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RESEARCH ARTICLE
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THE STUDY OF PREVALENCE AND RISK FACTORS ASSOCIATED WITH RECURRENT WHEEZERS FROM 1-6 YEARS OF AGE.

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ABSTRACT:
Introduction: Wheeze is common throughout childhood and a common reason for outpatient visit. Onset can be at any age it decreases with the age. Some kids are occasional wheezers, 1-2 episodes per year and some are recurrent wheezers i.e. >2 episodes/year. Recurrent wheezing have a significant morbidity and it is estimated that about one third of school age children manifest the symptoms during the first 5 years of life.
Aims and Objectives: To study the Prevalence and risk factors associated with recurrent wheezers from 1-6 years of age.
Material and Methods: A cross sectional observational study of 111 Pediatric patients presenting to the Pediatric OPD and respiratory clinic with wheezing over the period of one year.
Results: In the study, hospital based prevalence of recurrent wheezing in 1-6 years of age found to be 23.42%. With statistical significance it is observed that there is association of recurrent wheezing with the risk factors like Prematurity, Low birth weight, Family history of asthma and duration of the breast-feeding.
Conclusions: Proper identification of children at risk of developing asthma at school age may predict long term outcomes and improve treatment and preventive approach. Thus identifying the risk factors and elucidating the prevalence in the age group of 1-6 years children would help in developing targeted interventions and providing an insight regarding the condition for which the data available is still really scarce.

Key words: *Recurrent wheezing, atopy/asthma, Low birth weight.*

INTRODUCTION

Wheezing is a continuous, musical sound produced by oscillation of narrowed airways and is most commonly heard during expiration due to critical airway obstruction. Monophonic wheeze originates from obstruction in larger airways, such as distal tracheomalacia or bronchomalacia, whereas polyphonic wheeze reflects diffuse airway narrowing, typically seen in asthma. Inspiratory noise resulting from extrathoracic airway obstruction is termed stridor.[1]

Infants and young children are particularly prone to wheezing because airflow resistance is inversely proportional to the fourth power of airway radius. In children younger than five years, small-caliber peripheral airways account for up to 50% of total airway resistance; therefore, even minimal airway narrowing can result in significant airflow limitation.[1] Wheezing is common in childhood and a frequent cause of outpatient visits. Although it can occur at any age, its prevalence declines with increasing age. Children may experience occasional wheezing or recurrent wheezing, with clinical characteristics, asthma association, and risk factors varying across age groups. [2]

Recurrent wheezing in preschool children remains a common clinical concern, and its relationship with early asthma is not fully understood. Wheezing following viral respiratory infections, previously described as wheezy baby syndrome or episodic viral wheeze, continues to be debated. [3, 4] A single wheezing episode before three years of age is often associated with diminished airway function at birth and represents a transient, non-atopic condition. In contrast, recurrent wheezing between three and six years of age is more frequently linked to atopy and an increased risk of persistent childhood asthma.

The etiology of recurrent wheezing is multifactorial. While some studies emphasize a strong association with family history of atopy, particularly asthma, others highlight environmental influences such as maternal smoking. [5-8] Identified risk factors include male gender, low birth weight, prematurity, breastfeeding duration of less than six months, congenital heart disease, family history of asthma or atopy, and exposure to tobacco smoke. However, the interaction between genetic susceptibility and early-life environmental exposures remains incompletely understood.

Although wheezing in infancy often resolves as airway caliber increases with growth, a subset of children develop persistent symptoms reflecting early chronic airway disease.[9] Recurrent wheezing is associated with significant morbidity, with nearly one-third of school-aged children reporting symptoms during the first five years of life. Early identification of children at risk for asthma may help predict long-term outcomes and enable timely preventive and therapeutic strategies.[10] However, data on the prevalence and determinants of recurrent wheezing among children aged one to six years remain limited, particularly in developing settings.

Accordingly, the present study aimed to determine the prevalence of recurrent wheezing and its associated risk factors among children aged 1–6 years, to facilitate early risk stratification and guide targeted interventions.

MATERIAL AND METHODS

A cross sectional study, minimum sample size calculated is 111 cases. All children coming to the Pediatric OPD and Emergency Pediatric Services and satisfying the inclusion and exclusion criteria were considered as subjects for the study. Those who were willing and giving consent to take part in study were given case record form where all the relevant data was entered. Parents were asked about questions and responses were entered in predesigned questionnaire which was validated by face validation. All data from case record form and questionnaire was entered in MS EXCELL sheet format. Data was analyzed by SPSS software version 17. Results were depicted in tabular forms and graphs. Conclusions were drawn. Prevalence of recurrent wheezers was estimated as a percentage amongst all the subjects (wheezers) in the study.

