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RESEARCH ARTICLE

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NOISE POLLUTION MONITORING OF HOSPITALS IN NASHIK CITY

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ABSTRACT
Noise levels can be effectively reduced by providing rooms for a single patient, by installing high-performance sound-absorbing acoustic ceiling tiles and by removing or reducing sources of loud noise in hospital units. In addition, acoustic ceiling tiles improve speech intelligibility by reducing sound reverberation and increase speech privacy by reducing sound propagation in adjacent areas. A large body of research also shows that music therapy is effective at reducing anxiety and distress in patients in many types of health care settings. In this research, noise pollution monitoring of major hospitals of Nashik City has been done so as to identify the noise levels that could harm the patients in the hospitals which are most prone to noise pollution effects.

1. Introduction

Noise, defined as unwanted or excessive sound, is an unwanted by-product of our modern way of life. Noises are experience in many ways. On some occasions, we can be both the cause and the victim of noise, for example when we use noisy devices or equipment. There are also cases where we experience the noise generated by other people, just like second-hand smoke. In both cases, the noise is just as damaging. Second-hand noise is more disturbing because it has negative impacts on us, but is introduced into the environment by others, without our consent (Singh & Davar, 2004).

There are two types of noise:

i. Stable: Continuous noise of sudden or progressive appearance and long duration (more than one second). Examples: noise from power plants, propellers and the pressurization system. According to Occupational Safety and Health Administration (OSHA), the maximum permissible continuous exposure level for continuous noise in a work environment is 90 dB for 8 hours.

ii. Impulse / Breath: Sudden and short duration (less than one second) pulses of sound usually exceeding 140 dB.

There are two main reasons why hospitals are noisy. First, many sources of noise are present, and secondly, environmental surfaces in hospital walls, floors and ceilings tend to be soundproof rather than absorbent. The noises that contribute to high noise levels in hospitals come from alarms for the use of mechanical equipment, paging systems, telephones, printers, ice machines, staff conversations, and noises produced by roommates and homeowners. Many studies have shown that the conversation of the staff in particular is a major source of loud noises in the hospital unit. The presence of hard surfaces reflecting sound at the hospital tends to aggravate the noise problem in hospitals.

2. Procedure

A. Location Decision: For research work the location of hospitals which is near by the traffic area and crowded area. These hospitals are major and mostly

use. So finally we selected 10 major hospitals in Nashik city which are listed below:

i. Civil Hospital (CH)
ii. Super Specialty Hospital (SSH)
iii. Dhadiwal Hospital (DH)
iv. Sanjeevani Hospital (SH)
v. Shree Saibaba heart Institute & Research Centre (SSHI&RC)
vi. Shatabdi Super Specialty Hospital (SSSH)
vii. The HCG Curie Manavata Cancer Centre (THCGCMCC)
viii. Wockhard Hospital (WH)

B. Noise Measurement Parameters: Various noise levels data recorded at the measurements point in terms of levels exceeded certain proportion of the measured time is an important way of assessing the annoyance from community sound. This is due to the fact that the sound varied and fluctuated over time. Thus, the descriptors Equivalent Continuous Sound Level (L_{eq}), Sound Level exceeded 10% of the measurement period (L_{10}), Sound Level exceeded 90% of the measurement (L_{90}), minimum noise level (L_{min}), and maximum noise level (L_{max}) were measured to assist in assessing the existing noise levels at the selected sites. The Logarithmic and mathematical models that were used to calculate noise levels were based on average and expression of sound levels variation over time using Equation1 and 2 as shown below:

$$L_{eq} = 10Log_{10}\frac{1}{T}[t_1 * 10^{(L_1/10)} + T_2 * 10^{(L_2/10)} + \ldots t_n * L_n{}^{(L_n/10)}] \quad (1)$$

Where,

L_{eq}, is equivalent continuous sound level.

T: is the time for which sound is described

t1, t2…tn are the time period for which sound levels are L1, L2…Ln and so on

$$L_{eq} = L_{50} + \left(\frac{L_{10}-L_{90}}{56}\right)^2 + (L_{10} - L_{50}) \quad (2)$$

The assessment procedures of the monitored CNP at the selected areas consist of comparing an actual noise exposure (measured levels) with the WHO recommended level for outdoor residential and school area. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

C. Sound Level Meter: Description: Sound Level Meter, economical type Model: SL-4010Frequency and time weighting meet IEC 61672 class 2.

- 35 to 130 dB, 3 ranges, data hold.
- A frequency weighting, fast time weighting.
- Size: 250 × 83 × 32 mm.

Fig. 1 Sound Level Meter

D. Noise Level Standards: The effect of noise on human being which is depends upon the intensity and frequency measured in dB and Hz.

The permissible noise level changes from place to place and also from day to night. The following table states the values of sound during day and night at various places. (It is based on the Air Amendment Act of 1986.)

