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# Evaluation of Otological and Non Otological effects of noise exposure among bus drivers in an Indian metropolitan city

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## Abstract

**Aim:** To evaluate the Otological and Non Otological effects of noise exposure at work among intra-city public transport bus drivers.

**Materials and methods:** A survey was conducted among public bus drivers in Bangalore over a 4 month period using a questionnaire adopted from a study[8]. Information on hours of noise exposure, usage of ear protective devices, years in service along with occurrence of chronic illnesses such as DM, HTN etc, hearing loss, tinnitus, insomnia, headache, etc were collected. The above details were analysed and correlated with one another.

**Results:** Out of 247 bus drivers interviewed, 20 could not follow the questionnaire and 10 subjects did not consent for the study. Remaining 217 patients were included in the study. Occurrence of various comorbidities were studied- GERD had the highest incidence followed by hypertension and type II diabetes mellitus. None of the study subjects used any form of ear protective devices. 75.3% (162) of drivers exposed to front engine reported hearing loss, whereas none of the drivers of buses with back engine reported any form of hearing disturbances. Those with increased years of service and increased hours of noise exposure showed a positive correlation with hearing disturbance, tinnitus, irritability, poor quality of sleep and headache by the end

of the day. A shift over from night to day shift significantly helped improve health parameters.

**Conclusion:** Thus we conclude that public transport bus drivers are at a huge risk for both otological and non otological health issues in relation to the nature of their work and the working environment. This needs to be addressed from a public health stand point.

**Clinical significance:** There exists a higher prevalence of hearing loss and tinnitus, Type 2 Dm, HTN, GERD, headaches, sleeplessness and irritability at work, all correlating to increasing years in service with increased hours of exposure to noise. Thus, there is a serious need to take care of effects of noise pollution on those in the front line of our transport system.

**Keywords:** Bus Drivers, Hearing Loss, Metropolitan City, Noise Exposure, Tinnitus.

## Introduction

India is the sixth largest producer of vehicles in the world and is the second most populous country with a population of 1.42 billion[1] and. In India 36.5 million (18% population) people travel by public transport daily, with an estimated 19 lakh buses on the roads[2].

Among various sources of noise pollution including industries and powerplants, vehicular traffic noise is considered as the most important source of noise pollution in urban areas. History of public transport in Bangalore dates back to 1940 when it had only 98 buses on board. It has grown into an extensive public transport system with 6023 buses presently, catering to 35.8 lakh passengers every day[3].

The drivers of public transport buses in busy traffic lanes of cities are always at a risk of exposure to high levels of noise[4]. Studies by Karimi A et al[4]., and Basner Met al[5]., have shown that drivers subjected to long term loud noises show hearing loss and reduced efficiency[4,5].

A study by Basner M et al.,[5] showed non-otological effects of noise on health[5]. Another study by Babisch W et al.,[6] showed the occurrence of hypertension and ischemic heart disease among those exposed to high amounts of environmental noise affecting the cardiovascular system[6].

The bus drivers working in continuous shifts, night shifts with fewer breaks or resting time, along with constant stress due to the nature of their work including pressure for timely reaching of the destination, exposure to harsh weather conditions on the road and poor machinery at work, are more susceptible to various health disorders.

Previous studies by Sanju HK et al.,[7] have shown that 1/4th of bus drivers included in their study reported hard of hearing in phonic conversations, and 1/5th of bus drivers had hard of hearing in crowded places and 22.5% of them had tinnitus[7].

The primary aim of this study was to evaluate the prevalence of otological side effects like hearing loss and tinnitus as well as non-otological health implications of chronic noise exposure among bus drivers in the Indian metropolitan city of Bangalore. We also tried to analyse the poor working conditions and inhumane work hours and its effect over general well-being of drivers in public transport system.

## Materials and Methods

Our study was carried out by conducting a survey among bus drivers in public transport system in Bangalore from May 2022 to August 2022. For this we adopted a questionnaire from a study conducted on bus drivers in Brazil by Bruno, et al[8].

The aim was to evaluate otological and non-otological effects of chronic noise exposure at work among intra-city public transport bus drivers.

For the purpose of this study, the bus drivers were interviewed at bus depots during breaks. Initial questions were about the demographic details of the drivers and history of any comorbidities. Details about the bus such as model, noise emission testing, type of engine were recorded. The survey included multiple choice questions designed to be easily understood and completed. Further details on hours of noise exposure including number of day and night shifts, whether the drivers used any form of ear protection and any previous or current history of hearing loss were collected.

