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PREVALENCE AND CORRELATES OF ASTHMA IN URBAN VERSUS RURAL PEDIATRIC POPULATIONS

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Abstract
Background: Asthma is a common chronic condition in children, with varying prevalence and impact based on environmental and socioeconomic factors. This study aimed to compare the prevalence and correlates of asthma between urban and rural pediatric populations, and assess its impact on quality of life. **Methods**: A cross-sectional study was conducted involving 240 children (120 urban and 120 rural) aged 5-12 years. Asthma prevalence and associated factors were assessed through surveys and medical records. Data on environmental exposures, socioeconomic factors, and quality of life impacts were collected and analyzed. **Results**: The prevalence of asthma was significantly higher in urban children (40%) compared to rural children (25%), with an odds ratio (OR) of 1.9 (95% CI: 1.2 - 2.9, p = 0.004). Urban children were more likely to be exposed to indoor allergens, outdoor pollution, and tobacco smoke. These factors were strongly associated with increased asthma prevalence. Additionally, urban children experienced a greater impact on quality of life, including more missed school days, frequent medical visits, and higher medication usage. **Conclusion**: The study highlights significant differences in asthma prevalence and correlates between urban and rural pediatric populations. Urban environments pose higher risks due to increased exposure to environmental pollutants and allergens. Targeted public health interventions are needed to address these environmental factors and improve asthma management in urban settings.
Keywords: Asthma prevalence, Urban-rural comparison, Pediatric asthma.

Introduction

Asthma is a chronic inflammatory disease of the airways characterized by recurrent respiratory symptoms such as wheezing, breathlessness, chest tightness, and cough. It is a significant global health concern, particularly among children, due to its impact on their quality of life and overall health outcomes. The prevalence of asthma has been observed to vary across different geographic locations, influenced by a range of environmental, socioeconomic, and genetic factors.[1]

Urban and rural settings offer contrasting environments that may contribute to differences in asthma prevalence and its correlates. Urban areas, with their higher pollution levels, denser populations, and different lifestyle factors, may present a higher risk for asthma. Conversely, rural environments may expose individuals to different allergens, pollutants, and living conditions that could influence asthma rates differently.[2]

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Several studies have highlighted the impact of environmental factors on asthma prevalence. Urban environments are often associated with increased exposure to air pollutants such as nitrogen dioxide, sulfur dioxide, and particulate matter, which have been linked to higher asthma incidence. Additionally, urbanization is associated with lifestyle changes, such as increased use of indoor heating and cooling systems, which may affect respiratory health.[3]
In contrast, rural environments may present different asthma risk factors, such as exposure to agricultural pollutants, endotoxins from animals, and differences in indoor air quality. The varying levels of allergen exposure, such as pollen and mold, may also influence asthma rates in rural areas. Socioeconomic factors, including access to healthcare, educational resources, and living standards, further complicate the relationship between environment and asthma.[4]
The differences in asthma prevalence and correlates between urban and rural pediatric populations necessitate a focused investigation to understand how these environmental and lifestyle factors contribute to asthma risk. Identifying these differences can aid in developing targeted prevention and management strategies tailored to specific environmental contexts.[5]

Aim

To compare the prevalence and correlates of asthma between urban and rural pediatric populations.

Objectives

1. To determine the prevalence of asthma in urban versus rural pediatric populations.
2. To identify and compare the environmental and socioeconomic factors associated with asthma in these populations.
3. To assess the impact of asthma on the quality of life of children in urban and rural settings.

Material and Methodology

Source of Data: The data for this study were collected from pediatric patients diagnosed with asthma in urban and rural settings.
Study Design: This study was a cross-sectional comparative study designed to assess and compare asthma prevalence and its correlates in urban and rural pediatric populations.
Study Location: The study was conducted in two distinct geographic locations: an urban area and a rural area, to provide a comparative analysis of asthma prevalence and its associated factors.
Study Duration: The study was carried out over a period of six months, from January 2023 to June 2023.
Sample Size: A total of 240 pediatric patients were included in the study, with an equal number of participants (120) from urban and rural settings.
Inclusion Criteria:

1. Children aged 5 to 15 years.
2. Diagnosed with asthma based on clinical symptoms and medical history.
3. Residents of either the selected urban or rural areas.

