Original Article

A study of self-reported health problems of the people living near railway tracks in Raipur city

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Abstract

Noise is pervasive in everyday life and can cause both auditory and nonauditory health effects. Noise-induced hearing loss remains highly prevalent in occupational settings. Nonauditory effects of noise can cause tinnitus, headache, auricular plenitude, dizziness, and gastric, visual, sleep, and mood disorders, endocrine imbalance, and cardiovascular disorders. A cross-sectional study among resident above the age of 18 years of the selected urban slum near railway track of Raipur City with a sample size of 400 was conducted. 23.0% of the study subjects responded of facing auditory fatigue, followed by 11.5% of the study subjects reported of hearing loss, 6% of the study participants perceived that the surrounding noise led to an increase in their blood pressure. Loss of sleep/insomnia was reported by 6% of resident in our study. Health effects of environmental noise are manifold, serious and, because of the widespread exposure, very prevalent. These factors stress the need to regulate and reduce environmental noise exposure.

Keywords: Noise-induced hearing loss, nonauditory effects, railways, slums

Introduction

Noise is pervasive in everyday life and can cause both auditory and nonauditory health effects. Noise-induced hearing loss remains highly prevalent in occupational settings. The word noise is derived from the Latin word "*nausea*" meaning impulsive, unwanted, and unpleasant; it can also be defined as "unwanted sound"[1] and is perceived as an environmental stressor and nuisance. It interferes with human communication, comfort, and feeling of well being. Noise-induced hearing loss (NIHL) scientifically established as an adverse auditory health effect of noise is the most common cause of sensorineural hearing loss (SNHL). It is one of the most common workplace disorders and the second most common self-reported occupational injury according to the World Health Organization. Over 5% of the world's population (466 million people) has disabling hearing loss (432 million adults and 34 million children). It is estimated that by 2050 over 900 million people—or one in every ten people—will have disabling hearing loss.[2] Nonauditory effects of noise can be defined as "all those effects on health and well-being which are caused by exposure to noise, with the exclusion of effects on the hearing organ and the effects which are due to the masking of auditory information (i.e. communication problems)."[3] Noise exposure can cause tinnitus, headache, auricular plenitude, dizziness, and gastric, visual, sleep, and mood disorders, endocrine imbalance, and cardiovascular disorders.[4] These disorders related to continuous noise exposure will depend on frequency, intensity, duration, and rhythm of the noise, as well as exposure time and individual susceptibility. Sleep time noise can cause disturbance in sleep, increase of blood pressure, heart rate, stress, and hormone levels, which may result in endothelial dysfunction and arterial hypertension.[5]

Annoyance is defined as a person's individual adverse reaction to noise. The term reaction to noise denotes an emotional

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response and may be related to dissatisfaction and bother due to the sound.[6] Auditory fatigue is defined as a temporary loss of hearing after exposure to sound.

Noise-induced sleep disturbance is responsible for about 900,000 DALYs, annoyance for 650,000 DALYs, ischemic heart disease for 65,000 DALYs, and children's cognitive impairment for 45,000 DALYs.[7] The technological and industrial advancement has resulted in humans' facing noise pollution in their working and living environments. Noise has many sources, most of which are associated with urban development: road, air, and rail transport; industrial noise; neighborhood noise; and recreational noise.

Railways has dense network around Raipur city and the empty land near railway track is home to many people. Due to its considerable presence in the urban grid, the railway noise is a serious environmental problem for population staying beside the railway tracks. Noise pollution by railway is the second-largest source of transport noise after road traffic noise[8] and it is a complex phenomenon. The noise from locomotive engines, horns, whistles, and switching and shunting operation in rail yards can impact neighboring communities and railway workers. Railway noise also has important short-term impact on the cardiovascular system and might increase the risk for hypertension.

The disabling effect of hearing impairment has always been talked about in the literature. In this article, we try to delve upon both the auditory and nonauditory self-reported effects of noise.