In order to document the responses of study subjects on annoyance (and its intensity) and health implications, an analog scale based questionnaire was adopted[8]. The questions and their corresponding analog scale are as follows: "What is your sensation regarding the bus noise? [from "not annoyed (N.A.)" to "highly annoyed (H.A.)"]; What is your sensation about the quality of your sleep? (from "poor" to "excellent"); After the working day, do you fell tinnitus? (from "never" to "always"); After the working day, do you get irritated? (from "never" to "always"); After the working day, do you have a headache? (from "never" to "always"); In relation to the engine noise, do you feel uncomfortable? (from "never" to "always"); In relation to traffic noise, do you feel uncomfortable? (from "never" to "always"); In relation to noise from passengers, do you feel uncomfortable? (from "never" to "always")".

Study subjects were counselled and explained about the procedure of filling the survey questions. After the responses were documented, they were converted into a scale ranging from 0 to 10 thus quantifying driver's subjective sensation.

The data obtained was tabulated on Microsoft Excel 2019 version and analysed using mean, standard deviation, minimum and maximum values and other such descriptive statistical terms. The Kolmogorov-Smirnov test was used for checking normality of data. Non parametric Kruskal Wallis test and Dunn test was used for analysing data having multiple comparisons. Parametric one-way ANOVA with Tukey test was used for multiple comparisons. For correlation of variables Spearman's rank coefficient was applied. SPSS software version 20 was used for all statistical analysis keeping the significance level of $P < 0.05$.

**Results**

In our study, 247 subjects were interviewed with the help of the questionnaire. All subjects were bus drivers of public transport within the Indian metropolitan city of Bangalore. All study subjects were taught how to use the scale and 20 of them could not follow the questionnaire. 10 subjects did not consent for the study. These subjects were accordingly excluded and the remaining 217 patients were finally included in the study.

Table1: Distribution of demographic, comorbidity, bus and bus driver details in our study population

| | | Count | Percentage % |
|---|---|---|---|
| Age | 30 - 40 | 116 | 53.5% |
| | 41 - 50 | 80 | 36.9% |
| | Above 50 | 21 | 9.7% |
| | Total | 217 | 100.0% |
| Sex | M | 217 | 100.0% |

| | | | |
|---|---|---|---|
| | Total | 217 | 100.0% |
| Type 2 diabetes mellitus | Present | 18 | 8.3% |
| | Absent | 199 | 91.7% |
| | Total | 217 | 100.0% |
| Hypertension | Present | 24 | 11.1% |
| | Absent | 193 | 88.9% |
| | Total | 217 | 100.0% |
| Gastroesophagealreflux disease | Present | 29 | 13.4% |
| | Absent | 188 | 86.6% |
| | Total | 217 | 100.0% |
| Others | Present | 14 | 6.5% |
| | Absent | 203 | 93.5% |
| | Total | 217 | 100.0% |
| Year of manufacture | 1 - 2 | 45 | 20.7% |
| | 3 - 5 | 115 | 53.0% |
| | 6 - 10 | 45 | 20.7% |
| | Above 10 | 12 | 5.5% |
| | Total | 217 | 100.0% |
| Type of engine | Back engine | 2 | 0.9% |
| | Front engine | 215 | 99.1% |
| | Total | 217 | 100.0% |
| Latest noise emission test | < 1yr | 68 | 31.3% |
| | 1 - 2yrs | 44 | 20.3% |
| | Not done | 93 | 42.9% |
| | Unknown | 12 | 5.5% |
| | Total | 217 | 100.0% |
| Use of ear protectio2 | Present | 0 | 0.0% |
| | Absent | 217 | 100.0% |
| | Total | 217 | 100.0% |
| Night shifts | Yes | 111 | 51.2% |
| | No | 106 | 48.8% |
| | Total | 217 | 100.0% |

Study sample consisted of a mean age of 40.7 years with 100% of the subjects being males. Occurrence of various comorbidities were studied and it was seen that type II diabetes mellitus had an incidence of 8.3% (18), hypertension 11.1% (24), GERD 13.4% (29), others 6.45% (14) – including asthma, migraine, renal stones, back pain and dust allergy. No subjects reported of Ischaemic heart disease.

Buses driven by study subjects were analysed and it was seen that 20.7% (45) drove latest models manufactured in last 1-2 years, 53% (115) of buses 3-5 years old, 20.7% (45) 6-10 years old and 5.5% (12) of buses were more than 10 years old.

