

Noise Induced Health Impacts in Urban Areas: A case study in Allahabad

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Abstract- In the 21st Century, human population is experiencing the manmade plague of environmental noise from which there is virtually no escape, no matter where we are - in our homes and yards, on our streets, in our cars, at theaters, restaurants, parks, arenas, and in other public places. There are many factors, both emotional and physical, which contribute to the variation in human reaction to response. The existence of these variables prohibits defining an exact individual and community response. Exposure to noise induces fatigue, depressed mood and well-being, and decreased performance. Decreased alertness leading to accidents, injuries, and death has also been attributed to lack of sleep and disrupted circadian rhythms. Noise during sleep causes increased blood pressure, increased heart rate, increased pulse amplitude, vasoconstriction, and changes in respiration, cardiac arrhythmias, and increased body movement.

The purpose study was conducted to monitor noise level at different selected area of Allahabad representing different type of activity zone like commercial, transport and residential area and for the same area survey through questionnaire is conducted to study the impact of noise on their health. questionnaire was distributed to gather information about the health status of the residents and people working in these areas. Pearson correlation coefficient was used to set relation between the noise level and different health aspects and t-value tested for $P < 0.05\%$. Data gathered in this study provides information about the health aspect of subjects from different area states that the subjects are experiencing number of different problems including clinical unfitness. But to relate the problem with noise Pearson correlation coefficient has been calculated for all the taken aspect and significance level is calculated at $P > 0.05\%$. It suggests that in natural or ambient environment there exist different degree of correlation ranging from negative to positive (weak, medium and strong) for different aspects.

I. INTRODUCTION

In the 21st Century, human population is experiencing the manmade plague of environmental noise from which there is virtually no escape, no matter where we are - in our homes and yards, on our streets, in our cars, at theaters, restaurants, parks, arenas, and in other public places (Goines and Hagler, 2007). Despite attempts to regulate it, noise pollution has become an unfortunate fact of life worldwide. In a way that is analogous to second-hand smoke, second-hand noise is an unwanted airborne pollutant produced by others; it is imposed on us without our consent, often against our wills, and at times, places, and volumes over which we have no control (USEPA, 1978). Until

recently it was very difficult to arouse public offense against corporate targets in the way as other environmentalist attacked the automobiles or chemical manufactures. The reason was that the noise control supporter could not demonstrated a “direct cause and relationship” between excessive noise and health problem or deaths as with the case of water and air. Noise is more subtle pollutant, aside from sonic booms that can break windows; noise usually leaves no visible evidence. It is a silent enemy which is among the most frequently forgotten of the environmental pollutants whose effect can be far reaching. Noise can harm us in more ways than we can think of and at time without us knowing about it. The effects of noise on health are often misunderstood, not noticed or unrecognized. It will be not wrong to say that noise bug has bit every part of the countries and the disease is fast spreading to other areas. Noise is becoming one of necessary consideration to assess in favour of protection of the environment and to investigate it health impacts.

Apart from hearing loss it causes other health problems and interferes with peace of life. Since 1973, the U.S. Department of Housing and Urban Development has conducted a survey to find out what city residents dislike about their environment. And every year the noise has been named most objectionable. As per estimation 14.7 million American were exposed to noise that ensue threat to their hearing on the job. Another 13.5 million were exposed to dangerous level without knowing it through transport sector where continuous exposure to sound exceeds 70 dB (EPA, 1981). Presently it has been regarded as a major threat to urban life. With the technological advancement and changing life style of increasing population there has been increased in exposure of human to different types of noise related to day to day activity. Evidence now suggested that noise related stress also causes a wide range of psychological and physiological problems ranging from irritability to heart disease (Rosenberg, 1991).

Human health is surely facing major threats as a cost of modern life style. Noise directly or indirectly aggravates the already deteriorated status of public health. Individual human response to noise is subjected to considerable variability. There are many factors, both emotional and physical, which contribute to the variation in human reaction to response. The existence of these variables prohibits defining an exact individual and community response. Still threshold age for sound related disorder has been reduced to 45 yr rather than 65 yr can be easily observed (CSE, Draft Dossier, 2004). Number of children coming to hospital with ENT problem can be in -sighted in every city can raise finger towards increasing noise level in urban areas. In a study on 1,000 office workers, 70% of the respondents

said their productivity would increase if their offices were less noisy and Almost 10 years later, noise continues to be a primary cause of distraction, frustration, stress and dissatisfaction among employees, especially in open plan office spaces (Yankelovich, 1995).

