Influence of Noise Exposure Level on Hearing Impairment and Overall Well-Being of Factory Workers in Ogun State

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Abstract
Excessive industrial noise in Nigerian factories endanger the hearing and overall health of industry workers. The usage of massive, loud machinery has raised worries about workers' physical and mental well-being, reducing productivity. Given the significance of worker well-being in maintaining optimal productivity levels, this study looked into the impact of noise exposure on hearing impairment and overall health among industrial workers in Ogun state. A descriptive survey design was used, using 200 randomly selected employees from eleven factories in the Ogun East Senatorial District. Data were gathered using three study tools: the Level of Noise Questionnaire (LNQ), the Influence of Noise Exposure Level on Hearing Impairment Questionnaire (NELHIQ), and the Effect of Noise on Health Questionnaire. The results were evaluated using mean scores, standard deviation, linear regression and multivariate analysis of variance. The results showed a moderate but significant positive association between noise exposure levels and hearing impairment (r =.585), implying that as noise exposure increases, so does hearing damage. Noise exposure significantly reduced worker well-being (β = -0.567, p <.001). However, demographic characteristics such as age and years of experience had no significant impact on noise-related well-being. The article concluded that prolonged exposure to industrial noise contributes to hearing impairment and other health problems such as headaches and speech interference. It recommends strict enforcement of noise control regulations, consistent use of protective devices, and regular hearing and health assessments to safeguard the health and productivity of factory workers.
Keywords: Factory workers, Hearing Impairment, Noise exposure, Sound, Well-being

Introduction

Noise is defined as an unwanted or meaningless sound that not only causes auditory damage but also interferes with concentration and task performance (Nassiri et al., 2015; Gabriel et al., 2019). Unlike other environmental hazards, the effects of noise are often delayed and go unnoticed until significant harm has occurred. The World Health Organizations (WHO) identifies noise as the third most dangerous pollutant in mega-cities, contributing to growing health risks globally (Domina, 2022). Daily exposure to varying levels of noise can lead to hearing impairment, the severity of which depends on the noise intensity and exposure duration (Aliabadi et al., 2015). Noise-induced hearing loss may be temporary, manifesting as ringing in the ears or permanent, resulting in irreversible damage to the auditory system (Osinusi, 2018).

Factory environments have long been recognized as high-risk zones for noise-induced hearing loss. Occupational exposure to loud machines in industries such as sawmills, power plants, and metal workshops has resulted in conditions like acoustic trauma, tinnitus, and threshold shifts (Otoghile et al., 2018; Taneja, 2014). Such noise exposure damages inner ear structures like hair cells, which are vital for hearing. In noisy workplaces, communication among workers becomes difficult, increasing the risk of misunderstandings, accidents, and reduced task accuracy. The constant exposure also impairs concentration and cognitive function, compounding the risk of errors and inefficiencies.

Beyond auditory effects, excessive noise in factories contributes to broader health challenges such as hypertension, stress, sleep disruption, and cognitive decline (Münzel et al., 2018; Allen et al., 2012). Elevated blood pressure, especially among urban labourers, has been linked to chronic noise exposure (Böhm et al., 2018; Nassiri et al., 2013). These issues threaten worker health and performance. Meanwhile, automation and technological advancement in the industry have introduced even louder machinery, further endangering workers. While these technologies aim to improve productivity, they also require specialised skills and contribute to employee burnout (Faiza & Nazir, 2015; Bevan, 2015).

Despite WHO and Environmental Protection Agency (EPA) recommendations to limit noise exposure to below 70 dB over 24 hours and 75 dB for 8-hour workdays (Mahapatra et al., 2023), factory workers still face hazardous conditions. Prolonged exposure to excessive noise leads to hearing loss, poor job performance, and in severe cases, job loss and deteriorating health (Jiyah&Jiyah, 2020; Mahapatra et al., 2023). This can reduce productivity and result in economic hardships for both the workers and the companies involved. Given these risks, this article aims to investigate how noise-induced hearing loss and health challenges affect the well-being and effectiveness of factory workers in Ogun state.

Statement of the Problem

Factory work plays a crucial role in economic development by offering employment opportunities, particularly in regions where manufacturing is a key sector. For many individuals; especially those without specialized skills, it serves as a reliable source of income, supporting both personal and family needs. However, despite their vital contributions to production and the overall industrial process, factory workers often face serious health challenges. A major concern is their constant exposure to excessive noise from heavy machinery, which can lead to long-term health complications rather than enabling them to enjoy the benefits of their labour.

