

Measure of Hearing Threshold in Borma / Bakery Workers

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Abstract: ***Objective:** The current study was designed to measure the hearing threshold in borma (bakery) workers and to find out the levels of hearing loss according to the duration (years) of employment in the factory. **Methods:** This study was conducted in 23 borma workers with an age range of 30-60 years. Pure Tone Audiometry and Distortion Product Otoacoustic Emission (DPOAE) screening was done in the workers who were working in the factories for 8-10 hours per day. Few cases were excluded from the study because the hearing loss was due to the factors other than exposure to noise. **Result:** The results show that the rate of hearing loss was higher in the target population. 13.04% of the workers shows a mild to moderate hearing loss at the frequencies 500, 1000, 2000 Hz in Pure Tone Audiometry. 78.26% of Borma workers were failed in the left ear and 73.90% were failed in the right ear OAE screening test and a few of them showing a hearing loss in higher frequencies. **Conclusion:** Due to the high exposure of noise from the bakeries, the workers are at high risk of obtaining Noise Induced Hearing Loss (NIHL). Therefore it is essential to conduct an awareness program for the workers regarding hearing loss and the use of Ear Protection Devices (EPD).*

Keywords: Hearing, Threshold, Hearing sensitivity, Hearing loss, OSHA Protocol, Noise Induced Hearing Loss, Pure Tone Audiometry, Otoacoustic Emission, Borma/Bakery workers.

1. Introduction

Hearing has been called the most important of the human senses. It is the perception of sound. The hearing sensitivity is the number of decibel by which the hearing threshold of an individual exceeds the normal threshold. It is the capacity of the auditory system to detect a stimulus, most often described by an audiometric pure tone threshold (Stach, 2009).

Threshold is the least audible sound pressure level. It is the lowest intensity at which the patient responds to the sound at least 50% of the time (Gelfand, 2016). Hearing loss is defined as the loss of sound sensitivity, partial or complete produced by the abnormality anywhere in the auditory system (Martin and Clark, 2011). It is the reduction in hearing ability (Stach, 2009).

Hearing loss due to occupational noise exposure is most prevalent in individuals who were working in industrial areas. According to the Occupational Safety and Health Act (OSHA), the noise exposure between 85-90 dBA for 8 hours daily leads to damage to the inner ear hair cells and causes permanent hearing loss which results the Noise Induced Hearing Loss (NIHL). Due to the hazardous noise conditions the auditory cells in the cochlea are get destructed.

Borma workers are exposed to work at several hazardous situations. Noise is one of the hazard factors. Occupational exposure to extreme noise has been recognized as a very marked hazard encountered in diverse industrial sectors. Workers in borma were exposed to work for 8-9 hours in a background of machinery noise. Due to this noisy atmosphere, there is chance for occurring Noise Induced Hearing Loss in borma workers.

Noise Induced Hearing Loss (NIHL) is the permanent sensorineural hearing loss caused by exposure to excessive sound level (Stach, 2009). NIHL is the most common cause of acquired sensorineural hearing loss other than presbycusis. NIHL can be temporary or permanent. Exposure to excessive sound results in a change in the threshold of hearing sensitivity or a threshold shift.

In Pure Tone Audiometry, pure tones were used. Pure tones are tones of one frequency. Pure Tone Average (PTA) is the average of the hearing levels at frequencies 500, 1000, and 2000 Hz for each ear, as obtained on a pure-tone hearing test. Pure tone audiometry is the main hearing test used to identify hearing threshold level of an individual and it measures the softest or least audible sound that a person can hear.

Otoacoustic emissions (OAEs) are defined as the Sounds emanating from the cochlea that can be detected in the external auditory canal with probe-tube microphones (Martin and Clark, 2011). OAEs are considered to be related to the amplification function of the cochlea. The primary screening tool is a test for the presence of a click-evoked OAE. Otoacoustic emissions also assist in differential diagnosis of cochlear and higher level hearing losses.

2. Studies

Dr. Schokry conducted a study on Investigating Noise Exposure and Awareness among Bakery's Workers within the Gaza Strip in 2020, and it reveals that the workers in the bakery are at high risk of getting noise induced hearing loss (NIHL) and other illness due to the high exposure of noise and the non-use of hearing protection devices (HPD) and found that high exposure of noise can be prevented by the use of ear protection devices (EPD).

Dr. Anekoson (2017) investigated Knowledge of occupational hazards and use of preventive measures among bakery workers in Kaduna North Local Government Area, Kaduna State, Nigeria and found that the bakery workers are working for 6 to 8 hours per day and facing many problems like skin allergies, hearing problems, asthma and the preventive measures taken by them was apron, hand gloves and face masks. Only 19% of bakeries providing First Aid boxes and fire extinguishers.

