

Understanding and Managing Viral-Induced Wheezing in Children: The Role of Parental Knowledge

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Background: Viral-induced wheezing, a common respiratory issue in children, is characterized by wheezing triggered by viral infections. This study aims to evaluate parental knowledge, perceptions, and practices regarding viral-induced wheezing in Jordan.

Methods: A cross-sectional survey was conducted with 510 parents, recruited from schools and online platforms.

Results: The study found that 32.1% of parents had good knowledge about viral-induced wheezing, and 73.5% were aware that it could resolve in children over time. Parents of children with asthma, allergic rhinitis, or atopy were more informed about viral-induced wheezing. Regression analysis showed a significant association between children's recurrent upper respiratory tract infections and parental knowledge. During wheezing episodes, the majority of parents (91.8%) administered medications, and 80.1% used herbal remedies.

Conclusion: Parents of children with frequent upper respiratory tract infections exhibited greater knowledge related to wheezing management. Enhancing parental education may contribute to improved symptom recognition and management. These findings underscore the need for targeted educational initiatives and future longitudinal studies to explore the long-term impact of parental knowledge on respiratory outcomes.

Keywords: assessment, knowledge, parents, wheezing, viral

Introduction

Wheezing is a common respiratory symptom in early childhood, often triggered by viral infections such as respiratory syncytial virus (RSV) and rhinovirus, and is characterized by a high-pitched whistling sound during expiration, typically due to narrowed or inflamed airways.^{1,2} Viral-induced wheezing in preschool-aged children may present as isolated episodes or recurrent bouts and is sometimes referred to as wheezy bronchitis, a condition that may precede the development of asthma.³

Distinguishing viral-induced wheezing from asthma can be clinically challenging, especially in younger children, due to symptom overlap and the absence of definitive diagnostic markers. Risk factors such as personal or family history of atopic conditions, including eczema and allergic rhinitis, have been identified as strong predictors of asthma in children, supporting the concept of the "allergic march".^{4,5} Additionally, environmental exposures such as indoor allergens (eg, dust mites, pests), seasonal pollens, secondhand tobacco smoke, and emotional stress have been implicated in triggering wheezing episodes.⁶⁻⁸

The clinical presentation of viral-induced wheezing can vary over time, with acute viral bronchiolitis often being the initial sign, followed by recurrent infection-induced wheezing.^{9,10} Persistent or recurrent wheezing in preschool-aged children, estimated to affect one-third of them, and can eventually progress to asthma, leading to significant morbidity, reduced quality of life, increased medical utilization, and higher expenses.¹¹

To prevent the development of persistent or recurrent wheezing and asthma, the role of medication in controlling and treating viral-induced wheezing should be emphasized.¹² Delaying treatment by adopting a “wait and see” approach may allow recurring attacks to persist.

Parental recognition and interpretation of wheezing symptoms are crucial for timely intervention and management. However, studies show that nearly half of parents struggle to identify wheezing accurately, often confusing it with other respiratory sounds.¹³ This gap in recognition contributes to delay care-seeking and potential under diagnosis of conditions like asthma. Moreover, discrepancies in the interpretation of symptoms between parents and healthcare providers can hinder appropriate management. For example, only 45% agreement has been reported between clinicians and parents regarding a diagnosis of asthma or wheezing in children.¹⁴

Parental education level, prior experience with respiratory illnesses, and understanding of wheezing triggers significantly influence how caregivers respond to their child’s symptoms.¹⁵ Educating parents about risk factors and symptom patterns, and fostering effective communication with healthcare professionals, may enhance early recognition and improve outcomes for children with wheezing illnesses, as good knowledge in this regard is associated with positive attitudes and appropriate practices.¹⁶

This study aims to assess parental knowledge, perceptions, and practices regarding viral-induced wheezing in children. By identifying gaps in awareness and understanding, the findings may support the development of targeted educational strategies and improve the management of wheezing episodes, thereby reducing the risk of progression to persistent wheezing or asthma.