Methodology

Ethical committee clearance was obtained via AIIMSRPR/IEC/2019/306 DATED 05/08/19. A list of all settlements near railway track of Raipur City was obtained from Municipal Corporation. Random sampling was used to select an area. Center of that particular area/Government building was taken as the starting point and all the individuals who resided on the left-hand side of the building were enrolled for study purposes till the requisite sample size was achieved. Resident above the age of 18 years of the selected urban slum near railway track of Raipur City was taken as a study population. One to one interview was conducted for each of the participants thus enumerated and documentation done for all the health records present with them. A predesigned, pretested proforma was used to collect the information. Written informed consent was obtained from all the study participants. Information pertaining to sociodemographic profile was collected. Simultaneously, sensitization regarding reducing the effect of noise on their day to day activity was done.

Sample Size: The proportion of people in the urban slum with health problem in the selected slum sites "*P*" was taken as 50.0%. The permissible error was 5%. Using this formula ($4pq/l^2$) with 95% confidence limits, the sample size estimated was 396 which was rounded to 400 individuals in the selected urban slum.

Results and Discussion

The maximum number of participants were in age group 18–30 years (43.3%) followed by 31–44 years (31.3%) and 45–60 years (19.8%) [Table 1]. The majority were male; 38.5% of the study subjects were illiterate and 30.8% study subjects had high school level education. Majority 80.3% of the study subjects were married and belonged to nuclear family (90.8%).

Majority of the study subjects (64%) stated that they were facing a problem of noise pollution [Table 2]. The vibrations generated due to rail tracks/and engine radiate sound from the wheel and the rail and also from other vibrating surfaces such as parts of the boogi and suspension, rail car sides, and so on. In the present study, around half (47.8%) of the study subjects responded that train engine caused major noise pollution which was followed by track vibration (43.3%), and 9% reported train whistle as a source of noise.

Among the study subjects, 23.0% of them responded of facing auditory fatigue, followed by 11.5% of them reported of hearing loss [Table 3], which was similar to the study of Christi and

Table 1: Demographic variables

Demographic Variables	Number (percentage) *n*=400 (100%)
Age In Years	
18-30 years	173 (43.25)
31-44 years	125 (31.25)
45-60 years	85 (21.25)
Above 60 years	17 (4.25)
Religion	
Hindu	394 (98.5)
Muslim	4 (1)
Christian	2 (.5)
Gender	
Female	190 (47.5)
Male	210 (52.5)
Education	
Graduate	15 (3.75)
High School	123 (30.75)
Illiterate	154 (38.5)
Intermediate/plus12	31 (7.75)
Postgraduate	1 (0.25)
House Hold Type	
Kutcha	241 (60.25)
Pucca	80 (20)
Semi Pucca	79 (19.75)
Family Type	
Joint	37 (9.25)
Nuclear	363 (90.75)
Socioeconomic status (As per modified BG Prasad's classification	
Class 1	8 (2)
Class 2	49 (12.25)
Class 3	200 (50)
Class 4	134 (33.5)
Class 5	9 (2.25)

Adriyan[9] which reported 14% suffered from hearing loss among people living near a railway track.

A few (3%) of residents complained that their efficiency is reduced because of noise [Table 4]. Nausea was reported by 10.5% of participants. Visual disturbances were problem in 8.8% of the participants. Giddiness was perceived as a problem in 11.75% of the participants. In the present study, 17% population reported annoyance. Noise annoyance can result in interference with daily activities, feelings, thoughts, sleep, or rest, and may be accompanied by negative emotional responses, such as irritability, distress, exhaustion, a wish to escape the noise, and other stress-related symptoms. Severe annoyance has been associated with reduced well-being and health and, because of the high number of people affected, annoyance contributes substantially to the burden of disease from environmental noise. Studies have shown that the likelihood of depression and anxiety increased with annoyance.[10] Beutel *et al.*[11] and Pultznerova *et al.*[12] found that the degree of annoyance because of noise around the railway track to be 15.6% and 14.29%, respectively, which was similar to our study.

