EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 1
87-92
Year: 2021

PREVALENCE, RISK FACTORS AND OUTCOMES OF ACUTE RESPIRATORY TRACT INFECTION IN CHILDREN

[1]*Tahsin Abdulateef Hasan and [2]Hussein Hamdan Mukhlif

[1,2]College of Medicine/ Mosul University, High Diploma ؛ College of Medicine/ Anbar University.
Haditha Hospital - Department of Pediatric -Anbar /Iraq.

***Corresponding Author: Tahsin Abdulateef Hasan**
College of Medicine/ Mosul University, High Diploma ؛ College of Medicine/ Anbar University., Haditha Hospital - Department of Pediatric - Anbar /Iraq. **DOI: https://doi.org/10.17605/OSF.IO/FDN38**

Article Received on 04/11/2020 **Article Revised on 24/11/2020** **Article Accepted on 14/12/2020**

ABSTRACT
Acute respiratory infection is still the leading cause of morbidity and mortality in children under five years in many countries. In this study, we aimed to assess the incidence and risk factors predicting the outcomes of acute respiratory infection (ARI). This is a hospital-based case study conducted at Haditha general hospital/Anbar province / Iraq during the period from December 2017 to December 2019. Children from 2 months to five years of age were presented according to WHO's ALRI criteria and included in the study. The patients were evaluated for risk factors and outcomes. Routine investigations such as CBC, CRP and chest X-ray were done for all cases. The results showed that out of (407) children, only 150 (36.9%) fulfilled the WHO criteria of ARI program, with higher incidence among infants below (6) months (53.3%) and male children (47.3%). The majority of children had anemia (82%), and protein energy malnutrition (PEM) (28.7%). Need to change antibiotics, duration of stay and outcomes were significantly associated with to pneumonia severity (p=0.001, p=0.04 and p=0.03, respectively); while need for oxygen therapy was highly significant (p=0.001), and 15% required mechanical ventilation. Lobar pneumonia (32%) was the most commonly observed, and sepsis was the most frequent cause of death and mortality rate 6.0% (n=9). It can be concluded from this study that young age, malnutrition and poor socioeconomic status play an important role in in the morbidity, while effective management of malnutrition, improving the living standards and proper health education programs can reduce mortality from respiratory infection in children, ARI burden and severity.

KEYWORDS: Acute respiratory infection, Children, Outcome, Risk factors.

INTRODUCTION
Acute lower respiratory tract infection (ALRI) in children under-five years of age is the leading cause of mortality and morbidity.[1] It includes a heterogeneous group of diseases caused by many microorganisms including virus, bacteria or fungi.[2] ARIs not only affect the respiratory system but also have serious systemic complications due to spread of the infection or microbial toxins, inflammation and reduced lung function.[3] The prevalence of acute respiratory infection is higher in developing countries than in developed countries.[4] This is due to many environmental factors that play a role in the development of respiratory tract infections such as malnutrition, low birth weight, lack of breast feeding, air pollution, indoor crowding and lack of measles and pneumococci immunization and concomitant diseases e.g. asthma, diarrhea and heart disease.[5,6]

Recent studies from the World Health Organization (WHO) suggest that acute lower respiratory tract infection (ALRTI) is responsible for 20% of deaths in under five years old children, and every year, about 120–156 million cases of ALRI occur globally, and that about 1.4 million cases die every year. More than 95% of these deaths occur in underdeveloped and developing countries.[7,8]

As there is no standard definition of childhood ALRI, if the child presented with least one specific lower respiratory tract sign reported by caregiver or study personnel (fast or difficulty breathing, chest wall in-drawing) and/or abnormal auscultatory findings (crackles/crepitations or bronchial breath sounds) they should be considered as ALRI.[9] Further Integrated Management of Childhood Illness (IMCI) is classified as no pneumonia, pneumonia, severe pneumonia, very severe pneumonia based on respiratory rate according to age, presence or absence of chest retraction and general status of the patient.[10]

MATERIALS AND METHODS
This prospective hospital-based case study was conducted at Haditha general hospital/Iraq from December 2017 to December 2019. Any child aged from

2 months to 5 years presented by manifestations suggestive of lower respiratory tract infection and onset of symptoms less than two weeks were included in the study.