Methods

Study Design and Participants

Cross-sectional data for this study were collected from parents with at least one child, and were recruited from one of two sources: purposively selected nursery and primary schools (n=4) in Jordan, and via the internet (Social media sites – Facebook, WhatsApp) during December 2022 and March 2023. No major public health initiatives were initiated during that time. The schools were selected to maximise sample variation, and included urban and rural settings; large and small schools. During data collection in schools, parent were asked to return the completed questionnaires to the school for collection by members of the research team. Questionnaires were sent with a cover letter outlining the aims of the project and explaining that participation was voluntary. After collection of responses were entered by RH (a researcher not involved in the care of participants). In school based parents a return of the questionnaire indicated consent and all questionnaires were anonymous, whereas consent was implied from online participation. To maximize confidentiality, personal identifiers were not required.

Questionnaire Development

After reviewing previous related studies about wheezing and viral induced wheezing in children, A self-administered online survey was developed using Google Forms and the link was distributed in social media in both, Arabic and English languages. The questionnaire was piloted among 10 parents with at least one child to check clarity and readability of the questions, and the questionnaire was modified accordingly. Data obtained from the pilot were not included in the data analysis.

The testing instrument was four sections questionnaire, which assessed the parental level of knowledge and attitude toward viral induce wheezing in their children. Sections were designed to elicit information about the dependent variables (knowledge and attitude) and a series of independent variables, as follows: (1) Child information; (2) parent understanding of wheezing; (3) Knowledge about viral induce wheezing; (4); parent practice during wheezing episode.

Sample Size Calculation

The sample size was calculated using the Kish formula for sample size estimation at a 95% significance level and 5% error margin.¹⁷ The estimated sample size was 377. However, a total of 510 parents were recruited in the present study to ensure generalisability of responses.

Ethical Approval

The study was approved by the Zarqa University Ethics Committee (Reference number: (Zu-2023/7/5259/35)).

Outcome Measures

The following outcomes were assessed: the parental level of knowledge and attitude toward viral induce wheezing in children.

Data Analyses

The data analysis was performed using Statistical Package for the Social Sciences version 23.0. Descriptive statistics in the form of frequency and percentage were calculated for the variables under investigation. The level of knowledge about viral-induced wheeze among parents was quantified by assigning one point to each correct answer and zero points to incorrect answers. The total scores were then summed, with a maximum possible score of nine. To differentiate between good and poor knowledge, a cut-off point of five was used. Chi-squared test was utilized to identify any associations between parental knowledge about viral-induced wheeze and various variables. Additionally, binary logistic regression analysis was conducted to identify predictors of parental knowledge. Furthermore, Spearman's rho correlation was used to examine the correlation between parental knowledge of viral-induced wheeze and their reported past experience of wheezing in their children.

Results

Characteristics of the Study Sample

A total of 510 participants completed the questionnaire. The majority of respondents were mothers (73.7%; n=376). Among the children, 22.6% (n=115) had a history of allergic rhinitis. More than half of the fathers were smokers (54.9%; n=280), and 41.3% (n=211) of the children were exposed to smoking. Relying completely on breastfeeding in the first 6 months of birth was reported by 52.9% (n=270) (Table 1).

Table 1 Characteristic of the Study Sample

Character*	Frequency (%)
Parent Demographics	
Person who fill out data	
Mother	376 (74)
Father	93 (18.3)
Guardian	39 (7.7)
Education of father	
Secondary school or less	182 (36.0)
Diploma/Bachelors	247 (49.0)
Postgraduate degree	76 (15.0)
Education of mother	
Secondary school or less	111 (21.8)
Diploma/Bachelors	342 (67.0)
Postgraduate degree	57 (11.2)

(Continued)

Table I (Continued).

