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Knowledge, attitude, and practice regarding basic school noise exposure and hearing loss among teachers: A cross-sectional study

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Abstract

Background: Being exposed to high noise levels can cause hearing loss. The study aimed to assess the knowledge, attitude, and practice (KAP) concerning basic school noise exposure and hearing loss among teachers.

Methods: This study was done using a set of questionnaires to assess KAPs related to noise exposure and hearing loss among 276 full-time basic school teachers in Ghana from January to October 2023. Pearson's Chi-square analyses were done to determine the significance of the association between the dichotomized KAP domains and categorical variables. Also, binary logistic regression analyses of the risk factors for the dichotomized KAP were done.

Results: 77.9% had poor knowledge, while 22.1% of the teachers had good knowledge regarding noise exposure and hearing loss. 76.1% demonstrated negative attitudes regarding the significance of noise reduction within the school environment, audiometry, and the adoption of hearing protection devices. 23.9% of teachers had positive attitudes. 66.3% exhibited bad practices concerning audiometric testing, the supply and utilization of hearing protection devices, and health and safety training, while 33.7% adhered to commendable practices. There was an insignificant association at the 5% significance level between the dichotomized KAP domains and the categorical variables. Gender, age, and experience were all risk factors for dichotomized KAP.

Conclusion: Only a few of the basic school teachers had good knowledge (22.1%), positive attitudes (23.9%), and good practices (33.7%) to prevent occupational hearing loss. Therefore, there is a need to implement awareness and preventive programs.

Keywords: Knowledge, Attitudes, Hearing, School teachers, Risk factors

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Introduction

Noise-induced hearing loss (NIHL) is a public health issue that is prevalent in developing countries, including Ghana (1). Continued and recurring exposure to high volumes negatively impacts the auditory system, leading to the development of NIHL. The hearing loss starts gradually but picks up speed as long as they are exposed, and the disease is irreversible. Intense noises cause damage to the cochlea by speeding up cellular metabolism during episodes of acute noise exposure (2). The ear's antioxidant defense system becomes overwhelmed by the elevated level of free radicals due to increased oxygen consumption, ultimately leading to the death of sensory cells in the cochlea. Additionally, during repeated, prolonged noise exposure, the sensory cells may lose their stiffness and their capacity to function effectively and efficiently. The act of destruction is mechanical in nature. NIHL can result in temporary, permanent, or a combination of both outcomes (2,3). Studies showed that noise exposure is related to hearing loss (4,5).

The knowledge, attitude, and practice (KAP) model is a method used in the field of health sciences to assess the correlation between individuals' attitudes and behaviours and specific illnesses or disorders. It necessitates careful consideration of various practical aspects, encompassing elements such as the title, a concise introductory section featuring instructions, demographic information, and background details, and a principal segment comprising questions addressing the three components, i.e., KAP (6-8). The KAP survey results provide baseline information for future assessments of the effectiveness of interventions; hence, they are conducted before an intervention or

awareness program (6). Knowledge is a true conviction acquired through training, education, experience, and practice that influences behavior and brings order to man. Attitude involves influence, behavior, and cognition and is related to knowledge (7). Practice improves preventive behavior since attitudes have changed and knowledge has been obtained (8). Studies have shown the relationships in the KAP domains with hearing loss (1,9).

A study by Rai et al (10) showed that the population exhibits limited knowledge and awareness of the health consequences associated with noise exposure (10). This observation formed part of the basis for conducting this study. Despite the Environmental Protection Agency of Ghana's regulatory guidelines on noise pollution in educational facilities (11), Ghanaian schools continue to deal with this environmental problem. Therefore, this study assessed the KAP of the basic school teachers. Studies that assessed the KAP of the participants focused on other sectors such as hospitals, industries, etc. (1,9). Also, no such research has been conducted in Ghana. Therefore, this study was representative of the specific study area, aiming to address the identified knowledge gap regarding the KAP of teachers in Ghana as conducted by Osei and Effah (12).

The present study aimed to assess the KAP regarding basic school noise exposure and hearing loss among teachers to understand the teachers' ability to prevent occupational hearing loss. It aimed at answering the research question: Do the staff have appreciable knowledge, a good attitude, and practices to prevent occupational hearing loss? The study adds to the corpus of knowledge on the KAP of teachers regarding basic school noise exposure and hearing loss.

