

Risk Factors of Acute Respiratory Infection among Hospitalised Children in Basrah: A Case Control Study

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ABSTRACT

A case control study was carried out to investigate the role of selected presumed risk factors in the occurrence of acute respiratory infection (ARI) among hospitalised children below the age of five years in Basrah, Iraq. Controls were children of similar age range attending for routine immunisation schedule. The main factors which were found to be associated with significant risk of ARI were: parental illiteracy, presence of a sibling with ARI during the month prior to admission of the child, admission of a sibling below the age of five years to hospital for ARI during the previous year, use of kerosene for cooking and mother's employment. Father's smoking, crowding and use of kerosene for heating were not found to be significantly associated with ARI among children.

Acute respiratory infection (ARI) among children is one of the three principal causes of illness and death in developing countries,¹ the other two are diarrhoeal diseases and malnutrition. Mortality from ARI among children is 30-70 times higher in developing countries than in developed ones.² It has been estimated that around four million children below the age of five die each year because of ARI. This number represents 30% of total deaths which occur annually among this age group in developing countries.

In order to reduce morbidity and mortality associated with ARI, a combination of preventive and curative measures are required. On the curative side, case management guidelines for the treatment of respiratory infections among children have been developed by WHO.³ These guidelines are based on the assessment of the severity of the condition and the early use of antibiotics if bacterial infections are

suspected. The role of families at home in providing supportive care and the role of health workers at the primary care level in assessing the severity of the condition and providing the necessary care are emphasised. On the preventive side, immunisation is the main specific measure which could provide the most cost effective solution to the problem of fatal respiratory infections. Certainly the widespread use of vaccines against measles, tuberculosis, influenza type A, diphtheria and whooping cough could reduce the respiratory complications due to these infections. However, there are viral and bacterial pathogens which are responsible for significant proportion of ARI and against which still effective vaccines need to be developed and tested in the field. Recognised limitations of such vaccines include the need for multiple administrations, the maintenance of the cold chain, antigenic shift (as in influenza type A) and the inadequate immune response among children to certain vaccines.

Although promotional measures are widely recognised to be effective in reducing morbidity and mortality due to ARI, these measures should be based on the elucidation of the exact role of certain risk factors through well-designed controlled studies in specific epidemiological settings. The influence on respiratory infection of household air pollution, parental smoking, crowding at home, respiratory infection among other siblings and educational and socioeconomic factors had been assessed by several studies, the majority of which were carried out in developed countries.⁴⁻⁷

Since the profile and effect of risk factors vary from an epidemiological set-up to another, the present study was carried out to investigate the role of certain factors in the occurrence of ARI among children in Basrah, south of Iraq. The main factors which we looked into were:

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1. Parental education.
2. Parental smoking.
3. History of ARI among siblings below the age of five during the month prior to admission of the child.
4. History of admission to hospital for ARI among siblings below the age of five.
5. Crowding at home (expressed as the average number of persons per room).
6. Type of fuel used for cooking or heating. Since kerosene is widely used in Basrah, the risk of using kerosene relative to other types of fuel had been investigated.
7. Mother's employment status.

METHODS

The study was based on the case control approach. All cases were children below five years of age admitted to the paediatric wards of Basrah General Hospital because of ARI during the period from January to April 1988. This period corresponds to the relatively cold months in Basrah where the incidence of the respiratory infections is known to be highest. A special questionnaire form was used to collect information on the various variables listed above. The information was obtained by direct interviewing of the mothers by one of the authors. A child who was admitted for more than one episode during the study period was considered one for analysis.

The controls were healthy children below the age of five who were attending Al-Khaleej MCH centre for routine immunisations and who were not admitted to a hospital during the last one month for ARI. The above centre was selected because it serves a significant proportion of population in Basrah City and is fairly typical of other MCH centres in the city. A similar questionnaire form was used to collect information on the same variables from the controls.

