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ASSESSMENT OF PREVALENCE, RISK FACTORS AND OUTCOMES OF ACUTE RESPIRATORY TRACT INFECTION IN CHILDREN UNDER FIVE YEARS IN AMIRIYA GENERAL HOSPITAL, ANBAR-IRAQ

[1]*Dr. Muthana Dahham Mohammed, **[2]Dr. Mohammed Abdulrazzaq Mahmood**, **[3]Dr. Ahmed Fawzi Ibrahim Luhaibi**

[1,3]M B. Ch. B, Diploma D.C.H, College of Medicine Al Anbar University, Department of Pediatrics - Amiriya General Hospital - Anbar /Iraq.
[2]M. B. Ch. B, Diploma D.C.H, AL Mustansiriya College of Medicine, College of Medicine -Al-Nahrain University, Department of Pediatrics - Al Alwiya Children's Hospital Baghdad /Iraq.

***Corresponding Author: Dr. Muthana Dahham Mohammed**
M B. Ch. B, Diploma D.C.H, College of Medicine Al Anbar University, Department of Pediatrics - Amiriya General Hospital - Anbar /Iraq.

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ABSTRACT
Acute respiratory infection is still the leading cause of morbidity and mortality in children under five in many countries. The aim of this study was to assess the incidence and risk factors predicting the outcome of acute respiratory infections (ARI). This hospital-based case study was conducted at Amiriya general hospital, Anbar/Iraq from December 2016 to December 2018 on (150) children from 2 months up to five years presented with criteria of ALRI according to WHO criteria and evaluated for clinical presentation, risk factors and outcome. Routine investigations such as CBC, CRP and chest X-ray were done for all cases. The results showed that the highest incidence was among infants below 6 months (40%) and among male children (54%). The majority of children had anemia (82%) and PEM (34.7%). The most common clinical diagnosis was lobar pneumonia (36%), followed by bronchopneumonia (20%) and bronchiolitis in (18%). Croup was diagnosed in (6.7%), pleural effusion in (10.7%) of cases, while WALR was diagnosed in (8.7%) of cases. Need to antibiotic change, duration of stay and outcomes were significantly associated to pneumonia severity (p=0.001, p=0.009 and p=0.025, respectively); while need to oxygen therapy was highly significant (p=0.001). Sepsis was the most frequent cause of death and mortality rate was found in 18(12.0%) cases. It can be concluded that young age, malnutrition and poor socioeconomic status play an important role in in the morbidity; 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 infections (ALRTI) is responsible for 20% of deaths in under five years old children. Every year about 120–156 million cases of ALRI occur globally, and 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 Amiriya general hospital, Anbar/Iraq from December 2016 to December 2018 on (150) children aged from 2 months to 5 years and presented with manifestations suggestive of lower respiratory tract infection and onset of symptoms less than two weeks was 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] The children were classified into three groups according to age: Group 1, children aged from two to six months included 60 children (32 males and 28 females), Group 2, children aged from six to 24 months included 50 children (26 males and 24 females), and Group 3, children aged from two to five years included 40 children (23 males and 17 females).

Children were subjected to detailed thorough history taking, particularly past history, family history, nutritional history, immunization status, as well as 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 were documented. Cases were followed until recovery or death. Those with manifestations of severe respiratory distress were admitted to PICU. 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 containing tube for blood picture, and the other 2.5 ml was allowed to clot and was centrifuged, the resulting serum was used for CRP measurement by the standard nephelometric analysis method. Other investigation like culture and sensitivity for 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 version 20 program was used to analyze data. Group comparisons were done by the Chi-squared test or Fisher's exact test for categorical variables. Probability (p-value) of less than 0.05 was considered significant.

RESULTS

Table (1) summarizes the demographic and clinical characteristics of the patients, there were more males than females (54% and 46%, respectively), and children below 6 months constituted (40%). Regarding residence, the incidence increased in children living in rural areas (61.3%), lack of breast-feeding was present in 54% of children and improper weaning in 64.9%. Regarding nutritional status, most of the children were under weight (60%), in addition, rickets was found in 44% of cases and protein energy malnutrition (PEM) in 34.7%. Cough was the main presenting symptom (100%) followed by fever, tachypnea (84%), and chest indrawing (60%).

Laboratory investigations in table (2) revealed that anemia was present in (82%) of patients varying from mild to severe anemia, most of them were due to iron deficiency, total leucocytes increased in (46%), and decreased in 16%. In addition, C-reactive protein (CRP) was positive in (84%) of patients. Radiological findings consolidation was by far the most common presentation (40%), followed by bilateral infiltrates (16%), while normal findings were present in (14.7%) of cases as shown in table (3).

Table (1): General description of the studied cases.

Variables	Frequency Total number (150)	Percentage
Gender		
Male	81	54%
Female	69	46%
Age		
Below 6 months	60	40.0%
From 6-24months	50	33.3%
From 24-60 months	40	26.7%
Residence		
Urban	58	38.7%
Rural	92	61.3%
Breast feeding Yes	46	46%
No Weaning;	54	54%
Proper	34	35.1%
Improper	63	64.9%
Nutritional status		
Average	60	40 %
Underweight	90	60%
PEM	52	34.7%
Rickets	66	44.0%
Symptoms		
Fever	126	84%
Stridor	30	20%
Cough	150	100%
Tachypnea	126	84%
Wheezes	81	54%
Chest indrawing	90	60%
Cyanosis	22	14.7%
Fully vaccinated;		
Yes	130	86.7%
No	20	13.3%

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

Investigation	Frequency	Percentage
Anemia;		
Mild Hb 10-8 gm/dl	45	30%
ModerateHb6-8gm/dl	63	42%
Severe Hb ≤ 6gm/dl	15	10%
Total leucocytic counts		
≤ 4000	24	16%
4000-12000	57	38%
≥ 12000	69	46%
CRP +ve	126	84%
-ve	24	16%
Pleural fluid culture +ve	10	6.7%
-ve	7	4.7%
+ve: positive; -ve: negative.		