Materials and Methods

Study design

A quantitative research design was used in this cross-sectional study.

Setting

The study was done among basic school teachers in both private and public schools located in the Old Tafo Municipality of Ghana (Figure 1) from January to October of 2023. The twenty selected schools were sited along busy areas such as markets, roads, traffic zones, etc., in the following settings: Church of Christ School, God's Time Preparatory School, Old Tafo M/A, Scales SDA School, Rockanje Presbyterian School, Oniwaa Memorial International, Nana Antobre Memorial International, Action School, Happy International School, St. Bernadette R/C School, Methodist A. School, Nazareth Montessori School, McNeilus SDA School, TAPASS A, TAPASS B, Calvary International School, Zion Royal School, Darul Faizeen School, Pankrono R/C, and Word of Christ School (Figure 1). The recruitment of teachers and the data collection were done simultaneously over two weeks (February 27–March 10, 2023).

Study area

The Old Tafo Municipality is located in the central part of the Ashanti Region, Ghana. It shares boundaries with Kumasi Metropolitan Assembly, Suame Municipal Assembly, Afigya Kwabre North, and Kwabre East Municipality on the east, west, south, and north, respectively. The municipality covers 31.13 square kilometers of land, situated between the longitude and latitude of 1.35°W and 1.37°W, 6.42°N and 6.45°N, respectively. It is elevated 250 to 300 m above sea level and nearly 270 km north of the national capital, Accra. It is predominantly an Akan-dominated area with about 30 communities. The major communities are Pankrono, Tafo Nhyiaeso, Adabraka, Tafo Ahenbronum, and Old Tafo, which is the capital seat of the municipality. There are 125 primary schools in the municipality. However, basic schools are numbered 77, of which 38 are public schools and 39 are private ones (13).

Participants

According to the study of Johnson and Christensen (14), the research population comprises all the individuals to whom the study's findings are intended to be applied. The study population was estimated to be approximately 1160. Schools were purposively sampled for the study while basic school teachers were randomly sampled. Schools sited along busy and active areas such as roadsides, mechanic shops, commercial areas, musical shops, etc., were included in this research while those sited in less busy and isolated areas were excluded.

Study size

The formula for sample size simplified by Yamane (1967) was used. The assumed confidence level is 95%, P (estimated standard deviation of the scale) = 0.50, and ± 5% precision level. Equation 1 below was used:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where N represents population size, e is the precision level, and n is the sample size (15).

The survey was completed by 276 basic school teachers, representing the sample size.

Measurement

The KAP model/questionnaire was used to obtain data on occupational noise exposure and hearing loss among basic school teachers. The knowledge section was scored on a scale (1 = No, 2 = Do not know, 3 = Yes); the attitude section was scored based on a five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Do not know, 4 = Agree, 5 = Strong Agree); practice section was scored

