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Pattern of acute respiratory infections in hospitalized children under five years of age in Jos Nigeria

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Abstract *Background:* Acute respiratory infections are the commonest cause of acute morbidity in children especially those under five in the developing countries. Clinical diagnosis is of utmost importance considering the unavailability of radiological and microbiological services in most primary care settings in most developing countries.
Methodology: Thirty nine children with symptoms of acute respiratory infection attending our emergency room over a one year period were recruited. Each had a CXR and blood culture ordered by the attending physician on admission.
Results: Thirty nine subjects were admitted with ARI with a hospital prevalence of 43.5/1000 person per year (39/897). Mean age was 18.75+17.23 mo, (Females =25.6+19.1, Males = 13.8+14.2, t=2.2, p=0.03). Bronchiolitis was the commonest ARI seen in infants, tonsillitis in children beyond infancy while pneumonia was seen in all age groups. The cardinal feature of each disease entity was Fever, cough, breathlessness, tachycardia and hypoxemia in those with Pneumonia; Catarrh, nasal congestion and tachypnoea in those with bronchiolitis, while fever and vomiting were seen in those with pharyngotonsilitis.
Conclusion: This review highlights the common ARI in our setting. Efforts need to be intensified on the identification of children with ARI in the children emergency room with the aim of prompt and appropriate management in order to meet the MDG targets.

Introduction

Acute respiratory infections are the commonest cause of acute morbidity in children especially those under five in the developing countries.[1,2] Viral and bacterial organisms have been implicated as causative agents for most ARI in children.[3,4] Most diagnosis of ARI is made in the presence of clinical features and where available also radiological appearances especially in the case of Pneumonia.[4,5] However, radiological services in most cases are only available in tertiary care facilities with few radiologists available for specialist interpretation of films.[6,7] This then makes clinical diagnosis imperative and of utmost importance considering the high burden and the case fatality rate for children with ARI in developing countries.[8,9] There are features that are highly suggestive of ARI and have been defined by WHO(R) in the ARI case management for primary health care providers.[10] While this is very useful, few applications exist to distinguish the various forms of ARI-pneumonia. Bronchiolitis and others like pharyngotonsilitis. While the use of pulse oximetry has been deployed in several centres, its application and interpretation remains a challenge.

We sort therefore to examine the pattern of ARI in our environment, vis-a-vis age, sex, anthropometric findings, clinical symptoms and signs and pulse oximetry reading in ARI as seen in our hospital.

Patients and methods

Thirty nine children with symptoms of acute respiratory infection attending the emergency room of the Jos university teaching hospital over a one year period were recruited. Each had a CXR ordered by the attending physician on admission. All children with symptoms of ARI necessitating admission were recruited. However subjects with cardiovascular, pulmonary, or neurological congenital defects, or if 6weeks and below as well as those with chronic respiratory tract disorders or diseases

were excluded.

Informed consent was sought from care givers of all eligible children and only those who consented to participate in this study were recruited into the study. All children were evaluated by the attending physicians (1 of 4 of the investigators)
Data was collected using a standardised questionnaire which included information such as cough, fast breathing/rapid breathing, fever or hypothermia, nasal congestion, catarrh or vomiting. Axillary temperature and the status of the child (quiet or fussy/crying) were recorded. Hypoxaemia detected using pulse oximetric readings ($_{SaO2}$) measured three times using a Nellcor N10 oximeter with an adhesive sensor attached to the child's index finger was noted.

A complete chest examination was done. The presence of nasal flaring, retractions, wheezing or grunting was established with the child's chest naked, and the respiratory rate was determined by counting the respiratory movements for one minute. Auscultation for breath sound character and quality was done while the presence of abnormal respiratory sounds (crepitations, rhonchi, reduced breath sounds) were also recorded. All cases of ARI had chest radiograph against which we compared the clinical features being studied. Children with a history of rapid breathing, a history of difficulty drinking, tachypnoea (respiratory rate greater than 40 breaths/ minute for children older than 12 months, and greater 50 breaths/minute for children aged 3-12 months),wheezing, nasal flaring, or chest in drawing in the presence of a pulmonary parenchymal density compatible with pneumonia on chest radiograph as interpreted by the paediatric radiologist were defined as having pneumonia. While those with painful swallowing, vomiting and pharyngeal hyperaemia and exudates in the tonsilar crypts were classified as tonsillitis.
Data so generated was analysed using the Stata IC 10 statistical software.

