Risk factors of severe lower respiratory tract infection in under five years old children in Al-Batool teaching hospital, Diyala governorate

Submitted by

Abulhassan Ali Baqir Ismail

Supervised by

Assist. Prof. Dr. Aseel Jasim

Abstract

Background: Worldwide, lower respiratory tract infections (LRTIs) are a leading cause of infant and newborn death and morbidity. Cases of pneumonia, bronchopneumonia, bronchiolitis, and bronchitis are all considered LRTIs.

Aim of study: To determine the risk factors of severe respiratory tract infection in children below five years old in Diyala governorate.

Patients and methods: This is cross-sectional study. It was conducted during the period from the 1st of July 2023 to the end of January 2024 in Al-batool teaching hospital in Diyala governorate. We collected 120 patients suffered from LRTI according to WHO classification (presence of lower chest indrawing with respiratory rate more than 60 per minutes for infants less than 2 months old, more than 50 per minute in infants (3-12 months) and > 40 per minute in children between 13-60 months and absence of chronic diseases (such as congenital heart disease, asthma, etc). We collected information about gender, parents age, mode of feeding, etc. using a well-prepared written questionnaire and by direct interview with the mothers of the patients.

Results: 120 patients were enrolled in the study. 57.5% of them were males and 42.5% were females. 49.2% of them were immunized and 50.8% were not immunized. 71.7% were living in crowded houses and 28.3% were not. Familial smoking was present in 48.3% of the cases and 51.7% was not. 31.7% of them experienced mild malnutrition and 7.5% suffered severe malnutrition.

Conclusion: Male gender, incomplete immunization, low educational status, overcrowding, malnutrition and familial smoking were found to risk factors for severe lower respiratory infection

Introduction

Lower respiratory tract infections (LRTIs) in children can spread quickly in younger children. Serious mortality and death may result from it. Cases of pneumonia, bronchopneumonia, bronchiolitis, and bronchitis are all considered LRTIs. Chest X-ray and clinical symptoms alone may not always be sufficient to diagnose viral or bacterial pneumonia. Because of compromised host defense, pathogenic pathogens enter the lower respiratory tract after an upper respiratory tract illness. Airway edema follows leukocyte infiltration of peribronchial epithelial tissue. This procedure lessens secretion movement close to bigger airways, raises resistance, and diminishes lung compliance. Airway blockage results from this. Small airway occlusion results in the collapse of distal air gaps, air trapping, and modification of the ventilation-perfusion relationship. In severe infections, it causes bronchial-bronchiolar epithelial necrosis or pulmonary parenchymal necrosis (1).

Early in life is when the immune system, lungs, and airways are most susceptible. The most frequent causes of LRTI vary depending on an individual's age. The following are risk factors for developing lower respiratory tract infections (LRTIs): low socioeconomic status, living in crowded homes, poor hygiene, exposure to air pollution and cigarette smoke, inadequate nutritional intake, malnutrition, inadequate access to health services, male gender, low birth weight, preterm birth, parental smoking, immunodeficiency, presence of congenital anomalies, chronic pulmonary disease or reactive airway disease, swallowing dysfunction, underlying congenital heart disease, immunodeficiency and immunosuppression, Down syndrome, history of atopy, gastric reflux, and ciliary dysfunction (2).

In addition, children who have a persistent cough should have any autoimmune illnesses and potential allergies considered. Evaluations should be

conducted for the following reasons: parental consanguinity, sibling mortality, atopic illness prevalence in the family, family member with cystic fibrosis or primary ciliary dyskinesia, and presence of a close relative with a tuberculosis diagnosis (3).

Worldwide, lower respiratory tract infections (LRTIs) are a leading cause of infant and newborn death and morbidity. World Health Organization (WHO) data from 2002 show that 3.9 million deaths worldwide were related to LRTI. LRTI ranks #1 among the causes of mortality for children under five years old, accounting for 6.9% of infectious disease-related deaths (4).

