Paper10

by

TOPIC: TRAFFIC NOISE MEASUREMENT IN MYSURU CITY

ABSTRACT

Noise pollution is considered as a major factor affecting the quality of life in urban centers. Road traffic noise is one of the contributing factors in noise pollution. Mysuru has been subjected to persistent increase in road traffic from past few years. Intense and prolonged exposure to noise can have adverse effects in terms of both auditory and non auditory functions. Present study aimed at measuring traffic noise levels in Mysuru city. Noise measurement was carried out twice during peak hours in twelve different commercial locations in mysuru city. Digital sound level meters with frequency weighting networks were used in this study. 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 prescribed by the Ministry of Environment and forests, Government of India. This indicates that individuals working in these areas are exposed to high noise levels mainly caused by road traffic and are at risk of various health hazards. Audiologists and speech language pathologists plays an important role in creating public awareness about the negative health side effects emanating from prolonged exposure to high noise levels and as well as noise prevention and control.

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

Background:

Noise is an important environmental consideration in today's day to day life. International standards IEC 60050-801 (1994) define noise as an erratic or statistically random oscillation and a disagreeable or undesired sound or the other disturbance. Noise can interfere with sleep, work, and recreation and in extremes may cause physical and psychological damage depending on frequency characteristics and loudness. While noise

emanates from many different sources, transportation noise is perhaps the most pervasive and difficult source to avoid. Traffic can be considered as the main source of noise pollution. 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).

Extensive surveys carried out in many other countries have identified traffic as the most widespread and annoying source of noise (Sharp & Donovan, 1979). Survey of city noise, traffic noise, indoor and outdoor noise has been carried out in different cities across the country. Traffic and industrial noise measurement by Kameswaran (1992) in the cities of Madras, Coimbatore, Cochin and Trivandrum and found Trivandrum to be least noisy compared to the other cities. Sampath et al., (2004) carried out noise measurement in the three major cities in Kerala, viz. Thiruvananthapuram, Kochi and Kozhikode to assess noise pollution. The noise 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 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 city area and found increased noise level which affects human population. A study by Singh and Mahajan (1990) conducted in Delhi and Calcutta; found that the noise level is 95dB as against the ambient limit of 45dB. Even at the "calm" places, it does not fall below 60dB. Murli and Murthy (1983) also found that traffic noise in Vishakhapatanam exceeds 90dB even in morning hours.

Mysuru, generally known as the city of palaces and cultural heritage of Karnataka has been noticing 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. Though studies have been carried out across Mysuru city concerning traffic, very limited studies have been carried out measuring traffic noise levels in and around Mysuru city. With 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.

Materials and Methods:

The noise levels were measured in the Mysuru city of the southern Indian state of Karnataka. Mysuru is the second largest city of Karnataka with a total population of 887,446.In the present survey study; twelve different locations across Mysuru were randomly selected. 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 twice for all the locations during peak hours 9.30 am – 10.30 am during working days to ensure test-retest reliability. Following each measurement the values were documented and later subjected to statistical analysis using SPSS software (version 16.0).

Insert Table 1 here

Results

The obtained values for all the frequencies and for all the locations were tabulated and statistically analyzed using SPSS software (version 16.0).The mean and standard deviation (SD) were calculated for the values obtained for each location and for each frequency. 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 limits prescribed under noise pollution (Regulation and control) rules(2000)given by the Ministry of Environment and forests which specifies the allowable limits of noise separately for day and night time for each category and has been given in table 2.Results of ANOVA for noise measurements between the locations and frequencies have been given in table 4.Graphical representation of average peak values is given in graph 1.

Insert Table 2 here

Insert Graph 1 here

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 days. 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)] has 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.

Insert Table 3 here

Insert Table 4 here

The results of the statistical analysis can be inferred in terms of significant difference in the noise levels between locations ($F=12.220$, $p<0.05$) and between frequencies ($F=43.888$, $p<0.05$). Low frequencies have increased noise levels in all the locations compared to mid and high frequencies. Interaction between locations and frequencies indicate no statistically significant difference ($F=.650$, $p>0.05$).

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 occupational setting and school settings whereas environmental noise and its negative effects on health are often ignored. Environmental noise pollution can cause various health hazards and traffic noise is one of the major sources of the environmental 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. 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 increase 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. If exposure to noise is chronic and exceeds certain levels, then negative health outcomes can be seen in terms of auditory and non auditory effects. Continuous exposure to noise causes ear pain, hearing fatigue, tinnitus and hearing loss. Hearing loss leads to the inability to understand speech in everyday situations and can have a severe social effect. Noise induced hearing loss (NIHL) is an increasing problem which affects 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 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). With prolonged exposure to noise 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 results in an excess release of the neurotransmitter glutamate by the inner hair cells that may be responsible for the destruction of the primary auditory dendrites and loss of afferent cochlear terminals (Luxon & Prasher, 2007). The pathophysiological changes is not limited to cochlea, 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).

