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AN EMPIRICAL STUDY ON THE CO- RELATION OF NOISE LEVEL WITH VARIOUS PARAMETERS OF HEALTH – A CASE OF GHATKOPAR WEST, MUMBAI, INDIA

[1]Dr. Baishakhi Dutta

Abstract
The word "noise" is derived from the Latin word "nausea" meaning seasickness. Noise can be defined as the level of sound that exceeds the acceptable level and creates an annoyance. Noise produces an undesired physiological or psychological effect on an individual or group.. The major sources of noise are industrial noise, community noise and traffic noise. Out of these three parameters, the source that affects the most in urban areas is traffic or vehicular noise, which can be measured in decibels (dB). Noise is one of the most significant sources of environmental pollution in modern cities. It can be defined as an unpleasant and unwanted sound, which now becomes a serious threat to urban life. Long exposure to noise affects our physical and mental health adversely. Since Mumbai is a fast-developing city, there is a strong need for noise impact studies in such megacities at vulnerable places. Noise pollution is not fatal to human life, yet its importance cannot be overlooked because repeated exposure to noise reduces the sleeping hours and productivity or efficiency of human beings. It also affects the peace of mind and invades the privacy of human beings as a part of Quality of life (QOL) considered being a component of social justice and social inclusiveness. Such a study has been carried out in Ghatkopar West area, a part of eastern suburb of the mega city of Mumbai. The study has conducted various questionnaire surveys and measurement of noise to analyze this aspect and included different strata of people like residents, commuters, auto drivers, bus drivers' shopkeepers etc. to analyse the co-relation between noise and various important health parameters. Average, maximum and minimum values were calculated and compared with standards prescribed by the Central Pollution Control Board.
Keywords: Noise, Decibels, Quality of Life, Health parameters, Survey, Central Pollution Control Board.

1. Introduction:

Noise pollution is an invisible threat. . Noise pollution is considered to be any unwanted or disturbing sound that affects the health and well-being of human beings. Noise is any sound which may not be loud but which can produce an undesired physiological or psychological effect on an individual or group. Pollution can be defined as an unfavorable alteration of the environment where noise is one of the effective source of pollution most commonly found in major cities. Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. These health problems can affect all age groups, including children. Sound pressure is a basic measure of the vibrations of air that makes up sound and these levels are measured on the logarithmic scale with units of decibel (dB). Noise affects the peace of mind and invades the privacy of human beings as a part of Quality of life (QOL). Such a study has been carried out in Ghatkopar West area, a part of eastern suburb of the mega city of Mumbai.

[1] Associate Professor, Department of Geography, R.J. College of Arts, Science & Commerce, Mumbai.

Table 1. Ambient Air Quality standards in respect of Noise (Regulation and Control) Rules, 2000

Area Code	Category of Area/Zone	Limits in dB	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	40	50

Note: -
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Noise is measured by authorities by decibels (dB)
4. Silence Zone includes, Educational Institutes, Temples, Hospitals, and Parks etc.

2. Review of Literature

Rao and Rao carried out noise pollution studies and community survey in the city of Visakhapatnam (1991-1992). Measurements were recorded in different localities; correlation of annoyance using mean dissatisfaction score (MDS) with 198 traffic noise was studied and predictions were made.

Chakraborty reported the status of road traffic noise response in Calcutta city in terms of seasons (1998). Based on the annoyance survey, regression analysis of noise parameters are highly correlated.

Ingle and Pachpande conducted a community survey on traffic noise among residents of Jalgaon city (2005). The result of the study undertaken showed mild hearing impairment in people. Noise from traffic on highway or from industries have an impact on health.

Tripathi and Tiwari reported attitude of traffic personals toward transportation noise in a study in Ahmedabad (2006). The questionnaire included questions regarding the self-assessment of the policemen about their hearing ability, past and present exposure to loud sound.

Nandewar studied the effect of traffic noise on the quality of life among residents around the major road intersections in Nagpur city (2009). Majority of the subjects expressed annoyance due to traffic noise during daily activities, more annoyance during evening than daytime

Goswami studied traffic noise in terms of standard noise indices, community response, and community health effects in Balasore city (2009). It was reported that 63% respondents were not satisfied with the noise level in their dwellings.

Wani and Jaiswal studied traffic noise and subjective community response in the Gwalior city (2010). Based on a questionnaire survey, it was reported that 50% of people were always annoyed and 33% had a constant headache, 17% has other medical issues.

