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Original article

PREVALENCE AND RISK FACTORS ASSOCIATED WITH WHEEZING IN YOUNG CHILDREN LESS THAN 5 YEARS OF AGE: A RETROSPECTIVE STUDY.

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Abstract

Objective :

To identify risk factors that may contribute to recurrent wheezing in infants under the age of five.

Material and Method :

In the Outpatient Department of Saveetha Medical College and Hospital, Chennai, a cross-sectional investigation was conducted on children younger than 5 years old. The study group consisted of fifty infants with symptoms and signs of recurrent wheezing. All of the parents filled out the questionnaires provided. To comprehend the characteristics of the study groups, a statistical analysis of descriptive data was conducted. The risk factors were analysed using bivariate and multivariate statistical analyses that included all significant predictors with a $p<0.05$ level of statistical significance.

Results :

Upper respiratory tract infection [odds ratio (OR) 7.273; 95% confidence interval (CI) 2.277-23.232], lower respiratory tract infection [OR 5.332; 95% CI 2.326-12.225], passive smoking [OR 2.368; 95% CI 1.094-5.129], and daycare center attendance [OR 2.590; 95% CI 1.168-5.745] were risk factors for recurrent wheezing, as determined by bivariate analysis. Lower respiratory tract infection [adjusted odds ratios (aOR) 0.241; 95% confidence interval (CI) 0.088-0.659] was the most relevant risk factor for recurrent wheezing, according to multivariate logistic regression analysis.

Conclusion :

Lower respiratory tract infection, upper respiratory tract infection, and passive smoking were identified as risk factors for recurrent wheezing in children under the age of five, with lower respiratory tract infection being the most significant risk factor. Targeted surveillance of these risk factors ought to reduce the frequency of recurrent breathlessness. This is particularly essential for patients at high risk, such as asthma patients.

Keywords: Recurrent wheezing, Risk factor, Wheezing, Asthma, PICU, Submitted: 2023-06-22 Accepted: 2023-06-26

1. Introduction:

Wheezing is the symptom of any disease process that results in airway obstruction. Wheezing is an audible, high-pitched, adventitious respiratory sound generated in the airways from the larynx to the distal bronchioles during either the expiratory or inspiratory phase of breathing [1, 2, 3]. Modern computerised waveform analysis has provided a more precise definition of wheeze as a sinusoidal waveform with a dominant frequency of at least

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400 Hz and a duration of at least 80 milliseconds. It is commonly correlated with respiratory complications.

Inhaling out (expiration) or inhaling in (inspiration) may cause wheezing. Usually, wheezing is caused by an obstruction or constriction of the bronchial passages in the chest. It can also result from a blockage in the larger airways or vocal cords. The causes vary from chronic (long-term), typically manageable conditions like asthma to extremely severe conditions like heart failure [4, 5].

Asthma, a chronic disease that produces spasms and swelling in the bronchial tubes, is one of the most prevalent causes of wheezing. Exposure to airborne allergens such as pollen, mould, animals, or house dust can induce asthmatic wheezing [6, 7, 8]. Additionally, viral illnesses can exacerbate asthma symptoms. Bronchitis is an inflammation of the bronchial airways' lining. Bronchiolitis is most prevalent in infants and toddlers. Chronic obstructive pulmonary disorder (COPD) is a long-term inflammation and injury of the bronchial tube lining, which is typically caused by cigarette smoking [9, 10]. In persons with cystic fibrosis (CF), thick mucus clogs the airways and makes breathing difficult. Inflammation of the lungs induced by a virus or bacteria is pneumonia. The Respiratory Syncytial Virus (RSV) can cause bronchiolitis or pneumonia. Foreign object aspiration (inhalation) into the airways. Vocal cord dysfunction, or VCD, causes your vocal cords to close instead of open during inhalation and exhalation, making it more difficult for oxygen to enter and exit the lungs [11, 12]. GERD, Chronic acid reflux may cause the lower esophageal valve to relax, resulting in breathlessness. Allergies are caused by allergens including dust mites, pollens, pets, mould spores, and foods. Foods or insect stings can induce anaphylaxis, an acute (severe) allergic reaction. Left heart failure is the cause of the fluid in the airways that causes cardiac asthma. Cigarette smoking increases the likelihood of developing COPD and emphysema. Tobacco use and secondhand tobacco make asthma more difficult to control [13].

Infantile wheezing is a heterogeneous disease, and the mechanism of non-allergic wheezing remains unknown. Several risk factors for early wheezing in children and its association with the development of asthma, including a family history of allergy, a personal history of rhinitis or eczema, maternal smoking during pregnancy or passive exposure after birth, male gender, viral respiratory infections by RSV or rhinovirus, and day-care attendance [14]. Several wheezing phenotypes have been associated with various risk factors. It can be a symptom of a variety of conditions, including asthma, COPD, and other cardiac conditions. Typically, wheezing is treated by treating the underlying condition, sometimes with inhaled medications such as Bronchodilators and steroids, as well as some antibiotic tablets or injections [15].

