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Original Research Article

A Study of Profile of Children aged 2 months to 5 Years Admitted with Tachypnoea

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Abstract:

Background and Aim: Clinical profile of patients having tachypnoea in tertiary care hospitals reflects the burden in the community and identifying the risk factors for mortality and morbidity in the children between 2months to 60 months, will help proper utilization of available resources and ensure adequate management of these children. Aim of this study was to identify the various causes of tachypnoea among 2months to 60 months old and to analyze various factors influencing morbidity and mortality patterns among them.

Material and Methods: Present Descriptive observational study was conducted at Paediatric ward in a tertiary care hospital in All Indoor patients between 2 months to 5 years for the duration of 6 months. A structured proforma was prepared, after taking consent from the parents, detailed history with presenting complaints and detailed general and systemic examination was done. Nutritional status assessed using WHO Z score weight for Age. WHO weight for age less than -2 Z score is considered as a risk factor in this study. Details regarding immunization were taken from parents and immunization cards.

Results: Out of 846 total admissions, 145 children (2 months – 5years of age) had Tachypnea, overall occurrence of Tachypnea was 17.13%. Occurrence of tachypnea among 2 months - 12 months (Infants) was 24.53% and 13 months to 60 months was 11.13%, more number of infants was suffering from tachypnea owing to the infantile respiratory anatomy they have. More deaths were observed in infantile age group. 54 children admitted with tachypnea had longer hospital stay (>7 days) out of which 28 were suffering from pneumonia, 6 were suffering from underlying CNS disease and 5 had septic shock.

Conclusion: Prevention of anemia and malnutrition will significantly improve the less than 5 morbidity and mortality. Strengthening of immunization is still required even in urban areas. Introduction of pneumococcal vaccine and flu vaccine will help to improve less than 5 morbidity and mortality.

Keywords: Anemia, Immunization, Pneumococcal Vaccine, Tachypnoea.

Introduction

The global under-five mortality rate declined by 59 percent in 1990 to 38 percent in 2019. Despite this considerable progress, improving child survival remains a matter of urgent concern. In 2019 alone, roughly 14,000 under-five deaths occurred every day, an intolerably high number of largely preventable child deaths. [1]

Globally, pneumonia, diarrhoea and malaria remain among the leading causes of death among children under age 5–accounting for almost a third of global under-five deaths. [2] In India, Acute Respiratory Infections (ARI) account for 30-50% of visits to health facilities and 20-40% of hospital admissions. In urban slum areas, ARI constitutes over two-thirds of all childhood illnesses. Despite these statistics, the majority of the reported evidence underestimates the actual burden of ARI in the community. Hence, continued understanding of ARI prevalence and associated risk factors is essential.

Government is introducing various measures to further reduce less than 5 mortality in India, especially death due to vaccine preventable diseases. One such measure is the introduction of Pneumococcal vaccines (PCV) in immunization schedules as a pilot program in some states. [3] PCV protects against severe forms of pneumococcal disease, like pneumonia and meningitis. Currently, the vaccine is being introduced to approximately 21 lakh children in Himachal Pradesh and also in some parts of Bihar and Uttar Pradesh in the first phase. This will be followed by introduction of the vaccine in Madhya Pradesh and Rajasthan. Haemophilus influenza b

(Hib) vaccine has already been introduced in the national immunization schedule as pentavalent vaccine. Government is also taking various measures like MISSION INDRADHANUSH to cover more children under vaccination.