It has also been proven that nocturnal noise pollution significantly impairs sleep, objectively and subjectively. Loss of sleep/insomnia was reported by 6% of resident in our study, whereas Pultznerova *et al.*[12] in Northwest Slovakia found 26.42% sleep disturbance because of railway noise in its respondents (moderately + very much) and interfered with their daily activities and Khaiwal *et al.*[13]

Table 2: Problem of noise pollution

Variables	Yes
Is there any problem of noise in your area?	256 (64%)
Major sources of noise pollution in your area	
Track vibration	173 (43.3%)
Train engine	191 (47.8%)
Train whistle	36 (9%)

Table 3: Perception of auditory effects in study subjects

Variables	Yes	No
Whistling and buzzing in the ears (Auditory fatigue)	92 (23%)	308 (77%)
Hearing loss	46 (11.5%)	354 (88.5%)

Table 4: Nonauditory effects (as perceived by the study subjects)

Variables	Yes	No
Interference with speech	62 (15.5)	338 (84.5)
Annoyance	68 (17.0)	332 (83.0)
Efficiency problems	12 (3.0)	388 (97.0)
Loss of sleep/insomnia	24 (6.0)	376 (94.0)
Nausea	42 (10.5)	358 (89.5)
Fatigue	82 (20.25)	318 (79.75)
Visual disturbances	35 (8.8)	365 (91.2)
Giddiness	47 (11.75)	353 (88.25)

in India found that more than half of the respondents (55.6%) reported disturbance during sleeping due to noise.

Nonauditory effects of noise exposure are those effects that do not cause hearing loss but still can be measured, such as elevated blood pressure, loss of sleep, increased heart rate, cardiovascular constriction, labored breathing, and changes in brain chemistry [Table 5]. 6% of the study participants perceived that the surrounding noise led to an increase in their blood pressure. Two previous cross-sectional studies have investigated the effect of railway noise on the prevalence of hypertension and one found a significant positive association on road traffic noise, whereas the other study found no associations.[14,15] An overview from 2006 of the effects of exposure to transport noise (road, air, and rail) on cardiovascular health concluded that transport noise is associated with hypertension.[16]

In the study by Sørensen *et al.*[17] with respect to self-reported doctor's diagnosis of cardiovascular diseases, a borderline significant increase of risk was found in subjects exposed to the railway noise level. Babisch[10] also showed that long-term exposure to road traffic noise was weakly associated with a higher systolic BP in a cross-sectional design.

Increase in heart rate and breathing was reported by 12.25% of the participants but the increase in sweating was reported by 34.8% of the participants. Headache and heaviness were reported by only 10.75% of the participants in our study which was lower as compared to Khaiwal *et al.*[13] where 40.4% of respondents suffered from headache due to noise. There is clear evidence that sleep disturbances are associated with health deterioration, and growing evidence that exposure to noise pollution, around-the-clock, negatively affect health too.

In the present study, total 68 (17%) participants went through hearing testing in past one year. 28 (7%) participant underwent for the evaluation as per their self-decision, whereas 20 (5%) participants were advised by the doctors based on routine ear check-up and complaint [Table 6]. In addition, 9 (2.25%) were advised by their relatives as the participants were found to have difficulty hearing and understanding speech during a conversation. 11 (2.75%) participants documented no reasons for the hearing testing they went through. Out of 68 who underwent hearing testing (audiometric evaluation), 37 (9.25%) participants had documentation for audiometric evaluation. The document obtained reflected 16 (43%) participants having conductive hearing loss, whereas 21 (56%) participants were found to be suffering with sensori-neural hearing loss. Among SN cause of hearing loss, excessive noise in surrounding, i.e. railway track, train engine, and track vibration on passing of trail reported to be the main reason, in 16 (43%) which was reflected with notched pattern in audiogram. Audiometric notches commonly occur among nonnoise-exposed individuals, and there are still some who consider a notch as proof of NIHL.[18-20]

