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Short Communication

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Risk Factors for Severe Lower Respiratory Tract Infections among Infants in Tripoli-Libya: A Case-Control Study

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ABSTRACT

Acute Lower respiratory tract infections (ALRTI) are major cause of mortality and morbidity among children worldwide and particularly children in developing countries

The objective of this case control- study is to evaluate the risk factors for hospitalization with severe ALRTI in Tripoli-Libya. The study was conducted from November 2012 to March 2013.

Cases were recruited from all infant aged 1 to12 months admitted to Tripoli children's hospital with severe ALRTI and who met the inclusion criteria during that period. Controls were recruited from vaccination centers in different area inside Tripoli. Mothers were interviewed for potential risk factors using pre-designed questionnaire includes infant' age, sex, mother age, maternal education level, occupation, parity, pattern of feeding in the first four months of life, number of house hold ,number of persons sleeping with the infant in the same bed room and passive smokers. 154 cases and 194 controls were enrolled in the study.

In logistic regression model, significantly increased risk of hospitalization was associated with, young infant less than 3 months of age (odds ratio (OR) = 2.2, 95% CI 1.3-3.8), formula feed infant (OR=2.3, 95% CI 1.1-4.8), large number of house hold (OR=1.3, 95% CI 1.1-1.6) and increased number of person sleeping with infant at the same room (OR=1.9, 95% CI 1.4-2.4).

On another hand highly educated mothers (OR= 0.42, 95% CI 0.2-0.8) and mother' age above 30 years (OR = 0.19, 95% CI 0.08-0.4) were protective factors.

In this study several risk factors for severe ALRTI were identified, some factors are amenable to interventions.

Key words- *Risk factors; Case-control study; Acute lower respiratory tract infections; Infants*

INTRODUCTION

Acute lower respiratory tract infections (ALRI), such as pneumonia and acute bronchiolitis, are the leading cause of morbidity and mortality in children under five years of age. According to recent estimates, every year about 120-156 million cases of ALRI occur globally with approximately 1.4 million resulting in death. More than 95% of these deaths occur in developing countries.[1]

ALRI are major reason for admission to Tripoli children's hospital especially in winter season.

ALRI are caused by a number of infective agents, with Streptococcuspneumoniae being generally the most frequently identified bacterial agent, and Respiratory Syncytial Virus being the most frequent viral agent.[2]

A large number of factors determine whether the contact with an etiologic agent will result in a severe episode of ALRI. These factors are related to the child, disease, environment, the family and its socio-economic status, the health system and type of care.[3,4]

The child's age has been shown to be an important determinant of severity of ALRI; the rates of hospitalization which are marker of severity, were up to10 times higher for infants comparing with children aged 1 to 4years.[5]

In spite of the high incidence of acute respiratory infections, there is very little information on the risk factors for these infections. Epidemiological studies of LRTI in developing countries identified low birth weight, malnutrition, vitamin A deficiency, lack of breastfeeding and passive smoking as risk factors for LRTI.[6] Recent studies have added other risk factors to the list including poor socioeconomic status, large family size, and family history of bronchitis, advanced birth order, crowding, young age, inadequate ventilation and air pollution.[7,8] The identification of risk factors associated with severe LRTI especially these amenable to corrective measures is vital for the formulation of more effective policies and strategies to improve health globally.[9]

This case-control study was conducted to identify the risk factors for severe ALRTI among hospitalized infant at Tripoli-Libya.

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MATERIALS AND METHODS

Unmatched Case-control study conducted between November 2012 to March 2013 at Tripoli Children Hospital, Tripoli-Libya, a tertiary care hospital situated in northern west part of Libya.

All infants aged between 1 month and 12 months hospitalized with severe ALRTI and who met the inclusion criteria during the study period were included in the study as cases. The inclusion criteria include, infant's age between1 to12 months, full term, with normal birth weight and free from other chronic illness like congenital heart disease, chronic diarrhea, etc.

Hospitalization due to severe ALRTI was defined as "in-hospital care for ≥24 hours, when the infant presented with chest in drawing and/or tachypnea in the presence of cough or difficult breathing, complemented by information on other clinical signs (crepitation, wheezing) and/or radiological evidence of lung disease".[10,11]

Healthy infants between 1 month and 12 months, attending primary care center for routine vaccination in different areas inside Tripoli city were included in the study as controls.