Prevalence = (number of recurrent wheezers / total number of wheezers)

Chi square test was applicable to study groups. Our study involves wheezers which are likely to get classified into occasional wheezers and recurrent wheezers subgroups. Risk factors mentioned in the case record form were evaluated in occasional and recurrent wheezers.

Significant risk factors were noted in occasional or recurrent wheezers, their association was tested by applying the chi square test. ‘P’ value less than 0.05 was considered significant.

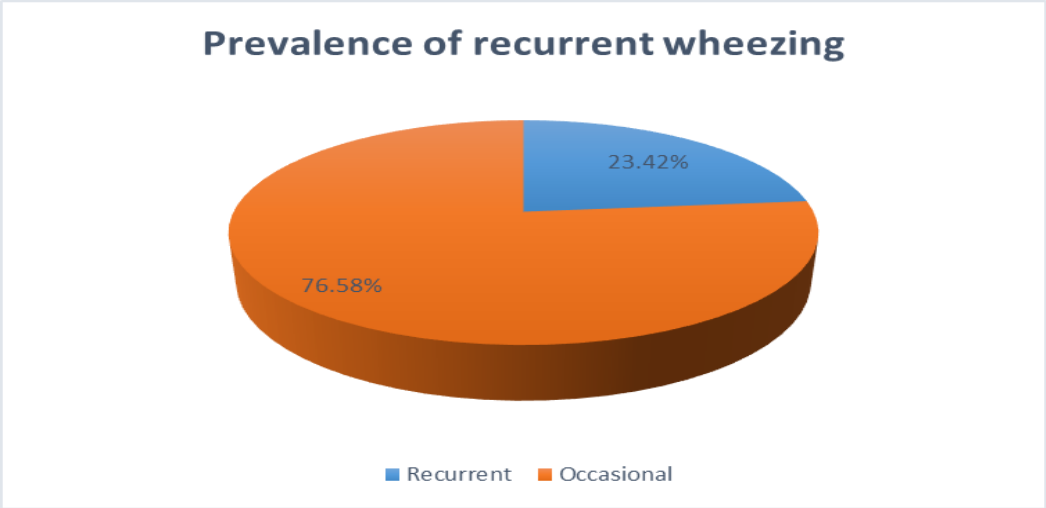
Results were graphically represented where deemed necessary.

RESULTS AND DISCUSSION

In this study, overall 111 patients with wheezing registered in the year in pediatric respiratory clinic and OPD were included in the study. The mean age of the study subjects were 3.14 $\pm$ 1.28 years. The

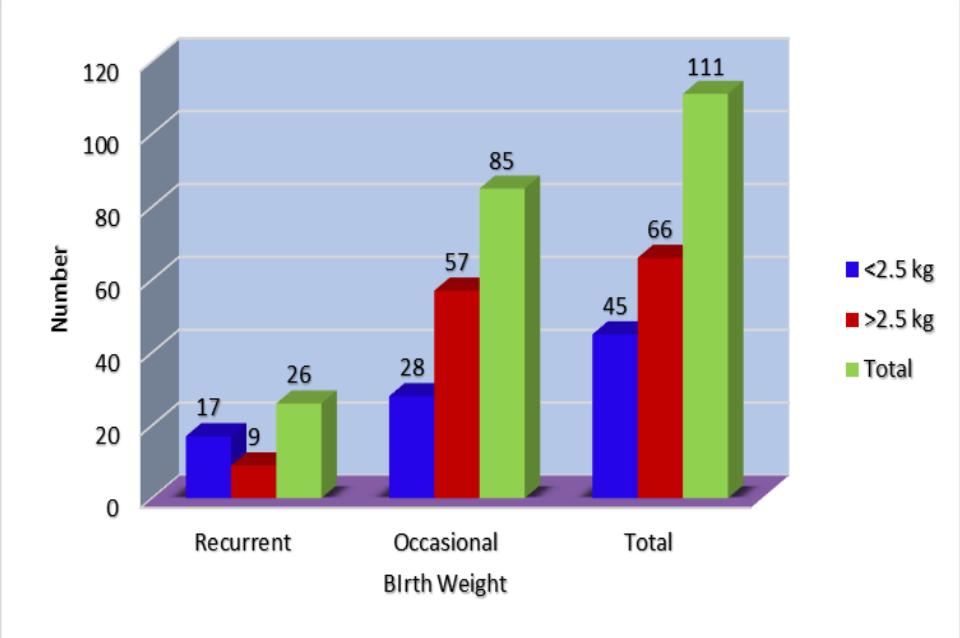
mean wheezing episodes per year were 2.09 ± 1.05. Out of which 26 patients were having recurrent wheezing and 85 patients were having occasional wheezing. In this research, 54.04 % were aged 1-3 years and 45.95 % were aged 3-6 years. So the overall hospital base prevalence of recurrent wheezing estimated as 23.42 %.

