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EVALUATION OF TRAFFIC NOISE LEVELS IN KATHMANDU VALLEY

ABSTRACT

Objectives:

Noise can directly or indirectly have untoward effects in health. Recognizing the level of noise the Kathmandu residents are exposed to in day-to-day may provide a forethought to develop policies and proposal to reduce the noise hazards.

Materials and methods:

Noise was measured at street level, specifically at busy intersections, commercial areas using integrated digital sound level meter. Multiple readings were measured at specific point of time and entered on a data sheet. Commonly used noise assessment parameters were computed.

Results:

Intensities of noise produced in major 31 intersections of the Kathmandu valley were recorded. Satdobato, a major crossroad in ring road and a busy commercial area Putalisadak were the areas with the loudest noise exceeding 80dB. Outskirt area had the lowest level of ambient sound. The sound produced during peak hours were significantly higher than those at usual times $p < 0.05$.

Conclusion:

Kathmandu Valley is continuously being exposed to a noise level of 72 dB and greater which is marginally lower than the occupational health hazard. Education and legislation regarding noise related hearing loss and its effects on the health of the inhabitants should be stressed soon.

Keywords: Ambient noise levels; Kathmandu valley; Noise pollution; Traffic noise levels.

INTRODUCTION

Sound can be viewed as an auditory perception of wave motions in air or other media that stimulates hearing mechanism. Noise can be defined as an unwanted or harmful outdoor sound created by human activities. Acceptable level of noise has been set by various bodies. Noise pollution is ranked second among a series of environmental stressors implicated in the public health impact according to the World Health Organization (WHO).¹

Exposure to noise has been set below a level equivalent to 85dB for eight hours a day in order to prevent occupational hazard. Exposure

to impulsive noise should not exceed 140 dB peak sound pressure level.² Once the noise level surpasses the acceptable level then, different health related issues are seen either temporarily or with permanent consequences. Noise has been considered as a major problem worldwide affecting quality of life in urban areas but yet it has been considered less important.³

2011 census shows the population of Kathmandu, Lalitpur and Bhaktapur districts as 1744240, 468132 and 304651, respectively.⁴ Kathmandu valley being one of the most densely populated, urbanized and commercialized area in the country, it sees a vast number of vehicles plying on the

streets every day. High level of noise generated by such activities cannot be overstated. Despite, it seems like people are living in coordination alongside.

For occupational hazards, exposure to noise should be controlled below a level equivalent to 85dB for eight hours a day. Exposure to impulsive noise should not exceed 140 dB peak sound pressure level. This study will trace the amount of environmental noise produced mainly by different kinds of vehicular movements along the busiest junctions inside Kathmandu valley. Specifically, at different times of a day where the noise levels may fluctuate. This will give us the idea of the level of noise that we are being exposed in daily basis. Has it crossed the hazardous levels? No such studies have been conducted inside Kathmandu Valley which sees the largest number of vehicular movements, population densities, business opportunities.

Constant exposure to high level of noise may directly or indirectly have adverse health consequences either audiological or non-audiological. It can range from but not limited to noise induced hearing loss, vertigo, cardiovascular problems, stress, depression etc. So prevention, precaution and mainly health education is necessary to avoid noise related complications. Identifying the level of noise, the Kathmandu denizens are exposed to in daily basis may provide a provision to develop strategies and plan to reduce the hazard and identify the individuals and societies at risk. In fact, policies and practical measures can be applied to reduce the exposure particularly to at risk individuals or even societies.

This study evaluates the level of environmental noise in the Kathmandu valley. It will demonstrate the sound intensities in different major junction where the commerce and movements are maximum. It will identify the high risk zones and times of days inside the valley.

MATERIALS AND METHODS

This was a descriptive cross-sectional study done from November 2017 to April 2018 for the duration of 6 months. Ethical Clearance was taken from Institutional Review Committee of Kathmandu Medical College. Various major traffic junctions in the valley were chosen. The area of interest was selected by categorization method.

The measurements were done with RadioShack Sound Level meter with measuring level ranging from 50-126 dB which is outfitted with high sensitivity Electret Condenser microphone. Noise were measured at street level, specially at busy junctions, commercial areas using integrated digital sound level meter.

Instrument was held comfortably with microphone pointed towards noise source, at least 1.5 meters away from reflecting surfaces. Multiple readings were measured at specific point of time, from morning to evening divided into five periods, and the mean data was calculated. The data were entered on a data sheet. Commonly used noise assessment parameters were computed.

Data management and analysis were done with SPSS 20. Non-parametric, Kruskal Wallis H test was applied and p value <0.05 was considered significant.