Emmanuel N and Susan U (2014) did a study on Assessment of Baking industries in a Developing Country: The common Hazards, Health challenges, control measures and Association to Asthma and found that the bakery workers are in a great risk of getting occupational health challenges like allergy, musculoskeletal disorders, hearing problems, respiratory problems and this can be reduced by wearing face masks at work.

Filza, Daud, Ismail & Abdullah (2013) investigated Noise-Induced Hearing Loss Among Quarry Workers in a North-Eastern State of Malaysia and found that noise is one of the occupational hazards and environmental pollutants in quarries causing NIHL among workers. The noise from the machines in quarries may leads to higher prevalence of NIHL in future.

Shakhatreh, Abdul-Baqi & Turk (2000) studied about hearing Loss in textile factories and found that hearing loss was higher in workers who were employed for more than 25 years and the hearing loss was increasing gradually.

3. Method

Aim

The study aimed to screen a sample of the target population (borma workers) for the presence of hearing loss. The particular borma workers were selected because they were working for 8-10 hours per day and they were at high risk of developing NIHL and not many studies have been carried out on this population.

Participants

A total of 23 individuals in the age range of 30-60 years were working as a bakery worker for 10 years.

Inclusion Criteria

- A total number of 23 individuals were included in the study, which includes bakery workers of age range between 30-60 years.
- Individuals with a working experience for 10 years.
- Include both male and female workers.
- Workers with 8-10 hours/day and who have been working continuously for six days a week with one day of rest were taken up for this study.

Exclusion Criteria

- No individuals with previous hearing loss.
- No Individuals with excess earwax, ear drainage.

- No individuals with age range below 30 years and above 60 years.
- No individuals with visual impairment.
- Subjects with no history of any present or past psychological problems were taken up for the study.

Materials Used

- Case History:** Includes demographic data, symptoms of hearing loss, and other hearing related problems.
- Otoscope Examination:** To find out the presence or absence of earwax and any ear drainage.
- Pure Tone Audiometry (PTA):** To check the hearing sensitivity in 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. The instrument used was Global Feel audiometer.
- Headphone:** supra-aural headphones were used.
- Otoacoustic Emission (OAE):** To check the inner ear function with Distortion Product Otoacoustic Emission. The OAE instrument used was GSI Corti.

4. Procedure

A brief case history of workers was administered before the test. It includes demographic data, symptoms of hearing loss, and other hearing related problems. An otoscopic examination was done in both left and right ears to find out the presence or absence of earwax and ear drainage.

PTA will be done in both ears to check the hearing threshold of bakery workers in 500, 1000, 2000 and 4000 Hz. The test was done in a room with noise free background. The person was asked to sit on a chair in a straight position with the headphones over their ears. The tone was presented on each ear separately. They were instructed to raise their hands as long as the beeping tone was heard, even if the tone is too louder or too softer.

OAE was done after an otoscopic examination. The test was done in a room with a noise free background. The person was asked to sit on a chair in a straight position and asked not to chew, swallow and no body movements. Probe was placed in person's ear separately. Distortion Product Otoacoustic emission (DPOAE) test were administered. DPOAE stimulus was presented in 2sec. The goal of the current study was to evaluate the hearing sensitivity of borma workers by conducting a pure tone and an OAE screening test.

5. Result

The aim of the study was to screen a sample of the target population (borma workers) for the presence of hearing loss.

a) Hearing evaluation on Borma workers based on Pure Tone Audiometry

Fig 1.1 & Fig 1. 2:

Show the Pure tone average of both right and left ear.

