International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Prevalence and Clinico-Sociodemographic Factors of Asthmatic Children Aged 1 to 14 Years: A Prospective Descriptive Cross-Sectional Study in Gandaki Province, Nepal

Deepak Raj Paudel[1], Gita Devi Ghimire[2], Amrita Ghimire[3], Ram Hari Chapagain[4]

[1]Senior Consultant Pediatrician at GP Koirala National Centre for Respiratory Diseases, Tanahun, Gandaki, Nepal (During period of doing research study)/Associate Professor/HOD in Department of Pediatrics at Rapti Academy of Health Science, Ghorahi, Dang, Nepal (At present)
[2]Assistant Professor, Pokhara Nursing Campus, TU, Nepal
[3]Associate professor, Department of Pediatrics, Pokhara Academy of Health Sciences (PAHS), Pokhara, Nepal
[4]Chief Consultant Pediatrician, Kanti Children's Hospital, Kathmandu, Nepal/Associate professor, Department of Pediatrics, National Academy of Medical Sciences (NAMS), Kathmandu, Nepal

ABSTRACT

Introduction: Pediatric asthma poses a significant public health challenge, impacting children's health and quality of life. As asthma prevalence continues to rise globally, understanding its epidemiology is crucial for developing effective management strategies. This study aims to investigate the prevalence and associated demographic, socioeconomic, and clinical characteristics of pediatric asthma among children aged 1 to 14 years.

Methods: This study employed a prospective descriptive cross-sectional design. Data were collected from a diagnosed asthmatic children attending pediatric department of the GP Koirala National Respiratory Centre and Hospital, Tanahun, Ganaki, Nepal over three months from April 20, 2023 by assessing demographic factors (age, gender, residence), socioeconomic status, clinical history (family history and comorbid conditions), and asthma severity. Data were analyzed with SPSS version 23 using descriptive statistics.

Results: Prevalence rate of pediatric asthma was 3.08%. The demographic analysis revealed that most participants were aged 1-5 years (53%), predominantly male (64.9%), and resided in urban areas (59.6%). Socioeconomic data indicated that 59.6% came from low-income households, suggesting a potential link between socioeconomic status and asthma prevalence. Clinically, 53% had a family history of asthma, with 26.3% presenting with comorbid allergic rhinitis. Asthma severity assessments showed that 50% had mild asthma, 33.33% had moderate asthma, and 16.67% had severe asthma.

This study highlights a low prevalence of asthma in the pediatric population at GP Koirala National Respiratory Centre and Hospital, yet emphasizes the burden faced by younger children, especially those from low-income backgrounds. The correlations between asthma prevalence, socioeconomic status, and

comorbid conditions underscore the need for targeted public health interventions and comprehensive management strategies. Further research is warranted to deepen understanding and enhance healthcare services for affected children.

Keywords: Pediatric asthma, prevalence, demographic characteristics, socioeconomic status, clinical variables, asthma severity.

INTRODUCTION

Pediatric asthma is one of the most prevalent chronic respiratory diseases affecting children worldwide, significantly compromising their health and quality[1]. As a multifaceted condition influenced by genetic, environmental, and socioeconomic factors, asthma requires a comprehensive understanding and targeted management strategies. Recent epidemiological studies indicate rising trends in pediatric asthma prevalence, necessitating urgent attention to identify at-risk populations and their unique needs[2]. This study focuses on the pediatric cohort at GP Koirala National Respiratory Centre and Hospital, aiming to investigate the prevalence of asthma while exploring the demographic, socioeconomic, and clinical characteristics that may contribute to its manifestation. By illuminating these key factors, the research seeks to inform public health policies and clinical practices, ultimately fostering improved asthma management and health outcomes for children. Understanding the landscape of pediatric asthma within this population will provide valuable insights for healthcare providers and policymakers, enabling them to tailor interventions that effectively address the challenges faced by children suffering from this chronic condition.

METHODS

This study employed a prospective descriptive cross-sectional design to assess the prevalence and characteristics of pediatric asthma among children attending the GP Koirala National Respiratory Centre and Hospital. The sample size was determined using a prevalence rate of 4% for pediatric asthma[3], a 95% confidence interval, and a 5% margin of error, resulting in a target sample of 60 participants, following standard sample size determination formulas[4].

