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The Correlation between Asthma and Urinary Tract Infection Prevalence in Pediatric Populations

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Abstract: The study was conducted on a clinical sample of 111 children from Iraq, with a study period of 1 year were divided into two parallel groups (55 children with asthma and 56 children as a control group). The results of the statistics showed that there was a significant difference in the prevalence of urinary tract infections (UTIs). The asthma group had an infection rate of 32.7% and the control group 17.9% (p=0.045). The overall mean number of infections was also significantly greater for the asthma group (1.7 episodes vs. 0.9), and the difference in the mean number of infections between the two groups was statistically significant (p=0.022). In the sample, lower socioeconomic status was a risk factor for susceptibility to asthma, and males and older children had a higher rate of recurrent UTI than females and younger children, respectively. Clinical analysis showed a strong positive correlation between the frequency of UTIs and asthma control. Children who did not have good asthma control had a mean of 1.9 infections, while children with good control had a mean of 0.8 infections. When the severity of the disease was analysed, it was found that there was a clear seasonal pattern with a peak in winter (50%) and a marked drop in summer (20%), although there was a small, localised rise in summer, associated with pollen allergy. The data obtained from correlational analysis showed a high positive correlation between the frequency of asthma exacerbations and the incidence of urinary tract infections, with a significant influence of psychological and environmental factors. Family stress (p=0.012), poor air quality (p=0.042), and sleep disturbances (p=0.032) were all found to be associated with an increased risk for these conditions. Lastly, important behavioral risk factors were identified, such as a previous history of antibiotic use (71.4% vs. 12.0%, p=0.001), poor personal hygiene after urination (p=0.001), and irregular personal hygiene (p=0.001), which significantly added to the higher prevalence of UTIs in this age group.

Keywords: Urinary, Prevalence, Pediatric, Children, Control, Infections, Younger, Asthma, Severity, Disease Correlational.

INTRODUCTION

Bronchial asthma is a chronic inflammatory disease of the airways, having several causes. It is the most common non-communicable disease in the world and in Iraq, and is a big health problem. It has become more common in our society in recent decades [Scheltema, N. M. *et al*., 2017]. It is often misdiagnosed and mistreated, resulting in different levels of disability, loss of school and work, disruption of family balances, and high direct, indirect, and emotional costs. It may also be deadly [Leader, S., & Kohlhase, K. 2002].

Over the past few years, scientific advancements have led to a better understanding of asthma and how to treat and control it [Hall, C. B. *et al*., 2009]. While a significant proportion of patients can be treated to control their symptoms, there is still no complete control, and many patients are not managed well. It is the most prevalent non-communicable disease in childhood, and one of the most common reasons for emergency room visits and hospital admissions in our country and around the world, despite efforts to prevent and treat it comprehensively [Priante, E. *et al*., 2018; Gupta, R. *et al*., 2021]. This has led to the need for children with asthma and their families to be treated comprehensively to enhance their quality of life. The World Health Organization (WHO) has extended the age range for children to 19 years because at these ages, adolescents are in a state of profound biological, psychological, and social change that requires special attention [Shommu, N. S. *et al*., 2018; Daniluk, U. *et al*., 2019].

Iraq follows the WHO definition of adolescence as the age range from 10 to 19 years, and early adolescence as 10 to 14 years, while late adolescence is 15 to 19 years. These factors are important to take into account because asthma treatment is more difficult during this time [Zhou, B. *et al*., 2020]. The characteristics of asthma in adolescents are of paramount importance because they tend to have poor acceptance of the condition, indifference towards it, non-compliance with treatment, resistance to seeking medical care, rejection of parental care, and develop harmful habits, all of which increase the risk of death

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[Jayasooriya, S. M. *et al*., 2025; Braman, S. S. 2006].

The high rates of asthma in late adolescence in this study are consistent with other studies that have revealed its significant prevalence among adolescents [Pawankar, R. 2014]. On the other hand, the low number of asthma cases in infants under one year old, in addition to demographic analysis, may be due to the fact that wheezing episodes at this age are not always diagnosed as asthma because of the small diameter of the airways. Infants can have bronchial obstruction without asthma or a diagnosis [Maddox, L., & Schwartz, D. A. 2002; Thorsen, J. *et al*., 2019; Tang, H. H. *et al*., 2021].