Noise during sleep causes increased blood pressure, increased heart rate, increased pulse amplitude, vasoconstriction, changes in respiration, cardiac arrhythmias, and increased body movement (Hobson, 1989). If sleep disruption becomes chronic, the results are mood changes, decrements in performance, and other long-term effects on health and well-being (Suter, 1991). Some of these effects like waking diminish with repeated exposure while other particularly cardiovascular responses do not. Secondary effects or after effects measured the following day include fatigue, depressed mood and well-being, and decreased performance. Decreased alertness leading to accidents, injuries, and death has also been attributed to lack of sleep and disrupted circadian rhythms. Particularly sensitive groups include the elderly, shift workers, persons vulnerable to physical or mental disorders, and those with sleep disorders (Berglund and Lindvall, 1995). Thus there is list of sicknesses which now getting evidences that noise is among one of the trigger. It may have direct impact or may work indirectly.

Allahabad is among one of religious city and been a hub of education since long. This make it important as educational, political and official zone hosting number of pilgrims along. Thus we find it important to monitor noise level of this city and if noise is responsible for negative impact. For the purpose study was conducted to monitor noise level at different selected area of Allahabad representing different type of activity zone like commercial, transport and residential area and for the same area survey through questionnaire is conducted to study the impact of noise on their health. Precaution has been taken in choosing the subject that they were supposed to spend their day duration at the area and age must be in between 18 – 50 to avoid very young and old age impact on the health effects.

II. MATERIAL AND METHOD

For the study, ten different areas (Civil Lines (S1), Rambagh (S2), Mahewa (S3), Bhairana (S4), Naini (S5), Zero road bus station (S6), Bus station Civil lines (S7), Railway Station (S8), Chowk, (S9) and Katra (S10)) were selected and noise monitoring was conducted with help of Standard SLM (sound level meter) model No.TES1350 with measuring range from 35-130dB in four adjustable read out scale has been employed to monitor the noise level reading. Later with the help of L_{10} and L_{90} Leq (Noise equivalent Level) value was calculated which indicates the noise level of the area in dB A. Later questionnaire was distributed to gather information about the health status of the residents and people working in these areas. Pearson correlation coefficient was used to set relation between the noise level and different health aspects and t-value tested for $P < 0.05\%$. for survey all the selected area were divided into zones viz; core zone which were representing the main roads and intersection with traffic noise prevailing and inner zone which is

approximately 100 m away from main roads. The idea behind was that may be inner zone were less noisy and there may be difference between that health aspects.

$$Leq = \frac{1}{2} (L_{10} + L_{90}) + .0175(L_{10} - L_{90})$$

III. RESULT

For all type of pollution the major concern is its impact on health. In case of noise it is however very critical to decide the way it is affecting the body. For the purpose of proper understanding, health effects have been categorized under three different aspects viz; behavioural, clinical and psychological and accordingly subjects are requested to fill the questionnaire. Result of the health study is documented separately for core and inner zones in following subheads in percentage. And correlation with noise was undertaken by combining the health information as area specific because noise level monitoring was area specific rather than inner and core area separately.

Clinical Aspect

At **core zone** cardiac patient was found maximum at S7 (22%) and minimum was at S4 (4%), weakness and fatigue reported maximum at S9 (24%) and minimum at S4 & S5 (6%), gastro-intestinal problems were maximum at S8 (54%) and minimum was at S5 & S6 (21%), eye sight problem was maximum at S7 (33%) and minimum was at S6 & S10 (18%), hearing problem was maximum at S9 (33%) and minimum was S3 & S4 (6%) while BP reported maximum at S8 (63%) and minimum at S6 (14%). For **inner zone** cardiac patient was found maximum at S8 & S7 (19%) and minimum was at S6 (4%), weakness and fatigue reported maximum at S9 (30%) and minimum at S6 (8%), gastro-intestinal problems were maximum at S9 (43%) and minimum was at S6 (10%), eye sight problem was maximum at S8 (59%) and lowest at S6 (6%), hearing problem was maximum at S8 (27%) and minimum was S6 (2%) while BP reported maximum at S8 (56%) and minimum at S9 (17%).

Psychological Aspect:

For **core zone** maximum number of response for occasional headache was at S8 (77%) with and minimum was at S3 (32%), fatigue was reported maximum at S7 (39%) and minimum at S9 (16%), hypertension was maximum at S8 (41%) and minimum was at S2 (14%), aggressiveness among people was maximum at S4 (62%) and minimum was at S2 (18%) further irritation was found maximum at S6 (86%) and minimum at S3 (37%). At **inner zone** maximum number of response for occasional headache was at S8 (67%) with and minimum was at S3 & S6 (21%), fatigue was reported maximum at S7 (41%) and minimum at S1, S3 & S10 (20%), hypertension was maximum at S8 (39%) and minimum was at S9 (11%), aggressiveness among people was maximum at S1 (44%) and minimum was at S3 (13%) further irritation was found maximum at S5 (60%) and minimum at S3 (14%) sleep disturbance was reported maximum at S2 (69%) and minimum at S3 (10%).