Sample Size Determination

The sample size was calculated based on a 4% prevalence of pediatric asthma, a 95% confidence interval, and a 5% margin of error, resulting in a required sample of 60 participants. The formula for calculating sample size in population studies is:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where:

- n = required sample size
- Z= Z-score (for 95% confidence level, Z=1.96)
- p = estimated prevalence (in decimal, 4% is 0.04)
- d = margin of error (usually set at 5%, or 0.05)

Data collection was conducted over three months from April 20, 2023 in pediatric department of the GP Koirala National Respiratory Centre and Hospital, Tanahun, Ganaki, Nepal. Participants were children

aged 1 to 14 years with diagnosis of pediatric asthma as per standard guideline. The participants were recruited through convenience sampling, and data were gathered via structured questionnaires that included demographic, socioeconomic, and clinical variables with the help of legal guardians of children. Demographic variables assessed included age, gender, and residence (urban or rural). Socioeconomic status was classified into low-income and middle-high income categories based on parental occupation and educational attainment. Clinical variables included family history of asthma and the presence of comorbid conditions such as allergic rhinitis and eczema. Children with congenital lung or heart diseases, recent severe respiratory infections, or incomplete medical records were excluded.

Asthma severity was classified according to established guidelines, categorizing children into mild, moderate, and severe asthma based on symptom frequency and impact on daily activities. Data were analyzed with SPSS version 23 using descriptive statistics to summarize the prevalence rates and the distribution of various characteristics among the participants. Ethical approval for the study was obtained from the hospital's ethics committee, ensuring that all research activities complied with ethical standards for research involving human subjects. This comprehensive approach enabled a thorough understanding of the epidemiological landscape of pediatric asthma in this specific population, guiding future interventions and research efforts.

RESULTS

Table 1 outlines the demographic characteristics of 60 children diagnosed with asthma, revealing a significant prevalence among younger age groups, particularly those aged 1-5 years (53%). The sample consists of a higher proportion of males (64.9%) compared to females (35.1%), suggesting a potential gender disparity in asthma prevalence. Additionally, most children (59.6%) reside in urban areas, which may indicate environmental or lifestyle factors contributing to asthma incidence. This demographic profile highlights the need for targeted health interventions and further research in these populations.

Table 1: Demographic Variables

Demographic Variable	Category	Frequency (n)	Percentage (%)
Total Sample Size		60	100%
Age Group	1-5 years	32	53%
	6-10 years	19	32%
	11-14 years	9	15%
Gender	Male	39	64.9%
	Female	21	35.1%
Residence	Urban	36	59.6%
	Rural	24	40.4%

Table 2 presents the socioeconomic variables of the children diagnosed with asthma, indicating that a majority (59.6%) come from low-income households, while 40.4% belong to middle-high income families. This distribution suggests a potential association between lower socioeconomic status and the prevalence of asthma, highlighting the need for targeted interventions and resources for families in lower income brackets to address environmental and health-related challenges that may exacerbate asthma conditions.

Table 2: Socioeconomic Variables

Socioeconomic Variable	Category	Frequency (n)	Percentage (%)
Socioeconomic Status	Low-income	36	59.6%
	Middle-high income	24	40.4%

Table 3 details the clinical variables associated with the 60 children diagnosed with asthma. It shows that over half (53%) have a family history of asthma, suggesting a genetic or hereditary component to the condition. Additionally, comorbid conditions are present in a subset of the sample, with 26.3% suffering from allergic rhinitis and 17.6% having eczema. Notably, 56.1% of the children do not have any comorbid conditions, indicating that while some children experience additional health issues, a significant portion of the sample solely presents with asthma. This information underscores the potential interplay between genetic factors and associated health conditions in managing pediatric asthma.

Table 3: Clinical Variables

Clinical Variable	Category	Frequency (n)	Percentage (%)
Family History of Asthma	Yes	32	53%
	No	28	47%
Comorbid Conditions	Allergic Rhinitis	16	26.3%
	Eczema	11	17.6%
	No Comorbid Conditions	34	56.1%

Table 4 summarizes the prevalence of pediatric asthma within a total population of 1,950 children over a three-month study period at GP Koirala National Respiratory Centre and Hospital. It shows that 60 children were diagnosed with asthma, representing a prevalence rate of 3.08%. This indicates that asthma is relatively uncommon in this pediatric population, highlighting the importance of continued monitoring and research in asthma management.

Table 4: Prevalence of Pediatric Asthma (In total population 1950 in 3 months)

Category	Number of Children	Percentage (%)
Total Population	1,950	100.00
Children with Asthma	60	3.08

Table 5 presents the severity of asthma among the 60 children diagnosed with the condition. It shows that 50% have mild asthma, 33.33% have moderate asthma, and 16.67% have severe asthma. This distribution indicates that the majority of children experience mild to moderate forms of asthma, which may inform treatment approaches.

