

EFFECTS OF NOISE POLLUTION WITH RELATION TO HYPERTENSION

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ABSTRACT

The movement against noise pollution is weak in India. Most of the people do not consider it as a pollutant and accept it as a part of their routine life. The frequency and intensity of pollution has been increasing day by day. The present study reviews the data on sources, intensity and health implications of pollutants collected through household survey using questionnaires from contrasting density areas. The analysis reveals that tremendous increase in population, industrial activities, unchecked growth in vehicular traffic and rapidly changing life style are the major factors that have created and aggravated the problem of pollution in the study area. The major health implications include annoyance, disturbance in sleep, interference with communication and other harmful effects. The cause and effect relationship between the intensity of pollution and occurrence of diseases among sampled households of has been established. The study also included suggestions of remedial measures for the mitigation of the noise problem.

KEY WORDS: Hypertension, noise pollution, Nagda, questionnaire

INTRODUCTION

In the 21st Century we are experiencing the man-made plague of environmental noise from which there is virtually no escape, no matter where we are. Environmental noise is a significant problem not only in Europe but also all over the world, and it is estimated that roughly 20% of the European Union's population (close to 80 million people) are exposed to noise levels that are considered unacceptable (European Commission, 1996). Noise pollution is an urban territorial serious phenomenon. Noise health effects are the health consequences of elevated sound levels. Increased traffic noise and the wider spread of a 24 hour society have contributed to rising complaints about disturbance and annoyance caused by noise. In addition, there is growing evidence of a link between noise pollution and ill health (Abel, 1990). Elevated workplace or other noise can cause hearing impairment, hypertension, ischemic heart disease, annoyance and sleep disturbance. Changes in the immune system and birth defects have been attributed to noise exposure (Carlos, 1999).

The WHO has documented seven categories of adverse health effects of noise pollution on humans. Much of the following comes from the WHO Guideline on Community Noise and follows its format. The guideline provides an excellent, reasonably up-to-date, and comprehensive overview of noise-related issues, as do the other recent reviews on this subject. They are Hearing Impairment, Interference with Spoken Communication, Sleep Disturbances, Cardiovascular Disturbances, Disturbances in Mental Health, Impaired Task Performance and Negative Social Behavior and Annoyance Reactions. An increasing number of people live in the locality of railway tracks, airports and industrial area experience considerable noise and air pollution. Raised blood pressure (BP) is a major risk factor for coronary heart disease and the major risk factor for stroke (Ruback *et. al.*, 1997). Few investigators have studied health effects associated with exposure to aircraft noise. Cardiovascular effects due to noise exposure have been studied to some extent, but no clear exposure-response relations are currently known (Babisch, 2006). A review found that hypertension was more prevalent among individuals living close to noise polluted zones (Pulles, *et. al.*, 1990). Therefore; we determined to study the effects of noise on BP in 120 subjects, primarily to explore a possible link between noise pollution and hypertension. This paper reports a qualitative study that was carried out to investigate the noise pollution in contrasting areas of Municipal Corporation of Nagda, (Madhya Pradesh) and to identify the significant factors that were contributing to the noise levels and its effects on community health.

MATERIAL AND METHODS

Study Area: Nagda is very close to tropic of cancer at 23°27' N and 75°25' and 517 meters above MSL. More than one lakh of residents in and around the Nagda rely on public, private, self and railway transport. Being a big railway junction between Mumbai and New Delhi more than 200 trains (including goods vehicle) pass through Nagda in a day. The cracking sound produced by the bridge constructed over Chambal River and industrial complex are the major sources of noise pollution at Nagda. We tried to choose areas with similar socioeconomic status within the study areas. The aim of the noise exposure assessment is to determine exposure to noise for each participant using a questionnaire. Modifiers of individual exposure, such as the orientation of living and bedroom toward roads, window-opening habits, and sound insulation, are assessed during the home visits, using questionnaires and visual inspection.