Aim of study

To determine Risk factors of severe lower respiratory tract infection in under five years old children in Al-Batool teaching hospital, Diyala governorate

Patients and methods

This is cross-sectional study. It was conducted during the period from the 1st of July 2023 to the end of January 2024 in Al-batool teaching hospital in Diyala governorate. We collected 120 patients suffered from LRTI according to WHO classification (presence of lower chest indrawing with respiratory rate more than 60 per minutes for infants less than 2 months old, more than 50 per minute in infants (3-12 months) and > 40 per minute in children between 13-60 months and absence of chronic diseases (such as congenital heart disease, asthma, etc) (12). We collected information about gender, parents age, mode of feeding, etc. using a well-prepared written questionnaire and by direct interview with the mothers of the patients.We preserved the privacy and we coded the patients for the reasons of confidentiality and risk of bias.

Statistical analysis

SPSS Version 25 was used for the description of the data and to calculate the odd ratio. We expressed the quantitative data by arithmetic mean, standard deviation and mode and the qualitative data by frequencies.

Results

120 patients were enrolled in this study, their gender is demonstrated in table 1. With male predominance (57.5%) while female (42.5%).

Table 1. distribution of cases according to gender

Gender	Frequency	Percent
Male	69	57.5
Female	51	42.5
Total	120	100.0

In table 2. We found that > half of the cases were less than 12 months old (59.2%) while the remainder were > 12 months old (40.8%).

Table 2. distribution of severe LRTI according to the age groups

Age	Frequency	Percent
>12 months	49	40.8
<12 months	71	59.2
Total	120	100.0

Our study showed that the majority of mothers (58.3%) were more than 25 years old while 41.7% of the mothers were below 25 years old. More than half pf the fathers were more than 30 years old (55.8%) and 44.2% of them were under 30 years old as demonstrated in table 3 below.

Table 3. distribution of parental age

Parental age		Frequency	Percent
Mother age	>25 years	70	58.3
	<25 years	50	41.7
Father age	>30 years	67	55.8
	<30 years	53	44.2

Table 4 demonstrate the educational status of the parents, as 50% of the mothers were educated and only 44.2% of the fathers were educated.

Table 4. distribution of educational status of the parents

Education level		Frequency	Percent
Mother educated	Yes	60	50.0
	No	60	50.0
	Total	120	100.0
Father educated	Yes	53	44.2
	No	67	55.8
	Total	120	100.0

Table 5 shows that 49.2% of them were immunized and 50.8% were not immunized.

Table 5. distribution of immunization among the cases

Status	Frequency	Percent
Complete	59	49.2
Incomplete	61	50.8
Total	120	100.0

Table 6 demonstrates the familial infection as 45% of the fathers had history of respiratory infections in the same period, 31.7% of the mothers had history and 59.2% of the cases had at least one brother or sister who was infected.

Table 6. distribution of familial infection among the cases

Familial infection		Frequency	Percent
Hx of father infection	Yes	54	45.0
	No	66	55.0
Hx of mother infection	Yes	38	31.7
	No	82	68.3
Brother or sister infection	Yes	71	59.2
	No	49	40.8
	Total	120	100.0

Table 7 show the number of children in the house as 71.7% of them lived in crowded houses where the number of children in the room is more than 2 and 28.3% lived in normal houses.

Table 7. distribution of number of children

Number		Frequency	Percent
Crowded	>2	86	71.7
Normal	<2	34	28.3
	Total	120	100.0

The incidence of malnutrition is demonstrated in table as 31.7% of them suffered from mild malnutrition and 7.5% of them suffered from severe malnutrition.

Table 8. distribution of malnutrition among the cases

Malnutrition	Frequency	Percent
None	73	60.8
Mild	38	31.7
Severe	9	7.5
Total	120	100.0

The feeding status is demonstrated in table 9. As 58.3% of the cases were exclusively breastfed for more than 4 months and 41.7% were less than 4 months.

