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RESPIRATORY TRACT INFECTION IN JORDANIAN CHILDREN BELOW 6 YEARS

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ABSTRACT

Background: Lower respiratory tract infections are increasing between children. 70% of pediatric pneumonia admissions are between children aged below five years in the USA. The responsible organism in severe acute respiratory illness was influenza A in 50%. Malnutrition is the important risk factor for death in children below five years with lower respiratory tract infections. **Objective:** To assess the respiratory tract infections characteristics in Jordanian children aged below 6 years. **Methods:** Our retrospective investigation recruited 299 children patients, of both sexes, aged below 6 years and with respiratory tract infections confirmed symptomatologically or radiologically at Queen Rania hospital for children, Amman, JORDAN, during the period Jan.2022-Jan.2023. Children were classified into two age groups: group I recruited children aged below 3 years and group II included children aged 3–6 years. Respiratory tract infections were classified into upper (n=151) (sinusitis and follicular tonsillitis) and lower infections (n=148) (bronchitis, bronchiolitis and pneumonia). The chi-square test was used. Logistic regression was done to assess the influence of independent on dependent factors. **Results:** 50.5% of respiratory tract infections in Jordanian children aged below 6 years were upper respiratory tract infections. Malnutrition was found in 11.7% of all children with respiratory tract infections. Lower respiratory tract infections and malnutrition were remarkably more between children aged below 3 years ($P < 0.05$ and $P < 0.005$, respectively). The commonest anticipator of lower respiratory tract infection was a younger age ($P < 0.005$). **Conclusion:** Upper and lower respiratory tract infections were almost equal in Jordanian children aged below 6 years. Malnutrition was a remarkable risk factors for lower respiratory tract infections in children aged less than 3 years.

KEYWORDS: Respiratory tract infections: upper, lower; malnutrition; Children.

INTRODUCTION

Acute respiratory tract infections are heterogeneous diseases induced by different pathogens where the anatomic locations are from the pharynx to the alveoli. Diarrheal diseases, malnutrition and acute respiratory infections are the important factors of morbidity between below-five children. Severe acute respiratory tract infections cause admission in 15% of patients.[1] Lower respiratory tract infections are increasing between children.[2] Pneumonia (severe acute respiratory tract infections) may be divided in simple pneumonia (with fast breathing) and severe pneumonia (with chest in-drawing).[1] 70% of pediatric pneumonia admissions are between children aged below five years in the USA.[3-5] The number of infants aged 1–11 months admitted for moderate or severe lower respiratory tract infections was 5.1% with 40% of patients with bronchiolitis.[6] The responsible organism in severe acute respiratory illness was influenza A in 50%, influenza B in 25% and respiratory syncytial virus in 25%, with 35.3% of children being below 5 years of age.[7]

Acute respiratory infections cause 30-40% of outpatient and 20-30% of hospital admissions.[8] They demand remarkable long-term empiric treatment and participate to antibiotics resistance. The total frequency of acute respiratory infections is 6-8 attacks within the first 5 years of life.[8] The incidence of acute respiratory infections is controlled by factors such as age, gender, nutrition, breastfeeding, socio-economic condition, overcrowding, indoor pollution and passive smoking.

Pneumonia may be caused by various bacterial, viral or fungal organisms. Prophylactic protocols include proper nutrition and immunization.[4] Recognizing the risk factors for lower respiratory tract infections can anticipate appearance. Malnutrition is the important risk factor for morbidity in children below five years with lower respiratory tract infections.[9] Severe acute malnutrition was responsible for increased morbidity due to pneumonia and younger age, low birth weight, under-vaccination, parental smoking.[9]

The objective of this investigation was to assess the respiratory tract infections and correlations in Jordanian children aged below 6 years and to recognize anticipators for lower respiratory tract infections.

METHODS

This retrospective investigation recruited 299 children patients, of both sexes, aged below 6 years and with respiratory tract infections confirmed symptomatologically or radiologically at Queen Rania hospital for children, Amman, JORDAN, during the period Jan.2022-Jan.2023, after obtaining approval from our local ethical and research board review committee of the Jordanian Royal medical services. Patients on steroids were ruled out from the investigation.