Character*	Frequency (%)
Father medical history of:	
Asthma	25 (5.0)
Eczema	13 (2.6)
Allergic rhinitis	71 (14.2)
Atopy†	49 (9.8)
Mother medical history of:	
Asthma	12 (2.4)
Eczema	48 (9.6)
Allergic rhinitis	109 (21.6)
Atopy†	64 (12.8)
Number of children	
<3	134 (26.5)
3-4	251 (49.7)
>4	120 (23.8)
Residency	
North Jordan	155 (30.4)
Middle Jordan	293 (57.4)
South Jordan	62 (12.2)
Child Demographics and Medical History	
Gender of child	
Male	168 (48.6)
Female	178 (51.4)
Age of the child‡	
≤6 years	213 (42.0)
>6 years	294 (58.0)
Term of child	
Full term	474 (93.7)
Preterm	32 (6.3)
Child medical history of:	
Asthma	26 (5.2)
Eczema	48 (9.7)
Allergic rhinitis	114 (22.6)
Atopy†	72 (14.5)

(Continued)

Table 1 (Continued).

Character*	Frequency (%)
Environmental and Perinatal Risk Factors	
Father smoking	277 (54.9)
Mother smoking	53 (10.5)
Keeping pets currently	75 (15.0)
Attends nursery/daycare	138 (27.4)
Dust accumulators	59 (11.7)
Mold at home	92 (18.4)
Cockroaches at home	30 (6.0)
Smoking during pregnancy	39 (7.8)
Exposure to smoke	208 (41.3)
Cesarean section	169 (33.6)
Exclusive breastfeeding ≤6 months	265 (52.9)
Repeated upper respiratory tract infection	162 (32.3)
Family history of wheeze	78 (15.5)

Notes: *The total number of responses may vary across variables due to missing data. †A genetic tendency to develop allergic conditions. ‡In case of more than one child the data is on the youngest.

Parental Knowledge of Viral Induced Wheezing

Among the study participants, a substantial proportion of individuals (32.1%) self-reported a good level of knowledge pertaining to viral-induced wheeze. This can be confirmed through the responses to the knowledge questions, where many participants exhibited a good understanding of key aspects related to viral-induced wheeze (Table 2).

To quantify the level of knowledge about viral-induced wheeze among parents, a scoring system was employed whereby each correct answer awarded one point. The total scores were then summed, with a maximum possible score of nine. A cut-off point of five was used to differentiate between good and poor knowledge, with a total score of five or

Table 2 Participants Knowledge About Viral Induced Wheeze

Item of Knowledge*	Correct Answer Frequency (%)
Child may grow out of viral induced wheeze	355 (73.5)
Is viral wheeze serious	140 (28.7)
Does this mean your child has asthma	67 (13.9)
In viral-induced wheezing no symptoms between attacks	143 (29.8)
The main cause of viral-induced wheezing is airway inflammation	303 (62.6)
Children might have attacks that are severe enough to require hospitalization	275 (57.1)

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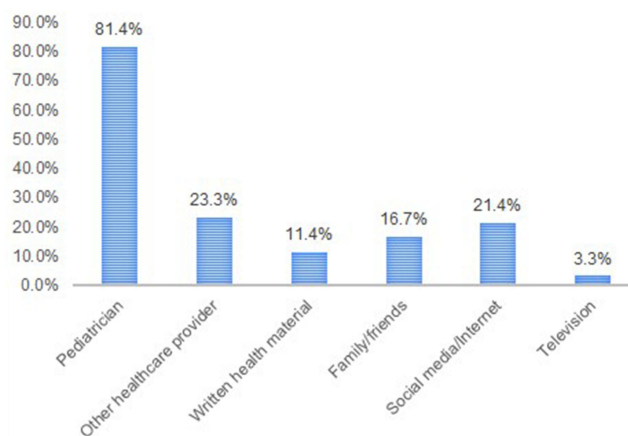
Table 2 (Continued).

Item of Knowledge*	Correct Answer Frequency (%)
Antibiotics effective in treatment of viral induce wheezing	218 (45.4)
Drinking warm liquid or inhaling mist air can help reduce symptoms	323 (67.0)
Children are at risk of developing wheeze every time they have a cold or viral illness	254 (52.7)

Note: *The total number of responses may vary across variables due to missing data.

above indicating good knowledge about viral-induced wheeze. The findings of the study indicate that 51% of participating parents had good knowledge, while the other 49% had poor knowledge of viral-induced wheeze (Figure 1).