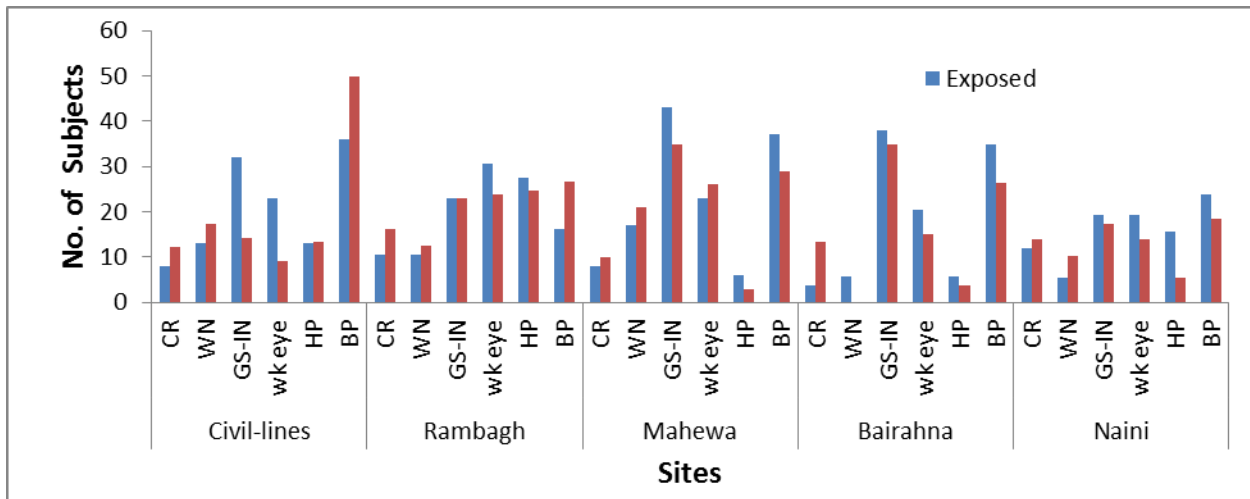


Figure 1: Showing the % of subject interviewed getting treatment of Clinical problems

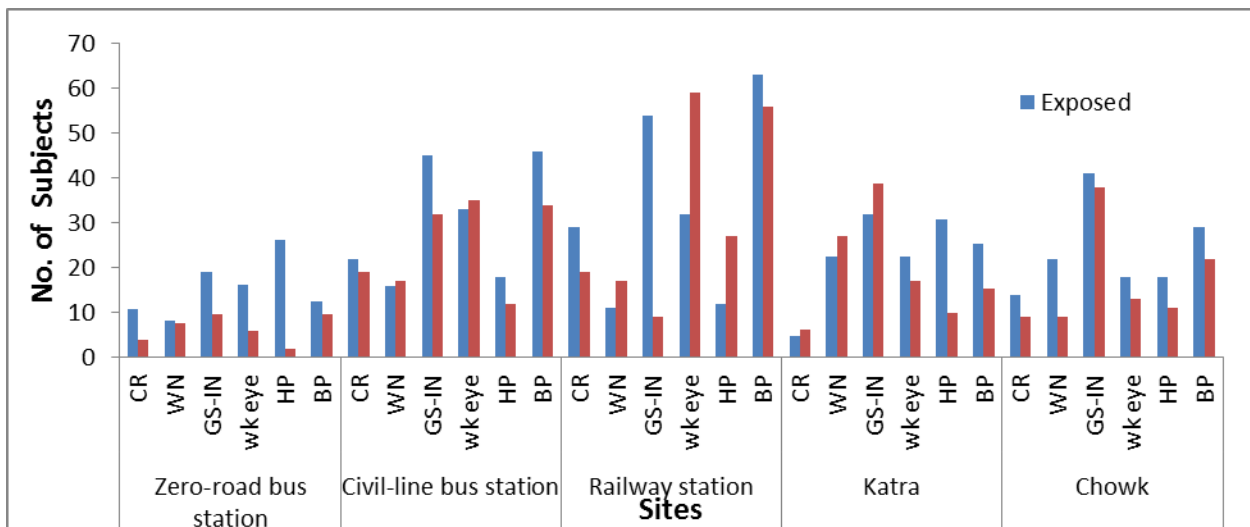


Figure 2: Showing the % of subject interviewed getting treatment of Clinical problems