Table 9. feeding status

Breastfeeding	Frequency	Percent
>4 months	70	58.3
<4 months	50	41.7
Total	120	100.0

Familial smoking was present in 48.3% of the cases and 51.7% was not.

Table 10 shows that 57.5% of the cases suffered from anemia (Hb less tan 10 mg/dl) and 42.5% of them were normal.

Table 10. distribution of anemia among the cases

Anemia	Frequency	Percent
Hb <10	69	57.5
Hb >10	51	42.5
Total	120	100.0

Discussion

About half of all hospitalizations in children ages 0 to 5 are related to LRTI. Low immune response, constricted airways, or inadequate nourishment could be the cause. Male gender and young age (particularly under a year old) may contribute to greater hospitalization rates. Over 50% of the patients were younger than 12 months old. LRTI cases in children are more common in boys than in girls. This could be because guys' airways are narrower than girls and these result are compatible with a study conducted by Polat et al (5).

Overcrowding at home can increase the risk of repeated hospitalizations from LRTI. It is dangerous for pathogenic agents to be carried and spread in a crowded home. Living in a crowded house with more than five occupants increases the risk of having LRTI. Approximately 71% of the patients in this research shared a home with two or more persons which is consistent with findings of Catak et al (6).

Compared to children living in non-smoking families, children who live in smoking homes are more likely to suffer from respiratory illnesses. Nicotine exposure has been shown to exacerbate LRTI severity (7). In terms of repeated hospitalization, there was no correlation between those in this research who were exposed to cigarette smoke and those who were not and these results are compatible with the study conducted in Turkey 2021 (7).

The parents of children with severe LRTI were reported to have completed elementary or secondary school education in the majority of the studies. Most of the fathers in this study had only completed basic school, while half of the moms had completed secondary education. The majority of the fathers' education scores were in the middle range. Parents' educational attainment was comparable between patients who had frequent hospital stays and those who did not (8).

The prevalence of ARI was found to be highly impacted by incomplete immunization status; 50% of participants with poor immunization status had severe types of ARI. This is in line with earlier studies and emphasizes the value of a comprehensive children vaccination program in preventing illnesses like measles, TB, and pertussis that can worsen when accompanied by pneumonia. This could be a sign of poor adherence or ignorance of the necessity of regular vaccinations. This highlights the need for further efforts to raise public awareness of the value of immunization and to provide parents with the option to give their children enhanced childhood vaccinations (9).

The prevalence of severe ALRI was found to be impacted by severe malnutrition; children who were malnourished had a three-fold higher relative risk of acquiring pneumonia than children who were well-nourished. This is also in line with research from earlier writers who have demonstrated a link between severe acute lower respiratory tract infections and malnutrition to the third degree. It has been demonstrated that malnutrition negatively impacts humoral, innate, and cellular immune development (10).

Hospitalization for acute lower respiratory infections in young children poses a substantial burden on health services, especially in developing countries. Despite this, there is often a lack of sufficient, inconsistent quality, and broadly applicable evidence about the risk factors contributing to this significant illness burden. Governments should think about what steps may be taken to reduce the incidence of these risk factors, though, as most of them are potentially preventable. This should significantly reduce the incidence of pediatric pneumonia in underdeveloped nations, combined with expanding access to the Streptococcus pneumoniae and Haemophilus influenzae type B vaccines. Furthermore, if the national/regional prevalence of these risk variables is known, the odds ratio meta-estimates presented

in this research should be helpful for modeling the global, regional, and national estimates of severe ALRI (11).

Conclusion and recommendations

Male gender, poor immunization, low educational status, overcrowding, malnutrition and familial smoking were found to risk factors for severe lower respiratory infection. We recommend perform further studies on the other risk factors and perform educational campaigns about the benefits of immunization, the nutritional status and the dangers of smoking.