The study was done according to the standards of local ethics committee and informed consent was taken from parents. According to WHO guidelines for diagnosis and treatment of ALRI.[10] Out of 407 cases, only 150 (36.9%) children were included the study; they were classified into three groups according to age: Group 1, children aged from two to six months included 80 children (37 males and 43 females), Group 2, children aged from six to 24 months included 45 children (22 males and 23 females), and Group 3, children aged from two to five years included 25 children (12 males and 13 females).

Children were subjected to detailed thorough history taking, particularly past history, family history, nutritional history, immunization status in addition to full clinical examination, assessment of weight, height, body mass index (BMI), manifestations of malnutrition and local chest examination for presence of tachypnea, nasal flaring, wheezes, chest retraction, presence of crackles and bronchial breathing. Cases were followed until recovery or death. Children with respiratory manifestations for more than two weeks, known congenital heart disease, immunodeficient states, receiving steroid therapy, neuromuscular or skeletal disorders, those who did not complete treatment or that referred to other centers were excluded from the study.

From all children, (3) ml of venous blood was taken and (0.5) ml was added to EDTA tube for blood picture using (Sysmex KX-21N, Japan), and the other 2.5 ml was allowed to clot and centrifuged to obtain serum which was used for CRP measurement by the standard nephelometric analysis method. Other investigation like culture and sensitivity of pleural fluid, tuberculin test were done for selected cases. Radiological examination by chest X- ray was performed for all included children and high-resolution CT chest was done for selected cases.

Statistical Analysis

The (SPSS for windows, version 20.0) was used for statistical analysis. The prevalence rate of ARI was described in simple proportion. Group comparisons were done by the Chi-squared (X^2) test or Fisher's exact test for categorical variables. Probability (p-value) of less than 0.05 was considered significant.

RESULTS

A total number of 150 (36.9%) children out of 407 who fulfilled the criteria of ARI control program were included in the study. Table (1) summarizes the demographic and clinical characteristics of the patients. There were more females than males (47.3% and 52.7%, respectively), and children below 6 months constituted the majority of cases (53.3%). Regarding residence, the incidence increased in children living in rural areas (66.0%), lack of breast-feeding was present in (64.7%) of children and improper weaning in (59.3%). In regard to nutritional status, most of the children were under weight (59.3%), in addition, rickets was found in (34.0%) of cases and protein energy malnutrition (PEM) in (28.7%). Cough was the main presenting symptom (94.7%) followed by fever (76.7%) and dyspnea (70.9%).

Laboratory investigations in Table (2) revealed that anemia was present in (82.0 %) of patients varying from mild to severe anemia, most of them due to iron deficiency. Total leucocytes increased in (42.0%), and decreased in 20.0%; in addition C-reactive protein (CRP) was positive in (80.7%) of patients. Radiological findings consolidation was by far the most common presentation (34.7%), followed by bilateral infiltrates (19.3%), while normal findings were present in (12.0%) of cases as shown in table (3).

Table (1): Baseline and clinical characteristics of the patients.

Variables	Frequency Total number (150)	Percentage
Gender		
Male	71	47.3%
Female	79	52.7%
Age		
Below 6 months	80	53.3%
from 6-24 months	45	30.0%
From 24-60 months	25	16.7%
Residence		
Urban	66	44.0%
Rural	84	66.0%
Breast feeding Yes	53	35.3%
No **Weaning;** Proper	97	64.7%
Improper	61	40.7%
	89	59.3%
Nutritional status Average Underweight		
PEM	61	40.7%

Rickets	89 43 51	59.3% 28.7% 34.0%
Symptoms Fever Stridor Cough Tachypnea Wheezes Chest indrawing	115 35 142 139 103 87	76.7% 23.3% 94.7% 92.7% 68.7% 58.0%

Table (2): Laboratory finding of the studied patients.

Investigation	Frequency	Percentage
Anemia; Mild Hb 10-8 gm/dl Moderate Hb6-8gm/dl Severe Hb ≤ 6gm/dl	45 63 15	30% 42% 10%
Total leucocytic counts ≤ 4000 4000-12000 ≥ 12000	30 57 63	20.0% 38.0% 42.0%
CRP +ve -ve	121 29	80.7% 19.3%
Pleural fluid culture +ve -ve	11 5	7.3% 3.3%

+ve: positive; -ve: negative

Table (3): Radiological findings on chest X-ray.

