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Traffic Noise Measurement in Mysuru City

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Abstract: ***Noise pollution is one of the key issues in today's urbanization. Road traffic is one of the significant contributing factors in noise pollution which is affecting the quality of life. Mysuru has been noticing increase in traffic flow from past few years. Continuous exposure to high noise can have adverse effects on auditory and non auditory functions. The present study aimed at measuring traffic noise levels in Mysuru city. Noise measurement was carried out during peak hours in twelve different commercial locations in Mysuru city using B & K Sound level meter. The obtained results showed noise levels at selected locations ranging from 68 dB to 79dB during peak hours of working days. The obtained values are exceeding the permissible noise limits specified by the Ministry of Environment and forests, Government of India. This indicates that individuals working in these areas are at risk of acquiring various health hazards due to high traffic noise levels. Audiologists and speech language pathologists play an important role in creating public awareness regarding prolonged noise exposure and its negative side effects on health and as well as noise prevention and control***.

Keywords: Noise pollution, Noise measurement, traffic noise, noise effects

1. Introduction

Noise is an important environmental consideration in today's day to day life. Noise is defined as an erratic or statistically random oscillation and a disagreeable or undesired sound or the other disturbance (International standards IEC 60050-801, 1994). Noise can interfere with day to day activities such as sleep, work and may also cause physical and psychological disturbances depending on frequency characteristics and loudness. Among various factors contributing to noise pollution,transportation noise is perhaps aninevitable source to avoid. Movement of different light motor vehicles as well as heavy motor vehicles, engine operation, the sound of sirens, squeaking brakes, work of technically defective vehicles and, in particular, restarting and movement of vehicles after stopping at a traffic light are effects which increase the noise level. Besides traffic, there are other sources of noise, such as the frequent strong closing of vehicle doors, people buzz on the street, barking dogs, noise from independent workshops and restaurants, music from the sound system, as well as many other phenomena that increase noise and which are present on the streets of cities (Marina et al., 2002).

Studies carried out on noise pollution and its effect on health reports traffic as oneof the most common source of noise (Sharp & Donovan, 1979). Surveys have been conducted on traffic noise, indoor and outdoor noise in different cities across the country. Traffic and industrial noise measurement was done by Kameswaran (1992) in Madras, Coimbatore, Cochin and Trivandrum. Results showed increased noise levels in all the cities exceptTrivandrum. Sampath et al., (2004) carried out noise measurement in Thiruvananthapuram, Kochi and Kozhikode to measure noise pollution. Thenoise level of 81.3dB (A), 78.5 dB (A) and 77.5dB (A) were recorded respectively which are above permissible limits. Noise measurements carried out at Aurangabad city also reveals exceed noise levels compared to the prescribed noise level (Bhosale et al., 2010).Neema and Dube (1990) studied noise pollution due to vehicles in some areas of Bhopal city and reported that the level of traffic noise is above 100 dB which is not acceptable for the human ear. According to a study conducted by Tamil Nadu Pollution Control Board (1989) the noise level in Tamil Nadu varied from 52.7 to 119.4 dB which is higher than the permissible limit. Pandya and Verma (1997) studied noise pollution related to vehicular traffic in the city area and found increased noise level which affects human population. Singh and Mahajan (1990) conducted a survey in Delhi and Calcutta and found increased noise level of 95dB which was against the ambient limit of 45dB.Murli and Murthy (1983) also reportedexceeding traffic noise in Vishakhapatanam (90dB) even in morning hours.

Mysuru, generally known as the city of palaces and cultural heritage of Karnataka has been noticing an increase in traffic from past few years resulting in noise pollution in the city. Naveen& Vinay (2010) measured noise levels at Ramanuja road, Narayana Shastri road and court road in Mysuru and reported noise levels to be above permissible limits (107dB) in Ramanuja Road during peak hours. Studies done on environmental pollution across Mysuru city has focused on traffic and other factors related to traffic whereasvery limited studies have been done measuring traffic noise levels in and around Mysuru city. With the increasing number of vehicles in Mysuru city, noise pollution has also increased which can lead to various health hazards. Hence the present study was planned to measure noise levels in the areas which are more prone to traffic noise pollution.