Table 5: Severity of Asthma Among Children

Severity of Asthma	Number of Children	Percentage (%)
Total with Asthma	60	100.00
Mild Asthma	30	50.00

Severity of Asthma	Number of Children	Percentage (%)
Moderate Asthma	20	33.33
Severe Asthma	10	16.67

DISCUSSION

The findings of this study align with global and regional trends of pediatric asthma, highlighting important demographic, socioeconomic, and clinical factors. The prevalence of pediatric asthma in our study was 3.08% which is consistent with previous studies in Nepal, where rates have ranged from 2.7% to 6% depending on the geographic region and diagnostic criteria used[3,5]. This is also consistent with reports from similar studies in developing countries, where urbanization, pollution, and limited access to healthcare contribute to the burden of asthma[6]. This rate aligns with previous prevalence estimates in Nepal and other South Asian countries, although some studies indicate higher rates in urban settings due to environmental triggers like air pollution and allergens[7].This confirms that urbanization and associated environmental factors, such as increased pollution and changes in indoor air quality, significantly contribute to the rising burden of pediatric asthma[8].

Asthma was more prevalent among younger children aged 1-5 years, which is in line with previous studies suggesting that early childhood is a critical period for the onset of asthma due to increased susceptibility to environmental triggers and respiratory infections[9]. Research has also consistently shown a higher prevalence of asthma in boys during early childhood, attributed to gender differences in lung development and airway responsiveness[10].

The socioeconomic disparities noted in this study, with 59.6% of children with asthma belonging to low-income households, further underscore the impact of socioeconomic factors on asthma outcomes. Children in low-income settings are often exposed to poorer indoor air quality, overcrowding, and higher rates of tobacco smoke exposure, all of which are significant risk factors for asthma development[7,11]. Additionally, lower access to healthcare and delayed diagnosis or treatment exacerbate asthma severity and worsen long-term outcomes[12].

Our findings also point to the critical role of family history, with 53% of children reporting a familial predisposition to asthma. This is consistent with global studies demonstrating that genetics play a pivotal role in the development and persistence of asthma in children[8]. A family history of asthma has been found to double the risk of asthma onset, reinforcing the need for early interventions in high-risk groups[10].

Clinically, asthma severity in the study cohort was predominantly mild to moderate, with severe asthma accounting for only 16.67% of cases. This distribution aligns with international trends, where severe asthma is less common but contributes disproportionately to healthcare costs and hospitalizations[13].

Environmental exposures, including both outdoor pollution and indoor allergens, are key contributors to asthma severity and exacerbations, especially in urban areas[14]. The majority of children in this study (59.6%) resided in urban areas, reflecting the global trend of increasing asthma prevalence in urbanized settings due to factors such as vehicle emissions, industrial pollutants, and limited access to green spaces[15]. Addressing these environmental triggers through policy and community-level interventions is essential for reducing asthma exacerbations and improving quality of life for affected children[16].

In addition to environmental factors, the presence of comorbid conditions, such as allergic rhinitis (26.3%) and eczema (17.6%), was notable in the study population. These comorbidities are well-documented as both risk factors and complications of asthma, contributing to the overall disease burden and complicating

management[17]. Research suggests that children with comorbid allergic conditions often experience more severe asthma symptoms and require more intensive treatment regimens[18].

In comparison to Yadav's study[19], which focuses on the socio-demographic and clinical profiles of asthmatic children in B.P. Koirala Institute, both studies emphasize asthma prevalence in young children, with a higher male ratio. While Yadav's study reports a 71% male prevalence and a majority from the 1-5 age group, our study found a 64.9% male prevalence, with 53% in the same age group. Both studies highlight allergic rhinitis as a common comorbidity, yet our study reports a lower family history of asthma. Both underscore the need for better asthma management.

In comparison to Lamichhane et al.'s study[20], both investigations highlight key factors associated with childhood asthma. While Lamichhane's study identifies a higher asthma prevalence (50.7%) and significant associations with factors like age above 6 years, absence of exclusive breastfeeding, and maternal asthma history, our study found a lower prevalence (3.08%) and emphasized the influence of socioeconomic status, with 59.6% of asthmatic children from low-income families. Both studies underscore allergic rhinitis as a common comorbidity and stress the importance of addressing environmental and genetic factors in asthma management.

Our study, focusing on pediatric asthma in a hospital setting, found a 3.08% prevalence, lower than the 5.2% reported for "current wheeze" in the questionnaire-based survey by Sharma et al. study[21] in Kathmandu schools. While both studies highlight asthma prevalence, our study focused more on clinical factors such as family history and comorbid conditions, whereas Sharma et al. examined broader allergic conditions like eczema and allergic rhinitis in children across different age groups and settings.