Radiology **finding**	Total number, 215	Percentage
Consolidation	52	34.7
Unilateral infiltrate	13	8.7%
Bilateral infiltrate	29	19.3%
Collapse	1	7.3%
Effusion	16	10.7%
Pneumothorax	4	2.7%
Hyperinflation	7	4.7%
Normal	18	12%

Table (4) shows the distribution pattern of ARI. Out of 150 cases, the most common clinical diagnosis was lobar pneumonia (32.0%), bronchopneumonia (20.7%) and bronchiolitis in 22.0%; croup was diagnosed in 6.7%, pleural effusion in 9.3% of cases, and WALR was diagnosed in 9.3% of cases. Change in antibiotics, duration of stay and outcomes were significantly associated with pneumonia severity (p=0.001, p=0.04 and p=0.03, respectively); while need for oxygen therapy was highly significant p=0.001). As seen in table (5).

Table (4): Clinical pattern according to clinical and laboratory findings.

Final diagnosis	Below 6 months, n=80	6- 24 months, n=45	24- 60 months, n=25	P-value
Croup, number (%) No= 10(6.7%)	2 (20.0%)	5 (50.0%)	3 (30.0%)	0.09
Bronchiolitis No=33(22.0%)	11 (33.3 %)	15 (45.5%)	7 (21.2%)	0.03
Bronchopneumonia No=31(20.7%)	18 (58.1%)	7 (22.6%)	6 (19.4%)	0.59
Lobar pneumonia No=48(32.0%)	35 (72.9%)	7 (14.6%)	6 (12.5%)	0.01
WALRTI No=14(9.3%)	4 (28.6%)	8 (57.1%)	2 (14.3%)	0.06
Pleural effusion No=14(9.3%)	4 (28.6%)	6 (42.9 %)	4(28.6%)	0.14

WALARTI: Wheeze associated lower respiratory tract infection.

Table (5): Outcomes according to WHO classification for ARI.

Variables	Sub-group	Pneumonia 32 cases (21.3%)	Severe Pneumonia 73cases 48.7%)	Very severe Pneumonia 45cases (30.0%)	Total, n=150	P-value
Changes of antibiotics	Yes	1	23	30	54	0.001
	No	31	50	15	96	
Oxygen	Yes	24	71	45	140	0.001
	No	8	2	0	10	
Duration of stay, day	≤ 7 d	20	49	18	87	0.04
	7-14	10	14	14	38	
	≥ 14	2	10	13	25	
Outcome	Improved	32	70	39	141	0.03
	Died	0	3	6	9	

DISCUSSION

Acute respiratory infections in children less than 5 years of age are a major concern in developing countries[11]; Srinivasa et al.[12] reported an incidence rate of 17.5%; while in a study by Paramesh[13] the incidence was 12.85%. Many factors contribute to incidence, like age group selection for a study, seasonal variation and other risk factors in a community.[14]

Result of gender distribution was in agreement with many previous studies by Srinivasa et al. (58%)[12], Savitha et al. (64.4%)[15], Broor et al. (73.1%)[16], Sehgal et al. (58.25%)[17], and Drummond et al. (58%),[18]; these results may be attributed to cultural factors, such as preference in seeking medical care for boys.

Results of age distribution was in accordance with previous studies by Srinivasa et al.[12], Savitha et al.[15], Broor et al.[16] and Sehgal et al.[17], where infants with ALRI accounted for 58%, 52% and 62%, respectively. This may be due to functional immaturity of the immune system and other anatomic factors such as narrow airways, short bronchial tree and under development of lungs. In addition, there was a significant association between age and ALRI severity, which is in agreement with El- Zanaty et al.[19], and Khalek and Abdel-Salam.[20] The incidence of ARI was common in children living in rural areas may be due to poor housing, overcrowding and low socio-economic factors. This was in agreement with Savitha et al.[15], and Hamid et al.[21] As to malnutrition in our study, 59.3% of cases were under weight, 28.7% had PEM and 34% had features of rickets, in addition, anemia was present in 82% of cases, 10% of them were severe and required blood transfusion and most of them were due to iron deficiency. These results were similar to studies by Kumar et al.[24] and Srinivasa et al.[12]