Hospital Based prevalence: 23/111 X 100 = 23.42 %



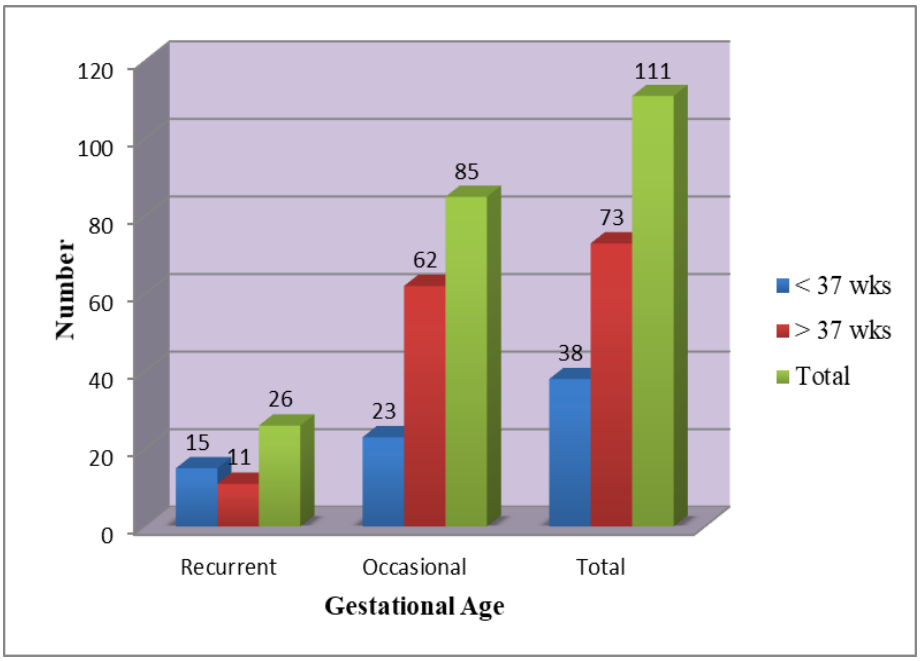
Graph 1: Prevalence of recurrent wheezing

In the study, out of the children aged 1–6 years, 23.42% were found to have recurrent wheezing, while the remaining 76.58% experienced occasional wheezing. This indicated that a smaller proportion of children had frequent episodes of wheezing compared to those with infrequent or occasional symptoms.



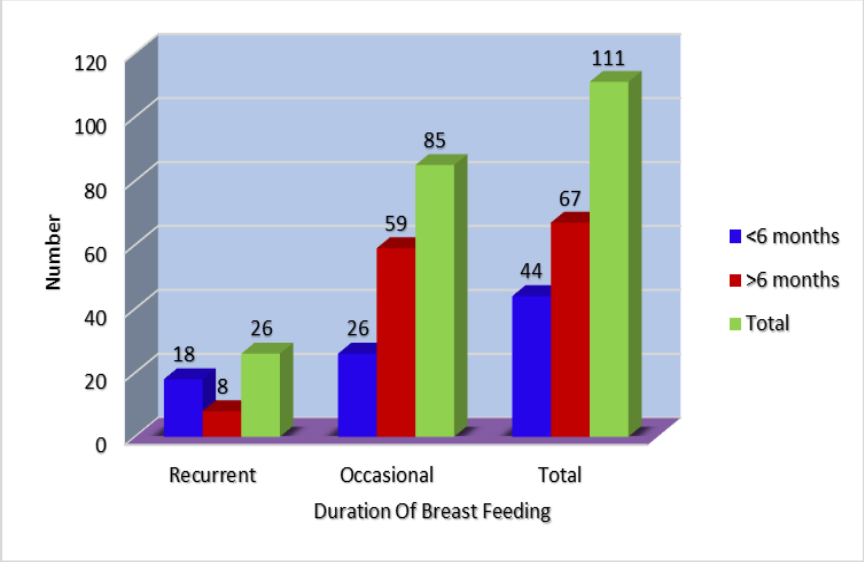
Graph 2: Birth weight and recurrent wheezing