99.1% (215) of the drivers drove buses with a front engine, whereas only a small percentage of 0.9% (2) drove the latest back engine buses. Among the buses driven, about 31.3% (68) had recent noise emission testing done within one year, about 20.3% (44) within 1-2years. Whereas 42.9% (93) had no recent noise emission testing done and 5.5% (12) had no knowledge of the noise emission testing follow up.

It was noted that none of the drivers used any form of ear protection while at work. Mean years of service among the study subjects was observed to be 16.26 years. Mean hours of exposure to noise per day being 12.38 hours. While 51.2% (111) of drivers had both night and day shifts, 48.8% (106) had only day shifts. Overall, an average of 11.07 hours of night shift was observed among the study population.

In relation to prevalence of hearing loss, it was observed that 25.3% (55) of drivers in the study reported a hearing loss. 75.3% (162) of drivers exposed to front engine reported hearing loss, whereas none of the drivers of buses with back engine reported any form of hearing disturbances.

Table 2(a) : correlations

| | | Years in service | Hours of exposure per day | Night shifts per month | |
|---|---|---|---|---|---|
| Hours of exposure per day | Pearson correlation | -.230** | | | |
| | P | 0.001 | | | |
| Night shifts per month | Pearson correlation | -.233** | .171* | | |
| | P | 0.006 | 0.044 | | |
| What is your sensation regarding the bus noise (0-not annoyed, 10-highly annoyed) | Pearson correlation | -0.104 | .298** | -0.148 | |
| | P | 0.125 | 0.000 | 0.082 | |
| What is your sensation about quality of your sleep (0-poor, 10-best) | Pearson correlation | -.206** | -.240** | -.351** | |
| | P | 0.002 | 0.000 | 0.000 | |
| After the working day, do you feel | Pearson correlation | .350** | 0.017 | -.210* | |

| | | | | | |
|---|---|---|---|---|---|
| tinnitus(0-always, 10-never) | P | 0.000 | 0.799 | 0.013 | |
| After the working day, do you get irritated(0-not irritated, 10-highly irritated) | Pearson correlation | -0.064 | .315** | .260** | |
| | P | 0.350 | 0.000 | 0.002 | |
| After the working day, do you have a headache (0-never, 10-always) | Pearson correlation | 0.075 | 0.036 | -0.002 | |
| | P | 0.271 | 0.594 | 0.982 | |
| In relation to the engine noise, do you feel uncomfortable (0-not uncomfortable, 10-highly uncomfortable) | Pearson correlation | -0.127 | .274** | .300** | |
| | P | 0.062 | 0.000 | 0.000 | |
| In relation to the traffic noise, do you feel uncomfortable (0-not uncomfortable, 10-very uncomfortable) | Pearson correlation | -0.005 | .136* | .211* | |
| | P | 0.939 | 0.045 | 0.013 | |
| In relation to noise from passengers, do you feel uncomfortable(0-never, 10-always) | Pearson correlation | -.172* | .139* | -0.093 | |
| | P | 0.011 | 0.040 | 0.276 | |

*correlation is significant.

Table 2(b) : correlations with questionnaire.