The results reveal the sources from which participants obtained their knowledge about viral-induced wheeze (Figure 2). Notably, the majority of participants (81.4%) obtained knowledge about viral-induced wheeze from pediatricians. Other healthcare providers, such as nurses and respiratory therapists, were also reported as a source of knowledge for 20% of participants, which indicates the significance of healthcare professionals in educating the public

**Figure 1** Parental knowledge of viral-induced wheeze.**Figure 2** Sources of knowledge regarding viral induced wheeze.

on this condition. Additionally, social media and internet were found to be a popular source of information, with 20% of participants reported that they relied on for their understanding of viral-induced wheeze.

Table 3 shows the univariate analysis (Chi-squared test) of the variables related to knowledge about viral-induced wheeze and revealed that several factors were significantly linked with good parental knowledge. Specifically, having a child with a history of asthma, allergic rhinitis, and atopy were found to be strongly associated with good knowledge among parents ($p=0.019$, $p=0.001$, $p=0.018$, respectively). Furthermore, having risk factors such as a smoking father, repeated upper respiratory infections, and a family history of wheezing were also positively associated with good knowledge about viral-induced wheeze ($p<0.05$).

Table 3 Factors Associated with Parental Knowledge of Viral-Induced Wheeze

Character	Poor Knowledge (N=250)	Good Knowledge (N=260)	p- value
Parent Demographics			
Person who fill out data			0.238
Mother	176	200	
Father	52	41	
Guardian	21	18	
Education of father			0.919
Secondary school or less	87	95	
Diploma/Bachelors	123	124	
Postgraduate degree	37	39	
Education of mother			0.441
Secondary school or less	58	53	
Diploma/Bachelors	161	181	
Postgraduate degree	31	26	
Father medical history of:			
Asthma	11	14	0.615
Eczema	4	9	0.185
Allergic rhinitis	35	36	0.899
Atopy	20	29	0.239
Mother medical history of:			
Asthma	6	6	0.955
Eczema	25	23	0.643
Allergic rhinitis	51	58	0.650
Atopy	26	38	0.146

(Continued)

Table 3 (Continued).

Character	Poor Knowledge (N=250)	Good Knowledge (N=260)	p- value
Number of children			0.133
<3	63	71	
3-4	115	136	
>4	68	52	
Residency			0.358
North Jordan	80	75	
Middle Jordan	136	157	
South Jordan	34	28	
Child Demographics and Medical History			
Gender of child			0.849
Male	81	87	
Female	84	94	
Age of the child			0.750
≤6 years	102	111	
>6 years	145	149	
Term of child			0.890
Full term	231	243	
Preterm	16	16	
Child medical history of:			
Asthma	7	19	0.019*
Eczema	19	29	0.161
Allergic rhinitis	40	74	0.001*
Atopy	26	46	0.018*
Environmental and Perinatal Risk Factors			
Father smoking	123	154	0.015*
Mother smoking	20	33	0.072
Keeping pets currently	35	40	0.621
Attends nursery/daycare	68	70	0.963
Dust accumulators	26	33	0.410
Mold at home	45	47	0.934
Cockroaches at home	13	17	0.507
Smoking during pregnancy	19	20	0.939

(Continued)

Table 3 (Continued).

Character	Poor Knowledge (N=250)	Good Knowledge (N=260)	p- value
Exposure to smoke	105	103	0.631
Cesarean section	86	83	0.527
Exclusive breastfeeding ≤6 months	141	124	0.064
Repeated upper respiratory tract infection	52	110	<0.001*
Family history of wheeze	25	53	0.001*

Note: *Significance at $p < 0.05$.

The results of the binary logistic regression analysis (Table 4) showed that recurrent upper respiratory tract infection was the only significant predictor of parent knowledge about viral-induced wheeze ($p < 0.001$). Specifically, Parents of children with recurrent URTI were found to be twice as likely to have good knowledge about wheezing compared to those of children with no recurrent URTI (OR= 2.164).