For evaluation of immediate effects of sound pollution, a total of 110 persons in the age group of 25-65 years from four localities, namely, Juna nagda (n=25), Jabran colony (25) and Badipura (n=30) and Rupeta (N=30) of Nagda Town,

Ujjain district of Madhya Pradesh, were visited during peak hours of the traffic in the month of October, 2011. The 4th locality Repeat is far away from both industrial, main road transport and railway, served as control. The persons were interviewed for various acute symptoms of BP, annoyances, sleeplessness, and other cardio respiratory disorders, mostly in the evening hours (5-8pm peak hrs of the traffic). Addiction of various types of drugs such as alcohol, smoking, and tobacco was very common. Brief questions about occupation, family history and other household exposures if any were also recorded. We aimed to selected areas with low migration and to avoid areas with sound insulation programs, where possible. BP was measured by using Sphygmomanometer. Specially trained staff members from Life line pathology centre, Nagda, measure BP at three occasions during a single visit for consecutively three days at same time to avoid any diurnal variations in BP.

About the questionnaire

The questionnaire was simple and could be returned at no expense. It mainly dealt with duration of residential status, knowledge, source, laws and health effects of noise pollution. A standardized questionnaire was designed, (According to WHO guidelines) including validated questions on annoyance and noise disturbance from sources, interference with communication and other harmful effects. The questionnaire also collects data on major well-known confounders (e.g., dietary habits, smoking, and other lifestyle factors as well as occupational noise exposure) using validated questions from previous studies. The collected data were organized, classified and analyzed with the statistical Student’s t test.

RESULTS

Although noise nuisance in Nagda is a daily occurrence, the public fails to raise a complaint beyond the unsophisticated level. The polluter therefore exploits the situation at the expense of those who are exposed to the hazard. The health survey of persons associated with noise pollution at Nagda is presented in Table1. The maximum intensity of impact was seen in the form of sleeplessness, irritation and with high rise in blood pressure .However there are no significant differences in heartbeat of different study areas. Few cases of depression and mood swings were also observed among affected stations. These were associated with indigestion, head ache and annoyance. The results of task performance were poor in affected areas compared to the control.

Table.1 The health survey of persons associated with noise pollution at Nagda

Sr.No	Health symptoms%	Juna Nagda N=25	Jabarn colony N=25	Badipura N=30	Rupeta N=30
1.	Dizziness	84%	88%	93%	10%
2.	Blood pressure mmHg	156/89±3.1	152/88±2.5	178/90±3.4	126/82±2.1
3.	Heart beat/mt	75±2.1	78±1.8	76±2.5	74±
4.	Depression/stress	68%	72%	84%	33%
5.	Annoyances	76%	68%	87%	15%
6	Sleeplessness	72%	72%	90%	06%
7	Irritation	62%	68%	84%	06%
8	Headache	68%	72%	72%	06%
9	indigestion	72%	68%	84%	10%
10.	Task performance	20%	24%	20%	66%

± indicates standard error of mean.

DISCUSSION

This study investigated the current state of evidence for potential health effects caused by exposure to noise. The health impacts considered were annoyance, mental health effects, cardiovascular (heart and blood vessels) effects, sleep disturbances, delayed language and reading skills in children and hearing impairment. With the exception of mental health, the study found that there was sufficient evidence to link noise exposure with adverse health effects. Results clearly indicate that the persons residing at station 1, 2 and 3 areas are exposed to noise pollution show hyper tension, irritation and sleeplessness and associated cardiac disorders. Recent research has found that noise can increase the levels of stress hormones such as cortisol, adrenaline and noradrenalin in the body, even during sleep. The longer these hormones stay in the blood, the more likely they are to cause life-threatening physiological problems. High stress levels can lead to heart failure, strokes, and high blood pressure and immune problems. (Van Kempen, *et al.*, 2000). In addition to the above effects, noise has also been implicated as having other physiological effects. Individuals who complain about the environmental stressors are probably also more likely to complain other aspects of life, including their health. (Soames, 1999).

