

ORIGINAL ARTICLE

BURDEN AND SPECTRUM OF RESPIRATORY AILMENTS IN PAEDIATRIC TERTIARY CARE SETTING

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Background: Respiratory tract infections are a significant cause of mortality and morbidity in paediatric age group all over the world and especially in under developed regions. The present study was conducted with an aim to assess the burden and the types of respiratory illnesses in our region. **Methods:** The study was a cross sectional study conducted at Paediatric A unit of Ayub teaching hospital from 1st October, 2018 to 31st March, 2019. All patients aged 1 month and above who required admission for various respiratory ailments were included in the study. **Results:** A total of 2255 patients were admitted in Paediatric A unit over a six months period. Of these, 603 (26.74%) patients were admitted with various respiratory problems and were included in the study. Among these, 389 (64.5%) patients were male and 214 (35.5%) were female. Mean age of the participants was 18.77±30.87 months. The major disease categories were bronchopneumonia in 189 (31.3%), bronchiolitis in 176 (29.2%), measles pneumonia in 60 (10%), lobar pneumonia in 52 (8.6%) and upper RTI in 32 (5.3%). Mean duration of stay was 3.13±2.08 days. Majority of the patients 482 (79.9%) were up to 24 months of age, followed by 77 (12.8%) patients in 25–60 months age and 44 (7.3%) patients more than 60 months of age. A total 295 (48.92%) patients were vaccinated while 308 (51.07%) patients were either partially vaccinated 116 (19.2%) or unvaccinated 192 (31.8%). A total of 576 (95.5%) patients were discharged, 17 (2.8%) patients expired and 5 (0.8%) were referred to higher specialty. Bronchopneumonia was the leading cause of mortality in this study. **Conclusion:** Respiratory tract infections constitute a major threat to the health of paediatric patients especially in the first two years of life. Improvement in vaccination coverage is essential in reducing the burden of a majority of respiratory ailments along with health education.

Keywords: Respiratory tract infections; Pneumonia; Mortality

Citation: Bibi S, Gilani SYH, Siddiqui TS, Siddiqui A, Najeeb S, Sidra H. Burden and spectrum of respiratory ailments in paediatric tertiary care setting. J Ayub Med Coll Abbottabad 2021;33(1):97–101.

INTRODUCTION

Infections of the respiratory tract constitute an important aetiology contributing to paediatric morbidity and mortality all over the globe.¹ Although a significant number of patients <5 years of age are affected with ARI all over the world but mortality is mainly reported from the developing areas like Africa and South East Asia. Reports from WHO suggests nearly 1.9 to 2.2 million deaths from ARI annually, 70% of which are reported from these areas. Studies suggest an incidence rate of 0.22 episodes of ALRI per child per year with the majority cases reported from India, China, Pakistan, Bangladesh, Indonesia and Nigeria.² Pneumonia labelled as “the world’s biggest killer of children” by WHO³ accounts for a significant number of deaths in younger paediatric patients especially in the underprivileged countries of the world⁴. Also, pneumonia and bronchiolitis comprise the most common aetiologies requiring inpatient admissions in under five paediatric population.³ A number of risk factors have been linked to the development of LRTI in paediatric

population. These include the younger age groups, poor socioeconomic status, malnutrition, tobacco smoke and indoor fuel exposure, winter season, unvaccinated status and immunodeficiency states.⁵ In spite of a multitude of medical research, a lot still needs to be discovered regarding aetiology of Pneumonia in different underdeveloped regions where it leads to a substantial number of deaths.⁶

Apart from the typical organisms like streptococcus pneumonia, many atypical pathogens like mycoplasma pneumonia and respiratory viruses have recently been the focus of interest keeping in view their ability to cause severe life-threatening respiratory illness necessitating hospitalization. Data suggests viral involvement in nearly 80% children below two years age with community acquired pneumonia with respiratory syncytial virus and influenza virus being the predominant pathogens.⁴ Bronchiolitis is also considered to be one of the commonest lower respiratory tract ailment in paediatric population. It is considered to have a seasonal predominance with a majority of cases

reported in the winter season. Being caused predominantly by respiratory syncytial virus in about 70% cases, the disease typically spans over 5–7 days with clinical features of cough, respiratory distress, wheeze/crackles and hypoxemia. The disease is more severe in patients with underlying congenital heart disease.⁷

