https://doi.org/10.48047/AFJBS.6.2.2024.2784-2801

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Sleep Disorders among Children with Allergic Diseases in Sharqia Governorate

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Article History

Volume 6, Issue 2, Apr-Aug 2024

Received: 10 August 2024

Accepted: 20 August 2024

Published: 20 August 2024

doi: 10.48047/AFJBS.6.2.2024.2784-2801

Abstract: Background: Sleep disorders and allergies in children are increasingly relevant health issues that require attention. Sleep is a vital component of human life that serves many critical roles in mental health and physical well-being. **This study aimed to** assess sleep disorders among children with allergic diseases. **Research design :** Across- sectional research design was carried out in this study. **Setting:** The present study was conducted at allergy and immunology unit outpatient clinics at Zagazig University Hospital and four schools at Abu Kabir Center, Sharqia Governorate, Egypt. **Subjects:** A matching sample of 87 parents of children with allergic diseases and 87 parents of normal children aged 6-15 years **.Tool:** Two tools were used for collecting the necessary data. The first tool was a structured interview questionnaire. The second tool was Sleep Disturbance Scale for Children (SDSC). **Results:** The total mean score of sleep disorders in children with allergic diseases was 41.16±11.54 compared to 30.82±7.94 in the control group. **Conclusion:** Children with allergic diseases were more vulnerable to sleep disorder than non-allergic children. Not only children with allergic diseases have sleep disorders but although non allergic children have sleep disorders. There was a highly statistically significant relation between types of allergic diseases and sleep disorders .**Recommendation:** Promoting early screening and diagnosis of these issues to provide timely support and intervention program for children with allergic diseases as well as non-allergic children .Encouraging collaboration between allergists, pediatricians, psychologists, and sleep specialists to provide comprehensive care plan.

Keywords: *Allergic diseases, children, Sleep disorders .*

Introduction

Allergic diseases are among the most common noncommunicable chronic diseases in children and adolescents worldwide**(Zainal et al ., 2021).**The prevalence of allergic diseases has risen worldwide, especially among children and adolescents **(Noh et al., 2023).**

In recent years, allergic diseases have been listed by the World Health Organization as one of the "three major diseases of the 21st century" to be prevented and controlled **(Wang et al ., 2023)& (Han et al ., (2021) .**In addition, it is listed by the World Allergy Organization (WAO) as "a public health issue of global concern". It is estimated that the prevalence of allergic disorders would reach 4 billion worldwide in 2050 and unfortunately we are nowhere near a cure **(Han et al ., (2021).** Allergic diseases have a negative impact on physical and psychological status, social life, participation in school and reduce the quality of life of patients themselves and their families **(Khamidovna, 2023).** The effect of allergic diseases on healthcare systems and society is generally remarkable and is considered as one of the most common causes of chronic and hospitalized disease **(Eslami et al ., 2020)** Pediatric allergic diseases are particularly important for society due to their chronic course and high healthcare costs **(Chang et al., 2013).**

Sleep disorders are known to be prevalent in children with chronic medical condition (CMDs) and can exacerbate the underlying health challenges associated with (CMDs) such as asthma **(Adavadkar et al ., 2024)**Allergic diseases are common conditions that can influence sleep and subsequent daytime functioning **(Koinis-Mitchell et al ., 2012).**

Sleep is vital for health and well-being in children, adolescents and adult. Healthy sleep is important for cognitive functioning, mood, mental health, and cardiovascular, cerebrovascular and metabolic health **(Ramar et al ., 2021).**Sleep supports homeostatic, cognitive, immune, and cardiovascular functions and is fundamental for a child's growth and development **(Deshpande et al ., 2022).**

Sleep disorders are a topic of great relevance due to their impact on children 's general health **(Diéguez et al ., 2024).** Sleep disorders among children are a significant public health concern worldwide and is defined as conditions that impairs a person's sleep and prevents their restful sleep .These disorders can impact a child's physical, neurological, and linguistic development as well as mental health, cognitive, emotional, social well-being and behavioral well-being **(Gao et al ,2023).**

Sleep disorders are defined as any disturbance in the sleep timing, quality, or quantity that affects the baseline functional status of an individual. According to the third edition of the International Classification of Sleep Disorders (ICSD-3), there are seven major categories of sleep disorders, namely, sleep-related breathing disorders, insomnia, parasomnia, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders, sleep-related movement disorders, and other sleep disorders **(Alfakeh et al ., 2023).**

Inadequate sleep or sleep disorders can present differently in children. Adults present with fatigue and daytime sleepiness; however, children may present with behavior problems, including irritability, hyperactivity, and poor school performance. Teenagers may experience increased motor vehicle crashes caused by drowsy driving **(Deshpande et al.,2022).**

Inadequate sleep in children and adolescents can have deleterious effects on mental health and cognitive functioning including attention, memory, executive functioning and school performance and is associated with increased risk for behavioural problems and physical health problems **(Rigney et al.,2021).** It may potentially negatively affect growth and development on children **(Horwood et al ., 2019).**

