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The Occupational hazard related to the work of archeologists and hearing healh

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Abstract

Introduction: The impact of occupational hazards produced as a result of workplace noise is one of the extreme concerns which might cause hearing loss and other health problems for workers in all industries.

Aim of the study: To investigate the occupational hazard related to the work of archaeologists and hearing health.

Subjects and Methods: A cross-sectional study design was implemented to determine the impact of hearing health among archaeologists. Chronic exposure to noise pollution threatens hearing health. So, it is necessary to raise awareness among workers to enable better hearing health protection and to promote the use of hearing protection devices in the work area. This study comprised 102 archaeologists, males and females, who presented with any of the following audiological symptoms; tinnitus, ear pain, hearing loss, headache, unsteadiness, imbalance, light-headedness, and vertigo.

Results: We recruited 101 cases in different occupations. The mean age of the included participants was 40.3 ± 9.5. The study population was composed of 70 males (69.6 %) and 31 females (30.4 %). Of all participants, 78 did not have any complaints; four suffered from tinnitus for one year or more, three had bilateral tinnitus, four had bilateral otalgia, three suffered hearing loss, four had vertigo, three had both tinnitus plus vertigo, two had tinnitus plus hearing loss, and only one case needed repeated words. The percentage of smokers was 88%, while the non-smoker was 12%. Only one participant suffered from COVID infection. Five participants had positive consanguinity, while 97 had negative consanguinity. Concerning the family history, only one case had a family history of hearing loss.

Conclusion: We estimated the occupational hazard related to the work of archaeologists and found no significant correlation between occupation and hearing health loss.

Keywords: Occupational hazard; Archaeology; Hearing loss; Audiometry; Tympanometry.

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Introduction

Occupational hazards are a significant concern for workers in all industries, and the potential for hearing loss is one of the most serious. Hearing loss caused by workplace noise is a common occupational hazard and can significantly impact an individual's quality of life. It can also lead to other health problems, such as tinnitus, balance issues, and depression [1]. The World Health Organization (WHO) estimates that over 1 billion people worldwide are exposed to hazardous levels of noise in the workplace, with more than 40 million suffering from disabling hearing loss, as a result [2].

Archaeology is that science concerns the past human cultures and societies investigations. As such, it is a profession that requires individuals to work in various environments, from outdoor excavation sites to indoor laboratory settings. Unfortunately, this work can put archaeologists at risk for hearing loss due to exposure to loud noises [3]. That is especially true when working in excavation sites or outdoor locations where heavy machinery and tools are used. In addition, archaeologists may be exposed to hazardous noise levels using tools such as hammers, drills, and saws in laboratory settings [4].

WHO has identified noise-induced hearing loss as one of the most common occupational diseases worldwide. According to WHO estimates, approximately 10% of all cases of hearing loss are caused by occupational noise exposure. Furthermore, research has shown that archaeologists are at an increased risk of developing hearing loss due to their frequent exposure to loud noises while on the job [5,6].

In order to protect themselves from developing hearing loss, archaeologists should take steps to reduce their exposure to loud noises while on the job. That includes wearing protective earplugs or earmuffs when working in noisy environments and taking regular breaks from noisy activities. Additionally, employers should provide adequate training and education on how best to protect workers from hazardous noise levels in the workplace [7,8].

Overall, it is mandatory for archaeologists and employers alike to be aware of the risks associated with noise-induced hearing loss and take steps to reduce these risks whenever possible. By doing so, they can help ensure that archaeologists remain healthy and safe while conducting their work. So, it is necessary to raise the level of awareness among workers in order to enable better hearing health protection and to promote the use of hearing protection devices in the work area.

In the current study, we aim to investigate the occupational hazard related to the work of archaeologists and other occupations.

1. Subjects and methods

1.1. Subjects

The current cross-sectional study was implemented to determine the impact of hearing health among archaeologists as chronic exposure to noise pollution threatens hearing health. The study recruited 102 archaeologists, males and females, who presented with any of the following audiological symptoms; tinnitus, ear pain, hearing loss, headache, unsteadiness, imbalance, light-headedness, and vertigo. The study group underwent essential audiological test batteries, including pure tone audiogram and tympanogram, and filled in both questionnaires. This study was conducted for two years, from November 2019 to November 2022, at Sakkara and Haram work areas.

Inclusion criteria

All participants were archaeologists who work in the same area, as Sakkara and the pyramids. Both genders with ages ranging from 20-70 years old were included. Other characteristics included non-smokers, with negative consanguinity or family history of hearing loss, and without any chronic auditory diseases.