Among respiratory tract infections, another highly communicable disease is Pertussis which is caused by *Bordetella Pertussis*. It is characterized by four stages and typical paroxysms of intense cough. This vaccine preventable disease is associated with many complications and can cause mortality in untreated patients especially the infants and younger paediatric patients. The disease is still prevalent in many parts of the world especially the developing countries.⁸ Respiratory viruses like influenza are also responsible for respiratory ailments in a significant number of paediatric patients. Vaccination is an important means of reducing the associated morbidity.⁹ Measles is a highly communicable viral respiratory ailment caused by measles virus and spreads through respiratory aerosols. The disease is vaccine preventable and associated with life threatening complications.¹⁰ Tuberculosis is considered to be one of the ten leading causes of mortality round the globe. The causative agent is *Mycobacterium tuberculosis* and it spreads through aerosolized droplets. Recent estimates suggest that nearly 1.7 billion people (23% of world population) is affected by *Mycobacterium tuberculosis*.¹¹ Tuberculosis, Pertussis and Measles present primarily as pneumonic illness. The complications and mortality associated with these vaccine preventable diseases can be reduced by vaccination.¹² Mortality from TB in paediatric population is quite high especially in untreated patients. Unfortunately, approximately two third of the children are either not diagnosed or not reported in many parts of the world.¹³ Pakistan is one of the top eight countries of the world with the highest number of tuberculosis patients.¹⁴

Cystic fibrosis, a rare genetic disorder afflicting around 90000 people all over the world is also an important cause of lung disease. Bacterial pathogens like *Staphylococcus aureus* and *Pseudomonas aeruginosa* cause serious respiratory problems in these genetically predisposed individuals leading to significant morbidity and mortality. In addition, viral pathogens are also responsible for serious disease in cystic fibrosis patients.¹⁵

Respiratory ailments are frequently encountered by mankind and have associated morbidity and complications. There are a variety of other implications as well in terms of absent days of work and school.¹⁶

There is scarcity of data estimating the burden of respiratory ailments in our region. Our estimates would help develop an insight into the burden of disease that could be utilized for assessing the need for equipment required for oxygen supply availability and medications and making efforts to provide them in the health facilities of this region especially at the district level.

MATERIAL AND METHODS

The study was a cross sectional study conducted in the Paediatric A unit of Ayub Teaching Hospital Abbottabad from 1st October, 2018 to 31st March, 2019. Approval of the hospital ethical committee was taken. A total 2255 patients were admitted in Paediatric A unit during this period. Out of these, all 603 patients aged 1 month and above who were admitted with signs and symptoms of respiratory disease and diagnosed as having respiratory ailments were included in the study. Patients who were admitted for other reasons and developed respiratory problem during hospital stay were excluded from the study. Patients with respiratory distress secondary to metabolic problems like acidosis secondary to chronic kidney disease and sepsis were also excluded from study. Patients' characteristics like age, gender, weight, duration of hospital stay, vaccination status, diagnosis and outcome were recorded on a structured proforma. Data was entered and analysed using SPSS version 20.

Descriptive statistics were used to calculate mean and standard deviation for age, weight and duration of hospital stay. Categorical variables like gender, age groups, vaccination status, diagnosis, duration of hospital stay groups and outcome were described as frequencies and percentages. Significance testing in case of categorical variables was done using chi square test. A *p* value of <0.05 was considered significant.

RESULTS

A total of 2255 patients were admitted in Paediatric A unit over a six months period. Of these, 603 (26.74%) patients were admitted with various respiratory problems and were included in the study. Among these, 389 (64.5%) patients were male and 214 (35.5%) were female. Mean age of the participants was 18.768±30.867 months. The major disease categories were bronchopneumonia in 189 (31.3%) patients, followed by bronchiolitis in 176 (29.2%). Details are given in Table-1. Data about other variables is outlined in Table-2. A total of (89.2%) patients presented with the pulmonary disease as their primary problem while underlying co morbid conditions like congenital heart defect and cerebral palsy predisposing to pulmonary problem

were identified in 10.8% patients. There was a statistically significant difference in duration of hospital stay among vaccinated versus unvaccinated/partially vaccinated children ($p=0.000$) (Table 3).