RESULTS

Traffic noise from three different cities from the valley and 31 major locations were analyzed. The average level of noise intensities in different places are shown in table 1. Putalisadak had the loudest level of noise followed by Ratnapark and Kalanki in Kathmandu city. While outskirts like Budanilkantha had the lowest level of noise followed by Duwakot, Bhaisepati and Kirtipur. Satdobato was the loudest place overall.

On average, Kathmandu city was the noisiest place in the valley followed narrowly by Lalitpur. The average noise intensity was 74.48 dB, 73.98 dB and 68.97 db in Kathmandu, Lalitpur and Bhaktapur respectively.

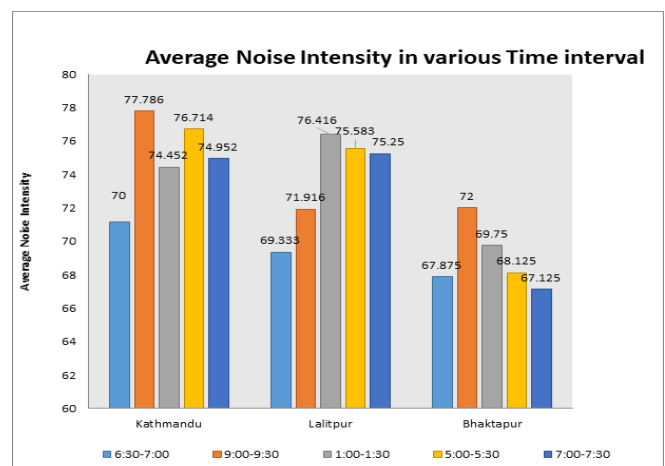


Figure 1: Average Noise intensities in various time intervals in different cities.

Figure 1 shows the average noise intensities recorded in different times of the day in three different cities. People were exposed to loud noise from 9:00 AM to 5:30 PM which coincides with the office hours. In different locations in the Kathmandu city, loudest noise was recorded during the peak hours (9:00 AM – 9:30 AM and 5:00 PM – 5:30 PM) compared to that in

the morning or evening, which was statistically significant.

Ring road area which sees an immense number of vehicles every day was the noisiest place in comparison to other places with 76.4 dB sound intensity on the road. Fortunately, noise was less inside and outside the ringroad area with 69.89 dB and 67.34 dB respectively.

Table 1. Average Noise Intensities in various places in the Kathmandu valley

Place	Average Noise Intensity	Location(Latitude/ Longitude)	Place	Average Noise Intensity	Location(Latitude/ Longitude)
Kathmandu					
Airport	74.1	27.71935/85.30948	RatnaPark	79	27.70668/85.31512
Ason	74.7	27.70362/85.3082	Sorakhutte	73.5	27.71935/85.30948
Balaju	75.5	27.74005/85.3369	Thamel	71.9	27.70351/85.30819
Balkhu	76.2	27.68491/85.2972	Thapathali	73.9	27.69085/85.31736
Budanilkantha	58.8	27.77798/85.36098	Lalitpur		
Chabahil	76	27.71711/85.34656	Bhaisepti	67.4	27.65235/85.30497
Gaushala	74.7	27.70696/85.34481	Jawalakhel	73.6	27.67314/85.31352
Kalanki	78.9	27.69134/85.28485	Kupondole	72.3	27.68768/85.31667
Kalimati	76.6	27.69826/85.29892	Lagankhel	77.3	27.66908/85.32287
Kirtipur	69.3	27.67704/85.28087	Patan Durbar	71.7	27.67283/85.32505
Koteshwor	74.6	27.67935/85.34977	Satdobato	81.6	27.65852/85.32459
Lazimpat	74	27.72125/85.31988	Bhaktapur		
MahaBaudha	77.4	27.72125/85.31988	Durbar Square	65	27.67189/85.42817
Maharajgunj	76.5	27.74005/85.3369	Duwakot	62.8	27.68412/85.4114
Maitighar	72.3	27.69406/85.32097	Madhyapur Thimi	74.4	27.67347/85.38522
New Baneshwor	76.3	27.6882/85.33522	Surya Binayak	73.7	27.66576/85.38522
Putalisadak	80.3	27.67704/85.32286			

Table 2. Krusmal Weil H Test of significance in two most noise polluted cities with respect to different intervals of vehicular movements.

	6:30-7:00 AM	9:00-9:30 AM	1:00-1:30 PM	5:00-5:30 PM	7:00- 7:30 PM
Kathmandu					
N	21	21	21	21	21
Mean	28.97	49.76	57.61	70.97	57.66
Total	608.5	1045	1210	1490.5	1211
H statistics	21.5974				
p value	p=0.00024				
Lalitpur					
N	6	6	6	6	6
Mean	8.5	12.16	18.58	20.75	17.5
Total	51	73	111.5	124.5	105
H statistics	7.8333				
p value	p=0.9788				

Correspondingly, figure II shows a map of the valley depicting noise intensities scattered in different places. Areas such as Satdobato and Putali sadak exceeded 80 dB.