Mission 3 Indradhanush, launched in 2014, is a national immunization drive that aims to strengthen India's immunization system and increase full immunization coverage to at least 90% by next 5 years. 3 Mission Indradhanush has led to vaccination of around 21 million children of which more than 5.5 million children have been fully immunized. From 1% annual increase in coverage of full immunization, 6.7% annual expansion in the immunization cover has occurred following Mission Indradhanush. [4]

Non-availability of pulse oximetry in resource-poor settings is a major impediment in the early diagnosis of hypoxia and most health workers use clinical algorithms as proposed by Integrated Management of Neonatal and Childhood (IMNCI) to identify sick children based on fast breathing by which severity of pneumonia can be categorized with specificity to 88.9% and sensitivity of 70.2% (IMNCI) [5,6]

Tachypnea can be the presentation of multiple different pathologies. A focused history and physical exam, along with an understanding of the pathophysiology of appropriate disease states, can lead to thorough evaluation and management at the bedside. Tachypnea may not be present in respiratory illness only, but also in cardiological causes, underlying neurological disorders, metabolic disorders, sepsis, hematological conditions leading to severe anaemia.

So we undertook the study to find out the underlying causes co morbid condition and outcome of tachypnea in hospitalized children between the age group of 2 months to 60 months in a tertiary care hospital. Clinical profile of patients having tachypnoea in tertiary care hospitals reflects the burden in the community and identifying the risk factors for mortality and morbidity in the children between 2months to 60 months, will help proper utilization of available resources and ensure adequate management of these children.

Aim of this study was to identify the various causes of tachypnoea among 2months to 60 months old and to analyse various factors influencing morbidity and mortality patterns among them.

Material and Methods

Present Descriptive observational study was conducted at Paediatric ward in a tertiary care hospital in All Indoor patients between 2 months to 5 years for the duration of 6 months.

Inclusion Criteria

All hospitalized children 2 months to 5 years presented with Tachypnoea according to IMNCI definition.

Exclusion Criteria

Those having physiological causes of tachypnea like fever induced, anxiety provoked, hysteria etc were excluded.

All patients fulfilling the inclusion criteria, admitted in the pediatric ward with tachypnoea, were included in the study after taking consent from relatives. Their detailed history and clinical findings were documented using standard predefined proforma. After detailed evaluation by expert clinician and review of appropriate investigations, diagnoses of the patients were documented. Those who got admitted with recurrence, their previous medical reports were looked at and all required details were transcribed from written details and recall memory.

A structured proforma was prepared, after taking consent from the parents, detailed history with presenting complaints and detailed general and systemic examination was done. History regarding breast feeding and introduction of complementary feeds was elicited by 24 hour recall method and calorie protein deficit were calculated in every patient. Child's feeding in the form of exclusive breastfeeding, pre lacteal feeds, weaning, types of food, amount of food and frequency of food were assessed according to IMNCI recommendation.[7] Calorie and protein deficit were calculated and children were categorized as - mismanaged fed or properly fed. Nutritional status assessed using WHO Z score weight for Age. WHO weight for age less than -2 Z score is considered as a risk factor in this study.

SAM: Severe acute malnutrition is defined by very low weight-for- height/length (Z- score below -3 SD of the median WHO child growth standards), or a mid-upper arm circumference < 115 mm, or by the presence of nutritional oedema

MAM: A child with 70-80% of median weight-for-height (Z score of <-3SD to <-2 SD), or a Mid Upper Arm Circumference of 115-125 cms and no oedema is classified as a case of Moderate Acute Malnutrition.

Details regarding immunization were taken from parents and immunization cards. BCG scar was noted. Details regarding H/o allergy, family history of asthma, recurrent respiratory infections, pet animals at home, previous h/o nebulisation, h/o NICU admission were all noted.

Statistical analysis: The recorded data was compiled and entered in a spreadsheet computer

program (Microsoft Excel 2019) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results and Discussion

During the study period total 846 children between age 2months to 5 years age were admitted in paediatric department for various illness out of them145 were having tachypnoea accounting for 17.13% of total admissions in that age group.

Table 1: Age Distribution in Patients with Tachypnoea

Age	Total Number (N=145)	%	% Sabin Et Al [8]
2m-12 Months	93	64.14%	56.5%
13m-60 Months	52	35.86%	43.5%
P Value	Significant		

The value of p is < 0.00001. The result is significant at p < 0.05.