Agarwal and Swami studied the impact of noise pollution on residents dwelling near roadside in Jaipur city (2011). The degree of annoyance was assessed by means of a questionnaire and it was reported that road traffic was the major source of noise in the area.

The city of Mumbai is a commercial capital of India with massive development projects both infrastructural and commercial types taking at a very fast pace. There is an increase in the noise produced on a daily basis. Mumbai is the 3rd noisiest city in the world.

Studies on noise pollution was undertaken by Maharashtra pollution control board, and Central Pollution Control Board to monitor noise during festival. Non-governmental agencies like the "Awaaz" has started monitoring noise. The first study was carried out by Vyas (2002) and second such study was conducted by Sumaira Abdulali (April 2006) with the support of MMDRA, her project was entitled 'The Mumbai City Noise Mapping Project'. Lot of

Geographical work concerning noise has also been done including noise mapping by Vyas (Vyas, 2002). Noise Mapping makes the government aware and hence enables them to take suitable measures in reducing it, thus leading to proper town planning. The idea of Noise mapping was 1st undertaken by Defra, a private research organisation in Europe. In India this is fairly a new concept.

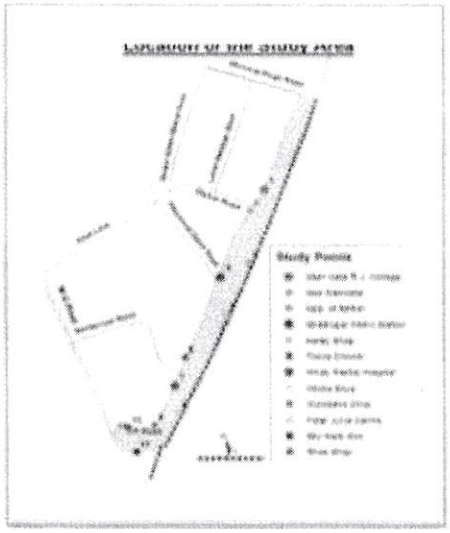
Thus, it became imperative to study noise levels in the study on a large scale and identify the critical areas. Along with other types of pollution, noise has become a hazard to quality of life (Davar, 2004). Various studies have revealed that noise levels in some of the Indian cities are higher than the standards prescribed by CPCB, Central Pollution

3. Profile of the Study Area:-

This paper was taken up with a genuine intention of creating awareness among students, commuters, public and other stakeholders. After thorough study the topic was narrowed down to a very grim problem of noise pollution and traffic congestion in Ghatkopar west. Site selected was Ghatkopar which is situated in the eastern suburbs of Mumbai is emerging as an industrial and commercial hub. The growth and expansion of Ghatkopar in the last decade has led to the establishment of new infrastructure projects e.g. Metro rail services from Ghatkopar to Versova etc. Ghatkopar is now considered to be the junction point for linking eastern and western suburbs of Mumbai. This has led to establishment of new construction projects, expansion of urban services and amenities leading to traffic congestion, construction hazards and huge growth of population leading to noise pollution impacting the health and wellbeing of people residing there.

The site selected for the study is served by the railway station on the Central Line of the Mumbai Suburban Railway and the metro station on Line 1 of the Mumbai Metro. Population of N Ward, Ghatkopar is 619,556. (Census Report, 2011) It is located in the heart of the city. The entire study and intervention strategies will be centered in and around Ghatkopar west area and the findings of the local study will be valid only for Ghatkopar which can be later replicated for other suburbs of Mumbai.

This project focuses on the Noise Pollution as one important parameter of QOL and hence the project is an attempt to create awareness and bring about measurable changes in and around Ghatkopar area (west). The project also puts emphasis on Traffic management to bring about good locality governance. The entire study and intervention strategies will be centered on Ghatkopar west area and the findings of the local study will be valid only for Ghatkopar as shown in Map no 1 which can be later replicated for other suburbs of Mumbai.



Map No 1.

4. The objectives of the present investigation are:

a. To measure the intensity of noise pollution in the study area.

b. To analyze the data and bring out a relation between various health parameters.

c. To work out possible preventive measures to ease the adverse long-range effect of noise pollution and its impact on human health.