The physical demands and hazardous conditions of factory environments; exacerbated by increased automation and technological advancements, expose workers to harmful elements such as intense noise, heat, and smoke. Prolonged exposure to high noise levels can result in temporary or permanent hearing loss, as well as other health conditions including hypertension, stroke, and stress-related illnesses. These risks significantly undermine the quality of life and productivity of factory workers.

In severe cases, the health issues linked to noise exposure can lead to permanent disability or even untimely death, particularly when affected workers are unable to afford adequate healthcare. As such, addressing the negative impact of excessive noise is essential to improving worker welfare and ensuring safe working environments in the manufacturing sector.

This article examines the impact of noise exposure levels on hearing impairment and overall well-being among manufacturing workers in Ogun state. The research aims to identify the magnitude of the problem and propose effective ways to protect workers' health and improve industrial workplace conditions.

Review of Literature

Several studies have been carried out on the effects of excessive noise on hearing, health and its relationship to job performance of factory workers and these effects are capable of degrading their health and productivity, this includes; review on noise exposure and workers' well-being, review on noise exposure and hearing impairment of factory workers and review on noise exposure and workers' performance.

Fasola and Osisanya (2022) investigated the effects of occupational stress and industrial noise exposure on the psychological health and auditory function of manufacturing workers in Ibadan, Nigeria. They conducted Pure-Tone Audiometric Assessments (PTA) and gave 304 employees a self-created questionnaire using a survey methodology. Results revealed a high prevalence of hearing loss, with 67.8% showing varying degrees and patterns of impairment, and many participants reporting symptoms like difficulty hearing, needing to switch ears during phone calls, and turning up device volumes. Additionally, over half struggled to communicate with co-workers, showing the combined effect of noise and stress on hearing and mental health. The study recommended regular hearing assessments, protective devices, stress awareness programs, and reduced working hours to improve worker well-being. This study examines how industrial noise affects Nigerian workers' health and productivity, which is in line with this article. The main difference, though, is in the regions of attention. While this article only considers the impact of noise exposure on hearing impairment and general well-being in Ogun State, Fasola and Osisanya, (2022) incorporated both noise exposure and work-related stress as predictors of auditory and psychological outcomes in Ibadan.

Amjad-Sardrudi et al., (2012) conducted a cross-sectional study in Iran to assess the link between noise exposure and occupational injuries among 1,062 factory workers. Workers exposed to sound pressure levels ≥85 dB faced significantly higher risks of injuries compared to those exposed to lower noise levels. Hearing loss further increased injury risk, with mild and moderate hearing loss contributing to injury risks by up to 7.87 and 4.58 times, respectively. The study concluded that occupational noise exposure significantly endangers workplace safety and that reducing noise levels and providing assistive listening devices can help lower injury rates among affected workers.

Mahapatra et al., (2024) examined how prolonged noise exposure affects the health and hearing of workers in noisy environments using a simulated annealing algorithm. The study focused on workers in hot environments exposed to machine noise for 8–10 hours daily. Audiometric tests were conducted on 76 workers, and findings showed significant hearing issues caused by noise, vibration, and temperature. Their model indicated worse hearing conditions inside noisy rooms compared to outside. The study recommended implementing hearing conservation measures in such environments.

Assaf, (2022) investigated how mental health affects employee performance in international non-governmental organizations (INGOs) in Jordan. Using qualitative methods through one-on-one interviews, the study revealed a significant relationship between mental health and job performance. Although some INGOs include mental health in policy, they rarely implement it in practice. The research concluded that poor mental health reduces employee performance, urging managers to prioritize mental health in strategic planning. This article relates to Assaf, (2022) in its focus on employee well-being but differs by exploring the impact of noise exposure on hearing and overall well-being among factory workers in Ogun state, Nigeria.

Owolawi, (2021) investigated noise exposure among Nigerian industrial workers and its connection to Noise-Induced Hearing Loss (NIHL). The study evaluated 70 workers across three manufacturing firms, revealing significant hearing impairments due to prolonged exposure to loud noise. It emphasized the need for hearing protection devices and preventive strategies to reduce acoustic trauma and improve worker safety.