Table 1: Permissible Noise Levels during day and night

Sr. No.	Area	During Day (in dB)	During Night (in dB)
1.	Residential Zone	55	45
2.	Silence Zone (Hospital, Schools)	50	40
3.	Industrial Zone	75	65
4.	Commercial Zone	65	55

3. Results

According to IS specification noise level for silence zone area (hospitals) ranged between 40 dB to 50 dB. Such monitored noise levels can cause sleep disturbance, interfere with speech and may affect patient health and doctor's performance as they interfere with speech communication and message extraction. Thus, hospital noise pollution is a serious environmental problem at public and hospital compounds within the working area. To abate noise problem, a proper use of vegetation and noise barrier are highly recommended.

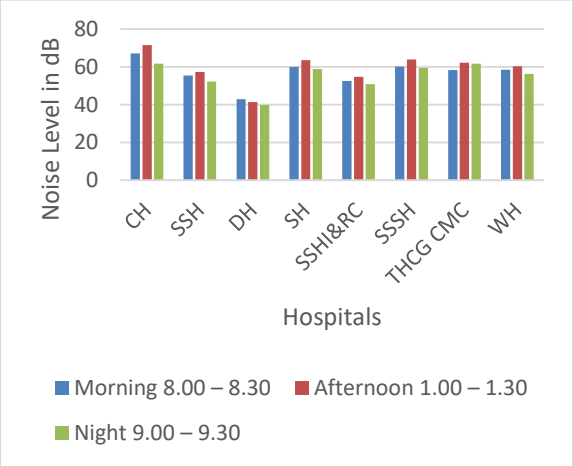

Fig. 2 Noise Level for Open Space Level

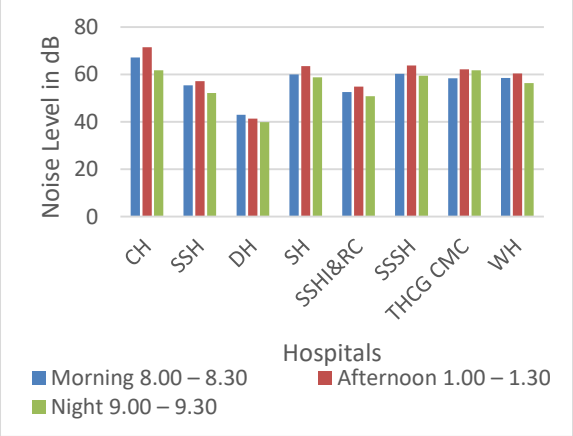

Fig. 3 Noise Level for Reception

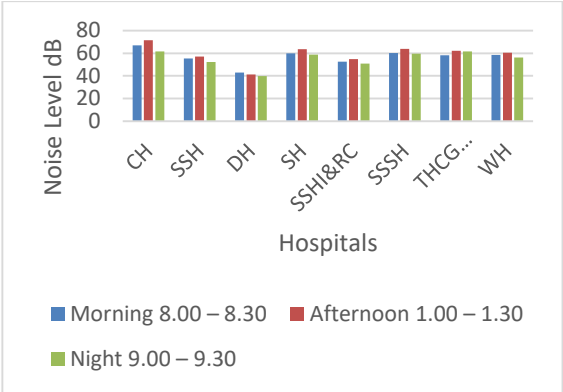

Fig. 4 Noise Level for OPD

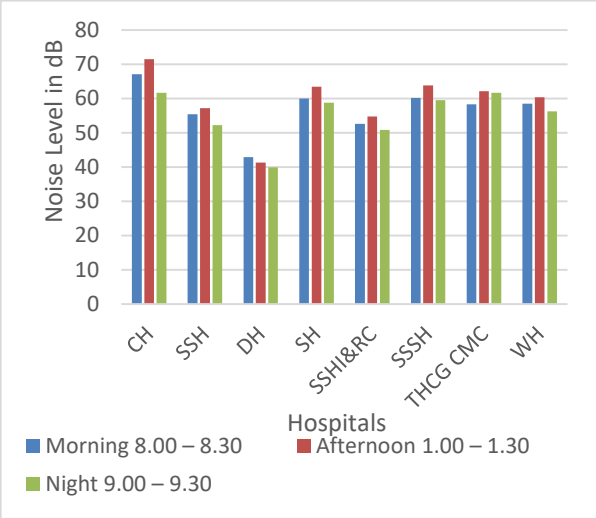

Fig. 5 Noise Level for ICU

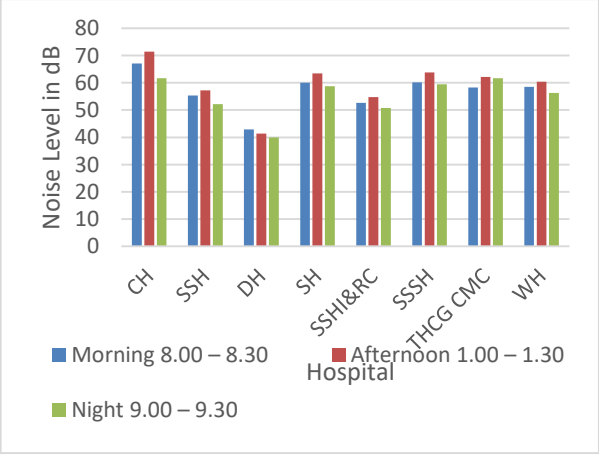

Fig. 6 Noise Level for General Ward Male

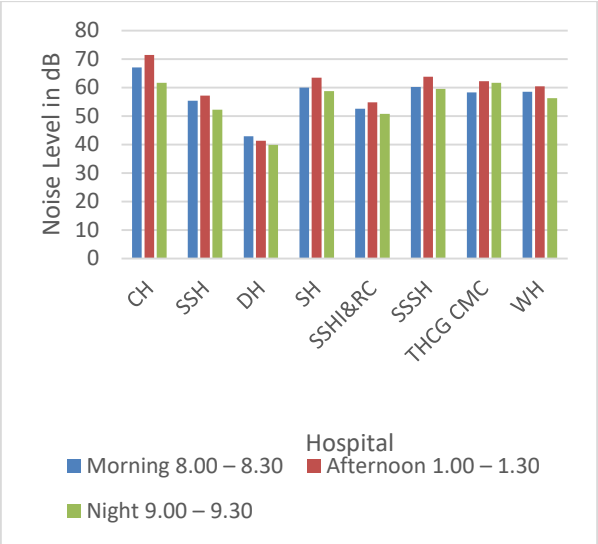

Fig. 7 Noise Level for General Ward Female

Sr. No.	Location	Session	Time	Average Noise Level (dB)							
				CH	SSH	DH	SH	SSHI&RC	SSSH	THCG CMC	WH
1	Open Space	Morning	8.00 – 8.30	73.2	69.3	61.9	59.7	66.8	63	67.2	66.3
		Afternoon	1.00 – 1.30	77.8	71.6	62.2	63.1	70.4	73.6	73.7	70.7
		Night	9.00 – 9.30	72	66.6	58.9	55.7	63.6	63.2	65.7	66
2	Reception	Morning	8.00 – 8.30	70.6	64.1	49.6	68	55.5	60.2	61.9	67.9
		Afternoon	1.00 – 1.30	78.6	64.4	50.7	72.1	59	63.8	64.9	71.3
		Night	9.00 – 9.30	67.6	61.3	48.4	64	56.4	59.5	64.8	65.1
3	OPD	Morning	8.00 – 8.30	61.7	60.5	41.4	57.4	54.3	64.6	60.8	45.4
		Afternoon	1.00 – 1.30	64.9	62.4	43.2	61.3	59	68.2	66.1	48.3
		Night	9.00 – 9.30	63.5	59.6	37	55.3	56.6	63.2	62.9	41.4
4	ICU	Morning	8.00 – 8.30	64.7	50.4	34.9	57.2	49	56.8	58.3	45.6
		Afternoon	1.00 – 1.30	61.5	53.4	38.5	59.3	51.4	59.7	58.9	54.2
		Night	9.00 – 9.30	56.3	53.2	32.3	59.1	45.2	57.1	59.7	42.4
4	General ward Male	Morning	8.00 – 8.30	71.5	58	45.5	62.5	52.2	61.6	58.7	57.5
		Afternoon	1.00 – 1.30	76	64.7	46.2	59.3	54.3	70	60.4	57.8
		Night	9.00 – 9.30	69.2	56.6	42.8	62.5	54.7	60.8	60.8	50.8
