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Prevalence of hearing impairment in employees working in Ratlam railway junction

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Abstract--Background: Noise pollution is contributed by various factors where railway noise is one of the major sources and causes of noise pollution. Railway noise mainly affects the population residing nearby and working at the railway stations as they are exposed to a high degree of noise from shunting operations, switching operations, whistles, horns, locomotive engines in the diesel shed, and rail yards of the railway station. Aim: The present study was conducted to assess the noise effects on railway employees with the rate of hearing loss growth and reduction in their working efficiency. Also, the study assessed noise's effect on regular daily life. Material and Method: The present study included 100 subjects working at the Ratlam railway junction who were selected by deliberate sampling method. The present study was a questionnaire-based study that utilized the preformed structure proforma that assessed basic knowledge about the well-being of the study subjects and their efficiency during working hours. The answer to the questions was either in the yes or no format on the marking grades of 0-5 that varied from not at all for 0 score and 5 for very much score. Results: Feeling any kind of

irritation/mental stress during working hours due to noise was seen in 65% (n=65) study subjects, Strain over the conversation when 2 or more people are talking was responded positively by 60% (n=60) subjects, Stress overhearing in the noisy background was filled as positive by 50% (n=50) subjects, and feeling of buzzing or ringing sound was felt in the ears of 36% (n=36) subjects, whereas, 64% (n=64) subjects responded that they did not feel any buzzing or ringing sounds in their ears. Frequent earaches were reported in 12% (n=12) of study subjects, and anxiety due to noise was reported positive in 20% (n=20) subjects and negative in 80% (n=80) subjects. Only 35% (n=35) of study subjects were aware of the hearing aid of any kind. 32% (n=32) of subjects admitted that noise was affecting their personal life. Conclusion: The present study concludes that noise has marked effects on the workers of the railway with an impact on their personal life. Owing to the prolonged exposure to the loud noise the railway workers, face problems in their professional and personal life.

Keywords---Hearing aid, hearing impairment, NIHL (noise-induced hearing loss), noise pollution, railway workers.

Introduction

In the recent past, there is a drastic increase in the noise levels globally with the fast-growing world where the silence factor is missing and slow progress us made towards the dead-end of the noise. Noise is defined as an unpleasant or loud sound that leads to disturbances. Balance and activity in life are disrupted by noise.¹ Noise pollution is contributed by various factors where railway noise is one of the major sources and causes of noise pollution. Railway noise mainly affects the population residing nearby and working at the railway stations as they are exposed to a high degree of noise from shunting operations, switching operations, whistles, horns, locomotive engines in the diesel shed, and rail yards of the railway station.²

With the prolonged noise exposure, many detrimental effects are seen which can be temporary or permanent including irritation, lack of concentration, and many more. Hearing impairment is a clinical condition characterized by the total or partial inability to hear which can affect one or both the ears. NIHL (noise-induced hearing loss) is a condition of hearing impairment that is caused by long-term exposure to loud sounds.³ This might be clinically manifested as impaired cognitive sound perception including sound sensitivity, ringing in the ears, and narrow frequency range perception. When prolonged hazard exposure like noise is seen at workplaces with associated hearing loss, it is known as occupational hearing loss.⁴

Hearing impairments are usually treated with the hearing aid which is a device operated on batteries that makes the sound loud and is worn either around or in the ear. These devices are commercially available in different types, sizes, and shapes. The functioning of all the hearing aids is identical and are comprised of

four main parts including a microphone that picks up the sound, an amplifier that increases the sound, digital/analog circuits, a speaker that bring sound to the ear, and an earphone or receiver where signals are received and converted into sounds.⁵ The hearing-aid technology can be analog/conventional which is the least expensive and is audiogram-based, analog programmable that has a microchip and has a longer life, but is expensive, and digital programmable using digital sound signals has better fit and sound reduction.⁶

Concerning occupational health in India, it is seen that very high sound pressure levels are seen in different industries where many industries are at a high risk of noise-induced hearing loss (NIHL). The history of NIHL as a compensable disease in India dates back to 1948 under the Workmen's compensation act (1923) and the Employees State Insurance Act of 1948. However, awareness concerning NIHL is very low in India with 250 workers getting legal compensation for NIHL in 1996 as the first case. The NIHL is commonly seen in railway personnel and the study aimed to assess detrimental noise pollution effects on the workers of Ratlam railway junction.⁷ The present study was conducted to assess the noise effects on railway employees with the rate of hearing loss growth and reduction in their working efficiency. Also, the study assessed noise's effect on regular daily life.

Materials and Methods

The present retrospective study was conducted to assess the noise effects on railway employees with the rate of hearing loss growth and reduction in their working efficiency. Also, the study assessed noise's effect on regular daily life. The study was carried out at Ratlam railway junction after obtaining the necessary clearance from the concerned committee. The study population was comprised of the subjects working at the Ratlam railway station. After explaining the detailed study design, informed consent was taken from all the study subjects.