| | What is your sensation regarding the bus noise (0-not annoyed, 10-highly annoyed) | What is your sensation about quality of your sleep (0-poor, 10-best) | After the working day, do you feel tinnitus(0-always, 10-never) | After the working day, do you get irritated(0-not irritated, 10-highly irritated) | After the working day, do you have a headache (0-never, 10-always) | In relation to the engine noise, do you feel uncomfortable (0-not uncomfortable, 10-highly uncomfortable) | In relation to the traffic noise, do you feel uncomfortable (0-not uncomfortable, 10-very uncomfortable) |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hours of exposure per day | Pearson correlation | | | | | | |
| | P | | | | | | |
| Night shifts per month | Pearson correlation | | | | | | |
| | P | | | | | | |
| What is your sensation regarding the bus noise (0-not annoyed, 10-highly annoyed) | Pearson correlation | | | | | | |
| | P | | | | | | |
| What is your sensation about quality of your sleep (0-poor, 10-best) | Pearson correlation | -.300** | | | | | |
| | P | 0.000 | | | | | |
| After the working day, do you feel tinnitus(0-always, 10-never) | Pearson correlation | .167* | -.266** | | | | |
| | P | 0.014 | 0.000 | | | | |
| After the working day, do you get irritated(0-not irritated, 10-highly irritated) | Pearson correlation | .371** | -.302** | 0.083 | | | |
| | P | 0.000 | 0.000 | 0.224 | | | |
| After the working day, do you have a headache (0-never, 10-always) | Pearson correlation | .159* | -.238** | .207** | .242** | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | P | 0.019 | 0.000 | 0.002 | 0.000 | | |
| In relation to the engine noise, do you feel uncomfortable (0-not uncomfortable, 10-highly uncomfortable) | Pearson correlation | .350** | -.161* | 0.095 | .276** | 0.052 | |
| | P | 0.000 | 0.018 | 0.162 | 0.000 | 0.448 | |
| In relation to the traffic noise, do you feel uncomfortable (0-not uncomfortable, 10-very uncomfortable) | Pearson correlation | -0.020 | -.141* | 0.049 | -0.037 | -0.088 | 0.125 |
| | P | 0.764 | 0.038 | 0.471 | 0.588 | 0.197 | 0.067 |
| In relation to noise from passengers, do you feel uncomfortable(0-never, 10-always) | Pearson correlation | 0.123 | .163* | 0.032 | 0.031 | 0.029 | -0.058 |
| | P | 0.070 | 0.016 | 0.639 | 0.649 | 0.672 | 0.393 |

*correlation is significant.

As depicted in tables 2(a) and 2(b), **Years in service** showed correlation that was negative, with the quality of sleep (p value < 0.05), whereas a positive correlation was seen with occurrence of tinnitus (p value < 0.05). There was also a positive correlation that was significant, between hearing loss and years in service (p value < 0.05)

It was noted that among those who had **Hearing loss** a positive correlation was noted with irritation end of the work day (p value= 0.015) and a higher discomfort to engine noise with a p value = 0.036. Also, a positive correlation with occurrence of tinnitus with a p value < 0.05.

With respect to **comorbidities**, there is a positive correlation between number of years of service and

occurrence of Hypertension and Type 2 Diabetes Mellitus (p value <0.05). A similar positive correlation was also noted between number of night shifts per month and incidence of Hypertension and Type 2 Diabetes Mellitus, with p values of 0.003 and 0.010 respectively.

Study population with poor quality of sleep reported higher incidence of hypertension, GERD and other comorbidities such as bronchial asthma, migraine, renal stones, weight gain. It was also noted that, with increasing hours of exposure to noise, annoyance towards it was significant with a p value<0.05.

A positive correlation that was statistically significant was observed between years in service as well as number of night shifts with occurrence of tinnitus. Similarly, it was noted that sleep quality was poor among those subjects with increased hours of exposure to noise (p value 0.002), more number of night shifts (p value 0.000) and increased years in service with (p value 0.000).

Lastly, drivers with more number of night shifts (p value 0.000) and increased hours of exposure to noise (p value 0.002) also reported significant irritation at the end of the work day.

Nonetheless, years in service and night shifts per month did not show significant correlation with respect to the sensation regarding bus noise. It was also noted that hours of exposure per day did not significantly cause tinnitus by the end of the day. Similarly, years in service and irritation at the end of the working day also didn't show significant correlation. No significant correlation was seen between occurrence of headache and years in service, hours of exposure per day and number of night shifts per month. With increasing years in service not showing significant correlation with annoyance towards engine noise, it was also seen that irritation towards traffic noise was not significant. Likewise, annoyance towards noise from passengers and number of night shifts per month was not seen to be significant.

**Discussion:**

Urbanization and industrialisation have lead to increasing vehicular population and subsequent rise in noise pollution world over, more so in metropolitan cities. Long term exposure to such loud noise increases stress levels and causes health effects including but not limited to discomfort, irritability, stress, anger, hypertension, mental diseases, lack of concentration at work and sleeplessness[9]. This reduces productivity and efficiency of the workforce. According to WHO, noise pollution is the third dangerous kind of pollution behind air and water pollution[10]. Most significant sources of noise include industries, vehicular traffic, air traffic and trains.

This discussion is based on the analysis made regarding 217 bus drivers working in the Bengaluru metropolitan transport corporation (BMTC). Data has been analysed about the age, years in service, hours of exposure per day and number of night shifts. Subjective sensation of annoyance with respect to noise from the traffic, engine and passengers were recorded. Annoyance at the end of work day, occurrence of headache and quality of sleep were also graded and recorded on the basis of a questionnaire. Occurrence of tinnitus and hearing loss among the bus drivers including usage of ear protecting equipment was recorded using the questionnaire.