In addition, 64.7% of cases were not breast-fed and inappropriate weaning was found among 59.3% of cases. These findings are in agreement with Broor et al.[16], and Savitha et al.[15], they reported high incidence of ARI among children who are not exclusively breast-fed or who did not receive proper weaning. In our study, 94.7% of the cases presented with cough and 76.7% with fever 18.0% of cases had cyanosis and altered sensorium. Among signs, tachypnea and chest indrawing were seen in 92.7% and 58% of cases and wheeze (68.7%), these findings were comparable with other studies like Kabra et al.[23], Ujunwa and Ezeonu[24] in their study, found cough and fever in 95% and difficult breathing in 38% of cases.

Other studies reported by Savitha et al.[15], 12.51% were pneumonia, 82.69% were severe and 4.8% were very severe pneumonia and Yousif and Khaleq[25] graded 23.4% as no pneumonia, 48.2% as pneumonia, 19.6% as severe and 8.8% as very severe pneumonia. Among 150 cases the most common clinical diagnosis was lobar pneumonia 32%, bronchopneumonia 31% and bronchiolitis 33% of cases. Pleural effusion was diagnosed in 9.3%, WALRT in 9.3% and Croup in 6.7%. These are in accordance with a study by Reddaiah and Kapoor[26]; bronchopneumonia was diagnosed in 64%, lobar pneumonia in 6.4% and post measles bronchopneumonia in 4.0% of cases. In this study, oxygen was required by 95.5% of cases, continuous positive airway pressure therapy (CPAP) administration in 12.5% and mechanical ventilation in 10.5% of cases.

Sepsis was the frequent complication occurred in 7% of mechanically ventilated infants cases. In this study change of antibiotics was required in 36% of cases, and the duration of stay in hospital was significantly less in cases of severe pneumonia compared to very severe pneumonia; these results are in agreement with Duke et al.[27], which reported that change in antibiotics in 11% of patients and 44.5% had hospital stay of more than 7 days. Mortality in our study was 6.0%; most cases were younger, less than 6 months and died from complications of sepsis and mechanical ventilation.

The results are relatively higher than those reported by Mishra et al.[28] that noted a mortality of 7.7% and Kumar et al.[22] which was 8%, this is due to many cases with severe and very severe pneumonia referred to our unit from many centers, and most of them were complicated by sepsis and multiple organ failure. Pneumonia is the main killer disease in children under 5 years in our locality most governmental and non-governmental agencies should collaborate to combat deaths from ARI via training of local health personnel in

early recognition, treatment and referral of sick and at-risk children help in decreasing the morbidity and mortality.