The data was obtained from the mothers in hospital for cases and in vaccination clinics for controls, using pre-designed questionnaire.

The questionnaire encloses the potential risk factors including the infant age, sex, feeding pattern in the first 4 months of life, maternal age, parity, education level, occupation, family size and number of persons sleeping with the infant at the same room and passive smoking.

Statistical analysis was conducted using Stata® version 12, Odds ratio estimated with 95% CI using logistic regression to adjust for confounders.

RESULTS

There were 154 infant admitted with severe ALRTI and met the inclusion criteria to Tripoli Children's Hospital during the study period. The cases were matched to194 controller.

The cases and controls did not differ significantly in age, the mean infant age was 4±2.6 months for cases and 3.9±2 months for controls, and there were more boys in cases (59.5%) as compared to controls (49%).

Infant's age of less than three months was associated with increased risk of severe ALRTI, OR=2.2, 95% CI 1.3-3.8 (Table 1).

The mean maternal age was almost the same in both groups 30 ± 5 years for cases and 31±5 years for controls.

The risk of developing severe ALRTI was lower among infants of mothers with higher level of education (OR=0.42, 95% CI 0.21-0.82) when compared with lower level of maternal education. Increased maternal age (above 30 years) was associated with lower risk of severe ALRTI, OR = 0.19, 95% CI 0.08-0.44), (Table 2).

Increased number of house hold or the number of persons sleeping with infant at the same room were associated with increased risk of severe ALRTI (Table 3).

Concerning the four types of feeding during the first four months of life, this study found that, formula only group had a higher risk of severe ALRTI compared with other groups, OR=2.3,95% CI 1.1- 4.8) (Table

Table 1: Distribution of cases and controls according to infant age and sex with respective odds ratios (OR), confidence intervals (95% CI) and *P* value.

Characteristics	Cases (%) no	Control (%) No	Adjusted OR (CI 95%)	P value
Infant age				
months 3 ≤	(51.3%)79	(58.8)114	1	
months 3 >	(48.7%)75	(41.2)80	(1.3-3.8)2.2	0.004
Infant sex				
Male	(59%)91	(49)95	1	
Female	(41%)63	(51)99	(0.53-1.50)0.88	0.63

Table 2: Distribution of cases and controls according to maternal characteristics with respective OR, 95% CI and *P* value.

Characteristics	(%) Case No	(%) Control no	Adjusted OR (CI 95%)	*P* value
Maternal education level				
Less than high school	(20.8)32	(11.9)23	1	
High school or university	(79.2)122	(88.1)171	(0.21-0.82)0.42	0.016
Maternal age				
Less than 25 y	(18.2)28	(9.8)19	1	
y 25-30	(28.6)44	(27.8)54	(0.17-0.90)0.39	0.027
More than 30 y	(53.2)82	(62.4)121	(0.08-0.44)0.19	0.001>
Maternal work				
House wife	(68.2)105	(61.9)120	1	
Employ	(31.8)49	(38.1)74	(0.48-1.18)0.76	0.22
(***Parity***	O.R per child 1.1(0.9-1.30			0.058

Table 3: Distribution of cases and controls according to house condition and smoking with respective OR, 95% CI and *P* value.

Characteristics	Case (%)No	Control (%)No	Adjusted OR (CI 95%)	*P* value
House crowding				
House hold size		(OR Per person 1.3(1.1-1.6		0.002
No sleeping with child in same room		(OR Per person 1.9(1.4-2.4		0.001>
Smoking				
Smoking	(49.3)76	(55.1)107	1	
No smoking	(50.7)78	(44.9)87	(0.82-2.40)1.40	0.20

Table 4: Distribution of cases and controls according to the type of feeding in first 4 months with respective OR, 95% CI and *P* value.

Type of feeding	Cases (%)No	Control (%)No	(Adjusted OR (95% CI	*P* value
Exclusive breast	(23)36	(23)45	1	
Breast with formula≤3 times day	(12)19	(32)63	(0.19-0.74)0.38	0.01
Breast with formula>3 times day	(34)52	(28)54	(0.67-2.2)1.2	0.87
Formula	(31)47	(16)32	(1.1-4.8)2.3	0.033

4).

DISCUSSION

This study had provided an optimal framework to assess the risk factors of severe ALRTI among infant 1 to 12 months of age in Tripoli, in particular the modifiable risk factors. We consider this study is the first study to examine risk factors for severe ALRTI in this area.