Previous Experience of Wheezing

Out of the 510 participants, 283 reported experiencing wheezing in their children. Of those, 201 reported wheezing in the last 12 months, with most of these cases (68.3%, $n=190$) occurring in children under the age of three. The most commonly reported symptoms were coughing (58.1%) and whistling (54.1%).

Common cold (62.8%) and infections (51.8%) were the most frequently reported provoking factors for wheezing. During wheezing episodes, 91.8% of the participants gave the necessary medications, while 80.1% used herbal remedies. To prevent wheezing, 82.1% of the participants reported trying to avoid triggers, and 75.2% contacted a physician in case of difficulty breathing (Table 5).

Our analysis revealed a statistically significant but weak correlation (Spearman's rho correlation coefficient=0.25, $p < 0.001$) between parental knowledge of viral-induced wheeze and their reported past experience of wheezing in their children.

Discussion

Viral-induced wheezing following upper respiratory tract infections is common in young children. A recent study conducted on 30 pediatric patients reported that 80% of emergency visits were due to such wheezing episodes.¹⁸ Our

Table 4 Regression Analysis Results

Predictor	OR	95% CI	p- value
Child medical history of asthma	2.198	0.822–5.882	0.117
Child medical history of allergic rhinitis	1.390	0.838–2.304	0.202
Child medical history of atopy	1.208	0.662–2.204	0.538
Having the risk factor of a smoking father	1.454	0.991–2.132	0.056
Having the risk factor of a recurrent URTI	2.164	1.411–3.321	<0.001*
Having the risk factor of a family history of wheeze	1.682	0.960–2.948	0.069

Note: * Significance at $p < 0.05$.

Abbreviations: URTI, Upper respiratory tract infection; OR, Odds ratio; CI, Confidence interval.

Table 5 Experience of Wheezing

Item	Frequency (%)
Had wheezing or whistling in the chest at any time in the past	283 (55.8)
Had wheezing or whistling in the chest in the last 12 months	201 (71.0)
Age of child wheezing	
Before year 3	190 (68.3)
After year 3	88 (31.7)
Had relatively rapid onset of wheezing	123 (43.9)
Signs of child wheezing:	
Hearing wheezing	151 (54.1)
Feeling the wheezy chest	83 (29.9)
Difficulty breathing	79 (28.3)
Coughing	151 (58.1)
Provoking factor of wheezing	
Pollen	51 (18.1)
Effort	33 (11.7)
Laughing or crying	29 (10.3)
Pets	27 (9.6)
Bedroom	14 (5.0)
Common cold	177 (62.8)
Infection	146 (51.8)
Unknown	59 (20.9)
During wheezing attack did you:	
Give your child necessary medications	157 (91.8)
Massage your child's chest or back	184 (66.9)
Give the child herbal remedies	221 (80.1)
How to avoid wheezing attack	
Giving regular medicine	156 (55.9)
Avoid triggers	230 (82.1)
Regular Doctor visit	134 (48.2)
When to contact your child's physician	
Difficulty breathing	212 (75.2)
Rapid breath	106 (37.7)
Briefly bluish skin color	137 (48.6)

Note: * Missing data were noted for some variables.

study aimed to assess parental knowledge of viral-induced wheezing in Jordan—a topic previously unexplored in this population.