Our study population showed a mean age of 40.7 years, all of them males. Similarly in a study by Adesokan et al.,[9] conducted on commercial drivers, consisted of an exclusively male study group with largest proportion between the age range of 46-55 years, our study has age

range of 30-40years comprising the largest group (n=116, 53.5%).The sex preponderance is not surprising in a country like India where majority of the middle-class working population comprises of males with women taking up domestic roles. This is in contrast to studies from other countries such as that in Sweden by Anna Anund et al.,[11] which saw 50% female bus drivers in their cohort. Details about comorbidities were collected and it was observed that GERD was the most common comorbidity presenting with 13.4% of study subjects reporting the same. This was followed by Hypertension and Type II diabetes mellitus with 11.1% and 8.3% study subjects reporting of their occurrence. Other comorbidities including asthma, migraine, back pain and allergy constituted a minor 6.45% of them. However, in a study by Sravanthi G et al.[12], on non-communicable disease risk factors among bus drivers it was noted that majority of the bus drivers had hypertension followed by diabetes and sleeplessness. It was observed in our study subjects that there was no history of cardiovascular pathology. A similar study by Snehal Chavhan et al.,[13] where 400 bus drivers were studied, commonest reported complain was related to musculoskeletal disorders followed by gastrointestinal disorders, obesity, hypertension, and diabetes mellitus. All related to duration of driving. In a study by A F Azenan et al.,[14] where health implications of constant movement and vibratory stimuli was studied among bus drivers in Malaysia, it was seen that these bus drivers suffered from shoulder pain, neck pain, upper back pain and lower back pain. This showed a positive correlation between exposure to vibration and causation of back pain and various other pains. However, in our study back pain was reported by a minority of 6 study subjects in the age range of 38-42 years.

Data regarding the buses driven were also taken and it was seen that about 53% of the buses were 3-5 years old, 20.7% drove latest models and another 20.7 % were 6-10 years old. About 5.5% of them were more than 10 years old. Majority of the study subjects, 99.1% of them, drove front engine buses whereas a minor 2 of them drove rear engine buses comprising mere 0.9%. Although rear engine buses are harder to cool, they are quieter and less fatiguing for the driver. This needs to be considered and more rear engine buses to be brought in place of the old front engine ones. Stronger and sturdier buses provided with ergonomically designed drivers seat with better roads will benefit in improving overall health condition of bus drivers.

About 31.3% had recent noise emission testing done within one year, about 20.3% within 1-2years. Whereas 42.9% had no recent noise emission testing done and 5.5% had no knowledge of the noise emission testing follow up. This shows there is poor awareness about the emission testing norms and its compliance. Therefore, timely emission testing should be made mandatory and regular checks regarding the same should be carried out.

Rajeshwar Balaji et al.,[15] conducted a study and showed that among the bus drivers, systolic and diastolic blood pressure and hearing deterioration index were significantly higher in comparison to control group. It also showed a positive correlation that was significant between hearing loss and years in service and noise exposure levels. It also showed a positive correlation that was significant between systolic and diastolic blood pressures and noise exposure levels.

In a study by Manar MK et al.,[16] on hearing loss among non-commercial personal car and autorickshaw drivers, it came to light that autorickshaw drivers exposed to high volume of noise were seen to have increased

sensory neural hearing loss in comparison to personal car drivers. Similarly in our study with increasing hours of work and increasing years in service, the exposure to loud noise increases ultimately causing hearing difficulties like hearing loss, tinnitus and irritability at work. Similarly, in our study it has been observed that 25.3% of drivers in the study reported a hearing loss. 75.3% of drivers exposed to front engine reported hearing loss, whereas none of the drivers of buses with back engine reported any form of hearing disturbances. With increasing years of service, the occurrence of type 2 diabetes mellitus, hypertension and GERD increased with statistically significant correlation. Also, this worsened with those having night shifts. Drivers also reported poor quality of sleep among those having hypertension and GERD.

One of the drivers also observed an improvement in GERD symptoms after change over from night to day shifts. Feelings of anxiety, lack of motivation to work, lack of interest towards previously enjoyed activities brings to light the possibility of depression among few drivers, although not quantitatively evaluated in all. This also improved with regular daytime work and better sleep at night. Change over from night to day shifts also improved anxiety and overall work performance.