Acute respiratory infection is a clinical condition with fast breathing more than anticipated upper level for age with or without lower chest in drawing, too ill to feed, nasal discharge, cough, fever with or without chest findings of less than 2 weeks. Severe acute respiratory infection is respiratory distress with oxygen saturation of less than 90% needing in-hospital management with intravenous medications and oxygen therapy. Pneumonia had rapid breathing, breathing difficulty, with inspiratory and expiratory crackles, rhonchi or bronchial breath sounds of less than 14 days' period. Bronchiolitis had respiratory distress, low grade fever and expiratory wheeze.

Malnutrition was evaluated using Shakir's strip measurement of the mid arm circumference (mid arm circumference less than 12.5 cm as severe malnutrition and borderline malnutrition as mid arm circumference between 12.5 cm and 13 cm). Weight less than 80% for anticipated weight for age as moderate and less than 60%with or without edema as severe. Optimum breast feeding was for minimum of 6 months and improper breast feeding was as no breastfeeding or mixed feeding in the first 6 months. Improper immunization was as no immunization. Large family size was as with more than six members. Rural regions were outside the metropolis.

Children were classified into two age groups: group I recruited children aged below 3 years and group II included children aged 3–6 years. Upper respiratory tract infections (n=151) included rhinitis, sinusitis, otitis media, pharyngitis, follicular tonsillitis and croup while lower respiratory tract infections(n=148) included bronchitis, bronchiolitis and pneumonia. Patients with minimum one of (tachypnea, chest wall in drawing, wheezes/crepitations, bronchial breath sounds or pathological chest X-ray) were confirmed of lower respiratory tract infections.

Statistics

The chi-square test was used. P less than 0.05 was considered significant. Logistic regression was done to assess the influence of independent factors on lower respiratory tract infection (dependent).

RESULTS

148 had lower respiratory tract infection and 151 had upper respiratory tract infection. The average age of children with upper and lower respiratory tract infections (n = 299) was 1.9 years. Children aged below 3 years were 142 (47.5%) and children aged 3–6 years were 157 (52.5%). The urban and rural inhabitants were 70.2% and 29.8%, respectively. Malnutrition was recorded in 35 (11.7%).

There was no remarkable discrepancy in nutrition between children with upper and lower respiratory tract infections [19 (12.6%) with upper compared to 18 (12.2%] with lower respiratory tract infections ($P > 0.05$). Children aged below 3 years had more of lower respiratory tract infections ($P < 0.05$). There were no discrepancies in the gender ratio, feeding within the first 6 months of life or inhabitance. Table I. 195/299 (65.2 %) children were breastfed and 22.7% (68/299) children were formula-fed.

Children with malnutrition had lower respiratory tract infection. Malnutrition was more in children below 3 years of age than in children aged 3- 6 years ($P < 0.005$). Rural residence with lower respiratory tract infection was with more malnourished children, but children with optimum nutrition were more in urban residence ($P < 0.005$). There were no discrepancies between urban and rural regions regarding history of early infancy breastfeeding. Table II.

Pneumonia was confirmed in 14 children (9.5% of 148 patients with lower respiratory tract infection). The effect of some factors on lower respiratory tract infection revealed that only age of less than 3 years is a remarkable anticipator of lower respiratory tract infection ($P < 0.005$). Every year increase in age was correlated with less respiratory tract infection. Table III.

Table I: Demographics correlated with upper and lower respiratory tract infection patients below 6 years of age (n=299).

Parameter	Respiratory tract infections		P
	Upper	Lower	
No.	151	148	
Age (no., %) Less than 3yrs. 3-6 yrs.	66(46.5) 85(54.1)	76(53.5) 72(45.9)	<0.05
Gender (no., %) M F	81(50.6) 70(50.4)	79(49.4) 69(49.6)	>0.05

Inhabitance (no., %) urban rural	108(51.4) 43(48.3)	102(48.6) 46(51.7)	>0.05
Feeding (no., %) Breast Formula mixed	95(48.7) 37(54.4) 19(52.8)	100(51.3) 31(45.6) 17(47.2)	>0.05
Nutrition (no., %) normal malnutrition	132(87.4) 19(12.6)	130(87.8) 18(12.2)	>0.05

Table II: Demographics discrepancies between normal and malnourished below 6 years of age with Upper and Lower respiratory tract infections (together) (n = 299).

	Malnourished	Normal	P
No.	35	264	
Gender (no., %) M F	20(57.1) 15(42.9)	141(53.4) 123(46.6)	>0.05
Age (no., %) less than 3years 3-6 years	26(74.3) 9(25.7)	115(43.6) 149(56.4)	<0.005
Inhabitance (no., %) urban rural	23(65.7) 12(34.3)	180(68.2) 84(31.8)	>0.05
Feeding (first 6 months) no., % breast Formula mixed	22(62.9) 11(31.4) 2(5.7)	174(65.9) 60(22.7) 30(11.4)	>0.05

Table III: Anticipators of lower respiratory tract infections in children under 6 years of age.

