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A Study of the Clinical Characteristics of Hospitalized Pneumonia Patients in Alexandria University Children's Hospital

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Abstract
Pneumonia is considered the most common cause of death due to infection among children under five. About 2 million episodes of pneumonia occur among children under 5 years old annually in Egypt The objectives of this study were to study the clinical characteristics of pneumonia patients and to evaluate the applied clinical practices in the management of these cases. This was done through prospectively collecting demographic and clinical details for pneumonia cases aged 29 days-15 years during the winter season of 2015-2016.It was found that among 130 subjects, the male-to-female ratio was 1:1, patients aged ≤ 2 years comprised 69.2% of the cases, the most common symptoms were cough and fever and 71.5% had co-morbid conditions. The most commonly used antibiotic was Ceftriaxone and most of the cases were treated using combined antibiotics. However, 11.5% died, while 22.3% had complications. The hospital stay duration had a mean of 6.92 ± 7.56 and the difference in mean hospital stay duration between cases of isolated pneumonia versus cases of pneumonia with an associated illness was statistically nonsignificant . This can lead to the conclusion that pneumonia is more common in infants and in children with co-morbid conditions and that pneumonia cases having other associated illnesses don't necessitate longer duration of hospital stay.

Introduction

Pneumonia is an inflammation of the lung parenchyma that is associated with symptoms of infection (e.g. fever and cough), abnormal chest findings(i.e. tachypnea, chest in drawing, altered breath sounds and rales), and/or radiological signs of consolidation of part or parts of one or both lungs.[1,2]

It is the most common cause of death in children older than 28 days globally. According to the World health organization (WHO) records in 2006, about 2 million episodes of pneumonia occur among children under 5 years old annually in Egypt.[3] It is important to note that the incidence of pneumonia in males is higher than in females[4] and that community-acquired pneumonia (CAP) occurs more during winter and spring.[5]

Pneumonia occurs in increased frequency in cases of immunodeficiency, chronic lung diseases, sickle cell disease, nephrotic syndrome, certain hematologic malignancies, previous or current serious illness and malnutrition. [6]

It can be caused by viruses, bacteria or fungi. Respiratory syncytial virus is the most common virus which causes pneumonia in developing countries, while *Streptococcus pneumoniae* is the most common bacterial cause. Mixed viral and bacterial infection account for 30 to 50 percent of the cases of CAP infections in children. [7,8]

In a typical scenario, pneumonia follows an upper respiratory tract illness that permits invasion of the lower respiratory tract by pathogenic organisms, that trigger the immune response and produce inflammation causing the lower respiratory tract air spaces to be filled with white blood cells (WBCs), fluid and cellular debris.[7]

In children under 5 years of age, the presence of cough and/or difficult breathing with either fast breathing or lower chest wall indrawing and even without fever is enough to diagnose pneumonia. [9]

While most pediatric CAP will be managed in primary or secondary care, in complications referral to a tertiary centre may be necessitated. In a recent British Thoracic Society(BTS) Pediatric Pneumonia Audit, the overall complication rate was 7.1%, with empyema in 4.4% and lung abscess in 0.9% of children.[10]

Treatment of pneumonia may require oxygen therapy, fluid therapy and antibiotic therapy which is often empirically initiated, according to the expected bacterial pathogens, age-group and clinical severity. [8]

The lack of local information about the cases of pneumonia admitted in Egypt's hospitals motivated us to perform this study aiming at studying the clinical characteristics of pneumonia patients admitted in Alexandria University Children's Hospital at ElShatby over a three months period and to evaluate the applied local clinical practices in the management of these cases.

Materials and Methods

Demographic and clinical information were prospectively collected for *admitted cases aged between 29 days and 15 years with a diagnosis of pneumonia* in Alexandria University Children's Hospital at ElShatby during the period from 21/12/2015 to 21/3/2016.

All cases were evaluated through history taking and full clinical examination focusing on chest examination.

The treatment given to the cases and the outcome of the cases including the mean hospital stay, the complications and the fate were recorded and the data were fed to the computer and analyzed using IBM SPSS software package version 20.0. Qualitative data were described using number and percent, while quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Chi-Square test was used to test the association between qualitative nominal variables, and Fisher's exact test was used whenever the expected frequency in any of the cells of 2×2 table fell below 5. Mann-Whitney Test was used for comparing two group medians based on independent samples (by ranking).