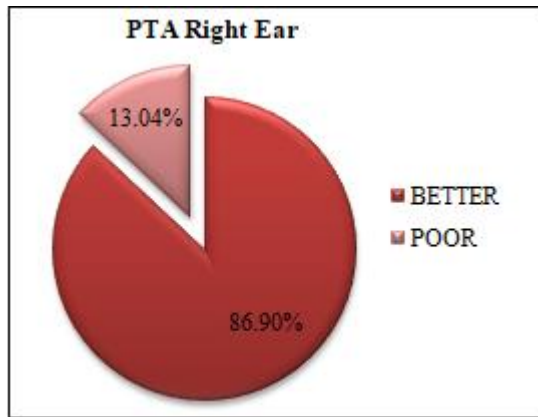


Figure 1.1

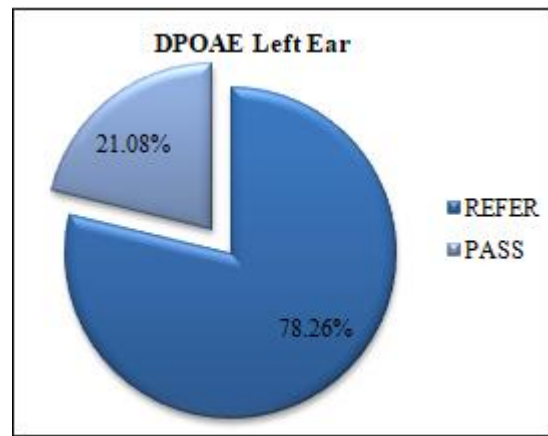


Figure 2.2

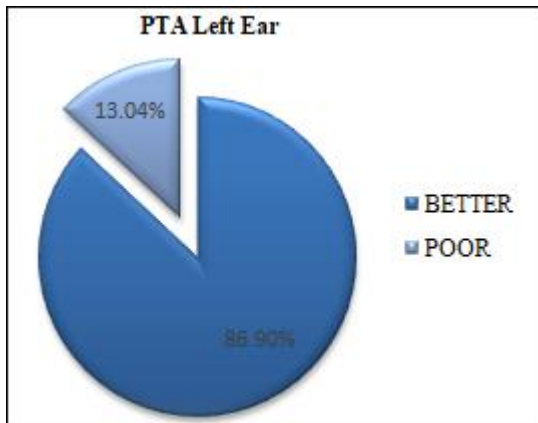


Figure 1.2

From the above both fig 1.1 & 1.2, it can be seen that the borma workers with the percentage of 86.90% have normal hearing sensitivity and 13.4% have poorer hearing range. Out of 23 workers, 20 workers shows normal hearing sensitivity and 3 of them shows mild to moderate degree of hearing loss according to Goodman’s classification.

b) Hearing evaluation on Borma workers based on DPOAE

Fig 2.1 & Fig 2.2:

Show the DPOAE test results in both right and left ears respectively.

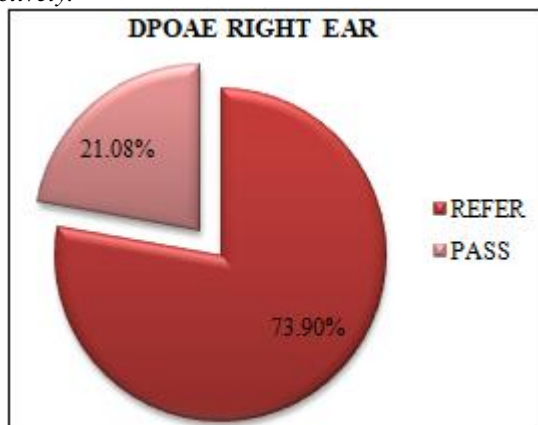


Figure 2.1

From the above Fig 2.1, it can be inferred that DPOAE in right ear shows that 21.08% were passed and the rest of the 73.90% were failed in the OAE screening test where as in left ear, 21.08% of workers were passed in the screening test and the remaining 78.26% were failed in the OAE screening test as shown in fig 2.2.

Both figures show that, there were vast differences in refer and pass percentages. In comparison between refer and pass percentages, the rate of pass percentage is less than that of refer percentage.

6. Discussion

The present study aimed to screen a sample of borma workers for the presence of hearing loss. A total of 23 borma workers in the age range of 30-60 years were taken for the study. They were having work experience for around 10 years.

Bakery Workers are people who were operating machines and perform routine tasks to make bread, cakes and other baked products, and to slice and wrap products. The machines used in these factories works more efficiently, speedily and make high level noises. In a medium size bread bakery, sound levels in the dough making area were 93-96 dBA. According to the OSHA, noise exposure level for 8 hours was between 85-90 dBA.

Due to the high exposure of noise through the machines in the factories, the workers are at high risk of developing Noise Induced Hearing Loss (NIHL). The borma workers were working around 10 hours in a bakery factory. The continuous exposure of the excessive noise in the workers may gradually increase a permanent hearing loss.

From the current study the pure tone results of subjects showed a mild to moderate degree of hearing loss in borma workers. And many of the workers showing high frequency hearing loss, mainly at 4000 Hz. According to this study, 86.90% of the workers PTA average falling in normal limits. Out of the 23 workers, pure tone average of 13.04% workers was abnormal. They were having mild to moderate degree of

hearing loss at frequencies 500, 1000, 2000 Hz. 78.26% of Borma workers were failed in the left ear and 73.90% were failed in the right ear OAE screening test. This also shows a probability of lesion in the inner ear region of borma workers. All these findings confirm that people working in a borma factory have high risks of developing NIHL. This may due to the exposure of noise from the equipment's and the environment for a long period of time and the workers are not using any ear protection devices (EPDs). High exposure of noise can be reduced by the use of ear protection devices. In people who were using EPDs there will be a low chance of having hearing loss as compared to those who are not using any EPDs.

pollution/control/how-to-control-noise-in-bakeries-noise-pollution/5911.

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