Marco et al., (2015) examined how health and well-being influence productivity in

British companies, drawing data from the Britain's Healthiest Company (BHC) competition. The study linked presenteeism and absenteeism to factors like workplace stress, personal lifestyle, and chronic conditions. Using regression models, it found strong associations between poor health and reduced productivity. While the focus was on British organizations, this article aligns with the present research in investigating how workplace conditions affect productivity. However, the article focuses specifically on noise exposure and hearing impairment among Nigerian factory workers.

Sripaiboonkij et al., (2013) studied noise-induced hearing health issues in motor compressor factory workers. The research used a cross-sectional method with hearing tests and noise measurements, revealing that long-term exposure (especially over 14 years or 8 hours daily) significantly increased the risk of standard threshold shift (STS). Workers with STS also experienced communication difficulties and stress. This study supports the present research by confirming that duration and intensity of noise exposure can cause significant hearing-related and psychological problems among workers.

Research Questions

The following research questions were used to guide the study

1. What is the magnitude of noise exposure experienced by factory workers in Ogun state?
2. What is the influence of noise exposure level on hearing impairment of factory workers in Ogun state?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant relationship between noise exposure level and hearing impairment among factory workers
2. Noise exposure level has no significant influence on the overall well-being of factory workers in Ogun state.
3. There are no significant differences in the influence of noise exposure level on hearing impairment and overall well-being across demographic group based on age and years of experience of factory workers in Ogun state

Methodology

This study employs a descriptive research methodology with a survey type to investigate the impact of noise exposure levels on hearing impairment and overall well-being of factory workers in Ogun state. This research strategy was chosen for this study because of its flexibility and in-depth comprehension, both of which were extremely useful in data collection. The data for this study was collected using three questionnaires: the Level of Noise Questionnaire (LNQ), the Influence of Noise Exposure Level on Hearing Impairment Questionnaire (NELHIQ), and the Effect of Noise on Overall Well-being Questionnaire (ENOWQ), with reliability coefficients (α) ranging between 0.76 and 0.97.

A purposive and random sampling strategy was utilised to pick 200 manufacturing workers from 11 of 48 factories in Ogun State's Ogun East Senatorial District as study participants. The Ogun East Senatorial District was chosen specifically because it is one of the state's industrial hubs. Descriptive statistics, such as mean and standard deviation (SD), are used to summarise overall trends and patterns in answers. Inferential statistics, such as linear regression and multivariate analysis of variance (MANOVA), were employed to examine and test the relationship between all dependent and independent variables. Specifically, study questions 1 and 2 were answered using descriptive statistics of mean and SD, and hypotheses 1–3 were assessed at the 0.05 level of significance.

Results

This section presents the data analysis and the interpretation of the results to answer the two research questions and the three null hypotheses formulated for the study.

Table 1

Mean responses on the magnitude of noise exposure experienced by factory workers in Ogun state

S/N	NOISE LEVEL	MEAN (X)	SD	REMARK
1	What is the average level of sound in the factory during peak production hours?	4.23	.701	High
2	What is the average level of sound of the machinery in the factory during peak production?	4.06	.641	High
3	What is the background sound level when machines are not operating?	2.54	.866	Low
4	What is the level of sound from noise generated from activities that occur outside regular working hours ?	2.77	.659	Low
5	What is the sound level during different shifts or operations?	4.24	.869	High
	Average mean	**3.56**		

Table 1 presents mean responses on the magnitude of noise exposure experienced by factory workers in Ogun state. The table revealed that the mean values on magnitude of noise these factory workers experienced range between 2.54 to 4.24, average level of sound in the factory during peak production hours (**X** = 4.23; SD= .701), average sound level of machinery in the factory during peak production (**X** = 4.06; SD= .641), and the sound level during different shifts or operations (**X** = 4.24; SD= .869). The noise experienced when machines are not operating and noise generated from activities that occur outside regular working hours are 2.54 and 2.77 respectively. However, with an average

mean of 3.56 which is greater than the decision rule (2.49) of the study, it was therefore revealed from this table that the magnitude of noise exposure experienced by these factory workers in Ogun state is extremely high and this could have adverse implication on the factory workers.