2. Materials and Methods

Mysuru, Southern Indian state of Karnataka is the second largest city of Karnataka and has a population of 887,446.Twelve different locations acrossMysuru were randomly selected for noise measurements. The areas were Ramanuja road, Devaraja URS Road, M.G road, Uttaradi mutt road, Mysuru Palace entry gate, Agrahara circle, RTO circle, Chamarajapuram (Railway gate), Saraswathipuram (Bake point circle), Vijaya bank circle, TK layout (Maruthi tent circle) and Sharadadevi nagar (Stone building circle). Noise level measurement was carried out using a calibrated Bruel and Kjaer sound level meter SLM (B&K2238 Mediator).Prior conducting the measurements SLM was calibrated using sound calibrator B & K 4231.B&K2238 Mediator SLM is equipped with pre-polarized ½ inch condenser microphone. Equivalent continuous 'A' weighted sound pressure level over reference time intervals L_{Aeq} andfast time weighting network settings were used for measurement.Equipment and measurement settings are

given in table 1.Noise measurement was done for all the locations during peak hours 9.30 am – 10.30 am during working day.Following each measurement the values were documented. Statistical analysis was done using SPSS software (version 16.0).

Table 1: Measurement Equipment and Measurement settings

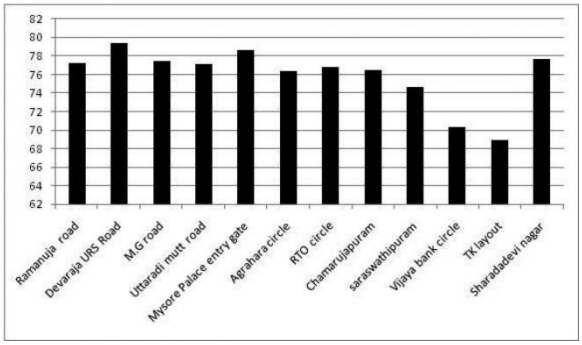
Particulars	*Measurement settings*
Sound level meter	B & K 2238 Integrating Sound Level Meter
MicrophoneType:	B&K 4188 Pre polarized Free-field 1/2" condenser microphone.
Nominal sensitivity:	-30dB re 1v/Pa or 31.6mV/Pa
Capacitance:	12pF (at 250 Hz)
Pre amplifier	-ZC0030
Input impedance	10GΩ ǁ0.2pF
Octave filters (in Hertz)	20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 8000, 10000 and 12500
Measurement Time	Continuous
Frequency weighting network	A
Time weighting network	Fast

3. Results

The obtained values for all the frequencies and for all the locations were tabulated and statistically analyzed using SPSS software (version 16.0).Univariate Analysis of variance was carried out to find the differences between the locations followed by Scheffe's post hoc test. The obtained results were compared with the permissible noise limitsspecified by the Ministry of Environment and forests (2000)and is given in table 2.Graphical representation of average peak values is given in graph 1.

Table 2: Noise limits prescribed under Environment (Protection) Act,1986 as amended in 2002.

Zone/Area	*Day (0600-2200 hours) In dB(A)*	*Night (2200-0600 hours) In dB(A)*
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence	50	40



Graph 1: Locations and average peak value measurements

From the graph, it can be inferred that the average maximum values of noise levels at selected locations ranged from 68 dB(A) to 79dB(A) during peak hours of working day. The noise values obtained are exceeding the permissible noise limits for commercial areas during day time as per the regulation. Maximum noise levels were observed at Devaraja URS Road [79.4dB(A)] and at Mysuru Palace entry gate [78.6 dB(A)]. Vijaya bank circle [70.3 dB (A)], and TK Layout [68.9 dB (A)]showed lower noise levels compared to the other areas. Increased noise levels in comparison with obtained average noise levels with permissible limits are given in table 3.

Table 3: Difference between obtained average noise levels in comparison with permissible noise levels recommended bythe Ministry of Environment and forests (2000)

Location	*Permissible noise limits In dB(A)*	*Obtainedaverage noise level in dB(A)*	*Excess noise levels in dB(A)*
Ramanuja road	65	77.2	12.2
Devaraja URS Road	65	79.4	14.4
M.G road	65	77.5	12.5
Uttaradi mutt road	65	77.1	12.5
Mysuru Palace entry gate	65	78.6	13.6
Agrahara circle	65	76.4	11.4
RTO circle	65	76.8	11.8
Chamarujapuram	65	76.5	11.5
Saraswathipuram	65	74.7	9.7
Vijaya bank circle	65	70.3	5.3
TK layout	65	68.9	3.9
Sharadadevinagar	65	77.7	12.7

The results of the statistical analysis revealed significant difference in the noise levels between locations ($F=12.220$, $p<0.05$) and between frequencies ($F=43.888$, $p<0.05$). Noise measurement was done from 20 Hz to 12500Hz. Low frequencies showed increased noise levels in all the locations compared to mid and high frequencies.