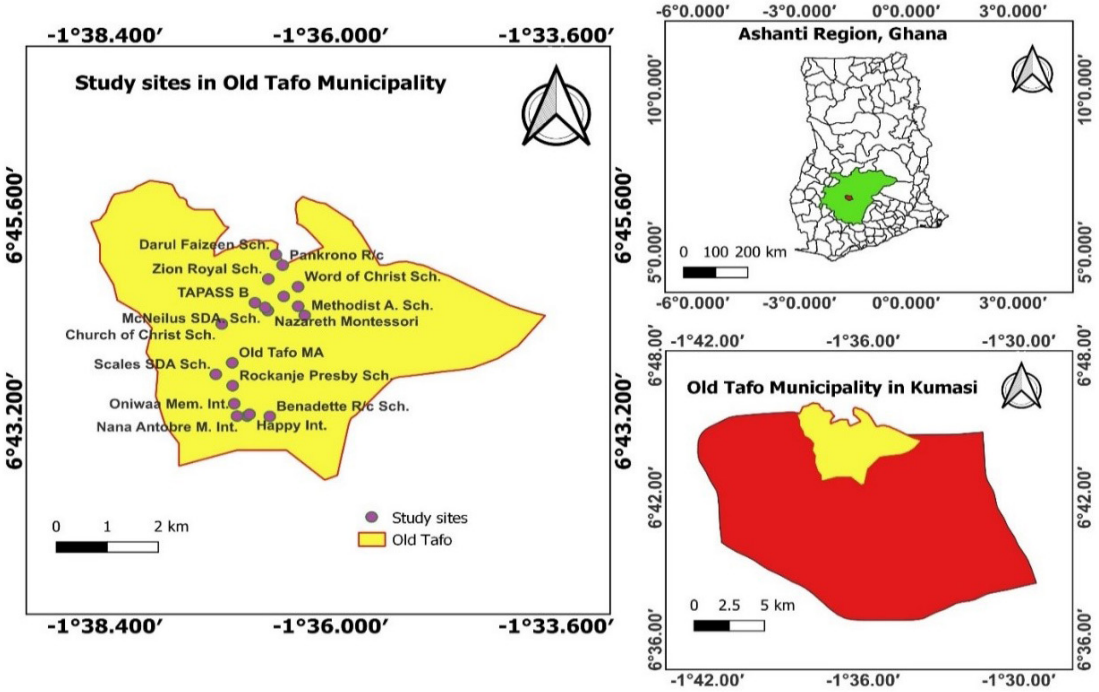

Figure 1. Map of Old Tafo Municipality showing the study sites

on a scale (1 = Never, 2 = Sometimes, 3 = Always).

Statistical methods

Data were analyzed using SPSS version 25. The Cronbach's alpha test of reliability was done to ascertain the internal consistencies of the KAP domains. The Cronbach's alpha (α) of 0.78, 0.70, and 0.81, respectively was obtained for KAP. These alpha values show that the KAP tool was reliable for the study. Descriptive statistics were presented as means and standard deviations for continuous variables while categorical ones were presented in frequencies and percentages. The results of the data analysis are presented in figures and tables. Chi-square test was used to analyze the association between dichotomized KAP domains and categorical variables. Also, logistic regression was used for categorical outcome variables to analyze the risk factors of the dichotomized KAP.

Results

Table 1 presents the demographic characteristics of the teachers that responded to the questionnaires. A total of 114 (41.3%) and 162 (58.7%) public and private basic school teachers, respectively, participated in the study. The number of female teachers (n = 149, 54%) was greater than the males (n = 127, 46%). Most of the teachers (n = 135, 48.9%) had 0 - 5 years of teaching experience while most of them (n = 113, 40.9%) had 30–39 years of teaching experience. The mean age of the teachers was within the range of 30–39 years. Only a few of the basic school teachers (n = 6, 2.2%) aged ≥ 60 years (Table 1).

Table 2 presents the average scores and standard deviations of the KAP domains based on the categorical variables. The total scores of the KAP domains were 45.00, 40.00, and 36.00 for knowledge, attitude, and practice, respectively. The highest average knowledge score in

Table 1. Demographic characteristics of basic school teachers

Categories	Frequency	Percent
Type of school		
Public school	114	41.3
Private school	162	58.7
Total	276	100.0
Gender		
Male	127	46.0
Female	149	54.0
Total	276	100.0
Years of teaching		
0-5	135	48.9
6-10	62	22.5
11-15	40	14.5
16-20	17	6.2
>20	22	7.9
Total	276	100.0
Age range (year)[a]		
18 - 29	97	35.1
30 - 39	113	40.9
40 - 49	43	15.6
50 - 59	17	6.2
≥60	6	2.2
Total	276	100.0

[a] Mean (Age range): 30-39 years.

Table 2. Average scores of the KAP domains in different variables

Variables		Average knowledge score		Average attitude score		Average practice score	
		Mean	Standard Deviation (σ_x)	Mean	Standard Deviation (σ_x)	Mean	Standard Deviation (σ_x)
Type of school	Public school	35.47	4.41	33.96	4.93	13.28	1.97
	Private school	35.72	5.21	32.88	5.43	14.09	3.06
Gender	Male	36.21	4.84	33.76	5.28	13.92	2.67
	Female	35.11	4.90	32.95	5.21	13.61	2.71
Years of teaching	0-5	35.30	4.98	32.62	5.52	13.83	2.88
	6-10	36.00	4.81	33.97	4.76	13.92	2.76
	11-15	36.15	5.20	32.68	5.59	13.50	2.45
	16-20	36.41	4.14	34.24	4.52	13.35	1.84
	21-25	32.75	5.01	36.63	2.77	13.63	2.45
	25+	36.14	4.22	36.14	3.76	13.57	2.38
Age range	18-29	35.38	4.86	33.10	5.28	13.98	3.01
	30-39	35.63	5.08	32.95	5.55	13.58	2.52
	40-49	35.93	4.59	33.47	4.84	13.74	2.58
	50-59	35.29	5.38	35.71	3.67	13.35	2.37
	60+	38.00	2.68	36.33	3.67	14.50	2.07

