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Respiratory symptoms in children living near busy road and their relationship to vehicular traffic

Shalini • Arsha Fatima
• Anupma Kumari

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Corresponding Author : Anupma Kumari

Abstract : 250 children were interviewed with standard predesigned questionnaires, which included children's age, sex, parental education and passive smoking at home. Overall 53.2% of children suffered from respiratory problems which were apparently due to their residential traffic exposure.

Keywords : Traffic pollution, Respiratory problems.

Introduction :

Vehicular traffic is a major source of outdoor air pollution. NO₂, hydrocarbons and Suspended Particulate Matter (SPM) are possible causes of traffic related pollution (Janseen et. al, 2003). Several studies have reported association between exposure to traffic pollutants and increased frequency of respiratory tract illness (Braun et.al,1997; Janssen et. al,2003). The prevalence of respiratory diseases such as asthma, cough, and phlegm has increased in recent years and especially in children due to increasing exposure to pollution, particularly from motor vehicles (Asher et. al,1995) and is a major problem of 21st century (W.H.O., 2002). About 2.7 to 3 million children die world wide due to asthma (O'meara et. al, 1999). Approximately 40 million children in India are estimated to have asthma, cough and phlegm (Chhabra et. al, 2007). According to Central pollution control board (CPCB), Patna has been identified as one of the major cities, where the air quality is found to be critical. It has been also observed that the concentration of NO₂ reached to 67µg / m³, whereas concentration of SPM is critical, i.e., 319. 67µg / m³ (CPCB, 2007) due to rapid increase in the number of vehicles from 1.75 lac (2007) to 2.93 lac (2009) (Pandey, 2010).

Shalini

B.Sc. III year, Zoology (Hons.), Session: 2008-2011,
Patna Women's College, Patna University, Patna,
Bihar, India

Arsha Fatima

B.Sc. III year, Zoology (Hons.), Session: 2008-2011,
Patna Women's College, Patna University, Patna,
Bihar, India

Anupma Kumari

Assistant Professor, Dept. of Zoology,
Patna Women's College, Bailey Road, Patna - 800 001,
Bihar, India
E-mail : anumpakumari10@yahoo.com

Vishwanathan et. al, (1996) showed that emission of these gases increases the prevalence of respiratory symptoms in children. Balmes et. al, (2008) found that mixture of traffic pollutant may be more relevant to human health than exposure to any single ambient air pollutant. However, respiratory system is also affected by several other factors such as socioeconomic status (Goten et. al, 1986), the number of family members in relation to residential space (Riediker et. al,2001), smoking habit (Charlton, 1984) and also metrological condition, specially temperature and humidity, may be potential risk factor (Weiland et.al,1994). The aim of undertaking this topic as our project was to investigate association between respiratory symptoms in children living near busy roads and their relationship to the vehicular traffic.

Materials and Methods :

The survey was conducted in year 2010, between August and November in different localities of Patna namely Kankarbagh, Rajendra nagar, Anisabad, Patna city,Patliputra. We investigated the association between respiratory symptoms in children and residential proximity to traffic in 250 children of Patna. The study area was divided on the basis of its distance to major roads around the child’s residential address. In our study, grouping of road was done on the basis of their distance from the major highway (NH-30,via Patna) as 1-3 (km), 3-6 (km), 6-9 (km), 9-12 (km), 12-15 (km). We collected information about ambient air quality of Patna and pollutants such as SO₂, NO₂ and SPM (Bihar pollution control Board) and traffic density (Pandey, 2010). We have used standardized self administered questionnaires to collect information about respiratory health outcome in children.

Results and Discussion :

In this prospective study, we randomly reviewed 250 children. Overall 19.2 % children were reported to have asthma symptoms and about 4.4% have asthma due to heredity.

Table-1 : Demographic characteristics of families

	Characteristic	Number
1.	Sex	
	Male	144
	Female	106
2.	Age	
	6-7 year	122
	13-14 year	128
3.	Parental education	
	University	171
	High School	58
	Secondary School	17
	Not known	04
4.	Smokers at home	28(11.2%)
5.	Parental asthma	25(10.0%)

The number of male children in our study was 144 while of female was 106. We could find that 122 children were within the age group of 6-7 yrs while 128 were in the age group of 13-14yrs. Almost 171 parents had university education and about 58 read upto high school. 28 parents had the habit of smoking and 25 parents were suffering from asthmatic problem (Table -1).

Table 2:Respiratory symptoms in 6-7yrs old children. (N=73)

6-7yrs	Asthma	Cough or Phlegm	Allergy	Genetic Problem	Percentage
1-3km(n=29)	10	11	2	3	89.65%
3-6km(n=20)	6	2	0	0	40%
6-9km(n=26)	1	6	8	2	65%
9-12km(n=20)	7	2	2	0	55%
12-15km(n=27)	0	7	4	0	40%
TOTAL	24	28	16	5	73

Out of 122 children (6-7 yrs old) 73 (59.836%) were suffering from respiratory problem and rest of them found healthy. 24 children were found to having asthmatic problem, but only five (6-7yrs)

children were having asthmatic problem due to heredity, while 28 were having cough or phlegm. These were living in the areas which were about (1-3) km of distance from the major road. The cases of respiratory symptoms were mostly in the areas which were close to traffic (23.77%, n=27). F-value (54.88) >F-critical (5.317655) and P- value was greater than 7 in case of 6-7yrs. Thus we found significant association between proximity to traffic and respiratory problem. (Table 2) .

Table 3: Respiratory symptoms in 13-14yrs adolescent

13-14yrs	Asthma	Cough or Phlegm	Allergy	Genetic Problem	Percentage
1-3km(n=21)	7	4	8	0	78.47%
3-6km(n=30)	8	7	3	2	66.6%
6-9km(n=24)	0	0	3	0	12.5%
9-12km(n=30)	3	2	0	4	30%
12-15km(n=24)	6	3	0	0	39%
TOTAL	24	16	14	6	60

Out of 128 children of age group 13-14yrs ,60 (46.875%) were having the respiratory problem and out of which 24 were having asthmatic problems and about six children had it,most likely because of heredity. We observed 28 parents were having the habit of smoking but only seven children were having respiratory problems. The cases of respiratory problems were also highest in those areas which were about 1-3 km of distance from the major road.We found a significant positive association between proximity to traffic and respiratory disease, as F-value(104.533) is greater than F-critical (5.317655).

A positive association has been reported between symptoms of respiratory problems and exposure to traffic related air pollutant among children living near busy road that had high traffic density (Kim et. al,2002; Vishwanathan,1996; Kuehni et. al,2006). Invine et.al, (1980) showed the

roles of air pollution, smoking, and respiratory illness in childhood for the development of bronchitis in children. We also observed the prevalence of respiratory symptoms is more in 6-7 yrs old children than in the 13-14yrs old ones. Lesouef et. al, (1989) found that respiratory system of infant is extremely sensitive to nonspecific stimuli. A study done by Sichletidis et.al,(1997) showed that the air pollutant, and more specifically,the suspended particles are inhaled through the nose leading to the development of chronic infection of respiratory airways.

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