Results

The study included hundred and thirty infants and children, 69.2% of them were infants, while 23.1% were preschool children and 7.7% were school children. Regarding the gender, the cases were divided into 65 males (50%) and 65 females (50%), and 95 cases (73.1%) were from Urban areas, of whom (53.1%) were residents of Alexandria in different districts; as 23 cases (17.7%) were from El Montazah, 15 cases (11.5%) from El Amreya , 11 cases (8.5%) from East, 7 cases (5.4%) from each of Middle and West of Alexandria, 4 cases (3.1%) from El Agamy and 1 case (0.8%) from each of Borg El Arab and El Gomrok. Cases from Beheera were 53 (40.8%), from Marsa Matrouh were 4 children (3.1%), from Suhaj were 2 children (1.5 % of cases) and from each of ElMenya and El Monofeya were only 1 child (0.8 %). (Table 1)

The most common observed symptom in these was cough, which was present 99.2% of them, followed by fast breathing in 94.6%.Table (1) shows the distribution of the cases according to the main symptoms and signs.

Table (1): Distribution of the studied cases according to the main symptoms and signs

	No.	%
Cough		
Yes	129	99.2
No	1	0.8
Fever		
Yes	114	87.7
No	16	12.3
Fast breathing		
Yes	123	94.6
No	7	5.4
Chest retractions		
Yes	46	35.4
No	84	64.6
Rales		
Yes	74	56.9
No	56	43.1
Bronchial breathing		
Yes	11	8.5
No	119	91.5
Wheezes		
Yes	98	75.4
No	32	24.6
Decreased air entry		
Yes	36	27.7
No	94	72.3

Thirty seven cases of the study's cases (28.5%) were admitted with isolated pneumonia while the remaining 93 cases (71.5%) were admitted with pneumonia associated with other illnesses, as cardiac diseases occurred in (26.2%), neurological diseases in 15.4%, metabolic diseases in (10%), gastrointestinal disease in (7.7%), Down syndrome in (6.9%), immunological disorders in (5.4%), nutritional disorders in (3.1%), in the form of failure to thrive in 2 cases (1.5%) and each of hypocalcemia and rickets in 1 case (0.8%), hematological diseases in (2.3%), each of renal and urological disease and bone disease in (1.5%) and each of laryngeomalacia and leukemia were present in (0.8%).

Combined antibiotics were used in the treatment of most of the cases and Ceftriaxone was the most commonly antibiotic. Table (2) shows the distribution of cases according to antibiotics used.

Table (2): Distribution of the studied cases according to the antibiotics used

	No.	%
Cases used combined antibiotics	117	90.0
Cases used single antibiotic	13	10.0
Antibiotics	No.	%
Ceftriaxone	85	65.3
Ampicillin-sulbactam	62	47.7
Vancomycin	49	37.7
Cefotaxime	38	29.2
Clarithromycin	34	26.2
Meropenem	33	25.4
Amikacin	12	9.2
Azithromycin	10	7.7
Metronidazole	7	5.4
Ciprofloxacin	5	3.8
Levofloxacin	4	3.1
Ceftazidime	4	3.1
Amoxicillin-clavulinic acid	3	2.3
Cefoperzone-sulbactam	1	0.8
Imipenem-cilastatin	1	0.8
Penicillin G	1	0.8
Cefepime	1	0.8

The course of the disease was smooth and ended with cure in 86 cases (66.2%) and was complicated in 44 cases (33.8%), as death occurred in 15 cases (11.5%), sepsis and shock in 14 (10.8%), pleural effusion in 7 (5.4%), each of respiratory failure, lung abscess and lung collapse in 2 (1.5%) and each of cavitary pneumonia and bronchiectasis in 1 (0.8%). The hospital stay duration ranged from a minimum of 0 days as 3 cases died on the day of admission, 1 case was referred, 1 case escaped and 1 case was discharged against medical advice on the same day of admission, to a maximum of 15 days with mean duration of 6.92 ± 7.56 days (Median 5 days). The hospital stay duration of 12 cases (9.2%) out of 130 cases was less than 2 days. The hospital stay duration of 20 cases (15.4%) was from 2 to less than 4 days. The hospital stay duration of 47 cases (36.2%) was from 4 to 6 days. The hospital stay duration of 51 cases (39.2%) was more than 6 days.

The difference in mean hospital stay duration between cases of isolated pneumonia versus cases of pneumonia with an associated illness was statistically nonsignificant (p=0.179) and the difference in deaths of pneumonia in cases <2

years of age versus deaths of pneumonia in cases ≥ 2 years of age was statistically nonsignificant too (p=147).

Table (3) shows the mean hospital stay of cases of isolated pneumonia and cases pneumonia with associated illnesses.