the categorical variables was 38.00 ± 2.68, which was equivalent to 84.4% of the total score and was found with basic school teachers who were 60 years and older. The lowest average knowledge score was 32.75 ± 5.01, which was equivalent to 72.8% of the total score and was found with those who had teaching experience of 21–25 years. Also, the highest average attitude score was 36.63 ± 2.77, which was equivalent to 91.6% of the total score and was found with teachers who had teaching experience of 21–25 years. The lowest average attitude score was 32.62 ± 5.52, which was equivalent to 81.6% of the total score and was found with teachers who had teaching experience of 0–5 years. Lastly, the highest average practice score was 14.50 ± 2.07, which was equivalent to 42.3%, and was found with basic school teachers who were aged 60 years and older. The lowest average practice score was 13.28 ± 1.97, which was equivalent to 36.9%, and was found with the teachers in the public schools (Table 2).

The percentage frequencies of the dichotomized knowledge of the basic school teachers on noise exposure and hearing loss are shown in Figure 2. The percentage frequencies of the dichotomized attitude of the basic school teachers to the importance of noise reduction, audiometry, hearing loss, and wearing of hearing protection devices are shown in Figure 3. The percentage frequencies of the dichotomized practice of the basic school teachers regarding audiometric tests, provision and use of hearing protection devices, as well as health and safety training are shown in Figure 4.

Pearson's chi-square analyses were used to determine the significance of the association between the dichotomized KAP domains and categorical variables (Table 3).

These analyses help identify inter-related factors.

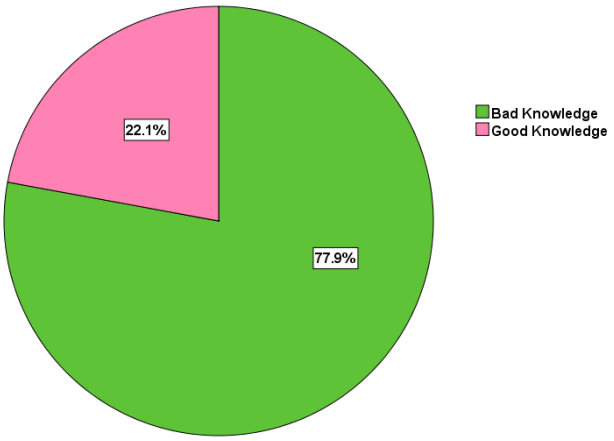

Figure 2. Percentage frequencies of dichotomized knowledge of the basic school teachers

According to Table 3, there is an insignificant association between the dichotomized KAP domains and the categorical variables at a 5% significance level.

The results of the binary logistic regression analyses of the risk factors of the dichotomized KAP are shown in Table 4.

The smaller the odds ratio than 1, the less likely the association between the variables. The higher the odds ratio than 1, the more likely the association between the variables. According to Table 4, and holding other variables constant, the odds of a private school teacher having good knowledge are 1.021 times higher than those having poor knowledge with 95% CI of 0.449 to 2.088. Also, the odds of a female teacher having good knowledge are 1.519 times higher than those having bad knowledge with 95% CI of 0.818 to 2.820. The odds of a teacher with 6-10, 11-15, 16-20, and 21-25 years of experience having