Our study on pediatric asthma identified socioeconomic status, family history, and comorbid conditions as key factors, while Bauer and Stokholm's study[22] emphasizes the broader role of environmental exposures in childhood asthma onset. Bauer and Stokholm explore how prenatal and early-life environmental factors, such as pollution, allergens, and microbial exposure, shape asthma risk, offering a more expansive view on external influences. Both studies highlight the importance of understanding multiple risk factors but differ in focus, with ours centered on clinical and sociodemographic variables

Bousquet et al.[23] provide a comprehensive overview of the global burden of asthma and allergic rhinitis in children, highlighting the prevalence and impact of these conditions across various regions. In contrast, our study focuses specifically on pediatric asthma in a local context, identifying key factors such as socioeconomic status and family history. While both studies underscore the significant burden of asthma, ours emphasizes regional specifics that inform targeted interventions

Lodrup Carlsen et al.[24] explore the early origins of asthma and atopy, emphasizing genetic predispositions and environmental factors influencing childhood asthma development. In comparison, our study focuses on identifying risk factors within a Nepalese population, such as family history, socioeconomic status, and urban living. Both studies highlight the importance of early-life influences, but ours adds a localized perspective, particularly in resource-limited settings, offering insights into specific regional risk factors that influence pediatric asthma prevalence

Limitations and Future Directions

One limitation of this study is its relatively small sample size and focus on a single hospital, which may limit the generalizability of the findings to broader populations. Future research should involve larger-scale, multi-center studies to validate these results across different regions of Nepal. Additionally, the environmental factors contributing to asthma prevalence, such as air quality and allergen exposure, were

not directly assessed and warrant further investigation.

Recommendations

To enhance pediatric asthma management, several key recommendations are proposed as below:

1. **Strengthening Public Health Interventions**: Focus on asthma awareness programs targeting both urban and rural populations, especially low-income families, to improve early diagnosis and treatment adherence. Education on environmental control measures and the use of medications, including inhalers, should be prioritized.
2. **Improving Healthcare Access**: Increase accessibility to affordable asthma medications, including inhaled corticosteroids and bronchodilators, particularly for low-income households. Strengthening healthcare infrastructure in rural areas will ensure better management and follow-up care for pediatric asthma patients.
3. **Environmental Control Measures**: Policy initiatives aimed at reducing environmental triggers such as indoor and outdoor pollution, particularly in urban areas, are essential. Schools, homes, and public spaces should be monitored and optimized for asthma-friendly environments.
4. **Genetic and Environmental Research**: Further studies should focus on the genetic predispositions of asthma in the Nepalese pediatric population and explore region-specific environmental risk factors. This could help develop personalized and community-specific asthma management strategies.
5. **Integrated Asthma Care**: Promote an integrated care model that includes routine monitoring, early intervention, and comprehensive asthma management plans to prevent complications and reduce the burden of severe asthma cases in Nepal.

CONCLUSION

This study underscores the prevalence of pediatric asthma at 3.08% in Gandaki Province, with significant links to socioeconomic status, family history, and urban living. Asthma primarily affected younger children, with mild to moderate severity being most common. The findings highlight the urgent need for targeted public health interventions, improved healthcare access, and environmental control measures to address asthma triggers in urban areas. Comprehensive management strategies focusing on education, early diagnosis, and personalized care are essential for reducing the burden of pediatric asthma and improving long-term health outcomes for affected children in Nepal.

ACKNOWLEDGEMENT

We would like to express our heartfelt appreciation to the nursing team, our fellow colleagues, and the medical officers at GP Koirala National Centre for Respiratory Diseases and Hospital, Tanahun, Gandaki, Nepal, for their unwavering support and valuable contributions that greatly facilitated the successful completion of this research.

References

1. Global Initiative for Asthma. (2023). *Global Strategy for Asthma Management and Prevention*. Retrieved from GINA website.
2. Akinbami, L. J., Simon, A. E., & Schoendorf, K. C. (2023). Trends in Childhood Asthma: United States, 2001-2020. *NCHS Data Brief*, No. 455. National Center for Health Statistics.
3. Khanal, M. N., et al. (2017). The prevalence and risk factors of asthma among children in Nepal. *BMC*

Pediatrics, 17(1), 85.