The impact of childhood sleep problems may be far-reaching and also have a significant influence on the psychological and physical functioning of the child's family. In children with complex medical and/or behavioral needs, sleep problems may contribute to further reduction in quality of life for both children and their caregivers **(Horwood et al ., 2019).**

In patients with chronic allergic diseases, including asthma, allergic rhinitis, and atopic dermatitis, sleep disorders may increase the severity of the condition, complicate the management by the physician and adversely affect the quality of life and mood. The resulting impairments in performance of common daily activities affect both children and adults and generate social and health care costs **(Ridolo et al., 2015).**

Pediatric nurses have critical roles in safeguarding, developing, and improving the health of children and their families. One of the ways were they actively use their positions as caregivers, advisers, educators, advocates, comfort providers, and comforters is to safeguard and improve children's sleep health. Nurses bear a lot of responsibility for sleep management. They observe the sleep behavioral patterns of healthy and unhealthy children with health problems, diagnose children's sleep disorders, provide education for adolescents, support families and teachers about good sleep hygiene practices, provide counsel, assess the sleep practice processes, and provide feedback **(Koyuncuoğlu & Gözen, 2024). Significance of the study:**

Associated symptoms of allergic diseases may interfere with everyday living and sleep quality of affected children, leading to mental health and behavioral problems **(Lin et al., 2016).**Sleep is crucial for childhood development, influencing physical and behavioral growth and emotional and cognitive performance. As a result, sleep disorders can have adverse short- and long-term effects on a person's life. Some short-term effects include low productivity, concentration, attention deficits, absence from classes, and decreased quality of life **(Maleki et al., 2023).**

It is essential for nurses in all practices settings to understand good sleep patterns as well as sleep disorder in children .Pediatric nurses, regardless of their setting, are in a unique position to screen children and adolescents for sleep behavior problems or sleep disorders, teach families about healthy sleep practices, provide guidance and feedback, and recommend referral to pediatric specialized care for further assessment and management **(Bastida-Pozuelo et al ., 2018)** So, the current study aims to assess sleep disorders among children with allergic diseases.

Aim of the study

The current study aimed to assess sleep disorders among children with allergic diseases.

Research Questions:

- Are children with allergic diseases subjected to sleep disorders?
- Is there a relationship between allergic diseases and sleep disorders?

Subjects and methods:

Research design:

Across- sectional research design was used .

Study setting:

The present study was conducted at allergy and immunology unit outpatient clinics at Zagazig University Hospital and four schools at Abu Kabir Center, Sharqia Governorate, Egypt.

Study subjects:

A matching sample of 87 parents of children with allergic diseases and 87 parents of normal children aged 5-16 years .

Tools of data collection:

Two tools were used to collect necessary data.

Tool I: Structured interview questionnaire A Structured interview questionnaire was developed by the researcher under supervision of the supervisors after reviewing related scientific literature and articles to collect the required date. It consists of three parts:

Part I: Characteristics of the studied children **(Case & Control)** .This part of the Questionnaire concerned with Socio -Demographical data of the Studied children such as child's age, gender , residence ,educational grade , child live with , number of sibling and birth order.

Part II: Characteristics of parents of the studied children (Case & Control) .This part of the Questionnaire concerned with Socio-demographic data of Parents of the studied children , such as father / mother age, father /mother level of education, father /mother occupation's, father/mother consanguinity and its degree, family income and crowding index.

Part II : Medical history of children with allergic diseases (cases) : This part of the questionnaire concerned with medical history of children with allergic diseases such as type of allergic diseases, family history of allergic diseases, medication taken , follow up , environmental condition.

Tool II: Sleep Disturbance Scale for Children (SDSC). It was adopted from (**Bruin et al ., (1996)** was designed to evaluate both specific sleep disorders in children, and to provide an overall measure of sleep disturbance suitable for use in clinical screening and research. This measure is completed by the parent of the child and takes approximately 5–10 min to complete.

Bruin et al ., (1996) conducted a psychometric evaluation of the SDSC and found an internal consistency ranging from .71 to .79, a test-retest reliability of .71, a diagnostic accuracy of .91.

Scoring system:

It contains 26 items. Item 1 measures the child's average hours of sleep, from 1 ('9–11 h') to 5 ('less than 5 h'). Item 2 measures the child's average time to fall asleep, from 1 ('less than 15 min') to 5 ('more than 60 min'). The remaining 24 items are rated on a 5-point Likert scale, from 1 ('Never') to 5 ('Always [daily]'); a 5-point Likert-type scale with values 1–5 (higher numerical values reflect a higher frequency of occurrence of symptoms). It covers six most common sleep disorders of childhood and adolescence: disorders of initiating and maintaining sleep (DIMS), sleep breathing disorders (SBD), disorders of arousal (DA), sleep wake transition disorders (SWTD), disorders of excessive somnolence (DOES), and sleep hyperhydrosis (SHY).