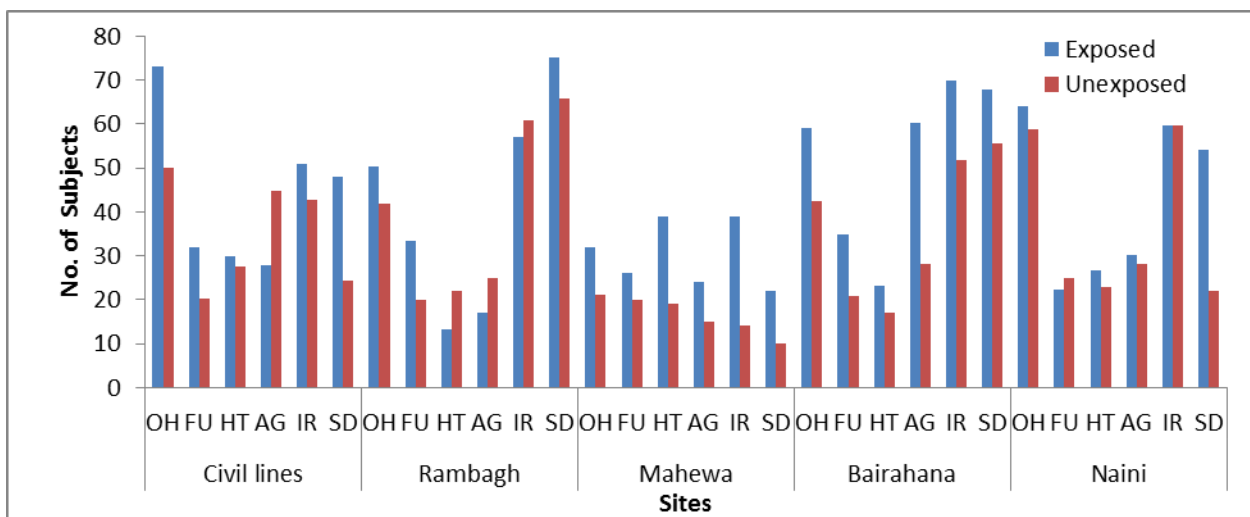


Figure 3: Showing the % of exposed subject responses for psychological Aspects

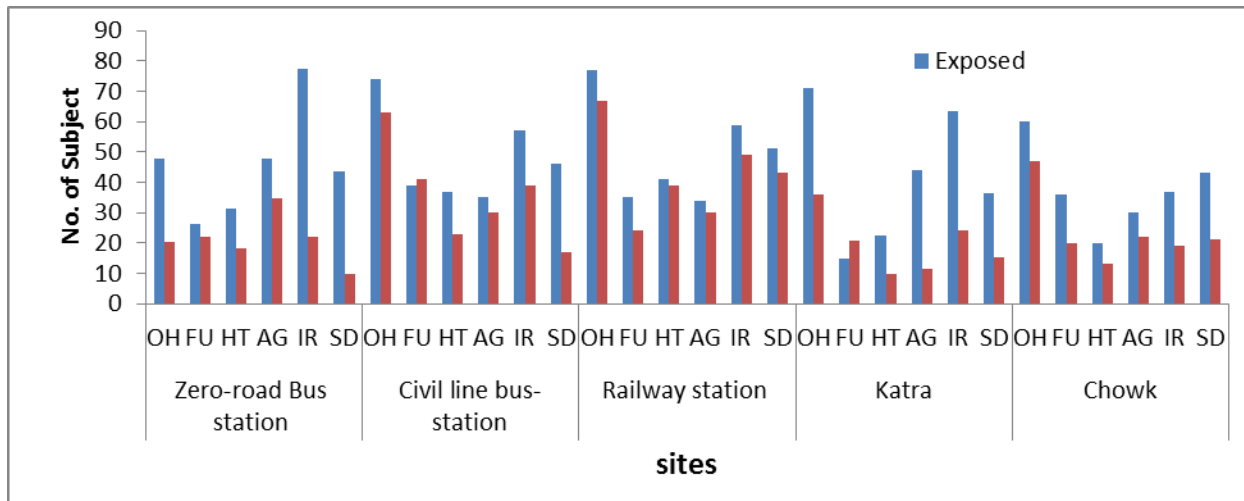


Figure 4: Showing the % of exposed subject responses for psychological Aspects

IV. DISCUSSION

Accepting noise as a hazardous pollutant is still a controversial issue. It does not leave its residue or footprint once its source is removed. Still there is an acceptance that it have not only responsible for hearing loss but also aggravates our endocrine system which further leads to different clinical specially cardiovascular and neural system and Psychological problems. There are evidence of causing annoyance, speech interference, sleep disturbance, metal stress, headache, lack of concentration (Nagi *et al.*,1993;) higher incidence of BP (Regwcova and Kellerova, 1995) high tone hearing loss (Kacker 1998). Data gathered in this study provides information about the health aspect of subjects from different area states that the subjects are experiencing number of different problems