REFERENCES

1. Nair H, Simoes EA, Rudan I, Gessner BD, Azziz-Baumgartner E, et al. (2013) Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children in 2010: a systematic analysis. Lancet, 381: 1380–90.
2. Walker CLF, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA, E, et al. Global burden of childhood pneumonia and diarrhoea. Lancet, 2013; 381(9875): 1405-1416.
3. Liu L, Johnson HL, Cousens S, Perin J, Scott S, et al. (2012) Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. Lancet, 379: 2151–61.
4. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global andregional mortality from235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burdenof Disease Study 2010. Lancet, 2012; 380(9859): 2095-128.
5. Jackson S, Mathews KH, Pulanic D, Falconer R, Rudan I, Campbell H et al.) Risk factors for severe acute lower respiratory infections in children: a systematic review and meta-analysis. Croat Med J., 2013; 54(2): 110-21.
6. Wonodi CB, Deloria-Knoll M, Feikin DR, DeLuca AN, Driscoll AJ, Moïsi JC, et al. Evaluation of risk factors for severe pneumonia in children: The pneumonia etiology research for child health study. Clin Infect Dis., 2012; 54 Suppl 2: S124-31.
7. Mertz D, Kim TH, Johnstone J, Lam PP, Science M, et al. (2013) Populations at risk for severe or complicated influenza illness: systematic review and meta-analysis. BMJ, 347: f5061.
8. Lozano JM. Epidemiology of hypoxaemia in children with acute lower respiratory infection. Int J Tuberc Lung Dis., 2001; 5: 496–504. PMID: 11409574.
9. Daniel E Roth,a Laura E Caulfield,a Majid Ezzatib, Robert E Black. Acute lower respiratory infections in childhood: opportunities for reducing the global burden through nutritional interventions.
10. WHO. Pneumonia. 2016. Available at: www.who.int/mediacentre/factsheets/fs331/en.
11. Lamberti L, Zakarija-Grkoviç I, Fischer Walker CL, Theodoratou E, Nair H, et al. Breastfeeding for reducing the risk of pneumonia morbidity and mortality in children under two: a systematic literature review and meta-analysis. BMC Public Health, 13: S18.
12. Srinivasa S., Shruthi Patel. A study on distribution pattern of lower respiratory tract infections in children under 5 years in a tertiary care centre. Int J Contemp Pediatr, 2018; 5(2): 456-61.
13. Paramesh H. Epidemiology of asthma in India. Indian J Pediatr, 2002; 69(4): 309-12.
14. Udaya K, Murteli VB, Desai A. Clinical profile of children with pneumonia admitted at tertiary care hospital, Belgaum: a prospective study. Indian J Child Health, 2017; 4(3): 352-5.
15. Savitha MR, Nandeeshwara SB, Kumar PMJ, Ul-Haque F, Raju CK. Modifiable risk factors for acute lower respiratory tract infections. Indian J Pediatr, 2007; 74: 477-82.
16. Broor S, Pandey RM, Ghosh M, Maitreyi RS, Lodha R, Singhal TS, et al. Risk factors for acute lower respiratory tract infections. Indian Pediatr, 2001; 38: 1361-7.
17. Sehgal VK, Mahesh RMU, Kandat J, Ponugoti M. Clinical study of lower respiratory tract infection in children attending a tertiary care hospital. Int J Contemp Pediatr, 2017; 4: 1733-38.
18. Drummond M, Pellegrin MC, Becker G, Lazzerini M, Risk factor for mortality from acute lower respiratory tract infection in children under 5 five years of age in low and middle-income countries: a systemic review and meta-analysis of observational studies. Plos One., 2015; 10(1): e0116380.
19. El-Zanaty F and Associates. Egypt Demographic and Health Survey 2014. Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International, 2015. Available at: https://dhsprogram.com/pubs/pdf/PR54/PR54.pdf.
20. Khalek EMA, Abdel-Salam DM. Acute respiratory tract infections in children under 5 years of age in Upper Egypt. Int J Community Med Public Health, 2016; 3: 1161-66.
21. Hamid M, Qazi SA, Khan MA. Clinical, nutritional and radiological features of pneumonia. J Pak Med Assoc., 1996; 46: 95-9.
22. Kumar AMK, Badakali AV, Mirji G, Vanaki RN, Pol R. Clinical profile and outcome of acute lower respiratory tract infection in children aged between 2 months to 5 years. Int J Contemp Pediatr, 2017; 4: 105-9.
23. Kabra SK, Verma IC. Acute lower respiratory tract infection. The Forgotten Pandemic, 1999; 66: 873-5.
24. Ujunwa FA, Ezeonu CT. Risk factors for acute respiratory tract infections in under-five Health Sci Res., 2014; 4(1): 95-9.
25. Yousif T, Khaleq B. Epidemiology of acute respiratory tract infections (ARI) among children under five years old attending Tikrit General Teaching Hospital. Middle East Journal of Family Medicine, 2006; 14(3): 148-52.
26. Reddaiah VP, Kapoor SK. Acute respiratory infections in under five: experience at comprehensive rural health services project

hospital Ballabgarh. Indian J Community Med., 1995; 20: 1-4.
27. DukeT Christi MJ, Tebruegge M, la Vincent S, Raham SM, Pneumonia in severely malnourished children in developing countries-mortality risk, aetiology and validity of WHO clinical signs: A systematic review. Trop Med Int Health, 2009; 14: 1173e-89.
28. Mishra AS, Iyer CR, Gornale VK, Katwe N, Sushma S, Harsha PJ, et al. Clinical profile of acute lower respiratory tract infections in children between 2 months to 5 years. J Evidence Based Med Healthcare, 2015; 2(35): 5426-31.