Table 2

Mean responses on the influence of noise exposure level on hearing impairment of factory workers in Ogun state

S/N	NOISE LEVEL	MEAN (X)	SD	REMARK
1	I hardly comprehend instruction from my supervisor due to high noise exposure	3.37	1.01	Agree
2	I often use earplugs when exposed to loud noises	4.24	.869	Strongly Agree
3	When people talk to me while in the factory, I usually request for repetition or clarification	3.54	.975	Agree
4	I cannot hear people well when am outside my place of work	2.87	1.15	Disagree
5	I have been told severally that i always talk too loudly when talking to someone at my place of work.	3.55	.982	Agree
6	Most times when receiving calls via mobile phone. I frequently change the phone from one ear to another	3.29	1.00	Agree
7	I hear better in one ear than other	3.13	1.01	Agree
8	I do have difficult hearing /understanding my co-workers, clients while in the factory.	3.25	1.02	Agree
9	My hearing performance cause me to feel frustrated when talking to co-workers during peak production hours	3.35	.994	Agree
10	My co-workers usually feel uncomfortable talking to me from a far distance	3.41	1.00	Agree
11	Factory noise makes me have poor hearing	3.06	1.12	Agree
12	I always have difficulty hearing someone voice while in the factory	3.33	1.05	Agree
13	I experience persistent ringing, buzzing, or humming in my ear due high noise in the factory	3.36	1.03	Agree
14	I sometimes experience ear fullness/discomfort due to high noise exposure in the factory	3.28	1.02	Agree
	Average mean	**3.35**		

Table 2 shows mean responses to the effect of noise exposure level on hearing impairment among factory workers in Ogun State. The table demonstrated a mean response of 2.87 to 4.24 on the effect of noise exposure level on hearing impairment in factory workers. It demonstrates that respondents felt that noise levels in factories could have a major impact on hearing impairment among manufacturing workers. However, with an average mean of 3.35, which is higher than the study's decision rule (2.49), it was discovered that noise exposure level has a significant influence on hearing impairment, and thus long-term exposure to high levels of noise may cause permanent or temporary hearing loss among factory workers.

Table 3

Relationship between noise exposure level and hearing impairment among factory workers

S/N	Variables	Mean (X)	SD	Sig. (2-tailed)	1	2
1	Noise exposure level	3.38	.45	<.001	1	
2	Hearing impairment	3.35	.79		.585**	1

Correlation is significant at the 0.05 level (2-tailed).

Table 3 indicates the correlation between noise exposure and hearing impairment among industry workers. The table displays noise exposure levels (X = 3.38, SD =.45) and hearing impairment rates among factory workers (X = 3.35, SD =.79). The table demonstrates a moderately positive correlation (r =.585) between noise exposure level and hearing impairment, with values ranging from 0.3 to 0.7.The table demonstrates a moderately positive correlation (r =.585) between noise exposure level and hearing impairment, with values ranging from 0.3 to 0.7. Additionally, Sig. (2-tailed) values of .001 indicate a statistically significant link at the 0.05 level. The study found a "moderate" positive association between the variables. The study found a moderate and positive correlation between noise exposure and hearing impairment among industry workers. **Ho1** was rejected as there is a significant link between noise exposure and hearing impairment among industry workers.

Table 4 shows the impact of noise exposure level on overall well-being of factory workers in Ogun state. The table shows that noise exposure level has an influence on the overall well-being of factory workers in Ogun state (β= -.567) and the influence is significant (p=.001). However, the table further revealed that there is a negative significant influence of noise exposure level on overall well-being of factory workers in Ogun state. Hence, **Ho2** was rejected, because noise exposure level has a significant negative influence on the well-being of factory workers in Ogun state.

Table 4: Linear regression showing the impact of noise exposure level on overall well-being of factory workers in Ogun state

Variable	B	SEB	B	T	P
Noise exposure level	1.057	.130	-.567	8.110	.001
Constant	-.175	.445			

Dependent Variable: Overall well-being

Table 5 presents the influence of noise exposure levels on hearing

impairment and overall well-being across demographic factors, specifically age and years of experience, among factory workers in Ogun State. The results indicate a significant overall effect of noise exposure on hearing impairment and well-being when considered jointly across these demographic factors, Wilks'(^)=.657, **f**=33.188, p=.001, partial n^2=.34. Separate MANOVAs were conducted for each dependent variable, with an alpha level set at .034. The analysis revealed no significant differences in the influence of noise exposure on hearing impairment based on age and years of experience,Wilks'(^)=.913, **f**=1.976[b], p=.069, partial n^2=.03, with factory workers aged 15 to 41 and above, and experience ranging from 0 to 31 years, showing an above-average mean of 3.35 (SD=.79). Similarly, no significant differences were found for overall well-being, Wilks'(^)=.858,**f**=2.536[b], p=.054, partial n^2 =.012, with the same demographic groups reporting an above-average mean of 3.40 (SD =.84). Therefore, the null hypothesis was retained, indicating that noise exposure's impact on hearing impairment and overall well-being does not significantly differ across age and years of experience among factory workers in Ogun state.