Initially 260 cases and 278 controls were included in the study. Since cases were admitted from various areas of Basrah while controls were drawn from the City itself and to ensure comparability, only cases who were residents in the City were included in the analysis; this 164 cases were finally included from the total cases admitted.

The risk of respiratory infection associated with each of the studied variables was estimated by the calculation of the odd ratios by the cross-product formula and the 95% confidence intervals were calculated from odd ratios and their estimated standard errors using Woolf method.⁸ χ^2 test with Yates correction factor was applied to estimate the level of significance.

RESULTS

Around 80% of cases (132 out of 164) were admitted because of bronchopneumonia, 14% were due to bronchiolitis or tracheobronchitis and the remaining 6% were admitted either due to group or upper respiratory tract infections. The sex distribution of cases and controls were similar (50% of cases were males while 51% of controls were males).

The estimated relative risks (odd ratios) of ARI associated with each of the variables are shown in Table 1; it also shows the 95% confidence intervals of the odd ratios and their levels of significance as detected by Chi-square values. It may be seen that either parent being illiterate is associated with a significant risk of their children being admitted for ARI relative to parents who were graduates of secondary schools (3.8 for fathers and 3.21 for mothers). It can also be seen that the higher the level of crowding, the higher is the associated risk of ARI. The figures however, did not attain statistical significance in spite of the apparent trend.

Presence of a sibling below the age five with either a history of ARI during the last month or history of admission for ARI during the last one year were found to be significantly associated with risk of ARI among cases (odd ratios of 2.33 and 2.8 respectively).

The use of kerosene alone or in combination with other types of fuel for cooking was associated with significant risk of ARI among children under the age of five. On the other hand, the use of kerosene alone or with other types fuel for heating were not found to be significantly associated with risk of ARI relative to the use of other types such as gas or electricity.

With respect to passive smoking, we could not demonstrate the presence of significant risk with father's smoking. Since one few mothers smoked in our series (2 mothers of the 164 cases and 4 of the 278 controls), it was not valid to estimate the odd ratio or the level of significance. Presence of smokers other than parents in the same household was not associated with any risk of ARI among cases admitted. The employment status of the mother was associated with a significant risk of ARI to her under-five year old children; employed mothers relative to housewives had shown an odd ratio of 4.14 with $p < 0.05$. The small number of mothers within each category of occupation did not allow estimation of risks associated with each individual occupation.

DISCUSSION

A prudent interpretation is always required when looking at the results of a case control study. The present

Table 1
The odd ratios (OR) and their 95% confidence intervals of the risk factors associated with ARI among hospitalised cases

<i>Risk factor</i>	<i>OR (95% confidence interval)</i>	χ^2	<i>p</i>
Father's education (relative to secondary education and higher)			
illiterate	3.80(1.83-7.87)	12.3	< 0.001
just literate	1.60(0.84-2.94)	1.6	NS
primary	2.51(1.45-4.36)	10.04	0.001<p<0.01
intermediate	1.70(0.81-3.53)	1.5	NS
Mother's education (relative to secondary education and higher)			
illiterate	3.21(1.54-4.3)	9.3	0.001<p<0.01
just literate	2.24(1.02-4.90)	3.5	NS
primary	1.93(0.88-4.22)	2.2	NS
intermediate	0.73(0.23-2.35)	0.7	NS
Crowding index (relative to ≤ 1)			
2	1.34(0.82-2.18)	1.1	NS
3	1.48(0.86-2.53)	1.64	NS
4	1.83(0.90-3.72)	2.21	NS
5+	2.46(0.98-6.18)	2.91	NS
Respiratory infection among siblings during the previous month	2.35(1.53-3.62)	14.50	< 0.001
Admission to hospital of a sibling for ARI during the last year	2.80(1.28-6.14)	6.10	0.01<p<0.05
Use of kerosene alone for cooking	5.32(1.42-19.94)	6.61	0.01<p<0.05
Use of kerosene alone or with other types of fuel for cooking	6.59(1.81-23.98)	8.9	0.001<p<0.01
Use of kerosene alone for heating	1.28(0.78-2.11)	0.72	NS
Use of kerosene alone or with other types of fuel for heating	1.00(0.45-2.25)	0.04	NS
Father's smoking	0.94(0.64-1.39)	0.07	NS
Mother's smoking	not calculated because of small number of mothers smoking		
Others' smoking	0.99(0.67-1.47)	0.002	NS
Mother's employment (relative to being a housewife)	2.12(1.10-4.18)	4.13	0.01<p<0.05