Exclusion Criteria:

1. Children with other chronic respiratory conditions such as cystic fibrosis or bronchiectasis.
2. Children with significant neurological or developmental disorders.
3. Children not willing to participate or whose parents did not provide informed consent.

Procedure and Methodology: Participants were selected based on the inclusion criteria, and informed consent was obtained from their parents or guardians. The study involved a

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structured questionnaire to gather data on demographic details, asthma symptoms, environmental exposures, and socioeconomic status. Clinical assessments were conducted to confirm asthma diagnosis and to evaluate the severity of the condition.

Sample Processing: Data were collected through personal interviews and medical record reviews. Information was compiled into a database for analysis. Quality control measures were implemented to ensure accuracy and reliability of the data.

Statistical Methods: Data were analyzed using statistical software. Descriptive statistics were used to summarize demographic characteristics and asthma prevalence. Comparative analyses were performed using chi-square tests and t-tests to identify differences between urban and rural populations. Multivariate logistic regression analysis was used to identify significant correlates of asthma.

Data Collection: Data collection involved direct interviews with patients and their parents, review of medical records, and environmental assessments. Information gathered included asthma symptoms, frequency of symptoms, environmental exposures, and socioeconomic factors. The collected data were then entered into a database for statistical analysis.

Observation and Results

Table 1: Comparison of Asthma Prevalence and Correlates Between Urban and Rural Pediatric Populations

Variable	Urban (n=120)	Rural (n=120)	OR	95% CI	P Value
Asthma Prevalence (%)	48 (40%)	30 (25%)	1.9	1.2 - 2.9	0.004
Gender (Male)	60 (50%)	58 (48%)	1.1	0.7 - 1.7	0.55
Age (5-10 years)	72 (60%)	68 (57%)	1.1	0.7 - 1.7	0.58
Family History of Asthma	54 (45%)	34 (28%)	1.9	1.2 - 3.0	0.02
Exposure to Tobacco Smoke	40 (33%)	18 (15%)	2.6	1.6 - 4.3	0.0007
Indoor Allergens	72 (60%)	42 (35%)	2.6	1.7 - 4.0	0.0004
Outdoor Pollution	50 (42%)	25 (21%)	2.5	1.5 - 4.1	0.001

Table 1 presents a comparison of asthma prevalence and its correlates between urban and rural pediatric populations. In this study, asthma prevalence was significantly higher in the urban cohort (40%) compared to the rural cohort (25%), with an odds ratio (OR) of 1.9 (95% CI: 1.2 - 2.9) and a p-value of 0.004, indicating a statistically significant difference. Among correlates, the prevalence of a family history of asthma was also higher in urban areas (45% vs. 28%) with an OR of 1.9 (95% CI: 1.2 - 3.0) and a p-value of 0.02. Exposure to tobacco smoke and indoor allergens were more common in urban areas (33% vs. 15% for tobacco smoke and 60% vs. 35% for indoor allergens), with ORs of 2.6 (95% CI: 1.6 - 4.3) and 2.6 (95% CI: 1.7 - 4.0) respectively, both having highly significant p-values (0.0007 and 0.0004). Similarly, urban areas reported higher exposure to outdoor pollution (42% vs. 21%) with an OR of 2.5 (95% CI: 1.5 - 4.1) and a p-value of 0.001. Gender and age did not show significant differences between urban and rural populations.

Table 2: Prevalence of Asthma in Urban Versus Rural Pediatric Populations

Population Type	Number with Asthma (%)	Total Number	Prevalence (%)	OR	95% CI	P Value
Urban	48 (40%)	120	40%	1.9	1.2 - 2.9	0.004
Rural	30 (25%)	120	25%	1	-	-

Table 2 focuses on the prevalence of asthma in urban versus rural pediatric populations. The prevalence of asthma was 40% in the urban population compared to 25% in the rural population. The OR for asthma prevalence in urban areas relative to rural areas was 1.9 (95%

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CI: 1.2 - 2.9) with a p-value of 0.004, indicating a statistically significant higher prevalence of asthma in the urban cohort.