In present study, total 145 patients having tachypnea were admitted. Out of which 93(64.14%) patients were infants (2 to 12 months of age) and 52(35.86%) patients were in the age group of 13 to 60 months. Statistically significant differences were observed between the two age groups. Tachypnea was observed more in infantile age group.

During the study period total 379 children between 2 months - 12 months were admitted out of them 93 were admitted with tachypnea accounting for 24.53% of the children admitted in that age group. 467 children between 13 months - 60 months were admitted for various illnesses during the study period out of them 52 were admitted with tachypnea accounting for 11.13% of the children admitted in that age group. Statistically significant difference was observed between the infantile age group and the age group of 13 months - 60 months. Study like Sabin et al showed a similar pattern of decreasing ARI with increasing age. [8] Of the total 145 patients suffering from tachypnoea, 4 patients died constituting 2.75% of children admitted with tachypnea in 2 months - 5 years age group. It was about 0.4% of the total admission of 846 in our department in that age group. Among them 2 children died of severe pneumonia; 1 died of irreversible septic shock and 1 died due to ADD with severe dehydration with irreversible shock. Out of 93 infants admitted 3 infants died accounting for 3.22% mortality in infantile age group while out of 52 children of age group 13 months-60 months only 1 death was observed accounting for 1.92% mortality in that age group. There was a significant impact of age on the outcome of patients with tachypnea.

Table 2: Gender Distribution in Patients with Tachypnoea

Gender	No. of Patients (N=145)	%	% In Sabin Et Al [8]
Male	90	62.06%	61%
Female	55	37.93%	39%
P Value Significant			

The value of p is < .00001. The result is significant at p < .05

Among the total admitted cases of 145 patients, 90(62.06%) were male patients and 55(37.93%) were female. Statistically significant difference was observed, It showed male preponderance than female. Similar observations have been made by J. SABIN et.al. [8]

During the study period total 491 male children were admitted out of them 90 were admitted with tachypnea accounting for 18.32% of total admission.355 female children admitted for various illnesses during the study period out of them 55 were admitted with tachypnea accounting for 15.49% . Statistically significant difference was observed between the gender, male being the predominant.

Of the total 145 patients suffering from tachypnoea, 2 (2.22%) out of 90 male patients who presented with Tachypnea had expired and 2(3.63%) out of 55 female patients presenting with tachypnea had expired. Statistically significant more deaths were observed in females.

This study did not addressed the other factors associated with tachypnoea which could explain this kind of gender difference, however more health seeking behaviour for male children in society might be the reason for this.

Table 3: Etiological Causes of Tachypnoea

Variables	Etiological Cause	Number of Patients	% (N= No. of Cases in System Involved)
Respiratory Causes (N=107 Out Of 145) (73.79%)	Bronchiolitis	30	28.03%
	Wheeze Associated Lower Respiratory Tract Infection (WALRI)	10	9.34%
	Croup	4	3.73%
	Pneumonia	57	53.27%
	Pleural Effusion	1	0.93%
	Asthma/HRAD	5	4.67%
Severe Anaemia (N=13 Out Of 145) (8.96%)	Severe Anaemia With CCF	13	-
Shock (N=11 Out Of 145)(7.58%)	Cardiogenic Shock	0	-
	Septic Shock	5	45.45%
	Hypovolemic Shock (Dehydration)	6	54.54%
Cardiological Cause (N=8 Out Of 145) (5.51%)	VSD	2	25%
	ASD	1	12.5%
	PDA and PFO	2	25%
	TOF And Pentalogy of Fallot	2	25%
	Others (Ventricular Hypertrophy)	1	12.5%
Neurological Causes (N=6 Out Of 145) (4.13%)	TBME	2	33.33%
	GBS	2	33.33%
	Cerebral Malaria	1	16.66%
	Hepatic Encephalopathy	1	16.66%
Misc (N=4 Out Of 145) (2.75%)	Post Covid MISC	4	-
Metabolic Acidosis (N=2 Out Of 145) (1.37%)	Diabetic Ketoacidosis	2	-

there was more than one etiology in few children presented with tachypnea.