Table 5: Distribution of nonauditory effect (physiological changes) of study subjects living near railway track (Self-reported)

Variables	Frequency (Yes)	Percentage (No)
Raise in BP	24 (6)	376 (94.0)
Headache and heaviness	43 (10.75)	357 (89.25)
Increase in heart rate and breathing	49 (12.25)	35 (87.75)
Increase in sweating	139 (34.8)	261 (65.3)

Table 6: Past history of health problems due to noise

Variables	Yes *n*=400	Percentage
Hearing test in last 1 year	68	17
Why did you get the test done		
Self-decision	28	7.0
Doctors' advice	20	5.0
Relatives' advice	9	2.25
No reason	11	2.5
Hearing loss test document obtained	37	9.25
Details obtained from documents	Frequency *n*=37	Percentage
Type of hearing loss		
Conductive	16	43
Sensorineural	21	56
Degree of hearing		
B/L Mild	14	37
B/L Moderate	11	29
B/L Severe	6	16
U/L Mild	6	16
Pattern of hearing		
Flat	2	5
HF hearing loss	1	2.7
Notched pattern	26	70.2
Slopping	8	21
Cause of hearing loss informed byProfessional		
ASOM	2	5
CSOM	1	2.7
High-frequency steeply sloping	8	21
Noise-induced hearing loss	26	70.2

The documents showed slopping 8 (21%) pattern of hearing loss which could be aggravated due to exposure of environmental noise, i.e. railway track noise as is evident by other studies too.[21] Majority (83%) of audiometric evaluated patients suffered from Bilateral hearing loss which point towards it to be because of NIHL CASES as repoeted by Dobie in his study,[22] 16 (56%) and 3 (7.7)% had hearing loss because of CSOM and ASOM, respectively.

The present study reflects the nonauditory effects on residential population near railway tracks. It is a well-known fact that prolonged exposure to high-frequency noise can lead to many life-threatening situations. Noise is pervasive in everyday life and induces both auditory and nonauditory health effects. It influences health, behavior, activity, efficiency, and wellbeing of humans.[21] It has also been observed that the more sensitive to noise the individual, the more frequent were these symptoms. Because more than half of the respondents in the present study reported some or other problem because of noise, it is now high time to ring alarming bells to face this challenge head-on rather than ignore this.

Relevant to the practice of primary care.

Primary care physicians are 1st point of care, knowledge regarding the health effects of noise can help in making an early diagnosis and result in a better prognosis. They can also help in generating awareness regarding portative measures to prevent noise-induced hearing loss. This article can sensitize researchers for further studies related to noise effects on people staying near a railway track as there is a paucity of published literature in the Indian context in this topic.

Conclusions

The populations of urban areas and large city are growing, and the interest in the health effects of exposure to environmental noise such as rail transportation noise has also increased. Within the past few years, several new studies have been conducted strengthening the evidence for a link between exposure to high levels of environmental noise and ill-health, especially with regards to cardiovascular and endocrine health, immune function, sleep loss, and mental health.

In this article, we emphasize that auditory and nonauditory health effects of environmental noise are manifold, serious and, because of the widespread exposure, very prevalent. These factors stress the need to regulate and reduce environmental noise exposure (ideally at the source) and to enforce exposure limits to mitigate negative health consequences of chronic exposure to environmental noise. Educational campaigns for children and adults can promote both noise-avoiding and noise-reducing behaviors, and thus, mitigate negative health consequences. Efforts to reduce noise exposure will eventually be rewarded by lower amounts of annoyance, improved learning environments for children, improved sleep, lower prevalence of cardiovascular disease, and, in the case of noise exposure in hospitals, improved patient outcomes and shorter hospital stays. Additional research will be needed to completely assess and understand the increasingly present threat to human health that is chronic environmental noise which is prevalent and constitutes a public health threat needing preventive and therapeutic strategies.

Declaration of patient consent

The authors certify that they have obtained all appropriate participant consent forms. In the form, the participants have given their consent for their images and other clinical information to be reported in the journal. The participants understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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