Table 5

MANOVA analysis of the differences in the influence of noise exposure level on hearing impairment and overall well-being across demographic factors based on age and years of experience of factory workers in Ogun State

Factor		X	SD	W test (^)	f	df_1	df_2	Sig.	n^2
Noise exposure level	hearing impairment			.657	33.188[b]	2	127	.001	.340
	well-being								
Age and year of experience	hearing impairment	3.35	.79	.913	1.976[b]	6	254	.069	.030
	well-being	3.40	.84	.858	2.536[b]	8	254	.054	.012

a. Design: Intercept + Noise_Level_Scale + Age + Years of Experience + Age * Years of Experience

Discussion of Findings

The study found that the level of noise exposure leading to hearing impairment among factory workers in Ogun State is significantly high. This indicates that prolonged exposure to excessive noise poses a serious risk to workers' hearing health. Similarly, a study by Fasola and Osisanya (2022) revealed that out of the participants who underwent audiological testing, 206 (67.8%) showed various forms and patterns of hearing loss. Specifically, 130 (47.0%) exhibited high-frequency hearing loss in the right ear, while 150 (54.6%) experienced the same in the left ear. Additionally, 90 (33.0%) had mild hearing loss in the right ear, compared to 80 (29.0%) in the left. Furthermore, 188 (61.8%) of the participants reported difficulty hearing when someone speaks in a whisper or low voice. A total of 216 (71.1%) frequently switched ears when using a mobile phone, and 181 (59.5%) acknowledged hearing better in one ear than the other.

Further findings revealed that 179 (58.9%) of the participants do have difficulty hearing as well as understanding their fellow co-workers, clients or customers whenever engaging in conversation. 163 (53.6%) of the participants agreed that they always tune up to high volume when using mobile phone, TV or Radio. The study found that high level of noise affects the well-being of factory workers with symptoms

such as headache, interference in speech, sleepless night, anxiety and psychological stress, muscle pain, depression, tiredness and also increase the risk of accidents among these factory workers in Ogun state. This means that excessive noise exposure significantly affects the well-being of factory workers in Ogun state.

The article revealed that the magnitude of noise exposure experienced by factory workers is high in Ogun state. This means that as noise exposure increases, hearing impairment also rises, though other factors may contribute. The statistical significance of the findings confirms that the observed relationship is unlikely to be due to chance. A moderate correlation indicates a meaningful, though not definitive, effect. This aligns with the study by Sripaiboonkij et al., (2013), which examined the health impacts and standard threshold shifts among workers in noisy environments. Their research found that the average continuous noise level in the workplace was 84.14 ± 5.21 dB(A), indicating a high noise exposure. Similarly, Aktuğ et al., (2019) reported through statistical analysis that noise levels at Erbil Steel Company were considerably high, placing workers at increased risk of noise-related disturbances. In that study, 70.5% of respondents who acknowledged high workplace noise also reported feeling exhausted due to the noise.

Ultimately, high noise levels in the factory can lead to various injuries and compromise worker safety. This is consistent with the findings of Amjad-Sardrudi et al., (2012), who noted that occupational noise exposure and hearing impairment negatively affect workplace safety and increase the likelihood of work-related accidents. Therefore, reducing noise exposure can significantly enhance safety in noise-prone work environments. Furthermore, according to employee replies, the majority (85.2%) of employees who thought that workplace noise levels were excessive agreed that noise had a negative impact on production quality and workmanship.