5. The methodology adopted in the ongoing study comprises of following steps:

a) Measurements of continuous hourly noise levels were made at a number of selected places in the study area.

b) Measurements of the Systolic and Diastolic pressure as well as pulse rate has been checked, analyzed and computed by various methods statistically, through finding Mean, Standard deviation and by sampling tests to find the co-relation.

Table 2. Mean and Standard Deviation for the Parameters Analyzed.

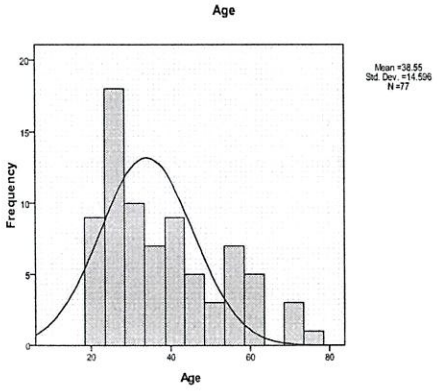
	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
AGE	77	21	75	38.55	14.596
NOISE LEVEL	77	62	119	85.44	11.943
SYSTOLIC PRESSURE	77	89	166	132.14	16.927
DIASTOLIC PRESSURE	77	60	109	82.62	11.677
PULSE	77	62	128	86.14	12.742

Analysis

Table 2 depicts that minimum age and maximum age of employees and people residing in the study area are 21year and 75 year respectively. Average age of 77 customers is 39 years old and Standard. Deviation is 14.59 years. If we look at noise level, minimum and maximum level are 62 dB and 119 dB respectively, mean and standard deviation of 77 customers are 85.44dB and 11.943dB.

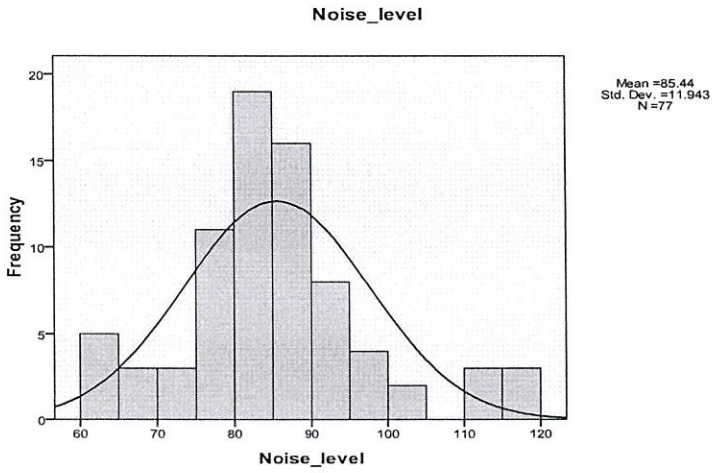
Similarly, for Systolic Pressure we find has a minimum level of 89 and maximum of 166. The mean is 132 with a Standard deviation of 17. For Diastolic Pressure 60 is the minimum value with maximum of 109 and mean of 83. Standard Deviation is 11.67. Pulse rate assessed has a minimum of 62 and maximum of 128. The mean comes out to be 86 and Standard Deviation of 12.72.

Figure 1



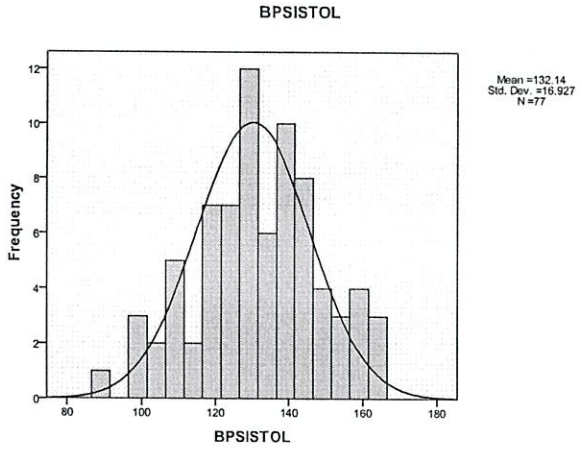
The distribution of age from mean is positively skewed