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

Radiological finding	Total number 150	Percentage
Consolidation	60	40%
Unilateral infiltrate	15	10%
Bilateral infiltrate	24	16%
Collapse	10	6.7%
Effusion	15	10%
Pneumothorax	7	4.7%
Hyperinflation	8	5.3 %
Normal	22	14.7%

Table (4) showed the distribution pattern of ARI, out of 150 cases, the most common clinical diagnosis was lobar pneumonia (36%), followed by bronchopneumonia (20%), and bronchiolitis in (18%). Croup was diagnosed in 6.7%, pleural effusion in 10.7% of cases, and WALR was diagnosed in 8.7% of cases. Change in antibiotics, duration of stay and outcomes were significantly associated to pneumonia severity (p=0.001, p=0.009 and p=0.025, respectively); while need for oxygen therapy was highly significant p=0.001). As seen in table (5), 18(12.0%) of them died because of complications of sepsis and mechanical ventilation.

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

Final diagnosis	Below 6 months, n=60	6- 24 months, n=50	24- 60 months, n=40	P-value
Croup, number (%) No= 10 (6.7%)	2 (20 %)	5 (50%)	3 (30%)	0.11
Bronchiolitis No=27 (18%)	6 (22.2 %)	17 (63.0%)	4 (14.8%)	0.09
Bronchopneumonia No=30 (20%)	16 (53.3%)	8 (26.7%)	6 (20.0%)	0.07
Lobar pneumonia No=54 (36%)	29 (53.7%)	17 (31.5%)	8 (14.8%)	0.05
WALRTI No=13 (8.7%)	2 (15.4%)	8 (61.5%)	3 (23.1%)	0.07
Pleural effusion No=16 (10.7%)	1 (6.3%)	9 (56.3 %)	6 (37.5%)	0.08

WALARTI: Wheeze associated lower respiratory tract infection

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

Variables	Sub-group	Pneumonia 27 cases (18.0%)	Severe Pneumonia 75 cases 50.0%)	Very severe Pneumonia 48 cases (32.0%)	Total, n=150	P-value
Changes of antibiotics	Yes	0	20	30	50	0.001
	No	27	55	18	100	
Oxygen	Yes	18	75	48	141	0.001
	No	9	0	0	9	
Duration of stay, day	≤ 7 d	23	50	22	95	0.009
	7-14	4	16	16	36	
	≥ 14	0	9	10	19	
Outcome	Improved	27	67	38	132 (88.0%)	0.025
	Died	0	8	10	18(12.0%)	

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 incidence in their study was 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]

In our study there was a slight increase in incidence in males (54%) than females (46%), this was in agreement with many previous studies by Srinivasa et al.[12], Savitha et al.[15], Broor et al.[16], Sehgal et al.[17] and Drummond et al.[18]; these results may be attributed to cultural factors, such as preference in seeking medical care for boys. Concerning age distribution, in our study ALRI among infants less than 6 months was 40%, this was in accordance with previous studies by Srinivasa et al.[12], Savitha et al.[15], Broor et al.[16] and Sehgal et al.[17] 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 was in agreement with El- Zanaty et al.[19] and Khalek and Abdel-Salam.[20] In the present study, the incidence of ARI was common in children living in rural areas compared to those in urban areas and these findings may be due to poor housing, overcrowding and low socio-economic factors. This finding agreed with Savitha et al.[15] and Hamid et al.[21] As to malnutrition, in our study 60% of cases were under weight, 34.7% had PEM and 44.0% 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.[22] and Srinivasa et al.[12]

The results also showed that 54% of cases were not breast-fed and inappropriate weaning was found among

64.9% of cases. These findings were in agreement with Broor et al.[16], and Savitha et al.[15] who reported high incidence of ARI among children who were not exclusively breast-fed or who did not receive proper weaning. In our study, 100% of the cases presented with cough and 84% with fever, while 14.7% of cases had cyanosis and altered sensorium. Among signs, tachypnea and chest indrawing were seen in 84% and 60% of cases and wheeze (54%), which 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. Out of 215 cases, 18.6%, 49.95% and 31.7% were pneumonia, severe and very severe pneumonia, respectively.

These studies were similar to those reported by Savitha et al.[15], and Yousif and Khaleq.[25] Among 150 cases, the most common clinical diagnosis was lobar pneumonia 36% followed by bronchopneumonia 20% and bronchiolitis 18%. Pleural effusion was diagnosed in 10.7%, WALRT in 8.7% and Croup in 6.7%. These results were in accordance with a study by Reddaiah and Kapoor[26] who reported that bronchopneumonia was diagnosed in 64%, lobar pneumonia in 6.4% and post measles bronchopneumonia in 4% of cases.

In this study, oxygen was required by 94% of cases. Change of antibiotics was required in 33.3% of cases, and the duration of stay in hospital was significantly less in cases of severe pneumonia compared to very severe pneumonia; these results agreed with Duke et al.[27] Mortality rate in our study was 12%; 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] who 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.

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