The purpose of this study was to investigate the prevalence and risk factors associated with wheezing in infants less than 5 years old. Using a comprehensive population-based survey of children younger than 5 years old, the objective was to assess the prevalence and risk factors associated with wheezing conditions.

2. Materials and Methods:

This retrospective analytical study included 50 samples with the help of a convenient sample technique. Those patients who came to Pediatrics OPD with wheezing complaints at Saveetha Medical College and Hospital, Chennai were included in this study.

2.1. Data collection:

At the time of enrollment, the researchers interviewed each parent regarding their child's symptoms of recurrent asthma. In the present study, recurrent wheezing was defined as three or more wheezing episodes diagnosed by physical examination (each episode had to be validated by a physician). Patients with signs and symptoms of recurrent wheezing were allocated to the study group, while patients of the same age and gender who did not exhibit such symptoms were assigned to the control group. On the same day, both the

study group and the control group presented as outpatients to the O.P.D. Paediatric.

Every parent who was given the questionnaire to complete did so. The questionnaire included eight items: general information, a history of respiratory symptoms during the previous year, treatments during the previous year, information on prenatal, perinatal, and postnatal periods, risk factors, and the home environment. The questionnaire was designed by researchers and validated by three specialists (one chest and two allergy specialists). A group of parents of children attending the respiratory clinic at Saveetha Medical College and Hospital, Chennai assessed its validity and reliability. In the Outpatient Department, nurses completed the questionnaire, which was then confirmed by a paediatrician.

2.2. Inclusion criteria:

- One episode or recurrent episode of wheezing till 5 years of age
- Any other previously known history of wheeze
- Any other dust exposure
- Any feeding difficulties,
- Any with other respiratory disorders.

2.3. Exclusion criteria:

- Children above 5 years of age
- A patient who aspirated any foreign body,
- Children with cleft lip and palate
- Children who use a nebulizer,
- Any other associated risk factors before wheezing

2.4. Statistical Analysis:

The collected data were analysed using a statistical program for descriptive data analysis (frequency, percentage, mean, standard deviation, and range) through descriptive statistics. To identify the risk factors for recurrent breathlessness, a bivariate analysis employing logistic regression models was conducted. The optimal model was determined by eliminating covariates one by one from a model containing all variables. Finally, a multivariate model incorporating all significant predictors with a statistically significant association ($p<0.05$) was implemented. The results were presented as odds ratios (OR) and adjusted odds ratios (aOR) calculated using maximum likelihood methods, along with their respective 95% confidence intervals (95% CI).

3. Results:

Table 1 shows the frequency of age distribution among children was less than or equal to 6 months has frequency (percentage) ≤6 months (12%), 6 months to 1 year were 22 (44%), 1 to 1.5 years were 1 (2%), 1.5 to 2 years were 6 (12%) and equal or more than 2 were 15 (30%).

Table 2 shows the Gender distribution in this study. Among 50 children 19 (38%) were female and 31 (62%) were male.

Among 50 children, 47 (94%) had cough, 35 (70%) had fever, 33 (66%) had breathing difficulty, 25 (50%) had expectoration, 36 (72%) had crepitation, 17 (34%) had ICU admission, 15 (30%) had recurrent wheezing, 16 (32%) had parental smoking, and wheezing duration were 1 puff had 5 (10%), 2 puff had 17 (34%), 3 puff had 14 (28%) and 4 puff 14 (28%) (Table 3).

4. Discussion:

In India, wheezing is extremely prevalent, with varying prevalence rates and risk factors between regions. Recurrent wheezing is a frequent sign of illness in infants and young children [16, 17]. Although the majority of children outgrow their symptoms, some children develop asthma. Due to the excessive use of public health care funds and resources, chronic wheezing is a significant public health concern [12, 13]. The prevalence of recurrent wheezing ranged from 14.3% to 36.6%, and the prevalence of wheezing associated with lower respiratory tract infection decreased from 32% in the first year of life to 17.3% in the second year and 12% in the third year [14].