Among recurrent wheezers, 17 children had a birth weight <2.5 kg and 9 children had a birth weight >2.5 kg, whereas in occasional wheezers, 28 children were <2.5 kg and 57 children were >2.5 kg. Overall, children with lower birth weight (<2.5 kg) were more frequently observed among recurrent wheezers, indicating an association between low birth weight and recurrent wheezing.



Graph 3: Gestational age and recurrent wheezing

In this study, the distribution of recurrent and occasional wheezers was analyzed according to gestational age. Among children born before 37 weeks of gestation, 15 had recurrent wheezing and 23 had occasional wheezing. In contrast, among those born after 37 weeks, 11 children had recurrent wheezing, while 62 had occasional wheezing. Overall, the total number of children with wheezing was higher in the term group, with 73 compared to 38 in the preterm group, making a combined total of 111 children. This indicated that occasional wheezing was more common than recurrent wheezing across both gestational age groups.



Graph 4: Duration of breast feeding and recurrent wheezing

The relationship between the duration of breastfeeding and the occurrence of wheezing was analyzed. Among children breastfed for less than 6 months, 18 had recurrent wheezing and 26 had occasional wheezing. In children breastfed for more than 6 months, 8 had recurrent wheezing while 59 had occasional wheezing. Overall, the total number of children with wheezing was 111, with occasional wheezing being more common than recurrent wheezing regardless of breastfeeding duration.

Table 1: Association of various factors with wheezing

Sr. No.	Risk Factors	Recurrent (No.)	Recurrent (%)	Occasional (No.)	Occasional (%)	Odds Ratio (95% CI)	P value
1	**Age group**						
	1–3 years	15	57.7	45	52.95	1.21 (0.49–2.94)	0.6705
	3–6 years	11	42.3	40	47.05	—	—
2	**Gender**						
	Males	16	61.54	52	61.18	1.01 (0.41–2.50)	0.9735
	Females	10	38.46	33	38.82	—	—
3	**Gestational age**						
	Preterm	15	57.69	23	27.06	3.67 (1.47–9.16)	0.0039
	Full term	11	42.31	62	72.94	—	—
4	**Birth weight**						
	< 2.5 kg	17	65.38	28	32.94	3.84 (1.5–9.74)	0.0031
	> 2.5 kg	9	34.62	57	67.06	—	—
5	**Family history of atopy/asthma**						
	Present	13	50	10	11.76	7.5 (2.7–20.6)	<0.001
	Absent	13	50	75	88.24	—	—
6	**Duration of breastfeeding**						
	< 6 months	18	69.23	26	30.59	5.10 (1.97–13.2)	<0.001
	> 6 months	8	30.77	59	69.41	—	—
7	**Family history of TB**						
	Present	1	3.85	1	1.18	3.36 (0.20–55.67)	0.415
	Absent	25	96.15	84	98.82	—	—
8	**History of meconium aspiration**						
	Present	0	0	3	3.53	—	1
	Absent	26	100	82	96.47	—	—

The study analyzed various risk factors associated with recurrent wheezing in children aged 1–6 years. Recurrent wheezers were slightly more common in the 1–3 years age group (57.7%) compared to 3–6 years (42.3%), but this difference was not statistically significant (OR 1.21, p=0.67). The distribution by gender was similar, with 61.5% males and 38.5% females among recurrent wheezers (OR 1.01, p=0.97). Preterm birth (57.7% vs. 27.1%, OR 3.67, p=0.003) and low birth weight (<2.5 kg) (65.4% vs. 32.9%, OR 3.84, p=0.003) were significantly associated with recurrent wheezing. A positive family history of atopy or asthma (50% vs. 11.8%, OR 7.5, p<0.001) and shorter duration of breastfeeding (<6 months) (69.2% vs. 30.6%, OR 5.10, p<0.001) also showed a strong association. Family history of tuberculosis and history of meconium aspiration did not show significant associations with recurrent wheezing (p>0.05).