A total of 576 (95.5%) patients were discharged, 17 (2.8%) patients expired and 5 (0.8%) were referred to higher specialty. The major causes of mortality were Bronchopneumonia in 8 (47.1%), aspiration pneumonia in 4 (23.5%), Pertussis in 2 (11.8%) and 1 (5.9%) each in tuberculosis, measles pneumonia and cystic fibrosis. There was a statistically significant difference in mortality among vaccinated patients as compared to unvaccinated/partially vaccinated patients ($p=0.030$). However, the difference was not statistically significant as regards outcomes in different age groups ($p=0.126$) and gender($p=0.951$) (Table-4).

Table-1: Diagnosis of patients (n=603)

Diagnosis	No. of Patients	Percentage
Bronchopneumonia	189	31.3
Bronchiolitis	176	29.2
Measles Pneumonia	60	10
Lobar Pneumonia	52	8.6
URTI	32	5.3
Aspiration Pneumonia	25	4.1
Wheezy bronchitis	23	3.8
Pertussis	14	2.3
Asthma	10	1.7
Pulmonary Tuberculosis	9	1.5
Croup	6	1
Cystic fibrosis	5	0.8
Others	2	0.
Total	603	100%

Table-2: Patient characteristics

Patient characteristics		
Mean age (months)	18.768±30.867	
Mean weight (kg)	7.561±5.421	
Mean duration of stay(days)	3.13±2.086	
Gender	No. of Patients	Percentage
Male	389	64.5
Female	214	35.5
Age Groups		
1 to 24 months	482	79.9
>24 to 60 months	77	12.8
>60 months	44	7.3
Vaccination Status		
Vaccinated	295	48.9
Partially Vaccinated	116	19.2
Unvaccinated	192	31.8
Duration of Hospital Stay		
<3 Days	283	46.9
3 to 5 Days	264	43.8
>5 Days	56	9.3
Outcome		
Discharged	576	95.5
Expired	17	2.8
Referred	5	0.8
LAMA	5	0.8

Table-3: Patient characteristics in relation to vaccination status

	Vaccinated	Partially vaccinated	Unvaccinated	p-value
Outcome				0.030
Discharged	289	108	179	
Expired	4	3	10	
Referred	1	2	2	
LAMA	1	3	1	0.000
Duration of Stay				
<3 Days	159	62	62	
3-5 Days	124	47	93	0.238
>5 Days	12	7	37	
Gender				0.238
Male	188	69	132	
Female	107	47	60	

Table-4: Patient characteristics in relation to outcome

	Discharged	Expired	Referred	LAMA	p value
Vaccination					0.030
Vaccinated	289	4	1	1	
Partially vaccinated	108	3	2	3	
Unvaccinated	179	10	2	1	0.951
Gender					
Male	373	10	3	3	0.951
Female	203	7	2	2	
Age Groups					0.126
1 to 24 months	464	13	2	3	
>24 to 60 months	73	1	2	1	
>60 months	39	3	1	1	

DISCUSSION

Diseases of the respiratory tract constitute an important entity contributing to a significant proportion of admissions and hence, burdening our already flail health systems. Our study showed that more than one quarter of total admissions during the study period were secondary to respiratory tract disorders. Liu Y *et al* reported 22.5% admissions with respiratory tract disorders from China¹⁷ while Ogunut *et al*¹⁸ reported 24.7% from Nigeria and Benet T *et al*¹⁹ 34% from Mali that are almost similar to our study.