In a study by K. Pushpa et al.,[17] on the implications of traffic noise exposure on hearing in BMTC drivers, it was observed that with growing years of service, the susceptibility of hearing loss also increased. In our study subjective sensation regarding annoyance towards various sources of noise were recorded. It was seen that those with increased annoyance towards bus noise and noise from traffic, with increased irritation after work, reported of severe GERD with a p value of 0.016- a significant correlation. Those with poor quality of sleep had increased occurrence of hypertension and GERD. Those with more night shifts and increased years in service reported of type 2 diabetes mellitus and hypertension.

It was noted that no study subject used any form of ear protective devices while at work. This needs to be noted and suitable ear protecting equipment such as earmuffs, ear plugs should be introduced as they are effective in dampening high frequency noise. This will not only prevent occurrence of hearing loss, it will also help prevent further worsening of the same, as noted in the study conducted by Usmani et al.,[18] .

Adenike E. Adesokan et al.,[9] conducted a study and it was noted that reduced auditory performance was seen among commercial bus drivers with increased exposure to traffic noise. This study, much like our own, also showed that there was no awareness of hearing conservation programs among most of the bus drivers. They were neither aware of the damaging effects of noise in traffic on health and general well-being. It also noted that lack of awareness was reflected in their non usage of hearing protective devices.

Auditory effects of noise are well known. Non otological effects of chronic noise exposure on public health is seemingly growing. In a study by Mathias Basner et al.,[19] it was noted that long term exposure to noise disturbs sleep and causes daytime sleepiness (which is particularly dangerous in occupations such as driving where focus is the key) with increased annoyance. Noise exposure also reduces overall efficiency and performance at work, increases occurrence of cardiovascular disease including hypertension.

Contrastingly in our study none of the study subjects reported of any cardiovascular complaints. However, occurrence of hypertension, annoyance and lack of sleep,

and reduced performance at work were all reported by our study subjects. Similarly in our study all those drivers who complained of headache by the end of the day also complained of increased annoyance towards the noise from bus and increased sensation of tinnitus. They also complained of poor quality of sleep and increased irritability by the end of a day's work. This significantly affected their mental health as also inter-personal relationships at home.

It was seen that drivers with increasing years in service and increased years of exposure to noise complained of tinnitus at the end of working day, increasing in the evenings. This in turn affected the sleep quality leading to sleeplessness and increased day time sleepiness. They also reported increased annoyance towards bus noise and reduced sensitivity towards phonic conversations.

In a study by Anund et al.,[11] on bus drivers to study sleepiness in split shifts 12 of 18 bus drivers reported that they find it difficult to stay awake while on the road, at least 2-4 times a month. This study clearly showed that bus drivers working in shifts struggled to stay alert and awake. Thus, suitable measures are required to ensure safety on road and reduce accidents.

Bus drivers play a key role in running the economy of a city such as Bangalore. Ensuring humane working conditions, reducing work related stress, providing ergonomically designed driver's seat as well as ear protective devices and conducting regular hearing check-ups along with general health checks will help in assuring good work force that runs our city. It also makes sure more and more drivers abide by the traffic rules and reduces accidents.

The possible mental health effects of working in noisy environments such as road traffic also needs to be taken into cognisance. Routine mental health checks must also be included in routine health check-ups.

Providing cleaner well-maintained lounges at bus depots will improve the quality of leisure time, this shall make the drivers motivated towards better performance at work. Improving the overall quality of life of drivers of public transport buses must be the foundation stone towards building a healthy workforce and a healthier economy.

**Conclusion:** Our study concludes that there is a wide lacuna in providing appropriate working environment for public bus drivers. There is also a loop hole in designing humane working shifts by reducing the number and frequency of night shifts as also providing a day off as and when needed. Routine check-ups and health counselling of drivers will provide a sense of safety and motivation to work better. This needs to be included in the public transport policy of the governing bodies of BMTC, which is solely run by the bus drivers.

**Clinical significance**: There exists a higher occurence of hearing loss among bus drivers with increased exposure to engine noise, all driving a front engine bus. It was observed that those with rear engine buses did not report of any hearing loss. This along with absence of ear protective gear further adds to the otological load among them. There is also increased incidence of tinnitus, all correlating to increasing years in service with increased hours of exposure to noise. Similarly, there is also a higher incidence of diseases such as Type 2 Dm, HTN, GERD etc among bus drivers, with reported sleeplessness and irritability at work. Few reporting headaches and poor quality of sleep. There is a serious need to take care of effects of noise pollution on those in the front line of our transport system.

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