Results

During the study period, a total of 113 children were admitted into the unit, out of which 78 (69.0%) were children 5years and below. From this, 39(50%) were diagnosed with acute respiratory tract infection. Males were 22(59.0%) and Females 16(41.0%).
Mean age was18.75mo$\pm$17.23, (Females =25.6$\pm$19.1, Males = 13.8$\pm$14.2, t=2.2, p=0.03). The 0-11months old accounted for 48.7% (19) of the patients seen. This was followed by the 12-36 month group with 28.2% (11) while the 36-60 month old group were 23.1 % (9).

Patient distribution by diagnosis of ARI

Of the 19 infants seen, aged 0-11 months, 8(42.1%) each had bronchiolitis and pneumonia, while 3(15.8%) had pharyngotonsillitis. Similarly, among the 12-36mo olds seen, none had bronchiolitis, 8(72.7%) had pneumonia while 3(27.3%) had pharyngotonsillitis. In the age group 36 month and above, all 9(100%) were seen with pneumonia while none were seen with either bronchiolitis or tonsillitis.

Frequency of common symptom encountered

Fever was found in all the children with pneumonia and tonsillitis but only present in 25% of those children seen with bronchiolitis.
Cough was a prominent symptom seen in 80% of children with pneumonia, while only 20% of those with bronchiolitis and none of those with tonsillitis presented with cough.
Breathlessness was seen in 75% of the children with pneumonia, while 25% of children with bronchiolitis and none of those with tonsillitis had breathlessness.
Catarrh was seen in 100% of those children with bronchiolitis while none of the children with pneumonia or pharyngotonsilitis had catarrh.
Vomiting was seen in only those children with pneumonia (25%) and those with tonsillitis (50%). This is as shown in table1

Table 1: Frequency of symptoms encountered by morbidity type

	% of children		
Symptom	Pneumonia	Tonsillitis	Bronchiolitis
Fever	100	100	25
Cough	80	25	0
Breathlessness	75	25	20
Catarrh	0	0	100
Nasal congestion	0	0	80
Vomiting	25	50	0

Cardiorespiratory parameters

The mean respiratory rate by age was 47±13.5 (range=30-80) for those aged 0-11 months, 33.6±6.9 (range=22-48), for those age 12-35 months and 35.8±10.5 (range=24-52) for those age 36-60 months. When stratified by diagnosis, the mean respiratory rate was 54.6±8.77 in children with bronchiolitis, 51.0±14.1 in those with pneumonia and 34.0±8.99 in those with acute tonsillitis.

The mean oxygen saturation by age was 96.3±2.08 (range=92-99) for those age 0-11 months, 95.8±4.8 (range=82-98), for those age 12-35 months and 96.6±1.9 (range=93-99) for those age 36-60 months. When stratified by diagnosis, the mean oxygen saturation was 97.8±0.71% in those with bronchiolitis, 95.5±3.40% in those with pneumonia and 97.5±0.55% in those with acute tonsillitis.

The mean pulse rate by age was 131.5±22.5 (range=98-162) for those age 0-11 months, 121.0±17.4 (range=100-153), for those age 12-35 months and 136.0±28.6 (range=160-168) for those age 36-60 months. When stratified by diagnosis, the mean pulse rate was

122.0±24.7, 134.4±23.2 and 117.3±14.3 in those with bronchiolitis, pneumonia and tonsillitis respectively. This is shown in table 2

Table 2: Cardio-respiratory parameters by morbidity of Subjects

Diagnosis	RR	SO2	PR
Bronchiolitis	44.6±8.77	97.8±0.71	122.0±24.7
Pneumonia	41.0±14.1	95.5±3.40	134.4±23.2
Tonsillitis	34.0±8.99	97.5±0.55	117.3±14.3

Commonest features of ARI

The cardinal feature of each disease entity was Fever (100%), cough (80%), breathlessness (75%), tachycardia and hypoxemia in those with Pneumonia. Catarrh (100%), nasal congestion (80%) and tachypnea(80%) in those with bronchiolitis. Fever (100%) and vomiting (100%) in those with pharyngotonsilitis. (Table 1 and 2)

Discussions

Clinical features and aetiologies of ARI differ from age to age and so also the patterns of the different ARI within the same age group.[11] Typical features of ARI include but are not limited to cough, breathlessness, catarrh, fever etc. Differences in features are seen in degree of respiratory distresses, hypoxaemia and age of typical presentation.[12] This was amply demonstrated in our study.