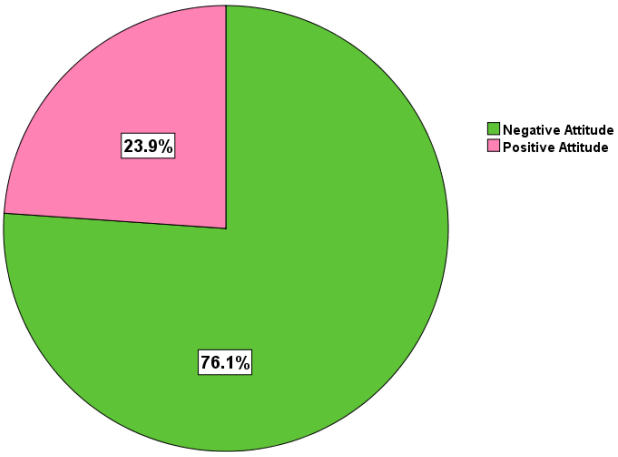

Figure 3. Percentage frequencies of the dichotomized attitude of the basic school teachers

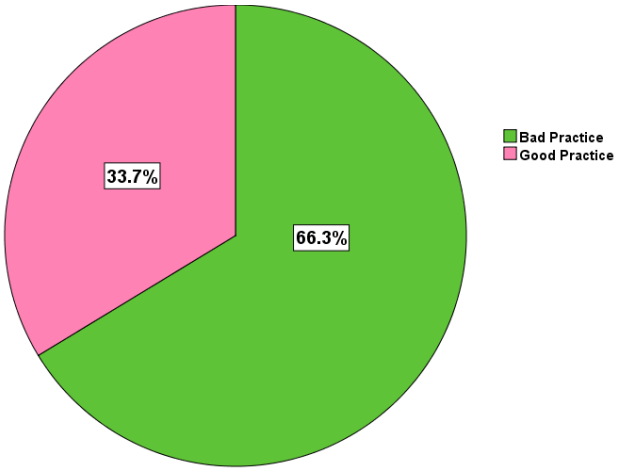

Figure 4. Percentage frequencies of dichotomized practice of the basic school teachers

Table 3. The output of the Pearson's chi-square analyses of variables

Variables		*P* values
Knowledge	Type of school	0.813
	Gender	0.253
	Years of teaching	0.291
	Age range	0.941
Attitude	Type of school	0.432
	Gender	0.190
	Years of teaching	0.452
	Age range	0.933
Practice	Type of school	0.162
	Gender	0.183
	Years of teaching	0.926
	Age range	0.404

good knowledge are 2.532, 3.086, 4.814, and 3.919 times higher than those having bad knowledge with 95% CI of 0.216 to 29.630, 0.268 to 35.554, 0.461 to 50.235, and 0.318 to 48.364 respectively. Additionally, the odds of teachers aged 30-39, 40-49, 50-59, and 60+years having good knowledge are 1.092, 1.064, 1.244, and 2.483 times higher than those having bad knowledge with 95% CI of 0.094 to 12.646, 0.095 to 11.870, 0.102 to 15.139, and 0.149 to 41.252, respectively.

Again, holding other variables constant, the odds of a private school teacher having a positive attitude are 1.425 times higher than those having a negative attitude with 95% CI of 0.703 to 2.889. Also, the odds of female teachers having positive attitudes are 1.725 times higher than those having negative attitudes with 95% CI of 0.934 to 3.186. The odds of teachers with more than 25 years of experience having positive attitudes are 1.068 times higher than those having negative attitudes with a 95% CI of 0.148 to 7.725. Additionally, the odds of teachers aged 30-39 years having positive attitudes are 1.587 times higher than those having negative attitudes with a 95% CI of 0.168 to 15.009. Lastly, holding other variables constant, the odds of female teachers having good practice are 1.274 higher than those having bad practice with 95% CI of 0.744 to 2.182 (Table 4).

Discussion

The study found that few of the basic school teachers had good knowledge (22.1%), attitude (23.9%), and practices (33.7%) regarding school noise exposure and hearing loss. Most of them had poor knowledge (77.9%), negative attitudes (76.1%), and poor practices (66.3%) (Figures 2-4). This suggests a lack of education and training regarding noise exposure and hearing loss of the basic school teachers and a lack of audiometric testing, hearing protection devices, as well as health and safety training. Additionally, knowledge informs attitude to improve practice (7,8). Since most of the basic school teachers had poor knowledge and negative attitudes, preventive behaviors were not improved. Therefore, the likelihood of occupational hearing loss from noise exposure among the basic school teachers is much expected.