one is not an exception. It should be emphasised that the significance of risk factors studied apply only to cases of ARI which were hospitalised and were living in the City of Basrah. Thus we cannot generalise our results to all cases of ARI or to children living in the peripheral areas. Their risk profile and the relative importance of each risk factor need not be the same.

In this study the following factors have been found to be significantly associated with ARI among hospitalised children below five years of age: the occurrence of ARI among siblings of similar age group during the last one month or his/her admission to hospital during the last year for an attack of ARI, low parental education, use of kerosene for cooking and mother's employment. Factors which were not found to be significantly associated with ARI were: paternal smoking, use of kerosene for heating and crowding; with respect to the latter factor, there was an apparent trend but it did not attain statistical significance.

Comparison of our results with those of studies carried out among children from other populations might shed light on the importance, of certain risk factors bearing in mind the varying genetic, sociocultural and environmental factors. Leeder et al⁵ have found that children who had a sibling with an episode of bronchitis and pneumonia were more likely to have an episode of ARI. This factor has been more important than passive smoking itself and in agreement with our results regarding the significance of a sibling with ARI. McConnochie and Roghmann found that the mere presence of an older sibling was highly correlated with bronchiolitis.⁷ This finding has been attributed to the introduction of infection into the home by older siblings.

Household pollution in relation to respiratory infection has been scrutinised by various studies. For example, the effect of gas for cooking has been found to be associated with high incidence of respiratory symptoms among British children.⁴ In crowded homes with poor ventilation indoor wood-burning stoves were found to be associated with respiratory illnesses among Nigerian children.⁹ Our study showed that kerosene, whether used alone or with other types of fuel for cooking, is significantly associated with ARI. Whether this association was due to the pollutant effect of burnt kerosene or due to the possibility that families using kerosene for cooking belong to a lower social class than those using gas or electricity cannot be ascertained. This issue needs further investigation using more objective measurements of household pollution and controlling for the possible confounding effect of socioeconomic status.

The failure to obtain a significant association between using kerosene for heating and ARI might be due to

the possibility that the majority of families in Basrah City use kerosene for heating.

A number of studies have concluded that maternal smoking is more important than paternal smoking as a risk factor for ARI.^{5-7,10} In our study, paternal smoking was not found to be a risk factor in agreement with the above mentioned ones. Although we did not attempt to estimate the risk of maternal smoking, we believe that this factor is of negligible importance because of its very low prevalence in our culture. Mother's employment and her low educational attainment were found to be associated with significant risk of ARI among children. This might sound paradoxical since women who are of higher educational background tend to be employed. Inspection of the values of the estimated risk (Table 1) reveals that the level of risk of the mother being illiterate is more than the risk of being employed (3.21 vs 2.24). However, the results have to be viewed within the context of the social transition occurring in our community whereby many women, including those of low educational levels, seek employment leaving their children either poorly attended to at home or in nurseries where the opportunities of cross infection are high.

CONCLUSION

Our results suggest that the group of children who are at risk of being admitted for ARI are those whose mothers and fathers are illiterate, who have siblings below five years old with either a history of ARI during the month prior to their admission or history of ARI during the month prior to the case admission or history of admission to hospital for ARI during the last year. Other risk factors include the use of kerosene for cooking and the employment of the mother. Crowding is a probable risk factor, though we could not demonstrate a statistical significance.

We suggest further investigations to be carried out using more objective criteria for the assessment of the risk factors as household pollution and level of crowding.

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