Exclusion criteria

Exclusion criteria included participants suffering from unilateral, conductive, low-frequency, syndromic, or a family history of hearing loss. Participants with positive consanguinity were excluded. Other conditions including a history of ototoxic medication, chronic or previous auditory diseases, head injury with auditory symptoms, or untreated infections were excluded, as well.

1.2. Study design

All subjects underwent a thorough medical history taking: It includes a complete description of the hearing loss and tinnitus complaints regarding frequency, duration, progression, and character. Also, precipitating and relieving factors were included. Any accompanying symptoms and medication received were documented.

Basic audiological evaluation: Pure tone audiometry: air conduction thresholds were tested at frequencies between 250 and 8000 Hz at octave intervals.

Speech audiometry: Speech reception threshold (SRT) and word discrimination scores (WDS).

Acoustic immittance testing: included tympanometry and acoustic reflexes (ipsilateral and contralateral).

Equipment:

Audiometry: Interacoustics AC40 (Interacoustics, Audiometer Alle, Middelfart, Denmark) was calibrated according to the ISO standards.

Immittance-meter: Interacoustics AT235 (Interacoustics, Audiometer Alle, Middelfart, Denmark) was calibrated according to the ISO standards.

1.3.Statistical analysis

Data were statistically analyzed by SPSS version 24 (IBM, Armonk, NY, United States).

2. Results

We include 101 cases in different occupations. The mean age of the included participants was 40.3 ± 9.5. We included 70 males representing 69.6 % of the population, and 31 females representing 30.4 % (Figure 1). Of all the included population, 78 did not have any complaints; four cases suffered from tinnitus for one year or more; three cases had bilateral tinnitus; four cases had bilateral otalgia; three cases suffered from hearing loss, four cases with vertigo, only one case needed repeated words, three had both tinnitus and vertigo and two cases had tinnitus and hearing loss. The percentage of smokers was 88%, while the non-smoker was 12%. Only one patient suffered from COVID infection (Table 1).

Table 1: The baseline characteristics of the study participants.

Parameters		Frequency
Gender	Male	70 (69.6%)
	Female	31 (30.4%)
Smoking	Smoker	90 (87.2%)
	Non-smoker	12 (11.8%)
Complains	No complaints	78 (76.5%)
	Tinnitus for one year or more	4 (3.9%)
	Bilateral Tinnitus	3 (2.9%)
	Bilateral Otalgia	4 (3.9%)
	Hearing loss	3 (2.9%)
	Vertigo	4 (3.9%)
	Needs repeating of words	1 (1%)
	Tinnitus and vertigo	3 (2.9%)
	Tinnitus and hearing loss	2 (2%)
COVID-19 infection	Positive	1 (1%)
	Negative	101 (99%)

Figure 1: The ratio between males and females in the included populations.

Most of the included participants worked as antiquities inspectors and represented about 87.3 of the included population. Four were antique security; two cases were wireless technicians; two were housekeepers; two had worked in the

monument's restoration field; the rest of the occupations were summarized in Table 2. Concerning the medical history, 89 cases did not have any significant medical history; five cases had both hypertension and diabetes, one was diabetic, and seven were hypertensive (Table 2).

Table 2: Two occupational hazards and medical history of each patient.

Parameters		Frequency
Medical history	Diabetes mellites	1 (1%)
	Hypertension	7 (6.9%)
	Diabetes & Hypertension	5 (4.9%)
	None	89 (87.3%)
Occupation	Antiquities inspector	81 (79.4%)
	Antique security	4 (3.9%)
	Wireless technician	2 (2%)
	Housekeeper	2 (2%)
	Monuments restoration	4 (3.9%)
	Antiquities restoration technician	5 (4.9%)
	Antiquities restoration manager	1 (1%)
	Archeologic manager Sakkara	1 (1%)
	Ticket office employee	1 (1%)
	Security representative	1 (1%)

Regarding hearing loss, 83.3% of the included populations were normal, while 31 cases had bilateral hearing loss, and one case had hearing loss in the left ear. The pure tone audiometry in the right ear reported that 85 points had normal hearing, 13 had sensorineural hearing loss (SNHL), three had mixed hearing loss, and one had conductive hearing loss (CHL). In the left ear, 98 cases had normal hearing, three had mixed hearing loss, and one had CHL. The degree of hearing affection is illustrated (Table 3). Concerning the tympanometry of both ears, only one patient had abnormal tympanometry, while all other cases had type A tympanometry, which is the normal form of tympanometry. In terms of hearing aid, only one patient had a hearing aid (Table 4). Five cases had positive consanguinity, while 97 cases had negative consanguinity. Concerning the family history, only one case had a family history of hearing loss (Table 5). According to the Fisher Exact test, there was insignificant correlation between occupation and hearing health (*P=0.707*).

Table 3: Type of Hearing loss and audiometry degree.