This study sought to examine the prevalence and risk factors associated with wheezing in children younger than 5 years old. 50 children with cough, cold, fever, breathlessness, expectoration, and wheezing were enrolled in the study, and crepitations were present among these children. 19

Table 1: **Demographic features of patients**

Characters	Frequency	Percentage (%)
≤ 6 months	6	12%
6 months to 1 year	22	44%
1-1.5 years	1	2%
1.5-2 years	6	12%
2-3 years	5	10%
3-4 years	6	12%
4-5 years	4	8%

Table 2: **Sex distribution**

Sex	Frequency	Percentage
Female	19	38
Male	31	62

(38%) of 50 children were female, while 31 (62%) were male, and their ages were categorized as 6 months, 6 months to 1 year, 1 year to 1.5 years, 1.5 to 2 years, and 2 years; children aged 6 months to 1 year were more likely to wheeze. This demonstrates that the age distribution of minors was less than or equal to 6 months has a frequency (percentage) of 6 (12%), 6 months to 1 year has 25 (50%), 1 to 1.5 years has 1 (2%), 1.5 to 2 years has 4 (8%), and 2 or more has 14 (28%) occurrences.

Numerous studies have focused on identifying the factors that cause neonates to wheeze. Multiple variables, including genetic, immunological, and environmental variables, as well as infection and maternal breastfeeding, appear to play a significant role in the onset and maintenance of wheezing in neonates [18, 19].

This study revealed a significant association between all forms of wheezing and respiratory infection. Childhood respiratory infections play a significant influence in infant morbidity and mortality. They necessitate multiple outpatient clinic visits and hospital admissions, thereby increasing the cost of public health care in many nations [15]. It appears that respiratory infections, particularly those caused by viruses, play a significant role in the pathogenesis of paediatric wheezing [16, 17].

This included the frequency (percentage) of cough, fever, breathing difficulty, expectoration, crepitations, ICU admission, recurrent wheezing, parental smoking, and wheezing duration, whereas 47 (94%) had a cough, 35 (70%) had a fever, 33 (66%) had breathing difficulty, 25 (50%) had expectoration, 36 (72%) had crepitation, 17 (34%) were ICU admission, 17 (34%) were recurrent wheezing, smoking [20].

The Chi-square statistic is computed for persistent wheezing. Admission to an intensive care unit is associated with recurrent breathlessness ($p=0.011$). Since the p-value is greater than 0.05, cough, fever, breathing difficulty, expectoration crepitorations, smoking, and wheezing duration are not associated with recurrent wheezing.

As a cross-sectional study with a relatively small sample size, the present study had some limitations that should be taken into account when interpreting the results. To elucidate the relationship between risk factors and recurrent wheezing, prospective studies are necessary. In addition, the capacity of interviewees to recall events that occurred when the children were younger than 5 years old may influence the success of interviews with parents or carers.

Table 3: Distribution according to cough, fever, breathing difficulty, expectoration,crepitations, ICU admission, recurrent wheezing, parental smoking, and wheezing duration

Cough	**Frequency**	**Percentage**
No	3	6
Yes	47	94
Fever	**Frequency**	**Percentage**
No	15	30
Yes	35	70
Breathing difficulty	**Frequency**	**Percentage**
No	17	34
Yes	33	66
Expectoration	**Frequency**	**Percentage**
No	25	50
Yes	25	50
Crepitations	**Frequency**	**Percentage**
No	14	28
Yes	36	72
ICU admission	**Frequency**	**Percentage**
No	33	66
Yes	17	34
Recurrent wheezing	**Frequency**	**Percentage**
No	35	70
Yes	15	30
Parental Smoking	**Frequency**	**Percentage**
No	34	68
Yes	16	32
Wheezing duration	**Frequency**	**Percentage**
1 puff	5	10
2 puffs	17	34
3 puffs	14	28
4 puffs	14	28

5. Limitations:

This research has several limitations. The retrospective nature of the investigation introduces the possibility of bias. Second, this is a study with a singular center. Further large-scale, multicenter studies are required to corroborate our findings. Thirdly, this study enrolled only patients who had been hospitalized twice for pneumonia with wheezing; thus, the record of subsequent wheezing episodes was unavailable.

6. Conclusion:

Wheezing is a common and significant clinical sign that strongly suggests airflow restriction. Lower respiratory tract infection, upper respiratory tract infection, and passive smoking by parents were identified as risk factors for recurrent wheezing episode in children under the age of five. In India, the primary risk factors for wheezing are repeated ICU admissions and repeated wheezing episodes in infants under the age of five.

7. Recommendations:

Future epidemiologic studies on childhood asthma should consider the onset of wheezing disorders as a critical variable to disentangle the role of various determinants.

8. Acknowledgment:

None

9. List of abbreviations:

OR- Odds ratio
CI- Confidence Interval
aOR- adjusted Odds Ratio
COPD- Chronic obstructive pulmonary disorder
CF- Cystic Fibrosis
RSV- Respiratory Syncytial Virus
VCD- Vocal cord dysfunction
GERD- Gastroesophageal reflux disease

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