Parameter	P
Gender(M/F)	>0.05
Age(yrs.)	<0.005
Inhabitance(urban/rural)	>0.05
Early infant feeding (Breast milk/formula)	>0.05

DISCUSSION

Acute upper and lower respiratory tract infections were equally common in both genders in this investigation. Male children had more frequency of respiratory tract infections in some regions[10] and female children had more frequency incidence in others.[11] Females have more remarkable immune reactions than males during all age groups, meaning that gender discrepancies are genetic in origin. Gender discrepancies in reaction to nutrition before birth cause epigenetic reprogramming of immune reaction. Breastfeeding helps female infants more than males because breastfed female newborns had a less risk of neonatal respiratory tract infections.[11]

Our investigation showed that 50.5% of respiratory tract infections in Jordanian children aged below 6 years were upper respiratory tract infections. The most anticipator of lower respiratory tract infection was age in children aged less than 3 years. Rates of lower and upper respiratory tract infections reduced as children aged below 3 years.[10-11] Immune immaturity in the first 3 years of birth explains the high incidence of respiratory tract infections.[10] Children under 3 years had the most increased frequency of malnutrition. Infants and young children are most exposed to malnutrition because of increased nutritional needs.[12] In our investigation, malnourished patients with lower respiratory tract infections were more in rural than nourished patients with lower respiratory tract infections. Lower socioeconomic condition is a remarkable risk factor for lower respiratory tract infections. In countries of low–middle income, have limited access to animal-based meals and suffer from hidden hunger, and a lack of vitamins and minerals.[13]

Breastfeeding during the first 6 months of life enhances immunity and must be sustained until the age of two. Children breastfed during the first 6 months of life in developing countries have a 30–42% decrease in the frequency of acute respiratory tract infections.[14] Breastfeeding rates in low-, middle- and high-income countries were 97.6%, 95.6% and 78.8%, respectively.[15] 65.2% of this investigation group with respiratory tract infections was breastfed and 22.7% had formula. Growth failure happens commonly between the ages of 3 and 18 months.[9] Children are exposed to infections within this period. The age group of 10-19 months falls in the age of introduction of complementary feeds, reducing breast feeding and weaning of passive maternal immunity, influencing the frequency of acute respiratory infections because of the exposure to the risk factors. Protective immunoglobulins are present in breast milk to prevent acute respiratory infections. Bronchiolitis was seen only in children less than 30 months due to poor compliance of the immature bronchioles in the very young children. Severe malnutrition influenced the incidence of severe acute respiratory infections. The risk of malnourished children to have pneumonia was remarkably more than the well-nourished children. There is a correlation between third degree malnutrition and severe acute lower

respiratory tract infections. Malnutrition may adversely influence the development of cellular, innate and humoral immunity. Poor breast feeding as mixed feeding from birth causes malnutrition.

Poor air prevalent in urban regions affects acute respiratory tract infections in children. Air pollution damage causes susceptibility to airway infections.[16] Children in rural regions can be exposed to indoor air pollution from burning wood or dung.[17]

The frequency of pneumonia may be decreased by optimum nutrition and immunization. 50% of poorly immunized patients experienced severe acute respiratory infections. Proper childhood immunization is important in avoiding diseases, which may be complicated by pneumonia such as measles, tuberculosis and pertussis. Family size of more than 5 influences remarkably the incidence of pneumonia due to overcrowding, which increases the transmission of droplets of infective organisms. More of the subjects with acute respiratory infections were from the urban than the rural regions. Exposure to smoke by use of smoke producing cooking fuel or passive smoking may participate to the frequency of severe acute respiratory infections due to action of smoke on ciliary activity of the lung parenchyma, inducing poor activity and secondary infection.

CONCLUSION

In 49.5% of infections in under-six years with respiratory tract infections had lower respiratory tract infections. The younger age (below 3 years) is the most important risk factor for lower respiratory tract infection and malnutrition. The nutritional condition of infants and young children must be enhanced by breastfeeding within the first 6 months of life and especially in rural areas. Risk factors may be addressed using proper nutrition, immunization, avoidance of pollution, parental education and environmental sanitation.

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