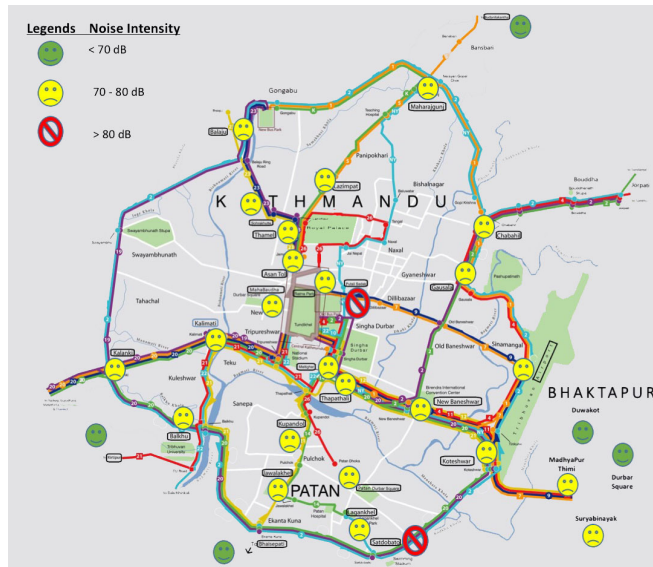


Figure II: Intensities of noise in different places of the valley.

DISCUSSION

Noise is a signal that bears no information and whose intensity varies randomly in time. It is any sound, irrespective of its waveform, which is unpleasant or unwanted.

Noise induced and occupational hearing loss may be due to prolong exposure to noise or by a single intense sound source. There have been alarming reports of synergistic interaction between the impact and prolong noise exposure.⁵

Even in 1713, It has been shown that workers who hammered copper for a living became hard of hearing. By then recommendation was made to use hearing protectors to prevent deafness occurring.⁶

By the 1880's, developed countries had all recognized the importance of industrial noise as a cause of hearing loss.⁷ Noise induced hearing loss is an irreversible process which can be easily prevented. Our study highlights on the need for such protective measures to those working or residing in places near the main traffic junction such as traffic police, shop keepers, volunteers and vendors etc.

Different studies of comparable nature were done in Kathmandu valley during 1980's and 1990's.

They all showed that the noise levels were more than that of the developed countries. Findings showed that during the last one and half decade, 70-100 dB of noise levels were typically observed in urban Kathmandu.⁸ In our study, sound levels from 58.8 dB to 81.6 dB were recorded with burst of noise near Koteshwor, Kalanki occasionally exceeding 85 dB.

The average noise levels for the specific time of day in various regions were all found to be higher than the accepted limits of 65 dB as prescribed by ISO (1996) except for Budanilkantha and Duwakot.⁹ This is supportive with former studies on noise levels probed in other towns of the world.¹⁰

This study shows that noise levels were comparatively intense at the ring roads than that observed within the cities or the suburbs. Calixto et al, disclosed that the total number of vehicular flow per day determines the noise levels in urban area.¹¹ It was concluded that high noise levels were experienced due to the percentage of heavy vehicles.

Other reason for increased seen in noise level during the peak hours was attributed to the rush to get home both by the commuters and the motorists, thereby increasing the number of vehicular flow.¹² Likewise, our study also showed the similar trend most probably due to the aforementioned reasons.

Furthermore, traffic hold-ups at major junctions, passengers loading/unloading on bus stops, vehicles honking, construction and commercial activities in these areas supplemented to the sound produced in the areas found to have the loudest intensities in our study. Okeke PN and George DMC recognized alike circumstances leading to intractable traffic attributing to dense traffic volume and thence increased noise.¹³

With due consideration of the adverse effects of noise, the European Commission recognized community noise as an important environmental problem and adopted the European Noise Directive to assess and manage environmental noise.¹⁴ Similarly, our legislators should consider this as an environmental setback and adopt ordinances to reduce the noise pollution and its unfavorable effects in the environment and population.

CONCLUSION

The denizens of Kathmandu valley are constantly being exposed to an unacceptable level of noise specially during the rush hours. Sooner or later, these all have an unfavorable health related issues in the population. Developed countries are gradually bringing noise under control to avoid and prevent health issues. People are encouraged to avoid certain areas during the peak time or to protect their ears to limit the exposure to the unwarranted noise. In average, Kathmandu Valley is constantly being exposed to a noise level of 72 dB which is equal to the noise level of vacuum cleaner endlessly running. Major junctions of ring road saw the loudest levels of noise pollution.

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