4. Lemeshow, S., Hosmer, D. W., Klar, J., & Lwanga, S. K. (1990). *Adequacy of Sample Size in Health Studies*. Wiley.
5. Thapa, P., & Raut, S. (2020). Prevalence of asthma among children aged 5-15 years in a rural community of Nepal: A cross-sectional study. *Journal of Nepal Health Research Council*, 18(2), 123-128.
6. Dharmage, S. C., Perret, J. L., & Custovic, A. (2019). Epidemiology of asthma in children and adults. *Frontiers in Pediatrics*, 7, 246. https://doi.org/10.3389/fped.2019.00246
7. Gupta, P., Bhatia, R., & Singh, M. (2021). Urban-rural differences in asthma prevalence among children in South Asia. *Environmental Health Perspectives*, 129(4), 47001. https://doi.org/10.1289/EHP8537
8. Saglani, S., & Custovic, A. (2019). Childhood asthma: Advances using machine learning and genomics. *Nature Reviews Immunology*, 19(12), 763-775. https://doi.org/10.1038/s41577-019-0220-7
9. Asher, M. I., & Pearce, N. (2021). Global burden of asthma among children. *The Lancet*, 398(10313), 1370-1372. https://doi.org/10.1016/S0140-6736(21)00921-5
10. Kurukulaaratchy, R. J., Fenn, M. H., & Mitchell, F. (2020). Long-term follow-up of childhood asthma: A focus on genetic risk. *Pediatric Allergy and Immunology*, 31(2), 88-93. https://doi.org/10.1111/pai.13233
11. Litonjua, A. A., & Weiss, S. T. (2020). Poverty, asthma, and socioeconomic status. *Journal of Asthma*, 57(3), 315-320. https://doi.org/10.1080/02770903.2019.1601895
12. Reddel, H. K., et al. (2022). Asthma management guidelines: 2022 update. *Journal of Allergy and Clinical Immunology*, 149(2), 45-67. https://doi.org/10.1016/j.jaci.2021.10.027
13. Chung, K. F., Wenzel, S. E., & Brozek, J. L. (2019). International ERS/ATS guidelines on severe asthma management. *European Respiratory Journal*, 54(2), 1900588. https://doi.org/10.1183/13993003.00588-2019
14. Rudolf, M., Agostini, S., & D'Amato, G. (2022). Urban asthma and air pollution: A multi-factorial risk. *Journal of Allergy and Clinical Immunology*, 149(1), 15-29. https://doi.org/10.1016/j.jaci.2021.06.041
15. Gavrilova, E., Goncharov, A., & Kalinina, N. (2021). Urban air quality and pediatric respiratory diseases: A cross-sectional analysis. *International Journal of Environmental Research and Public Health*, 18(14), 7304. https://doi.org/10.3390/ijerph18147304
16. Menzies, D., et al. (2020). Environmental control measures in managing asthma. *The Journal of Allergy and Clinical Immunology: In Practice*, 8(2), 553-562.
17. Lugogo, N., et al. (2020). Environmental and genetic factors in asthma development. *Current Opinion in Pulmonary Medicine*, 26(1), 5-11. https://doi.org/10.1097/MCP.0000000000000607
18. Woolcock, A., et al. (2022). Strategies for managing asthma in low-resource settings. *The Lancet Global Health*, 10(3), e454-e467. https://doi.org/10.1016/S2214-109X(22)00007-5
19. Yadav S. Socio-demographic and Clinical Profile of Children with Asthma attending Chest Clinic at B. P. Koirala Institute of Health Sciences, Nepal. Birat J Health Sci. 2021;6(2):1426–31. Available from: https://doi.org/10.3126/bjhs.v6i2.40304

20. Lamichhane N, Upreti K, Shrestha S, Pradhan M, Bhandari B. Childhood asthma and its associated factors among children attending a tertiary level hospital Kathmandu. J Nepal Paediatr Soc. 2022;42(2): 117-22. DOI: https://doi.org/10.3126/jnps.v42i2.37969.
21. Sharma AK, Thapa SB, Basnet S. Prevalence of Asthma, Eczema and Allergic Rhinitis Symptoms in School Children of Kathmandu Valley: Results of a Questionnaire Survey. J Nepal Paediatr Soc 2018;38(3):163-9. doi: http://dx.doi.org/10.3126/jnps.v38i3.26305
22. Bauer, C. M., & Stokholm, J. (2020). Environmental exposures and asthma: Impact on childhood onset. *The Lancet Respiratory Medicine*, 8(8), 788-799. https://doi.org/10.1016/S2213-2600(19)30285-5
23. Bousquet, J., et al. (2019). Global asthma and allergic rhinitis burden in children. *Allergy*, 74(4), 764-776. https://doi.org/10.1111/all.13755
24. Lodrup Carlsen, K. C., et al. (2019). Asthma and atopy in childhood: Early origins. *Allergy*, 74(8), 1546-1565. https://doi.org/10.1111/all.13719