4. Discussions

Noise has become a part of life around the world today but its effect on public health remains neglected and unattended. More attention is given towards noise exposure in the occupational and school settings whereas environmental noise and its negative effects on health are often ignored. Environmental noise pollution can cause various health hazardsand traffic noise is one of the major causes for noise pollution in today's life. The present study was conducted to measure traffic noise levels at various places in Mysuru city. The obtained result showed increased traffic noise levels in all the areas studied. The noise levels are above the permissible limits. The present study is in concurrence with the study done by Naveen & Vinay (2010) who also reported increased noise levels in Mysuru. Increased noise levels were recorded at Devaraja URS road and at Mysore palace entry gate. This can be attributed to the increasing number of vehicles which includes both light motor vehicles and heavy motor vehicles.Movement of vehicles, engine operation, crowded streets, and indiscriminate use of horn by the vehicles are the major contributing factors for increased noise levels in these locations. Though Vijaya bank circle and T K Layout has lower noise levels compared to all the other locations, noise levels in these two locations are above permissible limits.

Negative health outcomes can be seen in terms of auditory and non auditory effects if noise exposure exceeds certain levels. Continuous exposure to noise causes ear pain, hearing fatigue, tinnitus and hearing loss. Hearing loss leads to speech identification and speech discrimination problems. Noise induced hearing loss (NIHL) is an increasing problem which affects the hearing of an individual and disrupts daily life. Though cause of NIHL is mainly attributed to the occupational settings, with increasing traffic levels and traffic noise the issue must not be neglected. Individuals working in the high traffic noise levels are certainly prone to NIHL. Damage to the cochlea and cochlear innervation due to intense and continuous exposure has been reported. Noise exposure induces damage occurring initially in the outer hair cells of cochlea and then subsequently in the inner hair cells (Saunders, Dear & Schneider, 1985),and later destruction can be seen in sensory hair cells and supporting cells of organ of corti leading to hearing loss (Hamernik, Turrentine & Wright, 1984). Further noise exposure can cause excess release of the glutamate by the inner hair cells which damages primary auditory dendrites and loss of afferent cochlear terminals (Luxon & Prasher, 2007). The pathophysiological changes are not limited to the cochlea, whereas further continuous exposure may alter the structure and function of the central auditory pathway through tonotopic reorganization or neural hyperactivity (Gerken, Simhadri-Sumithra&Bhat, 1986).

Research also reports various non-auditory effects as a secondary effect of noise exposure. Most commonly reported problems are sleep disturbances and annoyance (Muzet, 2007, Ouis, 2001& Jakovljevic et al., 2006). Cardiovascular diseases including hypertension, ischemic heart diseases, stroke, blood pressure and heart rate discrepancies are also reported(Babisch, 2011 & Lusk et.al, 2004). Many past studies have reportedeffects of noise pollution on the physical and mental health of people (Guite et al., 2006& Vera et al., 1992). Prolonged exposure to noisecan have adverse effects on psychosocial health and wellbeing (Ohrstrom et al., 1998).According to World Health Organization, noise pollution interferes with social behavior (aggressiveness, protest and helplessness) and hampers cognitive performance in terms of attention and concentration.

Effect on children's learning outcomes and cognitive performance has been reported (Evans &Hygge, 2007) and those children who are exposed to high noise levels at school have poorer reading ability, memory, and performance at school (Bronzaft, 1981; Lercher, et al., 2003).

5. Conclusion

Noise measurement in schools and in occupational settings has been reported in many studies, but traffic noise is often overlooked. Traffic noise is a major problem affecting urban environment. Thepresent study shows that Mysuru being the heritage city as well as known as the cleanest city of India is facing increased traffic noise levels. The noise levels are above permissible limits. Various auditory and non auditory problems can arise due to continuous exposure to high traffic noise levels.Sensitivity to noise varies within theindividuals. Some people are highly sensitive to even low levels of traffic noise, while others may be habituated to high noise levels. However,noise pollution cannot be ignored. There is a need to controltraffic noise exposure to prevent its negative effects on health. Though discussions are made regarding rising traffic and its ill effects, very few efforts have been made to reduce traffic noise and to educate individuals on NIHL and importance of preserving hearing. This highlights the important role of speech and hearing professionals in creating awareness regarding the consequences of high levels of noise exposure and the need for immediate remedial measures to be considered. However noise measurements were done on few randomly selected places in Mysuru city. There is a need to carry out traffic noise measurements in other areas in and around Mysuru city. Measurements were done only twice during peak hours in the selected locations. Repeated measurements need to be carried out at different time intervals. The present study has concentrated only on commercial locations. Non-commercial and residential areas need to be included in further studies.

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