



Air and Noise Pollution and Cognitive Functions

Shubhria Sharma

ABSTRACT

The Cognitive advancements can be seen in the childhood stage and these functions involve changes in internal states and competencies of the maturing child. Normal childhood development and growth is affected by such factors such as genetic, nutrition and multiple familiar and social factors but today children are constantly exposed to varying amounts of assorted toxic chemicals both inside and outside the home. Many of these contaminants are suspected to associate with developmental alteration. Most babies are born healthy and labeled as free of disease but as they are exposed to environmental pollution it leads to change in their health and place them at increased risk. Today vehicular pollution is major environmental problem and the effects of pollutant leave a permanent imprint on Cognitive development of child. Thus present study was conducted in Lucknow city to understand if the pollution interferes with the cognitive development.

INTRODUCTION

The term Cognition (Latin word "To Know") is used in several loosely related ways to refer to a faculty for human like processing information applying knowledge and changing preferences. Cognition is an abstract property of advanced living organisms; therefore, it is studied as a direct property of brain or of an abstracted mind on sub symbolic and symbolic levels.

A child's rate of development probably depends mainly on hereditary factors limited by nutritional influences, however other factors also seem to have influence. Environmental experiences of children during postnatal life determine the pace and pattern of growth and development. Moreover infections and infestations are quite common during hot and humid climate in the post natal life.

A new born infant reclines in a helpless manner until he or she acquires better coordination of motor activity and reaches to his or her environment in a willful manner until he or she fully integrates an autonomous individual. Assessment of behavioral development is interpreted from the time of appearance of definite skills. Children all over the world are greatest victims of environmental degradation despite the great strides made over the past ten years in the improving both children's well being and the environment.

Today school going children are at increased risk because they are exposed to pollutants at critical time of their growth and development, since due to heavy vehicular population air and noise pollution both found to be associated with health related problems. According to Siegel (1982) the cognition and environmental factors related to language development. Noise also disturbs teaching and learning activities increase blood pressure and adversely affects cognitive performance and academic achievement of children (Crook and Langdon 1974, Cohen et al 1981, Bronzaft and McCarthy 1975) very heterogeneous entity

and air pollution is suspected developmental neuro toxicant. Most of the schools are located in busy roads where the air pollution and noise pollution peaks when they are at school. In this specific perspective a need is felt to conduct a study with specific objective whether the air pollution and noise pollution both are associated with impaired cognitive development.

Material and Method

Young children spend more time in their outdoor activities therefore they experience greater exposure to pollutants such as suspended particulate matter, Sulfur dioxide (SO₂) oxides of nitrogen (NO_x) and lead (Pb).

The present study was conducted to make an attempt to assess the cognitive development of children in relation to environmental pollution thus for this purpose the main objective of study was to assess and compare the areas on the basis of pollution level in Lucknow city and then the comparison of cognitive development between the two areas.

The present study was conducted in Lucknow and area specification was done on the basis of pollutants in Lucknow city since Industrial Toxicological Research Centre (Presently know as IITR, Indian Institute of Toxicological Research) conducted its survey twice in year during May June and during October . The basic objective is to assess the existing level of air and noise quality of Lucknow city. According to report Gomti Nagar shows less concentration level of SPM, SO₂ and NO_x where as Charbagh and Aminabad both areas were higher in respect of SPM, SO₂ and NO_x as well as in noise pollution. Thus Charbagh and Aminabad was considered as high polluted area where as Gomti Nagar as less polluted area. This area specification was done in the year on the basis I.T.R.C. report.

Table No. 1 -
Concentration level of pollutants during the year (2000)

S. No.	Location	SPM	SO ₂	NO _x
1.	Charbagh	547.48	32.70	30.92
2.	Aminabad	575.40	36.24	25.10
3.	Gomti Nagar	325.91	24.70	22.29

The concentration level of SPM were above the prescribed limit of NAAQS (i.e. 200 $\mu\text{g}/\text{m}^3$) whereas the concentration level of SO₂ and NO_x were within the prescribed limit of the NAAQS (SO₂ 70 $\mu\text{g}/\text{m}^3$ NO_x 70 $\mu\text{g}/\text{m}^3$).{ NAAQS-National Ambient air Quality Standard}

Several potential environmental risks are particularly associated preschool children thus children of belonging to age group 3 yr. to 7 yr. were selected for the study. The chronological age grouping was followed by "Tanner's decimal age calendar method" (3 yrs includes the subjects of age 2.500 - 3.499 yrs). Cross sectional method was used for the study where 30 males and 30 females were examined from each age groups, thus total 150 male and 150 female (total size 300 children) from less polluted area and similar sample size were taken from high polluted area.