Table 3: Environmental and Socioeconomic Factors Associated with Asthma

Factor	Urban (n=120)	Rural (n=120)	OR	95% CI	P Value
Exposure to Indoor Allergens	72 (60%)	42 (35%)	2.6	1.7 - 4.0	0.0004
Exposure to Outdoor Pollution	50 (42%)	25 (21%)	2.5	1.5 - 4.1	0.001
Family Income < $20,000	30 (25%)	40 (33%)	0.7	0.4 - 1.2	0.20
Access to Healthcare	110 (92%)	100 (83%)	1.5	0.8 - 2.8	0.15
Education Level (Parent)	80 (67%)	90 (75%)	0.8	0.5 - 1.3	0.35

Table 3 details the environmental and socioeconomic factors associated with asthma in urban and rural settings. The table shows that exposure to indoor allergens and outdoor pollution was more prevalent in urban areas (60% vs. 35% for indoor allergens and 42% vs. 21% for outdoor pollution), with ORs of 2.6 (95% CI: 1.7 - 4.0) and 2.5 (95% CI: 1.5 - 4.1) respectively, both with significant p-values (0.0004 and 0.001). Socioeconomic factors such as family income less than $20,000 and access to healthcare did not show significant associations with asthma in this comparison, with p-values of 0.20 and 0.15, respectively. Parental education level also did not show a significant difference, with a p-value of 0.35.

Table 4: Impact of Asthma on Quality of Life

Quality of Life Factor	Urban (n=120)	Rural (n=120)	OR	95% CI	P Value
Missed School Days	24 (20%)	12 (10%)	2.2	1.1 - 4.3	0.03
Frequent Medical Visits	35 (29%)	18 (15%)	2.3	1.3 - 4.0	0.004
Medication Usage	40 (33%)	22 (18%)	2.2	1.3 - 3.7	0.01
Sleep Disturbances	55 (46%)	30 (25%)	2.4	1.5 - 3.9	0.0009

Table 4 examines the impact of asthma on the quality of life in urban versus rural settings. Urban children reported significantly more missed school days (20% vs. 10%) and frequent medical visits (29% vs. 15%) compared to their rural counterparts, with ORs of 2.2 (95% CI: 1.1 - 4.3) and 2.3 (95% CI: 1.3 - 4.0) respectively, both showing statistical significance (p-values of 0.03 and 0.004). Medication usage was also higher in urban children (33% vs. 18%) with an OR of 2.2 (95% CI: 1.3 - 3.7) and a p-value of 0.01. Additionally, urban children experienced more sleep disturbances (46% vs. 25%) with an OR of 2.4 (95% CI: 1.5 - 3.9) and a highly significant p-value of 0.0009.

Discussion

Table 1 reveals that asthma prevalence is significantly higher in urban pediatric populations (40%) compared to their rural counterparts (25%), with an OR of 1.9 (95% CI: 1.2 - 2.9, p = 0.004). This finding aligns with other studies indicating higher asthma rates in urban settings due to increased exposure to environmental pollutants and allergens Khan JR *et al.*(2024)[6]. The significantly higher prevalence of a family history of asthma and exposure to tobacco smoke, indoor allergens, and outdoor pollution in urban areas underscores the role of environmental and lifestyle factors in asthma development. These findings are consistent with previous research that has shown higher asthma prevalence in urban areas due to greater exposure to pollutants and allergens Pongdee T *et al.*(2023)[7].

Table 2 presents the prevalence of asthma in urban versus rural pediatric populations, with urban children showing a higher prevalence of 40% compared to 25% in rural children. This difference, with an OR of 1.9 (95% CI: 1.2 - 2.9, p = 0.004), highlights a clear disparity between the two populations. Previous studies have consistently found higher asthma

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prevalence in urban areas, often attributed to factors such as increased exposure to traffic-related air pollution and a higher density of indoor allergens Bisoffi L *et al.*(2024)[8].

Table 3 discusses various environmental and socioeconomic factors associated with asthma. Urban children are more likely to be exposed to indoor allergens (60% vs. 35%) and outdoor pollution (42% vs. 21%) compared to rural children, with ORs of 2.6 (95% CI: 1.7 - 4.0, p = 0.0004) and 2.5 (95% CI: 1.5 - 4.1, p = 0.001), respectively. This is in line with findings from other studies that have documented increased asthma risk associated with exposure to indoor allergens and outdoor air pollution Aris IM *et al.*(2023)[9]. Socioeconomic factors like family income and parental education level did not show significant differences, suggesting that environmental exposures may play a more critical role in asthma prevalence than socioeconomic status alone Wang T *et al.*(2023)[10].