DISCUSSION

In the present study, gender was not significantly associated with recurrent wheezing, possibly due to the relatively small sample size and random selection of participants. However, previous studies have consistently reported a higher risk of early persistent wheezing and allergic sensitization among male children. [11, 12] Wheezing is more common in male infants and is often associated with greater symptom severity, including nocturnal awakenings and increased medication use. Smaller airway caliber in boys during early life has been proposed as a possible explanation for this association. [13]
Low birth weight was identified as a significant risk factor for recurrent wheezing, consistent with existing literature.[14, 15] Recurrent wheezing was observed in 37.7% of children with low birth weight, with a statistically significant association ($p = 0.0031$), indicating that lower birth weight is associated with higher odds of recurrent wheezing and emphasizing the role of impaired fetal growth in early-life respiratory morbidity.
Prematurity was also significantly associated with recurrent wheezing, with preterm children experiencing a higher likelihood of wheezing episodes during early childhood. Prematurity has been suggested as an important predictor of asthma and recurrent wheeze. [16] These findings are consistent with previous reports, including a meta-analysis of 19 studies demonstrating an increased risk of wheezing and asthma among preterm children. [17, 18] Prematurity is associated with altered lung function from infancy into later childhood, increased air trapping, and small airway abnormalities, which may predispose to recurrent wheezing. Additionally, prematurity and maternal smoking adversely affect lung development, contributing to reduced lung function, increased susceptibility to viral respiratory infections, and higher respiratory morbidity in early life. [19]
Breastfeeding appeared to have a protective effect against recurrent wheezing in this study. Children who had ever been breastfed showed a reduced risk of recurrent wheeze. Breastfeeding may protect against allergic sensitization by delaying exposure to foreign proteins and through immunomodulatory components of breast milk, including immunoglobulins, immune cells, cytokines, and growth factors. [20] In contrast, children breastfed for less than six months had a higher risk of recurrent wheezing. This finding is clinically important, as pharmacological treatment of wheezing in young children is challenging and may adversely affect lung growth and development.
Although breastfeeding is widely recommended for the prevention of atopic disease, evidence remains conflicting. The Promotion of Breastfeeding Intervention Trial found no reduction in asthma or atopy at 6.5 years of age, [21] whereas other studies have reported a significant reduction in asthma symptoms among exclusively breastfed children. [22, 23] These discrepancies may reflect variations in genetic susceptibility, environmental exposures, and breastfeeding practices.
Family history of atopy, particularly maternal asthma, is a well-established risk factor for persistent wheezing and childhood asthma. Several longitudinal studies have identified maternal asthma, parental history of asthma, and atopic conditions such as eczema and allergic rhinitis as strong predictors of persistent wheezing. [24, 25] In the present study, family history of atopy/asthma was significantly associated with recurrent wheezing ($p < 0.001$), highlighting the role of genetic and familial predisposition in early childhood wheezing.

CONCLUSIONS

Childhood wheeze is common and a substantial burden. The hospital based prevalence of recurrent wheeze is 23.42%. The main risk factors associated with recurrent wheezing are prematurity, low birth weight associated family history of atopy/asthma and duration of breast feeding less than 6 months. We haven't found association between family histories of tuberculosis, history of meconium aspiration with recurrent wheezing. This study shows that there are urgent unsatisfied needs for a better approach and evidence-based management of children with recurrent wheezing. The implementation of adequate educational programs directed to parents and health personal on prevention, diagnosis and treatment of children with recurrent wheezing and related co-morbidity, is clearly a pending task. In the same context, a full provision of primary care centers with proper inhaled medications and holding chambers, together with teaching parents on correct inhalation techniques are likely to have a direct and quick impact especially on decreasing the frequency of severe episodes, visits to the Emergency department, and admissions to hospital in children with recurrent wheeze.
Considering that many cases of asthma present the initial symptoms early in the first year of life, it should be a priority of public health policy to know the prevalence and risk factors of this disease, in order to develop control and treatment strategies that impact on morbidity and mortality of these diseases, and improve the quality of life of these children and their families.

LIMITATIONS

There are a few limitations of this study. It was a cross sectional study and thus follow up was not done. The sample size of the study was small thus under powering the results. The study was limited to respiratory cases from Mumbai and only from a single tertiary care hospital; this finding may not translate to children from other regions. This study uses parental report instead of physician report, however the questionnaire was validated for children attending the OPD and respiratory clinic so recall bias is always an issue in transversal studies.

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