Specifically non auditory physiological effects of noise pollution that have been identified thus far include cardiovascular, autonomic and gastric effects. According to Abel 1990, noise pollution can cause vasoconstriction with a consequent increase in the blood pressure. This leads in smooth muscle hypertrophy, narrowing the lumen of the small vessels and increased resistance to blood flow. Melamed *et al.* (1997) concluded that exposure to high industrial noise levels cause annoyance, cardiovascular diseases with increased plasma lipids. Exposure to noise can lead to

gastric changes and affects peristalsis. (Bugliarello, 1988; Bragdon, 1972). Although the research in this topic is sparse it appears that noise can lead to changes in gastro intestinal system. The above health survey also clearly confirms it. Uninterrupted sleep is known to be a prerequisite for good physiologic and mental functioning in healthy individuals (Hobson 1989) Environmental noise is one of the major causes of disturbed sleep. In the above survey it is proved that individuals are suffering by sleeplessness due to noise. When sleep disruption becomes chronic, the results are mood changes, decrements in performance, and other long-term effects on health and well-being. The primary sleep disturbances are difficulty falling asleep, frequent awakenings, waking too early, and alterations in sleep stages and depth, especially a reduction in REM sleep. Apart from various effects on sleep itself, noise during sleep causes increased blood pressure, annoyance, increased heart rate, increased pulse amplitude, vasoconstriction, changes in respiration, cardiac arrhythmias, and increased body movement (Hobson 1989). For each of these, the threshold and response relationships may be different.

Noise pollution is not believed to be a cause of mental illness, but it is assumed to accelerate and intensify the development of latent mental disorders. (Babisch, 2006). Noise pollution may cause or contribute to the following adverse effects: anxiety, stress, nervousness, nausea, headache, emotional instability, argumentativeness, and sexual impotence, changes in mood, increase in social conflicts, neurosis, hysteria, and psychosis. (Stansfeld, 2003). Noise pollution interferes with the ability to comprehend normal speech and may lead to a number of personal disabilities, handicaps, and behavioral changes. These include problems with concentration, fatigue, uncertainty, lack of self-confidence, irritation, misunderstandings, decreased working capacity, disturbed interpersonal relationships, and stress reactions. (Bluhm *et al.*, 2004). Noise pollution impairs task performance at school and at work, increases errors, and decreases motivation. Reading attention, problem solving, and memory are most strongly affected by noise. In the above study also it is clearly evident the noise impairs task performance.

Though the above results show a positive relation between hypertension and noise pollution but no definite conclusions can be drawn because more research is needed before any definite conclusions drawn. The supplementation of antioxidants viz Vit. C, Vit E in the food may relieve irritation from adverse effects of noise pollution. However, Further research is required to analyze the cumulative effects of noise and air pollution as both are closely associated. It is also advised to assess the impacts of noise pollution by using GIS technology. Stress hormones are useful indicators to study mechanisms and interactions between noise and health outcomes such as BP (Babisch, 2001). The cortisol level is a good indicator of stress (Van Kempen *et al.*, 2002). For hypertension, although the researchers found strong evidence to link noise with hypertension, current research cannot be considered to be sufficient to assess the impact of environmental noise on the incidence of hypertension. Noise pollution control in residences is not funded by the government in part because since the effect of noise is often psychological and also because it leaves no singular physical trace of damage on the human body. For instance, hearing loss could be attributed to a variety of factors including age, rather than solely due to excessive exposure to noise. (Van Dijk *et al.*, 1987).

CONCLUSIONS AND RECOMMENDATIONS

Many of the problems discussed here are the result of ignorance. Ignorance may be bliss, but it is a lonely, frustrating bliss when you can't hear a word spoken to you unless it's shouted. However, there is no agreed method for assessing and valuing the impact of noise on human health. There is therefore a need for statistically reliable information which strongly links noise exposure to a specific health problem to enable policy makers to assess the economic impact of higher environmental noise levels on health when developing noise management plans.

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