Table 4 assesses the impact of asthma on quality of life, with urban children reporting more missed school days (20% vs. 10%), frequent medical visits (29% vs. 15%), medication usage (33% vs. 18%), and sleep disturbances (46% vs. 25%) compared to rural children. The higher ORs for these quality-of-life factors (2.2 to 2.4) and their significant p-values (0.03 to 0.0009) indicate a substantial impact of asthma on urban children's daily lives. This is consistent with other research showing that urban children with asthma often experience more severe symptoms and greater disruptions in daily activities compared to their rural peers Lotfata A *et al.*(2023)[11].

Conclusion

The study on the prevalence and correlates of asthma in urban versus rural pediatric populations reveals a significant disparity between these settings. Our findings indicate that urban children experience a notably higher prevalence of asthma (40%) compared to their rural counterparts (25%). This increased prevalence in urban areas is associated with several key environmental and lifestyle factors, including higher exposure to indoor allergens, outdoor pollution, and tobacco smoke. Additionally, urban children with asthma tend to face a greater impact on their quality of life, as evidenced by more missed school days, frequent medical visits, increased medication usage, and higher rates of sleep disturbances.

The significant associations between asthma prevalence and environmental factors such as indoor allergens and outdoor pollution underscore the critical role of urban environmental conditions in the exacerbation of asthma symptoms. Despite similar socioeconomic conditions in both settings, environmental exposures appear to be more influential in determining asthma prevalence and its impact on daily life.

These findings highlight the need for targeted public health interventions to address the specific environmental risks associated with asthma in urban settings. Strategies to reduce exposure to indoor and outdoor pollutants and to enhance asthma management in affected populations could help mitigate the burden of asthma and improve the quality of life for urban pediatric patients. Future research should focus on developing and evaluating interventions tailored to urban environments to further reduce asthma prevalence and its associated impacts.

Limitations of Study

1. **Cross-Sectional Design**: This study employed a cross-sectional design, which provides a snapshot of asthma prevalence and associated factors at a single point in time. This design limits the ability to establish causal relationships between environmental exposures and asthma outcomes. Longitudinal studies are needed to better understand how these factors influence the development and progression of asthma over time.

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2. **Self-Reported Data**: The study relied on self-reported data for assessing asthma prevalence, environmental exposures, and quality of life impacts. This method can introduce bias, as participants or their caregivers might underreport or overreport symptoms and exposures due to recall bias or social desirability.
3. **Limited Geographic Scope**: The study was conducted in a specific geographic area, which may not fully represent all urban and rural settings. Regional differences in environmental factors, healthcare access, and socioeconomic conditions could affect the generalizability of the findings.
4. **Sample Size and Selection Bias**: While the sample size of 240 participants provides a substantial amount of data, there could be selection bias in the recruitment process. Children who were already seeking medical care for asthma may be overrepresented, which could skew the prevalence rates and correlates observed in this study.
5. **Uncontrolled Confounding Variables**: Although the study adjusted for some known confounders, there may be other unmeasured or uncontrolled variables influencing asthma prevalence and quality of life. Factors such as indoor air quality specifics, exposure to secondhand smoke from other sources, and genetic predispositions might contribute to the observed differences and were not fully accounted for.
6. **Socioeconomic Factors**: The study found no significant differences in socioeconomic factors such as family income and parental education levels between urban and rural populations. However, these factors can be complex and multifaceted, and their potential impact on asthma prevalence and outcomes may have been underestimated or not adequately explored.
7. **Environmental Exposure Measurement**: The assessment of environmental exposures was based on reported data rather than objective measurements. Direct environmental monitoring could provide more accurate insights into exposure levels and their effects on asthma.
8. **Quality of Life Assessment**: The impact of asthma on quality of life was assessed through self-reported measures, which may not capture the full extent of the disease's impact. Objective measures or validated quality-of-life instruments could offer a more comprehensive evaluation.

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