Table (3): Mean hospital stay of isolated pneumonia and pneumonia with associated illnesses

	Isolated pneumonia (n=37)	Peumonia with an associated illness (n=93)	P
Hospital stay duration (days) Min – Max Mean Median	 1.0 – 35.0 6.95± 7.53 5	 0 – 60 7.89 ± 8.33 6	 0.179*

p: p value for Mann Whitney test for comparing between Isolated pneumonia and peumonia with an associated illnesses.

*:Statistically non significant

Table (4) shows deaths of pneumonia in cases < 2 years of age and deaths of pneumonia on cases ≥ 2 years of age

Table (4): Deaths of pneumonia in cases < 2 years of age and deaths of pneumonia in cases ≥ 2 years of age

	Cases < 2 years (n=90)		Cases ≥ 2 years (n=40)		FEp
	No.	%	No.	%	
Died of pneumonia (n=15)	13	14.4	2	5.0	0.147*
Survived pneumonia (n=115)	77	85.6	38	95.5	

p: p value for Fisher Exact for Chi square test for comparing between <2 and ≥2 years.

*: Statistically nonsignificant

Discussion

The current study found that male to female ratio of pneumonia cases was 1:1, which is lower than reported by Wang et al 2013 [11],which was 1.4: 1.Lifestyle, behavioral, and socioeconomic differences between males and females may explain the observed findings.

In the present study, it was observed that most of the cases with pneumonia were infants (69.2%). Gentile et al [12] reported similar results, as pneumonia cases in their study occured mainly in infancy and early childhood under 2 years old.

In the current study most of the cases were from urban areas of Egypt, which was smiliar to the results of FonsecaW et al[13]. This could be attributed to more air pollution in the urban areas.

Cough was the most common presenting symptom in the present study, as it occurred in 99.2% of patients, while fever occurred in 87.7% of patients. It was also found that wheezes was present in 75.4% of the studied cases, which is similar to what was reported by Wang et al and Al-Dabbagh et al [11,14]. This is may be due to mixed viral/bacterial pneumonia or associated bronchial asthma, and the fact that most of the cases in both studies were infants who are prone to wheezes because of small caliber peripheral airways.

Rales were present in 56.9% of the cases, which is much less than what was reported in Al-Dabbagh et al.[14] The different stages of resolving pneumonic consolidation possibly explain most of the differences in the description of auscultatory findings in pneumonia.

In the current study, it was found that (71.5%) of cases were admitted with pneumonia associated with other diseases, of which the most common was cardiac and neurological diseases. Jain S et al [15] also reported associated illnesses with pneumonia in 51% of the cases. This could be explained by that, children with chronic or major illness have a impaired immunity and poor nutrition predisposing them to various infections including pneumonia.

Regarding antibiotics used, the current study found that combined antimicrobial drugs were used in the majority of cases and that the most commonly used antibiotic was Ceftriaxone, which was used in 65.3% of the cases, while Penicillin G was used only in one case, which is different from the results of Jelcic et al [16] who found that penicillins were used in two thirds of cases (60.7

%) and cephalosporins were used in 13.7% of the cases. These differences could be explained by that the pediatricians in Alexandria University Children's Hospital depend mainly on empirical treatment for expected organisms with overuse of broad spectrum injectable antibiotics while most of published works done in developed countries depend on the results of various cultures, CXR, clinical assessment, in addition to empirical treatment of expected organisms.

Pleural effusion was the most common pulmonary complication in the current study, while death occurred in 15 cases (11.5%). This is much more than what Ayieko P et al [17] reported in their study, which was the death of (5.9%) of their patients. This could be explained by the fact that Alexandria University Children's Hospital is a referral hospital, and severe cases from all the surrounding hospitals are referred to it.

In the current study, there difference in the duration of hospital stay between cases with co-morbid conditions and cases with isolated pneumonia was nonsignificant. Also, the difference in the deaths of pneumonia in cases who were <2 years of age and the cases who were ≥ 2 years of age was statistically nonsignificant. These results were similar to what was reported by Caggiano S et al [18] who found that co-morbidities did not increase the length of hospitalization and that there were no differences in terms of death and severity of pneumonia between both sexes and among younger and older aged children.

Conclusion

The current study concluded that pneumonia is more common in infants than older children and that children from Alexandria and nearby Beheera governorate represent most of the cases admitted to the hospital due to pneumonia. Heart disease and neurological conditions are the commonest co-morbid conditions but having other associated illnesses don't cause longer duration of hospital stay. Concerning the treatment, Combined and broad spectrum injectable antibiotics are the most frequently used for treatment. More surveillance studies should be done and their results should be considered in the compulsory vaccination program plan in Egypt to curb the burden of pneumonia especially in children with chronic diseases to acertain extent.

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