The article found out that there is a moderate and positive significant relationship between noise exposure level and hearing impairment among factory workers. It implies that higher noise exposure is associated with increased hearing impairment. A moderate correlation suggests that while noise is a key factor, other variables may also contribute. The significance indicates that the relationship is not due to chance. Similarly, the result of the study of Fasola and Osisanya (2022) showed that there was a positive significant relationship between industrial noise and auditory among factory workers in Ibadan. This means that there was a significant difference in the mean value of industrial noise and auditory performance, and that continuous exposure to industrial noise brings about negative changes in the auditory performance of these workers who were constantly exposed to the industrial noise. This finding was in line with the findings of Fada and Osisanya (2017); and Adesokan and Osisanya (2019) that reported similar high prevalence of high frequency hearing loss among the factory workers as well as the commercial drivers in Ibadan metropolis.

Besides, the article revealed that there is a negative significant impact of Noise exposure level on overall well-being of factory workers in Ogun State. This means that increased noise exposure levels negatively and significantly affect the overall well-being of factory workers in Ogun State. More so, workers are exposed to higher levels of industrial noise, experienced deteriorations in their physical, mental, and emotional health status. This negative impact could yield to issues which include increased stress levels, fatigue, sleep disturbances,

reduced concentration, and even long-term health complications. Therefore, high noise exposure level that affect the overall well-being of factory workers can easily affect their performance. Similarly, the study of Assaf, (2022) which investigated the employee performance impacted by mental Health and employee well-being in INGOs Jordan. The results demonstrate a strong correlation between workers' mental health and workplace performance. The findings suggest that employees' performance may suffer if they have poor mental health.

Similarly, Asad et al., (2013) found that workers experienced psychological issues such as anxiety and depression, which were linked to both night shift work and a noisy work environment. In line with this, Mahapatra et al., (2024) examined the impact of noise on human hearing and health using a simulated annealing algorithm. Their study revealed that environmental noise can significantly affect employee health and productivity. Prolonged exposure to high levels of noise and vibration was also found to pose serious health risks. Supporting these findings, Fasola and Osisanya (2022) reported a significant positive relationship between industrial noise and psychological well-being among factory workers in Ibadan. Their study further highlighted that continuous exposure to industrial noise can have detrimental effects on workers' mental health over time.

The article found that there are no significant differences in the impacts of noise exposure level on hearing impairment and overall well-being across demographic factors based on age and years of experience of factory workers in Ogun state. This implies that the impact of noise exposure levels on hearing impairment and overall well-being among factory workers in Ogun state does not significantly vary across demographic factors based on age and years of experience. Also, this means that both younger and older workers, as well as those with varying levels of work experience, experience similar effects from prolonged exposure to industrial noise. Regardless of how long workers have been exposed to noise in the factory environment, the risks of hearing impairment and negative health status remain consistent.

Consistent with the findings of Gyamfi et al., (2016), factors such as age, length of employment, and the use of earplugs were identified as independent predictors of hearing loss. Their study revealed that all machines operating in the quarries generated noise levels exceeding the permissible threshold, ranging from 85.5 dB to 102.7 dB. Among the respondents, 176 (44%) had hearing thresholds above 25 dB, with 18% experiencing moderate hearing loss (41–55 dB) and 2% suffering from severe impairment (71–90 dB). The use of earplugs was shown to have a protective effect against hearing loss. These findings align with those of Sripaiboonkij et al., (2013), which demonstrated that factory workers exposed to noise for at least 8 hours a day over a period exceeding 14 years were at an increased risk of developing hearing impairment.

Conclusion

The study revealed that noise exposure adds considerably to hearing impairment and has a detrimental impact on the overall well-being of industrial workers in Ogun state, with symptoms such as headaches, speech difficulties, sleep problems, and psychological stress. Despite a moderate positive link between noise exposure and hearing impairment, demographic characteristics such as age and years of experience had no bearing on these effects. The findings highlight the importance of implementing effective noise control measures, conducting regular hearing examinations, enforcing safety laws, and improving workplace

conditions to safeguard worker health and productivity.

Recommendation

Based on the study's findings, the following were recommended:

1. The government should enforce strict noise regulations and monitor factory compliance to reduce excessive noise exposure.
2. Factory workers should persistently use personal noise-protective equipment like earplugs and earmuffs to prevent hearing impairment.
3. Factory owners must deploy noise-reducing technologies and ensure regular machine maintenance to minimise noise in the workplace.
4. Government organisations should enforce periodic hearing tests and health assessments to uncover early signs of noise-induced issues.
5. Factory owners should modify work shifts to limit prolonged noise exposure and health risks for factory workers.

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