meta-analysis, age-specific prevalence of hearing loss indicated that 12% of adolescents had hearing loss, which was slightly higher than current study, which was 9.3% for the age group of 11 to 20 years who had at least one form of hearing loss. The study described that the adolescent age group was a risk factor for hearing loss, which was like the current study conducted at St. PHMMC [12]. The prevalence of hearing loss among schoolchildren in Ghana was 36.5%, and in Tanzania was 48% [13, 15], and compared to this study, the prevalence in each country was lower. Other studies conducted at Kenyatta National Hospital of Kenya revealed that 26.6% and 14.9% had mild or moderate and severe or profound sensorineural hearing loss, respectively [14] which was lower than this study, which was 37% mild or moderate and 19% severe or profound hearing loss, respectively. Similar risk factors for hearing loss identified for this study and the study conducted in Tanzania were the age group of respondents, history of noisy work environments, and ear infections [15]. The difference in the prevalence of hearing loss in the countries could be due to differences in study design, geographic area, age group of respondents, working environment of the study participants and period of the study.

The overall prevalence of HL in this study was 56.5%, which was nearly twice the prevalence of hearing loss among metal workers in Gondor City, Northwest Ethiopia, which was 30.7%. The risk factors that overlapped for each study were work area noise exposure and advanced age [16]. The study clearly revealed that exposure to work area noise increases a risk of hearing loss that could be increased by the duration and frequency with which the respondents remain in the work area. The higher prevalence of hearing loss in the current study and area could be estimated to be due to the referral of cases from different health facilities and regions for further investigation and management since the hospital provides specialty services for patients referred from different health facilities and regions of the country.

5. Conclusion

The study found that the overall prevalence of hearing loss in all ages and both sexes was 56.5%, which was much higher than the global and national prevalence of hearing loss. Among the study participants, those who had various degrees of hearing loss were categorized as mild, moderate, severe, and profound, which accounts for 17%, 20%, 15%, and 4% respectively. The prevalence of hearing loss among the respondents was very high, which could relate to the referral of patients from different regions and health facilities for better investigation and management. The age of respondents, occupation, having hearing difficulty before audiometer examination, history or current alcohol use, history or current noisy work exposure, and history or current Khat chewing were a risk factors significantly associated with hearing loss in this study.

Recommendation

Based on the findings of the study and the risk factors for hearing loss among the study participants, the following recommendations are recommended:

- Improving knowledge on risk factors for hearing loss among the general population to reduce the prevalence of hearing loss is highly recommended.
- Ensuring the work environment is reduced off or free of excess noise for all at-risk workers and creating job opportunities free of excess noise for those at risk of hearing loss
- Preventing Khat chewing among the target population to prevent hearing loss is recommended.
- The government and stakeholders working on the prevention of hearing loss among the at-risk population should strengthen the implementation of hearing loss prevention strategies at all levels.

Compliance with ethical standards

Disclosure of conflict of interest

The researchers declare conflict of interest none.

Statement of ethical approval

Ethical clearance was obtained from the ethical review board of Addis Ababa Medical and business college of postgraduate study, department of public health. A formal letter was given to all concerned authorities of St. PHMMC and permission was secured at all levels.

Statement of informed consent

The purpose of the study was clearly explained to study participants and informed consent obtained from all individuals included in the study.

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