The present study included 100 subjects working at the Ratlam railway junction who were selected by deliberate sampling method. The inclusion criteria for the study were subjects from the working-age group, the subjects who were an employee of Ratlam railway junction, and subjects who were continuously exposed to loud noise. The exclusion criteria for the study were subjects on ototoxic drugs, mentally unstable subjects, subjects having congenital defects, and subjects with active ear discharge.

After the final inclusion of the subjects based on inclusion and exclusion criteria, detailed history was recorded for all 100 study subjects. The present study was a questionnaire-based study that utilized the preformed structure proforma that assessed basic knowledge about the well-being of the study subjects and their efficiency during working hours. The answer to the questions was either in the yes or no format on the marking grades of 0-5 that varied from not at all for 0 score and 5 for very much score.

Audiometry was done for all the study subjects using an audiogram which is an electronic device producing the pure tones whose intensity can be raised or reduced in 5dB steps. The degree of hearing impairment assessment at a particular frequency was taken as the intensity amount which is raised above the

normal levels. The results that are obtained in the graph form were considered as an audiogram. The graph of the audiogram depicted the softest sound that a person can hear at various frequencies. Audiograms measure the threshold of hearing by bone and air conduction, and hence, assess the type and degree of hearing loss. The audiogram is essential for hearing aid prescription and helps in finding a handicap degree for medicolegal reasons. The study involved no risk as audiometry is a non-invasive procedure.

Results

The present retrospective study was conducted to assess the noise effects on railway employees with the rate of hearing loss growth and reduction in their working efficiency. Also, the study assessed noise's effect on regular daily life. The present study included 100 subjects working at the Ratlam railway junction who were selected by deliberate sampling method. The present study was a questionnaire-based study that utilized the preformed structure proforma that assessed basic knowledge about the well-being of the study subjects and their efficiency during working hours. On assessing the stress levels, it was seen that Feeling any kind of irritation/mental stress during working hours due to noise was seen in 65% (n=65) of study subjects, Strain over the conversation when 2 or more people are talking was responded positively by 60% (n=60) subjects, Stress overhearing in the noisy background was filled as positive by 50% (n=50) subjects, and feeling of buzzing or ringing sound was felt in the ears of 36% (n=36) subjects, whereas, 64% (n=64) subjects responded that they did not feel any buzzing or ringing sounds in their ears as shown in Table 1.

The answer to the questions in the present study was either in the yes or no format on the marking grades of 0-5 that varied from not at all for 0 score and 5 for very much score. Concerning feeling any kind of irritation/mental stress during working hours due to noise the scores of 0, 1, 2, 3, 4, and 5 were respectively seen in 45%, 25%, 13%, 8%, 7%, and 2% subjects, Stress overhearing in the noisy background was scored as 0, 1, 2, 3, 4, and 5 by 40, 37, 13, 6, 3, and 1 subject respectively, Stress overhearing in the noisy background was given a scoring of 0, 1, 2, 3, 4, and 5 by 50, 18, 14, 13, 5, and 0 subject respectively, and for the feel of ringing/buzzing, the scores of 0, 1, 2, 3, 4, and 5 were respectively seen in 64, 22, 6, 6, 2, and 0 subject as depicted in Table 2.

The other factors assessed on the questionnaire from study subjects were assessed on a yes or no scale where earplugs of any kind were used by 20% (n=20) subjects, whereas, 80% (n=80) subjects were not aware of earplug use, frequent earaches were reported by 12% (n=12) study subjects, and anxiety due to noise was reported positive in 20% (n=20) subjects and negative in 80% (n=80) subjects. Only 35% (n=35) of study subjects were aware of a hearing aid of any kind, whereas, 65% (n=65) of subjects were not aware of any hearing aid. 32% (n=32) subjects admitted that noise was affecting their personal life and in 68% (n=68) subjects noise did not affect their life. The study questionnaire also assessed the clarity of voice audibility in the study subjects, and it was seen that clear voice was audible from the right ear in 35% (n=35) subjects, from the left ear in 44% (n=44) subjects, and from both ears in 21% (n=21) subjects respectively as shown in Table 3.

Discussion

The present retrospective study was conducted to assess the noise effects on railway employees with the rate of hearing loss growth and reduction in their working efficiency. Also, the study assessed noise's effect on regular daily life. The present study included 100 subjects working at the Ratlam railway junction who were selected by deliberate sampling method. The present study was a questionnaire-based study that utilized the preformed structure proforma that assessed basic knowledge about the well-being of the study subjects and their efficiency during working hours. On assessing the stress levels, it was seen that Feeling any kind of irritation/mental stress during working hours due to noise was seen in 65% (n=65) of study subjects, Strain over the conversation when 2 or more people are talking was responded positively by 60% (n=60) subjects, Stress overhearing in the noisy background was filled as positive by 50% (n=50) subjects, and feeling of buzzing or ringing sound was felt in the ears of 36% (n=36) subjects, whereas, 64% (n=64) subjects responded that they did not feel any buzzing or ringing sounds in their ears. These findings were consistent with the results of Basner M et al⁸ in 2014 and Mirza R et al⁹ in 2018 where authors reported similar stress and strain in subjects with occupational exposure to loud noise as in the present study.