Figure 2



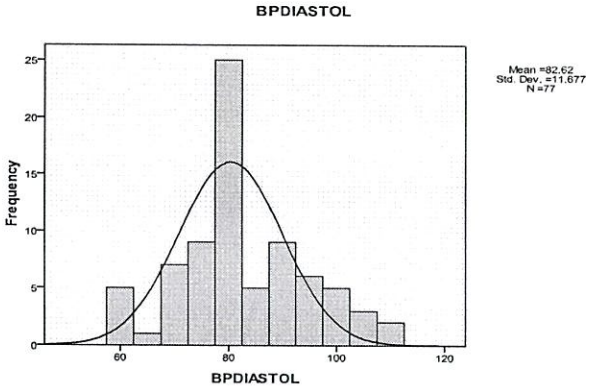
The distribution of noise level from mean is approximately normal

Figure 3



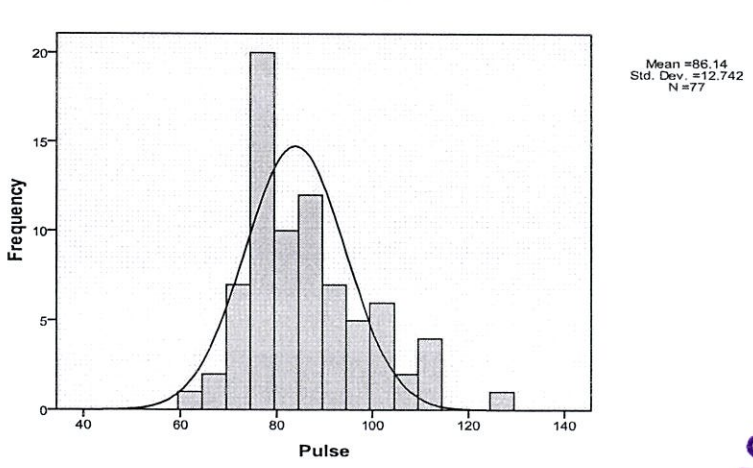
The distribution of systolic pressure from mean is normal distribution

Figure 4



The distribution of diastolic pressure from mean is positively skewed

Figure 5



The distribution of pulse rate from mean is positively skewed

Table 3

One-Sample Test

	Test Value = 60					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Noise level	18.695	76	.000	25.443	22.73	28.15

Table 4

One Sample Test

	Test Value = 80					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Noise level	3.999	76	.000	5.443	2.73	8.15

Ho: There is insignificant effect of noise level on human being.
H1: Not Ho
Since p value is 0.000 which is less than 0.05, we reject Ho. i.e there is significant effect of noise level on human being.

Table 5.

One-Sample Test

	Test Value = 120					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
BPDIASTOL	-28.089	76	.000	-37.377	-40.03	-34.73

Ho: There is insignificant effect of noise on Diastolic pressure.
H1: Not Ho
Since p value is 0.000 which is less than 0.05, we reject Ho. i.e there is significant effect of noise on Diastolic pressure.

Table 6

One-Sample Test

	Test Value = 80					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
BP SYSTOL	27.031	76	.000	52.143	48.30	55.98

Ho: There is insignificant effect of noise on Systolic pressure.
H1: Not Ho
Since p value is 0.000 which is less than 0.05, we reject Ho. i.e there is significant effect of noise on systolic pressure.

Table 7

One-Sample Test

	Test Value = 90					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Pulse	-2.656	76	.010	-3.857	-6.75	-.97

Ho: There is insignificant effect of noise on pulse rate.
H1: Not Ho
Since p value is 0.010 which is less than 0.05, we reject Ho. i.e. There is significant effect

6. Conclusion

From this analysis we can conclude that noise has health effects which pertains to the physical and psychological health consequences. Environmental noise causes a number of short and long-term health problems like hearing impairment, tinnitus, hypertension, ischemic heart disease, annoyance, and sleep disturbance. The analysis above has proved this fact to be true. Some suggestive measures can be taken to reduce the impact of noise on health. They are: -

1. Planting bushes and trees in and around sound generating sources in an effective solution for noise pollution
2. Regular servicing and tuning of automobiles can effectively reduce noise pollution.
3. Buildings can be designed with suitable noise absorbing material for the walls, windows, and ceilings.
4. Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation
5. Soundproof doors and windows can be installed to block unwanted noise from outside.
6. Social awareness programs should be taken up to educate the public about the causes and effects of noise

There is good evidence from large population studies that environmental noise is associated with cardiovascular morbidity and mortality. There may be both independent mechanisms and

common mechanisms for these associations of environmental exposures with health. Environmental planning and policy should take both exposures into account when assessing environmental impact

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