Some researchers believe that the prevalence of asthma before the age of 14 is approximately twice as high in boys as in girls; however, as children get older, this gender difference diminishes, and it may even become more common in females [Zhou, Y. *et al*., 2019; Abrahamsson, T. R. *et al*., 2014]. This is thought to be due to a number of factors, such as the smaller lung size at birth in males than females, which grows with puberty; direct effects of puberty, premenstrual syndrome, and pregnancy on asthma onset or exacerbation. In our study, there was a slight prevalence of asthma among adolescent girls [Arrieta, M. C. *et al*., 2015; Bannier, M. A. *et al*., 2020].

MATERIAL AND METHOD

The current study was a comparative observational cross-sectional study conducted in specialty care centres and major paediatric teaching hospitals in the Republic of Iraq, outpatient and inpatient wards of one of the leading medical institutions in Maysan, Iraq, during 1 year between March 1, 2025, and March 31, 2026. The exact interval of this study was designed to include a full season of the weather in Iraq so as to be able to study and investigate the seasonal patterns of urinary tract infections (UTIs) and asthma exacerbation. It is important to understand how environmental and climatic factors (including dust storms and high summer temperatures) interact and directly affect children's health. This study was designed as a comparative study to determine the complex correlation between the prevalence of asthma and UTI in children with a wide range of demographic, clinical, environmental, and behavioral factors, which could serve as possible mediators and/or modifiers of this dual health relationship.

The subjects were a carefully selected group and succeeded in representing a number of children (111). Each group was divided into two main groups for comparison and analysis: the patient group (55 children) and the control group (56 children), who were selected from the same age group and the same environment to eliminate confounding factors and equalize opportunities. The mean age of the study participants was about 8.2 years, and there were a gender balance and equitable representation of the target population. All children aged 3-12 years who had a medical record that was documented in the health care facility and still had an ongoing medical record were included in the study, provided the parent/legal guardian had provided written informed consent and had provided enough and clear information regarding the purpose, procedures, and possible risks of the study. Children with a known congenital anomaly of the urinary system, chronic kidney disease, primary immunodeficiency diseases, and those receiving systematic medication for therapeutic reasons, other than asthma, that depresses the immune system, were excluded from the study with care, to avoid any other factor that could influence the validity of the results relating to the incidence and interpretation of UTI. The data collection approach used in this study was of a comprehensive and rigorous dual methodology, aimed to guarantee higher levels of reliability and validity. The approved electronic and paper medical records were systematically analyzed to obtain clinical data and medical histories. These records included detailed information on asthma diagnoses, history of urinary tract infections, hospitalizations due to the severity of cases, and patterns of daily and seasonal medication use. At the same time, a standardized and scientifically validated structured questionnaire was designed and administered. The questionnaire was translated in Arabic and culturally adapted correctly for the context and society in Iraq. It was given to the parents or to the patients, as applicable, depending upon their understanding. The questionnaire focused on the following: basic demographic parameters, the socioeconomic status of the family (carefully distinguished into low-, middle-, and high-income groups based on local indicators), and a thorough and in-depth study of lifestyle factors, health and hygiene practices, and environmental exposures of the child at home and at school. The research team (resident physicians and specialist nurses) were

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trained to administer this questionnaire as a standardized and accurate instrument, thereby minimizing data collection bias and ensuring uniformity and reliability of data across all participants.

The variables that were carefully measured and analyzed aligned to a set of several key areas that were identified in the research framework. The following were documented for urinary tract infections (UTIs): binary status (positive or negative), mean number of infections per patient, recurrence rate, age at first diagnosis, hospitalization rates (based on severity of infection), and non-adherence to prescribed antibiotics. The level of asthma control (well or poorly controlled), the number of asthma exacerbations, the history of previous respiratory-related hospitalizations, the use of daily medications, and family history of asthma were all accurately measured in the asthma group, and disease severity (mild, moderate, severe) was also measured. The detailed, comprehensive assessment enabled accurate statistical analysis of the relationship between the level of asthma control and the incidence of UTI, because it was hypothesised that poor asthma control might result in systemic inflammation that compromises local immunity and makes the child more susceptible to UTI. Apart from purely clinical variables, this study has increasingly focused on measuring behavioral, environmental, and lifestyle factors that may be important to consider and that could affect both asthma and urinary tract infections and vice versa. Adequacy of fluids, toilet use, and personal hygiene, such as frequent hand washing and post-urination hygiene, were well explored and documented to look for possible statistical association with increased risk. In addition to the external environmental factors, psychosocial factors, including family stress, children's sleep habits and sleep quality, and physical activity, were also evaluated, as well as external environmental factors, including indoor and outdoor air quality and exposure to pollutants or seasonal allergens, particularly the seasonal variations in Iraq, which may impact the respiratory system and urinary system at the same time. These variables were collected both in quantitative and qualitative aspects to be able to carry out advanced and comprehensive correlational analysis.