Non Auditory effects includes interference with communication networks, personal annoyance, sleep disorder, poor psycho-physiological performance, low productivity, erratic social behavior, cardiovascular diseases including hypertension, ischemic heart diseases, stroke, changes in systolic and diastolic blood pressure and heart rate (Babisch, 2011; Lusk et.al, 2004; Jakovljevic et al., 2006; Muzet, 2007; Enmarker, 2004; Ouis, 2001; Kryter, 1982; Griefahn et al., 2000). Many past studies have indicated that noise pollution affects the physical and mental health of people (Guite et al., 2006; Vera et al., 1992). Decreased quality of sleep is considered to be a major health outcome of environmental noise (Berglund and Lindvall, 1995). Long- term effects of road traffic noise on psychosocial health and wellbeing are also described (Ohrstrom et al., 1998).According to World Health Organization, noise pollution interferences with social behavior (aggressiveness, protest and helplessness) and cognitive performance in terms of attention and concentration.

Studies have shown environmental noise exposure has a negative effect on children's learning outcomes and cognitive performance (Evans &Hygge, 2007) and those children with chronic aircraft, road traffic, or rail noise exposure at school have poorer reading ability, memory, and performance at school (Hygge, Evans & Bullinger 2002; Bronzaft, 1981; Lercher, Evans& Meis. 2003).

Conclusion

Various studies have reported noise measurement in schools and in occupational settings, but traffic noise is often overlooked. Traffic noise is a major problem affecting urban environment. Present study shows that Mysuru being the heritage city as well as known as cleanest city of India is facing increased traffic noise levels. The noise levels are above

permissible limits. Exposure to high traffic noise levels can give rise to various problems, including auditory and non auditory effects. There is, however, a wide range of sensitivity to noise within the individuals. Some people are likely to be disturbed at relatively low levels of traffic noise, while others may be adapted to high noise levels. However noise pollution cannot be ignored. There is an intense need to regulate and reduce environmental noise exposure and to enforce exposure limits to mitigate negative health consequences of chronic exposure to environmental noise. Much is known about the deleterious effects of noise, but few efforts have been made to reduce noises at their source, to protect hearing in noisy environments, and to educate individuals on the importance of preserving hearing. This highlights the important role of audiologists and speech language pathologists in creating awareness in general public 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. Present study has concentrated only on commercial locations. Non-commercial and residential areas need to be included in further studies.

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TABLES AND GRAPH

Table 1: Measurement Equipment and Measurement settings

Particulars	**Measurement settings**
Sound level meter	B & K 2238 Integrating Sound Level Meter
Microphone	
Type:	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 ǀ0.2pF
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

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

Table 3: Increased noise levels in comparison with obtained average noise levels

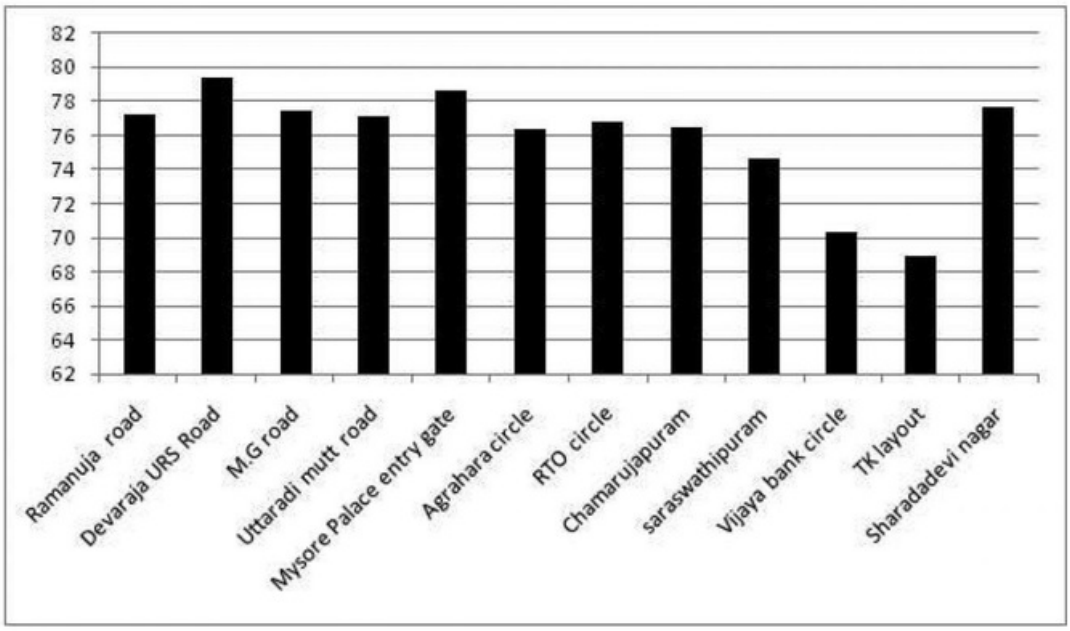
Location	Permissible noise limits In dB(A)	Average noise level in dB(A)	Increased noise levels in dB(A)
Ramanuja road	65	77.2	12.2
Devaraja URS Road	65	79.4	14.4
M.G road	65	77.5	12.5
Uttaradi mutt road	65	77.1	12.5
Mysuru Palace entry gate	65	78.6	13.6

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
Sharadadevi nagar	65	77.7	12.7

Table 4: Results of Univariate ANOVA for noise measurements between the locations and across the frequencies

Source of variations	F	Significance
Location	12.220	.000
Frequency	43.888	.000
Location * frequency	.650	1.000

*Significant at 95% confidence interval.



Graph 1: Locations and average peak value measurements

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