The responses in answer to the questions in the present study were either in the yes or no format on the marking grades of 0-5 that varied from not at all for 0 score and 5 for very much score. Concerning feeling any kind of irritation/mental stress during working hours due to noise the scores of 0, 1, 2, 3, 4, and 5 were respectively seen in 45%, 25%, 13%, 8%, 7%, and 2% subjects, Stress overhearing in the noisy background was scored as 0, 1, 2, 3, 4, and 5 by 40, 37, 13, 6, 3, and 1 subject respectively, Stress overhearing in the noisy background was given a scoring of 0, 1, 2, 3, 4, and 5 by 50, 18, 14, 13, 5, and 0 subject respectively, and for the feel of ringing/buzzing, the scores of 0, 1, 2, 3, 4, and 5 were respectively seen in 64, 22, 6, 6, 2, and 0 subject. These results were in agreement with the studies of Wada T et al¹⁰ in 2017 and Pelegrin AC et al¹¹ in 2015 where authors have reported comparable stress and strain in their studies as in the present study.

Concerning the other factors assessed on the questionnaire from the study, subjects were assessed on a yes or no scale where earplugs of any kind were used by 20% (n=20) subjects, whereas, 80% (n=80) subjects were not aware of earplugs use, frequent earaches were reported by 12% (n=12) study subjects, and anxiety due to noise was reported positive in 20% (n=20) subjects and negative in 80% (n=80) subjects. Only 35% (n=35) of study subjects were aware of a hearing aid of any kind, whereas, 65% (n=65) of subjects were not aware of any hearing aid. 32% (n=32) subjects admitted that noise was affecting their personal life and in 68% (n=68) subjects noise did not affect their life. The study questionnaire also assessed the clarity of voice audibility in the study subjects, and it was seen that clear voice was audible from the right ear in 35% (n=35) subjects, from the left ear in 44% (n=44) subjects, and from both ears in 21% (n=21) subjects respectively. These findings were in line with the results of Chadambuka A et al¹² in 2013 and Kitcher ED et al¹³ in 2014 where authors have reported similar awareness about

hearing aids, earaches, anxiety, and the effect of noise on personal life in subjects with noise exposure as of the present study.

Conclusion

Within its limitations, the present study concludes that noise has marked effects on the workers of the railway with an impact on their personal life. Owing to the prolonged exposure to the loud noise the railway workers, face problems in their professional and personal life. The present study had a few limitations including small sample size, shorter monitoring period, and geographical area biases. Hence, more longitudinal studies with a larger sample size and longer monitoring period will help reach a definitive conclusion.

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TABLES

Table 1: Stress and strain in the study subjects

| S. No | Questionnaire and response | Percentage (%) | Number (n=100) |
|-------|--|----------------|----------------|
| 1. | Feeling any kind of irritation/mental stress during working hours due to noise | | |
| a) | Yes | 55 | 55 |
| b) | No | 45 | 45 |
| 2. | Strain over the conversation when 2 or more people are talking | | |
| a) | Yes | 60 | 60 |
| b) | No | 40 | 40 |
| 3. | Stress overhearing in noisy background | | |
| a) | Yes | 50 | 50 |
| b) | No | 50 | 50 |
| 4. | Feel ringing/buzzing in the ear | | |
| a) | Yes | 36 | 36 |
| b) | No | 64 | 64 |

Table 2: Gradings of Stress and strain in the study subjects

| S. No | Questionnaire and response | Grades | | | | | |
|-------|--|--------|----|----|----|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 1. | Feeling any kind of irritation/mental stress during working hours due to noise | 45 | 25 | 13 | 8 | 7 | 2 |
| 2. | Strain over the conversation when 2 or more people are talking | 40 | 37 | 13 | 6 | 3 | 1 |
| 3. | Stress overhearing in noisy background | 50 | 18 | 14 | 13 | 5 | 0 |
| 4. | Feel ringing/buzzing in the ear | 64 | 22 | 6 | 6 | 2 | 0 |

Table 3: Assessment of voice effects on the personal life of the study subjects

| S. No | Parameters | Percentage (%) | Number (n=100) |
|-------|-------------------------------|----------------|----------------|
| 1. | Clear voice audibility | | |
| a) | Right | 35 | 35 |
| b) | Left | 44 | 44 |
| c) | Both | 21 | 21 |
| 2. | Earplug use | | |
| a) | Yes | 20 | 20 |
| b) | No | 80 | 80 |
| 3. | Frequent earaches | | |
| a) | Yes | 12 | 12 |
| b) | No | 88 | 88 |
| 4. | Anxiety due to noise | | |
| a) | Yes | 20 | 20 |
| b) | No | 80 | 80 |
| 5. | Awareness about hearing aid | | |
| a) | Yes | 35 | 35 |
| b) | No | 65 | 65 |
| 6. | Noise affecting personal life | | |
| a) | Yes | 32 | 32 |
| b) | No | 68 | 68 |