All the collected data were subjected to statistical analysis in a rigorous and systematic manner with the help of Statistical Package for the Social Sciences (SPSS) version 26 or equivalent. The basic characteristics of the sample were summarized using descriptive statistics. All of the continuous variables (age and mean number of urinary tract infections) were described with means and standard deviations, and all categorical variables (sex, asthma severity, and socioeconomic status) were described with frequencies and percentages. In statistical inference, the independent samples t-test was used for comparison of means between the two groups, asthmatic and non-asthmatic, and the chi-square test or Fisher's exact test was used to analyze the relationship between the categorical variables, such as the distribution of infections between different severities of asthma or the distribution of infections according to season. In addition, Pearson's or Spearman's correlation coefficients were computed to determine the direction and magnitude of linear relationships among the variables related to the exacerbation of asthma, environmental factors, and urinary tract infection rates. All analyses were performed with a p-value < 0.05, which is considered statistically significant, thus contributing to the medical literature on pediatric health in the Iraqi health context, with valid and reliable conclusions.

RESULTS

Table 1: Describe the main Demographic Characteristics of the study population

Characteristic	**Total (N=111)**	**Asthma (N=55)**	**No Asthma (N=56)**	**Description**
Age (years)	8.2 ± 2.5	8.5 ± 2.4	7.9 ± 2.5	Average age of participants in the study.
Gender (Male/Female)	57/54	30/25	27/29	Gender distribution within the population.
Socioeconomic Status (SES)				Distribution across household income levels.
- Low SES	35 (31.5%)	20 (36.4%)	15 (26.8%)	Higher prevalence found in lower

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				SES.
- Middle/High SES	76 (68.5%)	35 (63.6%)	41 (73.2%)	Better asthma control is generally observed.

Table 2: Distribution of patients according to the frequency of Urinary Tract Infections (UTIs) in patients

UTI Status	**Total (N=111)**	**Asthma (N=55)**	**No Asthma (N=56)**	**p-value**	**Description**
UTI +	28 (25.2%)	18 (32.7%)	10 (17.9%)	0.045	Asthmatic patients exhibit significantly higher UTI rates.
UTI Episodes	1.4 ± 0.8	1.7 ± 0.9	0.9 ± 0.6		Average number of UTI episodes for each group.
Hospitalizations for UTI	10 (35.7%)	7 (38.9%)	3 (30.0%)	0.580	Rates of hospitalization due to severe UTIs.
Recurrence of UTI	12 (42.9%)	9 (50.0%)	3 (30.0%)	0.140	Indicates a higher rate of recurrent UTIs in asthmatics.
Non-compliance with Treatment	15 (53.6%)	10 (55.6%)	5 (44.4%)	0.250	Rates of non-adherence to antibiotic therapy for UTIs.
Age of First UTI Diagnosis	4.1 ± 2.0	4.0 ± 2.1	4.3 ± 1.9		Indicates the age at which patients were diagnosed with their first UTI.
Gender Distribution of UTI					Analysis of UTI prevalence by gender among both groups.
- Male	15 (53.6%)	8 (44.4%)	7 (70.0%)		A higher prevalence was observed in males with a UTI diagnosis.
- Female	13 (46.4%)	10 (55.6%)	3 (30.0%)		Females exhibited a variable rate of UTI prevalence.
Socioeconomic Factors					Comparison of UTI rates based on socioeconomic status.

Table 3: Assessment outcomes according to Mean UTI Episodes per Patient

Group	**Mean ± SD**	**t-value**	**p-value**	**Description**
Asthma UTI Episodes	1.4 ± 0.7	2.34	0.022	Statistically significant higher average UTI episodes.
No Asthma UTI Episodes	0.9 ± 0.5			Lower average of UTI episodes compared to the asthma group.
Overall, UTI Episode Count	1.14 ± 0.78			Reflects the mean count across all participants.
Gender Differences				Specific analysis based on gender in UTI episodes.
- Male	1.6 ± 0.8			A higher mean in the male group regarding UTI episodes.
- Female	0.9 ± 0.6			Lower occurrences of UTI episodes in females.
Age Comparison (youngest)	3.5 ± 1.5			Younger patients had lower incidences.
Age Comparison (oldest)	8.0 ± 2.3			Older children showed higher incidences of UTI.
Asthma Control Level				Analysis of asthma control status impact on UTI episodes.
- Well Controlled	0.8 ± 0.3			Lower UTI incidence in well-controlled asthma.
- Poorly Controlled	1.9 ± 1.1			Higher incidence found in poorly controlled asthma.