5	General ward Female	Morning	8.00 – 8.30	67.1	55.4	42.9	60	52.6	60.2	58.3	58.5
		Afternoon	1.00 –	71.5	57.2	41.3	63.5	54.8	63.8	62.2	60.4

			1.30								
		Night	9.00 – 9.30	61.7	52.2	39.9	58.8	50.8	59.5	61.7	56.3

4. DISCUSSION OF RESULTS

The study showed that controlled noise pollution in the area of some hospitals far exceeded the level recommended by the Indian Standard Specification, with the exception of Dhadiwal Hospital. A study analyzes the effects of ambient noise on physiology for patients and visitors. Hospitals should also provide their nurses with periodic noise control training courses to reduce noise caused by "nurses screaming" and "cart wheel rolling". Higher noise level than the standard Indian noise level prescribed by CPCB (Central Office for Pollution Control), New Delhi, India. It can be inferred that noise pollution directly or indirectly affects, at the same time, the subjective perception of noise, emotions, physiology and noise experience inside and outside the services of medical staff, patients and visitors.

5. CONCLUSIONS

In addition to the measures put in place to reduce the source and transmission of noise, measures can be taken to protect hospitals and buildings from noise, thereby reducing occupant noise exposure. A number of techniques are used to reduce noise levels in hospitals and from hospitals, including:

- Finishes and construction details designed to minimize the impact of noise in sensitive areas such as intensive care units, OPTs, children's rooms, etc.
- A range of solutions to combat road traffic noise, including acoustic insulation of the walls closest to the noise source, mechanical ventilation rooms and the construction of barriers between the noise source and the site touch.
- measures to control air traffic noise, including room orientation to reduce noise exposure; use of noise abatement materials and construction techniques; bigger than normal Roof overhangs and highly insulated roofs with acoustically absorbent gutter liners; and soft floor finishes immediately adjacent to the windows to reduce sound reflection in the openings.

Suggestions for environmental interventions can be effective in reducing noise levels in hospitals and improving the acoustic environment.

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