including clinical unfitnes. But to relate the problem with noise Pearson correlation coefficient has been calculated for all the taken aspect and significance level is calculated at $P > 0.05\%$. It suggests that in natural or ambient environment there exist different degree of correlation ranging from negative to positive (weak, medium and strong) for different aspects. As for clinical aspect it shows medium degree of correlation with Hearing loss and blood pressure. Hearing loss is well known and accepted loss due to noise. Possibly there is no single person will exist at present with perfect hearing ability. Wallagen *et al* 1997; Kacker 1998; Adiseshiah *et al.*, 1998; Roozbahani *et al.*, 2009 during the course of their study found high level of noise exposure may result to hearing loss.

Table 1: Correlation analysis for Noise level with Clinical responses of subject at different sites

Sites	Leq	Cardiovascular problem	Weakness/ wt loss	Gastrointestinal problem	Eyesight weakness	Hearing loss	B.P
S1	72.9	10	15	23	16	13	42.5
S2	79.7	14	11.5	24	28.5	27.5	22.5
S3	71.3	9	19	39	24.5	4.5	33
S4	74.5	9	9.5	38	18.5	5	32
S5	75.2	14	8.5	20	17.5	11.5	23
S6	76.7	8	8.5	15.5	12	15.5	12
S7	76.6	20.5	16.5	38.5	34	15	40
S8	83.7	24	14	31.5	45.5	19.5	59.5
S9	72.4	6	27	38.5	21.5	22	22
S10	72.9	11.5	15.5	39.5	15.5	14.5	25.5
Pearson correlation coefficient r value		0.7728***	-0.3962	-0.308	0.7134***	0.5382**	0.4132**
P > 0.05%		S	NS	NS	S	NS	NS

Table 2: Correlation analysis for Noise level with Psychological responses of subject at different sites

Sites	Leq	Occasional headache	Fatigue	Hypertension	Aggressiveness	Irritation	Sleep disturbance
S1	72.9	61	26	28.5	36	46.5	36
S2	79.7	48.5	28	18.5	22	62	74
S3	71.3	26.5	23	29	19.5	26.5	16
S4	74.5	53	29	21	46	63.5	64.5
S5	75.2	67	24.5	27	32	62.5	41.5
S6	76.7	37	26	27	44.5	54.5	29
S7	76.6	68.5	40	30	32.5	48	31.5
S8	83.7	72	29.5	40	32	54	47
S9	72.4	58	19.5	17.5	30	47.5	28
S10	72.9	53.5	28	16.5	26	28	32
Pearson correlation coefficient value	r						
		0.4157**	0.4156**	0.5108**	0.0798*	0.5378**	0.535**
P >0.05%		NS	NS	NS	NS	NS	NS

* Weak relationship ** Medium relationship *** Strong relationship

Further the data states the high degree of positive correlation with cardiac problems and noise level. **Regecova and Kellerova 1995** states effect on systolic and diastolic blood pressure among school going children. Increase in blood pressure and possible cardiac disorders were reported by many other investigator during the course of their study (**Abdullah, 1997; Paschier and Paschier 2000; Stansfield and Matheson, 2003; Tsai et al., 2005; Mead 2007; Mahmood et al., 2008; Barma et al., 2009**). Psychological aspects data suggests positive medium relation between all the features except the aggressiveness showing weak relation. **Kohrs et al., 1998** studied the high degree of sleep disturbance due to traffic noise and train horns. Similarly **Koeboe et al., 2000 and Chanderprabha and Singh, 2013** observed fatigue and exhaustion due to noise, **Paschier and Paschier 2000** observed sleep disturbance hypertension and decreased school performance. **Joshi et al., 2003** reported irritation, fatigue, sleep disturbance and headache in a survey conducted at Nepal. All this suggest that there should not be any doubt that noise have it negative health paraphernalia which have wide spectrum but there extent and effectiveness varies from person to person depend upon their mental status and environmental adaptation. The data gathered in the study is based on interviewing subject and their observation of their own behavior which need depth study at behavioural and psychological aspects by medical person and psychiatric.

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