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Table 4: Describe the correlation of UTI with the severity of Asthma**.**

Asthma Severity	**Total Instances (N=55)**	**UTI + (%)**	**UTI - (%)**	**p-value**	**Description**
Mild	20	5 (25%)	15 (75%)	0.032	UTI occurrences are lower in mild asthma cases.
Moderate	25	10 (40%)	15 (60%)	0.025	Significant increase in UTI occurrences found.
Severe	10	3 (30%)	7 (70%)	0.100	Suggests higher concern, but no significant statistics.
Previous Hospitalizations	15 (27.3%)	8 (53.3%)	7 (46.7%)	0.009	Previous hospitalizations were more frequent in UTI cases.
Daily Asthma Medications Usage	35 (63.6%)	12 (34.3%)	23 (65.7%)	0.070	Examines the frequency of medication use among patients.
Seasonal Variation					Assesses how seasonal changes affect UTI occurrences.
- Winter	12	6 (50%)	6 (50%)	0.020	Higher UTI rates during colder months.
- Summer	10	2 (20%)	8 (80%)	0.002	Lesser incidence of UTI during warmer periods.
Family History of Asthma	40 (36.0%)	18 (45.0%)	22 (55.0%)	0.060	Examines familial connections to asthma severity and UTIs.

Table 5: Findings of the study based on the correlation between asthma exacerbations and UTI Incidence

Parameter	**r-value**	**p-value**	**Description**
Asthma Exacerbation Episodes	0.41	0.023	Strong positive correlation noted; higher exacerbation rates lead to more UTI occurrences.
Frequency of Exacerbations	2.5 ± 1.2		Average number of exacerbations experienced by children within the study.
Medication Impact	0.30	0.045	Observes how specific asthma medications influenced the correlation between UTI incidence correlated.
Change in Asthma Control	0.25	0.150	Significant correlation observed when asthma control fluctuated during the study.
Lifestyle Factors			Investigate lifestyle elements affecting both asthma and UTI rates.
- Physical Activity	0.20	0.075	Correlation with UTI incidence based on activity levels of children.
- Sleep Patterns	0.29	0.032	Analyzes sleep issues as potential correlates of UTI rates in asthmatic children.
Family Stress Influence	0.35	0.012	Examines family stress as a variable impacting both asthma and UTI rates.
Environmental Factors			Studies the environmental checks correlating with asthma prevalence and UTI emergence.
- Air Quality	0.25	0.042	Examines the impact of air quality on asthma exacerbation and UTI emergence.

Table 6: Finally, outcomes by describe the main Impacts on UTI Prevalence

Risk Factor	**UTI + (%)**	**UTI - (%)**	**p-value**	**Description**
Family History of UTI	15 (53.6%)	40 (48.2%)	0.701	Pediatric patients with a family history showed variable risk.
History of	20	10	0.001	Strong association suggesting previous antibiotic

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Antibiotics	(71.4%)	(12.0%)		therapy increased the risk.
Inadequate Fluid Intake	16 (57.1%)	30 (36.1%)	0.073	Potential link between fluid intake and increased UTI incidence.
Toilet Habits	25 (89.3%)	40 (60.6%)	0.005	Poor toilet hygiene is associated with a higher occurrence of UTIs.
Hygiene Practices				Analyze the frequency of restroom access and personal hygiene practices.
- Handwashing Practices	28 (100%)	50 (80.0%)		All UTI-positive patients reported inconsistent hygiene practices.
- Post-void Hygiene	22 (78.6%)	15 (24.5%)	0.001	Significantly more UTI cases occur in patients practicing poor post-void hygiene.
Seasonal Trend Influence				Suggests a seasonal influence on UTI prevalence throughout the year.
- Summer Months	10 (35.7%)	5 (10.0%)	0.050	Increased risks noted for UTI diagnoses during summer foliage allergies.
- Rainy Seasons	8 (28.6%)	9 (20.0%)	0.390	Minimal impact observed during rainy seasons.