Again, the study found an insignificant association between the dichotomized KAP domains and the categorical variables at a 5% significance level. This means that variables are independent of each other. Thus, the KAP levels do not depend on the age range, experience, type of school, and/or gender of the basic school teachers. Contrarily, a study by Wen et al. (16) reported a significant association between working experience and KAP. Another study by Abu Al-Halawa et al (17) found a significant difference in the overall level of knowledge according to age and locality, as well as gender, where urbanite female pharmacists had better knowledge scores. However, some risk factors of KAP were identified. Private school teachers were associated with the likelihood of good knowledge, positive attitude, and not good practice. Female teachers were also related to the likelihood of good knowledge, positive attitude, and good practice. The teachers aged 30 years and beyond

Table 4. The results of the binary logistic regression analyses

Dependent variables	Categorical variables	N	OR	95% CI	*P* value
	Type of school				
	Public	114	1	(Reference)	0.954
	Private	162	1.021	0.499–2.088	
	Gender				
	Male	127	1	(Reference)	0.185
	Female	149	1.519	0.818–2.820	
	Years of teaching				
	0-5	135	1	(Reference)	
	6-10	62	2.532	0.216–29.630	0.459
Knowledge	11-15	40	3.086	0.268–35.554	0.366
	16-20	17	4.814	0.461–50.235	0.189
	21-25	8	3.919	0.318–48.364	0.287
	25+	14	0.000	-	0.999
	Age range (year)				
	18-29	97	1	(Reference)	
	30-39	113	1.092	0.094–12.646	0.944
	40-49	43	1.064	0.095–11.870	0.960
	50-59	17	1.244	0.102–15.139	0.864
	60+	6	2.483	0.149–41.252	0.526
	Type of school				
	Public	114	1	(Reference)	0.326
	Private	162	1.425	0.703–2.889	
	Gender				
	Male	127	1	(Reference)	0.082
	Female	149	1.725	0.934–3.186	
	Years of teaching				
	0-5	135	1	(Reference)	
	6-10	62	0.207	0.026–1.623	0.134
Attitude	11-15	40	0.443	0.059–3.319	0.428
	16-20	17	0.339	0.047–2.438	0.282
	21-25	8	0.609	0.075–4.923	0.642
	25+	14	1.068	0.148–7.725	0.948
	Age range (year)				
	18-29	97	1	(Reference)	
	30-39	113	1.587	0.168–15.009	0.687
	40-49	43	0.987	0.108–8.986	0.990
	50-59	17	0.761	0.082–7.054	0.810
	60+	6	0.516	0.056–4.764	0.559
	Type of school				
	Public	114	1	(Reference)	0.504
	Private	162	0.807	0.430–1.515	
	Gender				
Practice	Male	127	1	(Reference)	0.378
	Female	149	1.274	0.744–2.182	
	Years of teaching				
	0-5	135	1	(Reference)	
	6-10	62	0.663	0.090 - 4.881	0.687 0.957
	11-15	40	0.947	0.132 - 6.813	0.718
	16-20	17	0.700	0.101 - 4.854	0.822
	21-25	8	0.786	0.096 - 6.433	0.737
	25+	14	0.692	0.081 - 5.915	
	Age range (year)				
	18-29	97	1	(Reference)	
	30-39	113	0.359	0.047 – 2.748	0.324
	40-49	43	0.332	0.045 – 2.465	0.281
	50-59	17	0.299	0.038 – 2.336	0.249
	60+	6	0.210	0.023 – 1.899	0.165

N = Frequency; OR = Odds ratio; CI = Confidence interval.

and those with teaching experience from 6 to 25 years were associated with the likelihood of good knowledge. However, only those with 25 years and more experience and aged 30–39 years were associated with the likelihood of a positive attitude. Good practice is unlikely to occur among these groups of teachers. Nonetheless, these risk factors may not be the actual cause of KAP outcome.

Since there is a lack of literature similar to the research topic globally, the results of this study could be described as novel and fundamental. However, related works have been done in different settings such as hospitals and industries (1,9). In Korean hospitals, an assessment of auditory-related KAP of healthcare officers showed that knowledge highly influenced the attitude and practice of the professionals and proved that adequate knowledge is a vital force for positive attitude and health-related practice. Researchers recommended that guidelines should be developed to enhance auditory-related knowledge, alter weak attitudes, and promote positive practices (9). Additionally, Nyarubeli et al (1) evaluated KAP concerning exposure to noise, hearing loss, ear screening, and usage of hearing protection devices among workers in iron and steel factories in Tanzania. They found that most of the workers had poor practice due to poor knowledge (94%), which is consistent with the findings in this study. The discrepancies lie in the fact that most of the workers (76%) they studied had the right and positive attitude, which is inconsistent with the findings of the present study. This means that the chances of improving practice among the workers (1) studied are higher and more efficient with the provision of education and training compared to the basic school teachers considered in the present study.