Parameters	Frequency

Type of hearing loss (n=17)	Bilateral	16 (15.7%)
	Left ear	1 (1%)
	Right ear	0
PTA in the right ear (n=17)	SNHL	13 (12.7%)
	Mixed	3 (2.9%)
	CHL	1 (1%)
Degree of hearing loss in the right ear (n=17)	Mild	2 (2%)
	Mild to Moderate	7 (6.9%)
	Moderate	3 (2.9%)
	Moderate to severe	4 (3.9%)
	Profound	1 (1%)
PTA in the left ear (n=4)	SNHL	0
	Mixed	3 (2.9%)
	CHL	1 (1%)
Degree of hearing loss in the right ear (n=4)	Mild	3 (2.9%)
	Mild to Moderate	7 (6.9%)
	Moderate	7 (6.9%)
	Moderate to severe	2 (2%)
	Profound	0

PTA: pure tone audiometry; SNHL: sensorineural hearing loss; CHL: conductive hearing loss.

Table 4: The tympanometry measurements in both ears and the use of hearing aids.

Parameters		**Frequency**
Tympanometry in the right ear	A	101 (99%)
	Perforated	1 (1%)
Tympanometry in the left ear	A	101 (99%)
	Perforated	1 (1%)
Hearing aid in the right ear	Negative	101 (99%)
	Positive	1 (1%)
Hearing aid in the left ear	Negative	99 (97%)
	Positive	3 (3%)
Tympanic membrane	Intact	101 (99%)
	Perforated	1 (1%)

Table 5: The family history and consanguinity of the study population.

Parameters		Frequency
Consanguinity	Negative	97 (95.1%)
	Positive	5 (4.9%)
Family history	Negative	101 (99%)
	Positive	1 (1%)

3. Discussion

Occupational hearing loss is one of the most common conditions experienced by workers in the United States. It is a type of noise-induced hearing loss (NIHL) that occurs when workers' exposure to high levels of noise in the workplace exceeds the recommended eight-hour average daily noise exposure limit over a long period of time. It might be caused by exposure to loud noises from industrial environments and repetitive exposure to certain types of machinery. Occupational hearing loss can be temporary or permanent, depending on the intensity and frequency of noise exposure, and can range from mild hearing loss to complete deafness [9,10].

In the current study, we estimated the occupational hazard related to the work of archaeologists. However, we found no significant correlation between occupation and hearing health. The most common symptoms, associated with occupational hearing loss, included difficulty understanding speech in noisy environments, persistent ringing in the ears or tinnitus, buzzing sounds inside the ear, reduced or muffled hearing ability, and balance issues. In more severe cases, victims may suffer from cognitive decline due to difficulty comprehending conversations and understanding of the instructions [7].

Employers are required to take steps that reduce employees' noise-exposure levels and mitigate potential hearing losses over time. That included implementing engineering controls, such as acoustic curtains and enclosures that dampen sound around machinery; administrative controls, such as scheduling employees away from noisy areas; training programs that cover safe listening practices; providing personal protective equipment included earplugs; and using special monitors that continuously track sound levels around workspaces. Employers must also conduct regular assessments of work environments in order to identify any [11].

In order for employers and workers alike to manage occupational hearing losses, it is important for both parties to remain fully apprised of all relevant regulations guiding workplace safety procedures. As such, employers must ensure they are providing their staff with proper safety materials, including user manuals and communications outlining proper techniques needed for preventing further damage over time [7]. Workers should also be regularly screened for signs of occupational hearing loss, as early detection can help control potential damages over time while enabling appropriate medical care if needed [12-14].

Given this evidence, it is important for archaeologists working in the field or museum settings to take the necessary precautions when it comes to protecting their hearing health. That could involve using earplugs or other forms of hearing protection, such as noise-canceling headphones when working with noisy machinery or limiting their exposure time where appropriate. Furthermore, it is also important for employers in this sector to provide adequate training on proper safety protocols and preventive measures such as annual hearing screenings – so that any problems can be identified early on before they become more serious issues down the line.

The main limitation of the study is the lack of a control group. Failure to use a control group, or use of an inappropriate control group, can make it impossible to draw meaningful conclusions from a study.

Conclusion

In the current study, we calculated the occupational danger associated with archaeologists' occupation. However, we discovered no statistically significant link between occupation and hearing health. Recommended hearing assessment for cases with chronic diseases such as hypertension, diabetes mellitus, positive family history, and positive consanguinity. Follow-up hearing loss cases.

Ethical considerations

The study was approved by the ethical committee of the faculty of medicine at Fayoum University.

Patient consent

Informed consent was taken from subjects enrolled in the study.

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Conflicts of Interest: All authors declare no conflict of interest.

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