Young infants, young mothers, lower maternal education, bottle feeding, and increased number of house hold and the number of children sleeping at the same bed room have shown significant association with severe ALRTI.

More boys were effected compared with girls in this study, although this was not statistically significant. However, a significant association has been observed in some other studies.[12,13]

Infant's age was a significant risk factor for severe lower respiratory tract infections. The highest risk was found among children aged 1to 3 months. It is well known that the age between 6 and 18 months has indeed been termed as the period of vulnerability due to degradation of maternal antibodies and immaturity of immune system.[14] The finding of the opposite relative risk of severe lower respiratory tract infections for children aged 1to 3 months in our study may be explained by yet the risk of transmission of infectious agents may be smaller in the youngest age group, but when infected this group experiences severe symptoms.

Concerning maternal factors, higher level of maternal education (high school and university level) appeared to reduce the risk of severe ALRTI compared with a lower level of education (primary and secondary level). The relationship between better maternal education and lower risk of infection is widely known in the literature.[15-17] Mothers with better education are more likely to have better socioeconomic positions enabling for better nutrition, better housing environment, better access to health and social care.

In our study, the association between higher education and lower risk of severe ALRTI was significant.

Regarding maternal age, older maternal age was protective factor. The protective effect of older maternal age on children's respiratory health has been noted previously.[18,19] and was further proved in this study. Most authors explain this association based on common sense arguments i.e. the older the mother, the more experienced she should be in caring for her child.

Despite that literatures shows that maternal work and parity have significant negative effect on child health[20-21] our study does not demonstrate any statistically significant risk of these two factors.

In relation to the risk of severe ALRTI and type of feeding in the first four months of life. We found a protective effect of exclusive breastfeeding or more breast feeding (3 bottle or less per day) compared with bottle feeding or more bottle feeding (more than 3 bottles per day).

A similar protective effect of exclusive breast feeding has been observed in previous studies from other parts of the world.[22]

Moreover we noticed that, the most protective factor is more breast feeding (3 bottles or less per day group), the reason of why this factor is the most protective even when compared with exclusive breast needs further research.

Household crowding and Night time crowding were risk factors for severe ALRTI due to enhancement of exposure to infectious agents especially when sharing the bedroom.[23,24]Our study showed a significant increase in the risk of severe ALRTI due to crowding.

It is well known that houses in Libya are large and that housing standards have improved, but many families have the habit of sleep in one bed room. Recognizing of this fact by public may reduce the number of persons sleeping in the same rooms and consequently reduce the risk of ALRTI.

Passive smoking is a recognized risk factor for ALRTI.[25] The mechanism behind this is the known inhibitory effects of smoking on ciliary activity and other local protective mechanisms.[26] However our risk estimate for lower respiratory tract infections associated with smoking was nearly the same among cases and controls.

The possible explanation is that in our study almost all of the fathers smoke outdoors and none of the mothers were smokers.

This may explain the different results of this study when compared with other study in which maternal smoking is quite high, reach up to 66% in some studies.[27]

A Similar results to our study has been obtained in Alaska study.[28] Which reveal that smoking by a household member was not associated with increased hospitalization risk, in spite that smoking is common (39%) but smoking in house was rarely reported (1%).

All children may be exposed to tobacco smoke, although educational efforts may have reduced smoking inside homes and subsequently reduced the risk of passive smoking as what was noticed in the present study.

Limitations of the present study

Selection of controls, as selection of appropriate controls for cases of severe ALRTI possess several difficulties.

Selection of patients admitted to the same hospital for other diseases as controls may result in biased comparisons as described by Berkson[29], subjects selected from the community would have the advantage of being more representative of the general population, but for logistic reason that was impossible in our study.

Therefore we selected controls from vaccination clinics in Tripoli, as the vaccination coverage in Libya is very high[30], infants presented to vaccination clinics should be representative for infants in the community.

CONCLUSION

Young infants, young less educated mother, bottle feeding, increased number of households, nighttime crowding, and bottle feeding were the main risk factors for severe lower respiratory tract infections.

RECOMMENDATIONS

Encouragement of breast feeding especially in first 4-6

months by increasing the awareness about benefits of breast feeding during antenatal visits, improving maternal education level, reducing the number of persons sleeping in the same room whenever possible especially with children less than five years of age, finally smoking in the household should be strongly discouraged. Taken together, these measures may reduce the burden of severe ALRTI.

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