Most of the basic school teachers had a negative attitude, inconsistent with the findings of Nyarubeli et al (1). Similar to the findings of Nyarubeli et al (1), most of the basic school teachers had bad practices to prevent occupational hearing loss. This informs that knowledge acquisition and training of workers in different settings

on noise exposure is vital to change attitudes and improve practices to prevent occupational hearing loss. Further, the findings of this study predict the low awareness level of the basic school teachers in the Old Tafo Municipality on the effects of elevated noise levels on their hearing and the need for ear protection. Again, this assertion based on the findings of the study is consistent with that of Alnuman and Ghnimat (18) who found that about 64.1% of their study population suffered from hearing-related problems. Their awareness level of hearing loss was low. A study conducted on mill workers in Ghana revealed a significant prevalence of NIHL at 44%, and comparatively, low knowledge levels among 55% of respondents (19). On the other hand, employees in Nigerian steel mills had a high prevalence of NIHL (57%) despite having a good level of knowledge (93%), suggesting that other factors may be at play in addition to NIHL and that a high level of knowledge may not be enough to prevent it (20).

Certainly, 8% of the convenient sample size did not submit their responses to the set of questions, the results of this study are limited to the 92% that responded. The perceived significant change to the results with the excluded 8% is very minimal since a greater percentage of the basic school teachers had bad knowledge, negative attitudes, and bad practices. The study was limited to basic schools sited near busy areas and not vice versa, hence, a comparative analysis of outputs could not be made. However, it is presumed that the KAP levels and scores of teachers in basic schools sited in less busy areas would have been similar to the findings of this study. Again, the data collection was done with basic school teachers within the Old Tafo Municipality only, therefore, there is a need to evaluate the KAP scores from other districts within the Ashanti Region of Ghana. The data collected through a cross-sectional survey and self-reports reflects subjective evaluation and will not permit to determine the causality. Also, there is always survey bias, even if they can yield some insightful data and answer some research issues. The average scores of KAP were used in the analysis, therefore, each item in the KAP tool used was not analyzed. Not all factors associated with noise exposure and hearing loss were captured on the KAP tool.

Conclusion

In response to the research question, only a few of the basic school teachers had good knowledge (22.1%), positive attitudes (23.9%), and good practices (33.7%) to prevent occupational hearing loss. These teachers will likely develop occupational hearing loss with exposure to high noise levels over time. Therefore, there is a need to implement awareness and preventive programs. Future studies should assess the environmental noise levels in basic schools and the effects on the hearing of teachers.

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Authors' contributions

Conceptualization: Francis Acheampong Osei.
Data curation: Francis Acheampong Osei.
Formal analysis: Francis Acheampong Osei.
Funding acquisition: Esther Asantewaa Effah.
Investigation: Francis Acheampong Osei.
Methodology: Francis Acheampong Osei.
Project administration: Francis Acheampong Osei.
Resources: Esther Asantewaa Effah.
Software: Esther Asantewaa Effah.
Supervision: Alhassan Sulemana and Lyndon Nii Adjiri Sackey.
Validation: Alhassan Sulemana and Lyndon Nii Adjiri Sackey.
Visualization: Francis Acheampong Osei.
Writing–original draft: Francis Acheampong Osei.
Writing–review & editing: Alhassan Sulemana and Lyndon Nii Adjiri Sackey.

Competing interests

The authors declare that they have no conflict of interests.

Ethical issues

The research was conducted with the approval of the Committee for Human Research and Population Ethics at the Kwame Nkrumah University of Science and Technology's School of Medical Sciences (ethics number: 2377183231) and the Ghana Education Service (GES), Old Tafo Municipality, Ghana. Consent forms were endorsed by teachers who participated in the study. The authors confirm that all data collected during the study are as presented in this manuscript and that no data from the study has been or will be published separately elsewhere.

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