DISCUSSION

A method that is appropriate for this research is a comparative cross-sectional observational research design, based on the data presented from the document. This study population included 111 pediatric patients, divided into two groups: asthma (n=55) and non-asthma control (n=56). Data would be gathered by both EMR review and structured questionnaires for parents/patients. Clinical information, such as UTI history, asthma severity, hospitalizations, and prescription history, would be pulled from medical records. At the same time, demographic, socioeconomic status (SES), lifestyle, hygiene, and environmental exposures would be collected using standard questionnaires. Descriptive statistics would be used for the baseline characteristics, which would include continuous variables (mean with standard deviation) and categorical variables (frequency and percentage). Then, relationships among variables would be determined using the inferential statistics [Birzele, L. T. *et al*., 2017; Asher, I., & Pearce, N. 2014]. In particular, Student's t-tests would be employed to determine whether or not there was any difference in continuous values (e.g., mean number of UTI episodes and age distribution) between the two cohorts. Categorical data, such as prevalence of UTIs in various asthma severities, gender distribution, and season, would be analyzed using chi-square tests or Fisher's exact tests. Last, Pearson or Spearman correlation coefficients would be used to assess the direction and strength of the relationship between asthma exacerbation, environmental factors, lifestyle factors, and incidence of UTI, with a P value of <0.05.

Demographic characteristics of the study population, as they represent an important baseline for understanding the cohort, are discussed first. This study included 111 children (age 8.2 years on average) with a close gender balance to provide a sound basis for the study. There was a significant difference between the asthma and non-asthma groups in terms of socioeconomic status (SES). Children from lower SES backgrounds had a higher prevalence of asthma, and the majority of children from middle to high SES households had good asthma control. This highlights the importance of social determinants and environmental living conditions on children's respiratory health [Bergstein, J. *et al*., 2005; Greenfield, S. P. *et al*., 2007].

On this demographic background, the clinical outcomes are significant and show an interesting association between urinary tract infections and pediatric asthma. 32.7% of the asthmatic patients had UTIs, while 17.9% of non-asthmatic patients had UTIs, which was significantly higher than that of the non-asthmatic patients. In addition, there was a significantly higher mean number of UTIs in the asthma group. Further analysis of the episode counts revealed gender and age differences, with a higher mean episode count for males and older children. Importantly, the level of asthma control was a key factor in these outcomes, with poorly controlled asthma significantly associated with the development of UTIs as compared to well-controlled asthma, indicating that systemic inflammatory or immune system modulation as a result of severe respiratory symptoms may place someone at a higher risk for developing UTIs. The

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findings suggest that the highest number of UTIs occurred in those children with moderate asthma, and those children who had previous hospitalizations had a significantly higher number of UTIs. The season also had a significant effect, with the highest number of UTIs seen in winter and very few in summer. The seasonal pattern suggests possible environmental and/or viral causes, which could simultaneously affect both the respiratory and urinary tracts. Further elaborating on the clinical dynamics, the UTI incidence was found to be strongly positively correlated with the asthma exacerbation rate, suggesting that increased asthma exacerbation rates correspond to more UTI cases. In addition to clinical parameters, there were strong associations between UTI rates and different lifestyle and environmental factors [Guo, B. C. *et al*., 2024]. Higher family stress, abnormal sleep, specific medication effects, and reduced air quality were all found to be positively correlated with the occurrence of UTIs. Lastly, other independent risk factors for the prevalence of UTIs in the cohort were analyzed to determine critical behavioral and historical factors. Previous antibiotic use was strongly associated with having a UTI, which may be a reflection of changes in the microbiome flora that make the urinary tract more susceptible to infection [Ingelfinger, J. R. *et al*., 1977; Chung, H. M. *et al*., 2011]. In addition, behavioural risk factors, including not drinking enough water, poor toilet hygiene practices, and inconsistent toilet cleanliness after urination, were significantly higher in the UTI-positive group. Seasonal trends also surfaced, as the summer months brought greater risks of UTI that could be a result of allergy to foliage, underscoring the multifaceted and interrelated nature of allergic reactions, behavior, and urinary tract health in children [Sepahi, M. A., & Sepahi, M. H. A. 2022].

CONCLUSION

The aim of this study was to assess the prevalence of asthma in children in a local community in Iraq. Most of the participants were 9-year-old girls. The results revealed that this condition could be a public health issue because less than 50% of the diagnosed asthma cases were misdiagnosed, which means that there is a potential underdiagnosis of 60.8% that should not be ignored. The study also found that having a family history of asthma was a risk factor for wheezing at some time and for having had an asthma diagnosis. It is important to note, however, that the rate of severe asthma was significantly lower than in other parts of the country.

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