STUDY OF ENVIRONMENTAL RISK FACTORS FOR ACUTE LOWER RESPIRATORY TRACT INFECTIONS (ALRI) IN CHILDREN.

ABSTRACT

Introduction-Acute lower respiratory tract infection (ALRI) is a leading cause of mortality in children below 5 years of age. In the International Consultation on Control of Acute Respiratory Infections, December 1991 reported links between environmental risk factors (passive smoking and overcrowding) and risk of ALRI. This study highlights the various environmental risk factors for ALRI in children.

METHOD- An observational case control study conducted in Tertiary care centre in metropolitan city during the two year period (Jan 2013-June 2014). A total of 150 children of age 2 months to 14 years admitted with clinical diagnosis of ALRI were taken as cases and 150 children of same age group who did not have ALRI as controls.

Results and conclusions- Environmental factors statistically significant and linked to higher incidence of ALRI were overcrowding (81.3%), liquid/solid cooking fuel medium(42.7%) and exposure to passive smoking(65.3%). Data suggests that the majority of respiratory infections in children are preventable or treatable.

KEYWORDS

INTRODUCTION

Acute lower respiratory tract infection (ALRI) is a leading cause of mortality and one of the common causes of morbidity in children below 5 years of age.1

In developing countries 30% of all patients’ consultation and 25% of all paediatric admission are of ARF.2 Most infections are limited to the upper respiratory tract and 5% involve the lower respiratory tract. ALRIs are mostly caused by both viruses and bacteria. Viral agents account for 90% of upper respiratory tract infection (URIs) while bacterial pulmonary infections are common in developing countries associated with a greater risk of death.3 Viral and bacterial infections occur concomitantly very frequently. Some associated infections include: common cold, acute otitis media, acute sinusitis, Pertussis, bronchiolitis and pneumonia.4

The International Consultation on Control of Acute Respiratory Infections, December 1991 reported that there are links between environmental risk factors (such as smoke, outdoor air pollution, indoor pollution, passive smoking, overcrowding) and ALRI.

Recent estimates from UNICEF show that pneumonia continues to be the number one killer of children around the world, causing 18% of all child mortality, an estimated 1.3 million child deaths in 2011 alone.5 50% of World's pneumonia deaths occur in India which means approximately 3.7 lakh children die of pneumonia annually in India.6 Recent surveys (2006-2013) indicate that, worldwide, 59% of approximately 3.7 lakh children die of pneumonia annually in India.7

A case of acute lower respiratory tract infection is defined as per ARI control programme as "Presence of cough with fast breathing of >60/minute in <2 month age; >50/minute in 2 month to 12 months and >40/minute in 12 months to 60 mo of age; the duration of illness being <30 days.

The disease was classified as-

1. Very severe pneumonia, the child with cough or difficult breathing must have the following signs:
   - Fast breathing;
   - Lower chest wall in drawing;
   - Plus at least one of the following: —central cyanosis, inability to breastfeed or drink, vomiting, convulsions, abnormally sleepy or difficult to wake or unconsciousness, severe respiratory distress, nasal flaring, grunting.

2. Severe pneumonia, Cough or difficult breathing, Fast breathing and, Lower chest wall in drawing

3. Pneumonia (non severe) the child with cough or difficult breathing with fast breathing and on examination NONE of the signs of severe or very severe pneumonia are present. Other signs of pneumonia (on auscultation) may be present: crackles, reduced breath sounds or an area of bronchial breathing.

4. NO pneumonia (cough and cold) a child without fast breathing, lower chest wall in drawing, stridor when the child is calm or absent danger signs.

METHOD

This is an observational comparative study of 150 patients and 150 controls conducted in Tertiary care centre in metropolitan city during the two year period.

Inclusion criteria-150 Children of age 2 months to 14 years admitted with clinical diagnosis of acute lower respiratory tract infection (ALRI) were taken as cases and 150 children of same age group who did not have acute lower respiratory tract infection (ALRI) were taken as controls.

Exclusion criteria- 1. Children <2 months and > 14 years age.
2. Children with clinical diagnosis of bronchial asthma and pulmonary Tuberculosis.

MATERIALS AND METHOD

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Clinical grounds.