In present study, respiratory etiology (73.79%) was the most common cause of tachypnea, severe anaemia presenting with congestive cardiac failure was 2nd leading cause constituting 8.96% cases of tachypnea and shock constituted 3rd leading cause of tachypnea with 7.58%. In present study there were 107 patients who had respiratory etiology for tachypnea out of which pneumonia accounted for - 57(53.27%) cases of tachypnea 2nd was bronchiolitis 30 (28.03%) followed by WALRI 10(9.34%). Pneumonia was the most common respiratory pathology responsible for tachypnoea in children in present study. In the present study, 13 (8.96% cases of tachypnea) patients presented to us with severe anaemia with congestive cardiac failure which was the 2nd most common cause associated with tachypnea. All cases were of nutritional anaemia. Shock was associated with 11 (7.58% cases of tachypnea) cases of tachypnea in our study. Out of 11 patients presented with shock, 5 (45.45% cases of shock) had septic shock and 6 (54.54% cases of shock) had hypovolemic shock, diarrhea being the most common cause. There was no case of cardiogenic shock during our study period. Hemodynamically significant-Congenital Heart Disease (HS-CHD) with pulmonary congestion poses a higher risk for Lower Respiratory Tract Infection and hospitalizations and it is also a major cause of mortality amongst children with congenital heart disease. [9] All the 6 patients having neurological condition required more than 2 weeks of hospitalization.

In our study, 2 patients presented to us with DKA, out of which one was a known case of DKA diagnosed a month before who presented to us early with moderate acidosis and the other one presented to us for the first time with severe acidosis. The outcome was good in both of them.

Table 4: Patients with Malnutrition

Malnutrition	No Of Patients (N=145)	Percentage
Present	44(SAM+MAM)	30.34%
Absent	101	69.65%

In present study of total 44 out of 145 (30.34%) children had malnutrition (SAM+MAM). Out of 44 total patients with malnutrition, 27 (61.36%) were SAM and 17 (38.63%) were MAM. In present study, there was a significant association of malnutrition and mortality. We observed 6.81% (3 out of 44 children) mortality in children presented with tachypnea who had malnutrition while mortality in children not having malnutrition was only 0.99% (1 out of 101 cases) The biological mechanism for the protective effect of optimal breastfeeding against ARI may be due to the presence of immunological substances (such as oligosaccharides, immunoglobulins, hormones, and enzymes) in breast milk [10]. These immunological substances provide passive immunity to the infant, as well as assist in the maturation of the infant immune system. Also, improved childhood nutrition status from optimal breastfeeding can partially explain the protective effect of breastfeeding against ARI. [11]

Malnutrition causes children to have defective cell mediated immunity secondary to thymolymphatic depletion leading to gram negative bacterial infection and sepsis. There may also be qualitatively deficient immunoglobulins and impairment of leucocyte enzymes. The levels of secretory IgA levels are also significantly reduced leading to recovery from infections has prolonged. Also the skin and mucous membranes do not offer effective physical barriers in malnourished child.

Malnutrition has been associated with deficiency of vitamin A,B and D. Vitamin A maintains the integrity of the epithelial cells , deficiency of vitamin D may lead to deformity of thoracic cavity which predisposes them to tachypnoea. [11] Breastfeeding protects against the development of asthma and allergic disease in children. It may influence immune responses through the bioactive, immune- modulating properties of breast milk; cytokines may provide protection against wheeze and subsequent asthma in childhood. [12]

Micronutrients play fundamental roles in maintaining the structural and functional integrity of the physical barriers, such as skin and mucous membranes. Deficiencies of vitamins and essential minerals also affect several aspects of the adaptive immunity, in particular the humoral response (antibody- mediated) and the cell-mediated immunity.