Some measurement techniques were on observations such as milestones of Development. In this study "Nancy Bayley's scale of development was used (Source - Singh, 1997). This scale was developed by Jaswal et al (1988). This scale assesses cognition by evaluating individual performance in cognitive abilities. In this assessment some test were applied on children and these tests were Verbal test, Identification, Recognition, Comparison performance ability, Thinking ability, Memory.

In biology most events are affected by several casual influences that are uncontrollable in their variation are frequently unidentifiable statistics are required to measure such measure with predictable error and to determine the reality of these differences (Sokal 1981). For the purpose of study, first data were organized tabulated and

then analyzed by suitable test statistics i.e. Mean, Standard Deviation, Coefficient of variation and student's t-test.

Discussion and Results

In the cognitive development some test procedure was applied on the children and the findings of the study suggests that male children of higher age group depicts differences in verbal test where as female children shows differences only at 4 and 6 yrs in verbal test similar result also found in identification and comparison test where the male children of high polluted area (age group 7 yr) depicts the significant difference when compared with the male children of less polluted area, where as the performance test and thinking ability indicates almost similar result.

Another important cognitive function impaired by air and noise pollution is memory. The children of less polluted areas shows significant differences in comparison to the males of high polluted area in all age groups except the 3 year whereas female do not show any significant differences in higher age groups i.e. 6 and 7 yr.

Collective cognitive ability which combines the individual scores depicts a situation firmly in favour of less polluted area especially in higher age groups and male children are more prone to the environmental pollution, because of their outdoor physical activities

According to Jerison (1954) memory is influenced by noise. It is also observed that road noise influences the dependency of clustering of the words or similar meaning during recall (Horman 1966). The development delay due to pollution was also supported by some studies in which E.P.A., 2005 (Environmental Protection Agency) found that several wide environmental contaminants can damage children's developing brain and nervous system. In large urban cities children are constantly exposed to varying amount of air pollutants as suspended particulate matter shows the higher concentration therefore the effects can be seen in some cognitive tests among the children of high polluted area.

Bronzaft (1975) found that the second to fourth grade children in class room on the side of school going children and deleterious effect on their communication, cognitive functions and subjective symptoms. Many studies suggested that air and noise pollution can affect the health but these pollutants sloos affects the cognitive development. Suspended particulate matter effects on breathing, respiratory system, as these tiny particles work their way across the blood brain barrier, children's cognitive development may begin to suffer similarly the noise stress stimulates the adrenal medulla to produce epinephrine and nor epinephrine. It also stimulates the pituitary gland which in turn affects the adrenal cortexcorticosteroids produced by the adrenal cortex affect growth directly, the thyroid gland regulates metabolism and its hormones are essential for normal growth and development.

The conclusionof the present study indicates that environmental pollution is related to children's cognitive development especially in comparison, identification and memory test.Children are particularly vulnerable to environmental toxins. Several factors have the effect of increasing children's potential risk. All children should have the right to safe clean and supportive environments that ensure their survival growth and development healthy life and well being.

References

- Industrial Toxicological Research Centre (presently known as I.I.T.R.) 1999-2003 Assessment of environmental status of Lucknow City Council of Scientific and Research
- Singh S.P. and BalaRaju (1997), Cognitive and Somatic Development

- Guillette A. Elizabeth (2000) Examining Childhood development in contaminated urban settings (Environm Health Perspective 108 (supples3) 389-393
- Schell L M (1997) Using Pattern of child growth and development to assess community, wide effects of low level exposure to toxic materials; Toxicology and Industrial health Vol 13, 373-378
- Hormann and Oster Kamp (1966) In Jones D.M. and Chapman A.J. (1984) Noise and Society: John wily and Sons New York
- Bronzaft A and McCarthy D 1975 The effect of Elaeated Train noise on reading ability Enviornment and Behaviour 7, 517-527
- Pope A (2992) Respiratory Health and PM to Pollution Am.Resir Dis, 144 P.P 668-674
- Schell L.M (1968) Airport noise exposure and postnatal growth of children Am. J. of Physical Anthropology 63: 473-482