RESULTS- TABLE 1: COOKING FUEL AND INCIDENCE OF ALRI:

<table>
<thead>
<tr>
<th>FUEL USED FOR COOKING</th>
<th>Study Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases (n=150)</td>
<td>Control (n=150)</td>
</tr>
<tr>
<td>Heater (Electronic)</td>
<td>6 (4.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Liquid</td>
<td>14 (9.3%)</td>
<td>28 (18.7%)</td>
</tr>
<tr>
<td>LPG</td>
<td>86 (57.3%)</td>
<td>83 (55.3%)</td>
</tr>
<tr>
<td>Solid</td>
<td>4 (2.7%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Solid with other</td>
<td>40 (26.7%)</td>
<td>39 (26.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>150 (100.0%)</td>
<td>150 (100.0%)</td>
</tr>
</tbody>
</table>

Chisquare test: Df 1, P value 0.005, Association is significant.

The association was found to be statistically significant (p<0.05) which indicates that cooking fuel in the house, other than LPG (solid and liquid fuels) can predispose children to LRTI.

TABLE 2: RELATION OF PASSIVE SMOKE INHALATION WITH ALRI

<table>
<thead>
<tr>
<th>SMOKING IN FAMILY</th>
<th>Study Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases (n=150)</td>
<td>Control (n=150)</td>
</tr>
<tr>
<td>Yes</td>
<td>98 (65.3%)</td>
<td>25 (16.7%)</td>
</tr>
<tr>
<td>No</td>
<td>52 (34.7%)</td>
<td>125 (83.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>150 (100.0%)</td>
<td>150 (100.0%)</td>
</tr>
<tr>
<td>Chi-square test</td>
<td>Df 1</td>
<td>P value 0.005</td>
</tr>
<tr>
<td>Pearson Chi-Square</td>
<td>1</td>
<td>0.000</td>
</tr>
<tr>
<td>Fisher's Exact Test</td>
<td>0.000</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Ninety eight (65.3%) patients in the study group had history suggestive of exposure to passive smoking as compared to 25 (16.7%) children in control group. Exposure to smoking by a family member was found to be highly significant in increasing the risk of LRTI in patients (p<0.05). Odds ratio for smoking in family is 9.4 and lower limit is 5.4 while upper limit is 16.2.

DISCUSSION-
Pneumonia continues to pose a threat to health of children in developed and developing countries despite improvements in socioeconomic status, immunization, early diagnosis and treatment.

Overcrowding in homes has proved to be a major risk factor for ALRI in children in several published studies. In our study too, 81.3% patients were living in overcrowded homes.

Likewise, D’Souza RM, et al (1997) identified ‘Five’ household risk factors for respiratory infections:

- The number of children under 5;
- Poor housing structure,
- Increased household density,
- Humidity inside the house less than the humidity outside house and Frequent cooking inside the house.

Similarly Jaimes MB et al (2003) found significant risk factors for severe ALRI - (a) living in borrowed houses (odds ratio (OR) = 2.7; 95% Confidence Interval (CI): 1.06-7.07), (b) sharing the bed (OR = 1.88, CI: 1.0-3.7), (c) living with more than 9 people (OR = 1.82, CI: 1.0-3.51) and (d) living with smokers (OR = 1.4, CI: 1.0-2.05).

In year 2003 Prietsch SO et al (2003) identified environmental score =/> 3 points, maternal schooling < 5 years, monthly family income < US$ 200, four or more people sharing the child’s bedroom, and maternal smoking as the main risk factors for ALRI in young children. In year 2007, Savitha et al (2007) found that overcrowding was present in 91.35% cases. Meta analysis of 36 studies by Jackson et al (2013) suggested 19 risk factors for severe ALRI of which crowding (>7 persons per household) is one such risk factor (OR=1.96; CI 1.53-2.52)

CONCLUSIONS-
The majority of respiratory infections in children are preventable or treatable.

Protection against pneumonia through Parent Education Programs,

Pneumonia awareness workshops and

Community awareness of practices of personal hygiene like hand washing and reduction of the use of materials like fire-wood and kerosene which cause indoor air pollution. Such awareness can be created through the support of community leaders such as politicians and religious leaders.

Therefore, knowledge of risk factors related to acquisition of ALRI will help in prevention, through effective health education of the community and appropriate initiatives taken by the government, leading to a healthy community and a healthy nation as a whole.

References-
6. IAP RECOMMENDATIONS FOR PROTECTION AGAINST PREVENTION AND TREATMENT OF CHILDHOOD PNEUMONIA.
7. www.who.int/glu/child_health/prevention/pneumon.txt/en