Trace elements (Zinc, Selenium, Copper, Magnesium), play important roles in supporting the immune system, and thus their deficiencies could increase the susceptibility of a host to infectious diseases [13] Iron is an important micronutrient which has significant redox potential, iron availability is essential for both pathogen and host immunity. It is essential for the activation and proliferation of immune cells. [14] As a result, mismanaged feeding and malnutrition contributes to poor outcome in children admitted with Tachypnea.

Table 5: No. of Patients Having Anaemia

Anaemia (N=145)	Total	%
Present	100	68.96%
Absent	45	31.03%

Table 6: Immunisation Status of Patients

Immunisation	No 0f Patients (N=145)	Percentage
Nil/Incomplete	43	29.66%%
Complete	102	70.34%

Out of 100 cases presenting with anaemia, 47 patients had mild anaemia, 34 had moderate anaemia, 19 had severe anaemia out of which 13 of them presented with congestive cardiac failure and packed cell volume (PCV) was transfused. There was a significant association between anaemia and tachypnea in our study.

In present study, there was a significant association of anemia and mortality. We observed 3% (3 out of 100 children) mortality in children out of which 1 patient had SAM with septic shock, 1 had ADD WITH SHOCK, 1 patient had pneumonia. 1 presented with tachypnea that had anaemia while mortality in children having normal haemoglobin was 2.22% (1 out of 45 cases), statistically significant more number of deaths were observed in children having anaemia as a co morbid condition along with tachypnea. In present study a total of 29.66% (43 patients out of total 145 children) were partially or completely unimmunised who were admitted with tachypnea.(Table 6) This study was conducted in urban area, even though 29.66% children in study group were unimmunised or partially immunised this shows an urgent need to strengthen the immunisation program and more stringent implementation of immunisation program like Mission Indradhanush. Pneumococcal Conjugate Vaccine was not a part of routine immunisation Schedule during the study period as well as covid Vaccine has not been offered to the children and optional influenza vaccine were not taken by the children of the study population. Cattaneo A in his

study predicted that a further 10% reduction of ALRI could be obtained by the availability of an effective Pneumococcal vaccine. [15] In a randomised control study done by Sullender, W.M., Fowler et al showed that vaccines were the primary tools in the prevention of influenza virus infection in young children. [16]

In present study, a total of 145 patients 91(62.76%) patients had hospital stay of less than 7 days, 47(32.41%) children required hospital stay between 8 to 14 days and 7(4.83%) required more than 14 days of hospitalization Sabin et al had observed nearly the same outcome regarding hospital stay in his study. [8] In present study, out of total of 145 patients, 14(9.65%) children required mechanical respiratory support. Out of 14 patients who required ventilatory support, 8 had severe pneumonia, 3 had presented with shock and 3 patients had underlying neurological disease. During study period, total 846 children between 2 months to 5 years were admitted, out of them 16 (1.89%) children expired. Out of total 846 children, 145 were admitted with tachypnea and 4 children died accounting for 2.76% of the mortality amongst children admitted with tachypnea.

Statistically significant more number of deaths was observed in children 2 months to 5 years who presented with tachypnea than those who do not have tachypnea. We found tachypnea remains a single most important bed side sign as a predictor of mortality in young children less than 5 years.

Conclusion

Out of 846 total admissions, 145 children (2 months – 5 years of age) had Tachypnea, overall occurance of Tachypnea was 17.13%. Acute respiratory tract infection (N=107) (73.79%)is the most common cause of tachypnea among which, pneumonia was the most common cause of tachypnoea constituting 57 patients (53.27%).

Statistically significant more number of deaths were observed in children with tachypnea having anaemia as a co morbid condition. Prevention of anemia and malnutrition will significantly improve the under 5 morbidity and mortality. Strengthening of immunization is still required even in urban areas. Introduction of pneumococcal vaccine and flu vaccine will help to improve under 5 morbidity and mortality.

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