In this study we found, as has been reported severally [13,14] bronchiolitis in infancy, pharyngotonsilitis in older children and pneumonia cutting across all age groups as well as being the commonest ARI in our environment.[1,15] Younger children especially infants are predisposed to viral bronchiolitis because placentally transmitted anti-RSV maternal antibody, even if present in high concentration, provides partial but incomplete protection.[16] On the other hand, pneumonia is caused by a wide range of organism with most been virulent.[5,7] Besides, the absence of vaccine against the common under five causes of pneumonia in our national immunization schedule is a significant contributor to the high prevalence of pneumonia found in children under five years old. [17]

We also found a higher proportion of infants compared with other age groups presenting with ARI similar to previous reports where infants have been shown to be generally more predisposed to infections as a result of their relatively immature adaptive immune system compared to older children and adults.[18] Also, degradation of maternal antibodies, cessation of breastfeeding, and been at child-care centres increases the risk of infections especially respiratory tract infections.[19] It is thus not surprising that even in this study the proportion of children with ARI decreased with age.

Typical features seen in each entity showed fever and cough been predominant features in pneumonia while cough and catarrh were more frequent in bronchiolitis. Pharyngotonsilitis had more of fever and vomiting and less cough. Reports have shown bronchiolitis to be commonly associated with nasal congestion, catarrh and breathlessness. [20] The course of bronchiolitis is usually variable and dynamic ranging from transient events such as nasal blockade to progressive respiratory distress from lower respiratory tract inflammation and obstruction. As reported by other researchers[20,21] fever was not a common feature of bronchiolitis in our study. However, we did not find cough as a prominent symptom unlike what Fattouh et al[20] reported in Egypt. Since all our patients with bronchiolitis were younger than 6 months where cough is not so prominent with respiratory infections, it is not surprising that fewer than 25 percent of our children reported cough as a symptom.

On the other hand, that we found pharyngotonsilitis associated commonly with fever and vomiting is not surprising.[22] Though pharyngotonsilitis is an acute respiratory infection, its onset is sudden and usually characterized by symptoms of fever and sore throat, nausea, vomiting, headache, and rarely, abdominal pain.[22] Cough and breathlessness are not prominent features especially since it is an upper tract infection without the usual lung parenchyma inflammation and the lower tract obstruction seen in pneumonia and other lower tract infections.

In general, pneumonia was more associated with hypoxaemia than bronchiolitis and pharyngotonsilitis similar to what Shann et al,[23] in Papua New Guinea reported in their clinical assessment of ARI in children and the WHO clinical criteria for the diagnosis of ARI.[10] Like the Shann study[23], the present study made use of the added clinical finding of crepitations in the diagnosis of pneumonia. Crepitations had been demonstrated to give an added strength in the diagnosis of pneumonia.

Conclusion

This study showed that the commonest acute respiratory infections encountered in our emergency room were pneumonia, bronchiolitis and pharyngotonsilitis. Bronchiolitis is a frequent infection in infants while pharyngotonsilitis occur commonly in children beyond infancy. On the other hand, pneumonia cuts across all age group. Furthermore, the common features seen in the emergency room associated with pneumonia were cough, breathlessness, tachycardia and hypoxemia while bronchiolitis was more commonly associated with infancy, breathlessness, catarrh, and nasal congestion. Pharyngotonsilitis was seen in association with fever and vomiting.

Limitation

The small sample size here will preclude drawing hasty inferences however our findings still give some insight on the current problem as seen in our facility. Secondly,

our studied population consisted of only children admitted in the EPU rather than the whole paediatric cases seen in the facility with a diagnosis of ARI. Since most ARI will be mild and may not necessarily be admitted, that group seen in the outpatient clinic will be invariably missed.

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