Our study reported a male preponderance among admitted patients. This is comparable to studies from other regions of the world. Liu Y *et al*¹⁷ reported 67% male patients while a study from Thailand²⁰ documented 77.1% male patients. Benet T *et al*¹⁹ also reported a higher proportion of male patients (57.1%). Studies from Nigeria also documented a higher percentage of male patients 61.5%¹⁸ and 58.6%.²¹ This gender difference could be attributed to smaller airways size in boys as compared to girls as reported by Hoo *et al*.²²

However, studies from the underdeveloped regions report the social and cultural reasons as major contributors to this difference as people tend to prioritize male children for seeking medical care.²³

The results from our study document that the majority of admissions were in the younger age groups especially below two years of age and only 7.3% above 5 years of age. Similar results are reported from studies conducted in China¹⁷ and Nigeria.¹⁸

Our study reported a relatively shorter mean duration of stay. Samoo U *et al*²⁴ has reported similar results from Karachi. Aderemi JA *et al*²⁵ reported a median duration of hospital stay of 4 days whereas Oguonu *et al*¹⁸ also reported a shorter (2 days) stay. Studies from Mali¹⁹ and Thailand²⁰ reported prolonged median durations of 7 and 11 days respectively. Shorter duration of stay could be attributed to social reasons and shortage of hospital beds in our setups which result in earlier discharges.

Bronchopneumonia was documented as the major disease category requiring admission in our study. Study from Karachi²⁴ also documented bronchopneumonia as the major diagnosis requiring admission in 62.9% patients. Aderemi JA *et al*²⁵ from Nigeria also reported pneumonia (50.08%) as the leading disease requiring admission. Other major disease categories were pharyngotonsillitis (25.63%), aspiration pneumonia (5.87%), Bronchiolitis (5%), TB (3.5%), asthma (3.15%) and pertussis (0.88%). The results are comparable to our study except that the proportion of patients with bronchiolitis is much higher (29.1%) in our study. Moreover, nearly 10% patients with measles pneumonia were also documented in our study. Aderemi JA *et al* documented measles as a comorbid condition in 17.8% patients.²⁵ Oguonu T *et al*¹⁸ reported that Pneumonia (34%) Asthma (27.7%) and rhino sinusitis (14.6%) were commonest aetiologies. Mortality was documented at 2.8% in our study which is comparable to results from Malaysia²⁶ showing 1.3% mortality and from Mali¹⁹ showing 4.2% mortality. Study from Nigeria²⁵ documented that mortality was 6.1% among patients with respiratory ailments. The main diseases contributing to mortality were Pneumonia (68.1%), aspiration pneumonia (10.1%) and tuberculosis (7.6%). Ezeonu CT *et al*²¹ reported that majority of patients (88.3%) were discharged home while 7.5% patients expired. In this study, Bronchopneumonia was the leading cause of mortality and children aged between one to five years had the highest mortality. This study also showed a significant correlation between mortality and immunization status ($p < 0.05$)⁵ which is similar to our study that shows a statistically significant difference in mortality in vaccinated children as

compared to unvaccinated/ partially vaccinated children ($p < 0.05$).

The strength of our study is to include all the patients admitted during the time period and study them through rigorous data collection method. Limitations of our study are that due to paucity of resources, we could not perform Viral PCR on nasopharyngeal swabs or tracheal aspirates and blood cultures to identify the causative agents of respiratory infections in our region. Further studies are required to exactly identify the causative agents (viral and bacterial) so as to streamline strategies to combat these illnesses in our region. Studies with analytical designs may determine the cause-and-effect relationship.

CONCLUSION

Respiratory ailments constitute a major disease entity requiring hospital resources in a vast majority of paediatric patients especially in fall/winter season. Poor immunization is associated with higher mortality and prolonged duration of hospital stay. Keeping in view the burden of respiratory illnesses, it is imperative to provide essential medications and oxygen supply at healthcare facilities at regional and district levels. Furthermore, optimizing immunization coverage and imparting health education in these areas would reduce the burden of disease.

AUTHORS' CONTRIBUTION

SB: Principal author, data analysis and interpretation, write-up. SYHG: Literature search. TSS: Conceptualization of study design. AS: Proof reading. SN, HS: Data collection.

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Submitted: November 29, 2020

Revised: --

Accepted: February 3, 2021

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