Comparative Health Risk Assessment For Environmental Pollution In North Chennai, India.

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INTRODUCTION

It is well known that with rapid industrialization, urbanization and migration particularly in the developing world, there is a general deterioration of environmental conditions and health. In addition to inadequate housing, ventilation, sanitation, poor water supply and malnutrition populations have been exposed to raising levels of air pollution. Despite the vast improvements in health globally over the past several decades, environmental factors remain a major cause of sickness and death in many regions of the World. In the poorer regions one in five children does not live beyond five years of age largely because of environmentally related preventable diseases. That number translates into 11 million deaths each year, mostly due to diarrhoea and acute respiratory infections. Insect borne disease are also exact a heavy toll; malaria alone claims one to three million lives in a year, again most of them are children (Ravi Shankar, 2003).

Urban air pollution has worsened the health in the cities of both developed and developing countries. The health impacts in developing world have driven by population growth, industrialization, sanitation, waste disposal and increased vehicle use. These conditions along with the personal habits and living style (tobacco smoking, alcohol consumption and indoor pollution) and living environment of the population have become a major interacting factor in influencing the health morbidity (Roger Mark De'Souza, 1999)

The greatest burden of health risks is very often borne by the disadvantaged in our societies. The vast majority of threats to health are more commonly found among poor people, in people with little formal education and those with lowly occupations. These risks cluster and accumulate over time (World Health Report, WHO, 2002). Unfortunately, data are particularly scanty where they are required most, in the poorest countries of the World. Nonetheless WHO listed the risk factors for these poor countries, as water and sanitation is in the second place and air pollution (both indoor and ambient) taking eighth and ninth positions respectively.

The environment in which we live greatly affects our health. The household, workplace, outdoor and transportation environments pose risks to health in a

number of different ways, from the poor quality of the air many people breathe, to consumption of contaminated water to living in unhygienic conditions. In wake of this Comparative Risk Assessment (CRA, World Bank, 1997) provides a systematic way to compare environmental problems that pose different types and degrees of health risk. It combines information on the inherent hazards of pollutants, exposure levels and population characteristics to predict the resulting health effects. Using data from available sources, rapid, inexpensive comparative risk assessments can identify the most significant health problems. Together with consideration of costs, technical feasibility and other factors, the results of CRA can be used to set priorities for environmental management.

SOURCES OF DATA

Data on air and water quality has been obtained from Tamil Nadu Pollution Control Board (TNPCB) and National Environmental Engineering and Research Institute (NEERI) under National Ambient Air Quality Monitoring (NAAQM) for CRA purpose. Department of Environmental Health Engineering (EHE) administered a valid health questionnaire for the reported health symptoms in the study area, with assistance from trained field personnel in collecting the health information. The field team was guided by a Doctor and a statistician. Information colleted includes socioeconomic status, demographic characteristics, existing health status and symptoms such as cough, cold, phlegm, wheeze, breathlessness, dental carries, fluorosis, eye irritation, vector born diseases etc.

METHODOLOGY

The scheme of this paper in divided into two sections. Initially it discusses the health damage in North Chennai using comparative risk assessment as a tool, making use of the secondary information on air pollution, water pollution and health status. Which is available with TNPCB, NEERI and public health centers (PHCs). Then CRA approach has been applied which is originally developed by the United States Environmental Protection Agency (USEPA). This method was applied in many developing nations including India. And in the second section an attempt has been made to assess the health status of the North Chennai by collecting cross sectional epidemiological information. For this purpose cluster sampling has been used, as the risk of exposure is uniform across the community or the study areas. An appropriate sample was selected with a level significance (alpha) of 0.05 and with a power (beta) of 0.80 to achieve the desired level of prevalence of the respiratory symptoms (three to five percent, American Thoracic Society). After univariate and bivariate tabulations logistic regression technique has been applied to find the odds of having the morbidity or respiratory symptoms in an area, which is highly polluted to those of less polluted. Also to cross check these findings with the secondary information

collected on the health and the CRA measured for ambient air quality and water quality prevailing in the selected areas.

FINDINGS

The environmental air quality data analysis revealed that levels of PM_{10} are the single biggest concern. The results of limited primary sampling show that a significant fraction of the population is exposed to PM_{10} levels not adequately reflected in the area average reported by NAAQM database. Population exposure profiles show that nearly 95 per cent of the population is exposed to concentrations in excess of the WHO air quality guideline values.

Although, the annual 24 hour averages of SO2,NO_X, and CO were below the WHO guide line values the short term exposure limits were exceeded due to open garbage burning, releases by the industries and the use of biomass fuels for cooking purpose. Based on this, health risk calculation were made only for PM_{10}, the consequent health risks for other pollutants could not be quantified due to the uncertainties in the dose-response relationship data for such exposures.

The second stage of the epidemiological data analysis shows that there is a significant difference between the health status and the area of living. The symptoms and the diseases are more in the area which is in the industrial proximity, where as they are less in the other selected areas which are away from the industrial activity. This clearly shows the effect of ambient air quality (higher levels of PM_{10}) on health. Disorders like diabetes and hypertension did not show up any difference between the areas. In the logit regression the predictor variables include age, sex, education, income, Body Mass Index (BMI, proxy for nutrition), smoking habit, type of fuel (cleaner Vs. solid fuels) and area of living (more polluted Vs. less polluted). With this it is clearly shown that the odds of having respiratory symptoms and disorders are significantly higher in a polluted area as compared to other areas. Fluorosis is more in the third area where the ground water was contaminated; it is 4.8 times more as compared to the reference area, which is affected by air pollution rather than water pollution. But disorders like diabetes and hypertension did not show any difference in the selected areas but there is an effect of age, they are old age dependent. Also diabetes is influenced by greater BMI (more than 25), as the odds (4.2 times) of having diabetes is more as BMI is increasing.

DISCUSSION

Air pollution is consistently increasing over the last decade in this region, population stress is also on a high note in this area as it attracts people form the neighbouring state, Andhra Pradesh for employment. As the population growing there has been a greater stress on the resources and environmental

quality. These different stress factors not only effecting the environmental quality but also the health status of the people. So, it is clearly evident that significant health differentials exist between high and low polluted areas. All this invaluable epidemiological findings could be made possible only because of the differentials that are existing in these selected areas; in the absence of proper health monitoring and registration system and availability of environmental related health data.

With the help of these simultaneous findings it can be easily concluded that, high polluted area(s) has a greater impact on health as compared to a low or less polluted area(s).

REFERENCES

De'Souza, Roger Mark (1999), "Household transportation use and urban air pollution: A comparative analysis of Thailand, Mexico, and the United States", PRB, USA.

Ostro, Bart(1994), Estimating the health effects of air pollution; A method with applications to Jakarta, World Bank policy research working paper, #1301.

Ravi Shankar Pitani (2003), "Epidemiological assessment of air pollution-related health effects", IIPS, Mumbai, India.

USEPA (1989) of policy, planning and evaluation, Comparing risks and setting environmental priorities: Overview of three regional projects.

World Bank (1996), " Urban air quality management strategy in Asia, URBAIR, Greater Mumbai Report.