Our findings indicate that 73.5% (n= 355) of parents were aware that children could develop wheezing after respiratory tract infections. However, the modest knowledge of parents about wheezing in general is not surprising. A previous epidemiological study has reported that both parents and clinicians mutually agreed in 45% of wheezing occasions recognition for children aging 6 months to 15 years old.¹⁹ Likewise, *Kapil et al* found in a cross-sectional study that both parents and caregivers had poor knowledge about acute respiratory tract infections in children (49.49%).²⁰

A key limitation in interpreting our findings is the clinical overlap between viral-induced and other types of wheezing, particularly asthma or allergen-related wheezing. While our study focused on parental knowledge, not diagnosis, several children had risk factors such as family history of asthma, eczema, and allergic rhinitis—known predictors of asthma-related wheeze.^{6–8,21} Therefore, it is likely that some cases attributed by parents to viral infections may actually reflect early asthma or allergen-induced wheezing. This is consistent with the literature, which identifies overlapping triggers for wheezing in children, including respiratory syncytial virus (RSV), pollen, and other environmental allergens.²¹ While we cannot definitively determine the etiology of each case without clinical testing (eg, PCR or allergen-specific IgE), our findings remain relevant to public health education.

In our study, a significant association was found between parental smoking (particularly paternal smoking) and the risk of wheezing in children ($p = 0.015$), consistent with previous studies linking passive smoke exposure to increased wheezing risk by 30–70%.²² Interestingly, some studies also emphasize maternal smoking as a more potent risk factor when combined with atopic predisposition.²³ The smoking prevalence in our sample 54.9% (n= 280) aligns with regional data from Mediterranean countries, including Jordan 50.1% (n= 1925).²⁴ Additionally, we found that 62.8% of parents reported recurrent wheezing episodes in their children following URTIs, especially those caused by common cold viruses such as RSV, which is known to trigger airway inflammation and Th2-mediated immune responses.²¹ These findings highlight a potential educational opportunity to improve symptom recognition and early management at home.

However, the relationship between education and effective self-management was not consistently supported across studies. For example, while we observed that parents with prior experience of wheezing episodes demonstrated better knowledge, other research has found no significant differences in management practices based on parental education levels.²⁵ In our study, home remedies and self-administered antibiotics were used by 67% and 45.4% of participants, respectively. Yet, there is no subtle evidence that home remedies could improve or prevent recurrence of symptoms,²⁶ and their widespread use underscores the need for targeted parental education.

Another debated predictor of wheezing is breastfeeding. *Wright et al* reported an association between breastfeeding during early infancy and reduced incidence of viral-induced wheezing.²⁷ However, our study did not replicate this association ($p = 0.064$), highlighting variability across populations.

Consistent with previous studies,^{28,29} our findings support a significant link between recurrent URTIs and wheezing in preschool children. Furthermore, parental knowledge appeared significantly higher among those whose children had asthma ($p = 0.019$), possibly due to more frequent interactions with the healthcare system and disease education.

This study has several limitations. The use of a self-administered questionnaire may have introduced recall or social desirability bias. Its cross-sectional design prevents any causal inference between parental knowledge and clinical outcomes. Online recruitment may have resulted in selection bias toward more educated or internet-literate participants. Additionally, the knowledge assessment tool lacked formal validation, which may affect the reliability of the findings.

Conclusions

In conclusion, this study identified significant gaps in the knowledge and practices of Jordanian parents regarding viral-induced wheezing in children. Although parents of children with a history of respiratory conditions demonstrated higher knowledge levels, the continued reliance on non-evidence-based home treatments and inappropriate antibiotic use remains concerning. These findings underscore the need for culturally appropriate, targeted educational interventions to improve parental management of wheezing episodes. Future research should focus on developing and evaluating the effectiveness of such interventions to support better respiratory health outcomes in children.

Contributions to the Literature

- Families were aware that viral infections may trigger wheezing, reflecting a general awareness of symptom patterns.
- Parents with prior experience of respiratory symptoms in their children demonstrated superior knowledge, likely due to repeated interactions with healthcare providers.
- Parental ability to manage wheezing was inconsistent, with a considerable number relying on home remedies and self-administered antibiotics, despite limited supporting evidence.
- Improved parental education about symptom management and appropriate response strategies may contribute to better respiratory outcomes and reduce unnecessary medication use.

Data Sharing Statement

The authors confirm that the data supporting the findings of this study are available within the article.

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of ZARQA UNIVERSITY (Reference number: (Zu-2023/7/5259/35), Approval date: 1/ 12/ 2022).

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflicts of interest in this work.

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