We considered as having a sleep disorders those patients with an SDSC total score over the cut-off score of 39 indicated by the authors **(Bruin et al ., 1996)** . For the subscales, we considered T-scores (normal if ≤ 70) as reported on the original paper; therefore, pathologic scores were ≥17 for DIMS, ≥7 for SBD, ≥6 for DA, ≥14 for SWTD, ≥13 for DOES, and ≥7 for SHY.

Content validity& Reliability:

The tools used in data collection were standardized with reported validity and reliability. Tools were translated into Arabic, utilizing translation and back-translation techniques to ensure their original validity. Content validity was checked before the pilot study and the actual data collection. The tools were revised by a jury of five experts through the distribution of the two tools with a covering letter and explanation sheet that explained the purpose of the study. Five-person panels of experts included: Professor of Pediatric Nursing, Assistant Professor of Psychiatry Health Nursing, Faculty of Nursing, Zagazig University. Professors of allergy and immunology, Professor of psychiatry medicine, Faculty of Medicine, Zagazig University, and Professor of Pediatric Nursing, Faculty of Nursing, Banha University .They revised tools for clarity, relevance, applicability, comprehensiveness, understanding, and ease of implementation. The recommended modifications were done, and the final form was ready for use.

Testing reliability of sleep disturbance scale for children was done by Cronbach's Alpha test, it was (0.910).

Fieldwork

After getting the official permission to proceed with the study, the pilot study was done and analyzed. The researcher interviewed parents of children with allergic diseases who fulfill the criteria of the study individually to collect necessary data. The aim and the procedures of the study were explained briefly, and oral consent was obtained from parents of children with allergic diseases and their children who accepted to participate in the study. Also reassured them that the information obtained was strictly confidential and used for research purposes only. The process for data collection for each child took about 40–45 minutes.

The researcher attended the Allergy and Immunology Unit outpatient clinics at Zagazig University Hospital for 3:4 days/week (Sunday, Monday, Tuesday, and Thursday) for data collection from 9:00 a.m. to 2:00 p.m. The data was collected from parents of allergic children during two months, starting from October 2023 to December 2023.

After collecting the data, the researcher decided the number of students (control group) to be collected from each school based on correspondence with studied allergic children (cases group). Then, the researcher went to the selected schools and explained to their directors the aim of the study and the nature of the tools used for data collection, gave them a copy of the tools, and approved letters from the Directorate of Education in Sharkia Governorate and Abu Kabir Educational Administration.

The director referred the researcher to the school's social and psychological specialist and asked him to help the researcher communicate with the parents of the selected students. Communication was made with the

parents of the selected students who fulfill the criteria of the study in more than one way, e.g., through parent councils, parents who attend their children's school, contacting parents by phone, explaining the aim of the study to them, giving them the right to participate or not, and if they agreed, setting a date for the interview at school. The researcher found great cooperation from parents of students, The researcher explain the aim of the study and the nature of the tools to every Parent of selected students.

The researcher interviewed parents of control group children individually for 4 days/week (Saturday, Sunday, Monday, and Thursday) from 9 a.m. to 1 p.m. for primary school and from 1 p.m. to 4 p.m. for preparatory school. Data was collected from selected students within one month, from the beginning of January 2024 to February 2024.

Pilot study:

The pilot study was conducted on 18 parents of children (9 parents of children with allergic diseases (Cases) and 9 parents of normal children (control) representing about 10% of calculated total sample size for the main study. The children involved in the pilot study were included in the study sample since no modifications were done in the tools. The aim of the pilot study were to test the questions for any obscurity and to assess the applicability, feasibility and practicality of the tools as well as it helped to determine the time needed for filling out the tool sheets.

Administrative and ethical considerations:

All ethical issues were taken into consideration during all phases of the study. Firstly, the current study was approved by the research ethics committee of the Faculty of Nursing, Zagazig University. Then official permission was obtained by submission of formal letters containing the aim of the study issued from the dean of the faculty of nursing, Zagazig University, to the responsible authorities of the allergy and immunology unit outpatient clinic at Zagazig University Hospitals and obtaining their permission for data collection after approval of the Zagazig University Institutional Review Board.

Also to the Directorate of Education in Sharkia Governorate that referred the researcher to the Educational Administration at Abu-Kabir City, that directed the researcher to selected schools with approval letters. Additionally , oral informed consent was obtained from the participants who accepted to participate in the study after a full explanation of the study aim. Participants were given the opportunity to refuse participation. They were assured that the information obtained during the study would be confidential and used for scientific research purposes only.

Statistical analysis:

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA 2011)). Quantitative data were expressed as the mean ± SD and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percent of categorical variables were compared using Chi-square test or Fisher's exact test when appropriate. The student "t" test was used for comparison of means of two independent groups of quantitative data which were normally distributed.

The Mann-Whitney U test was used for comparison of means of two independent groups of quantitative data which were not normally distributed. Spearman correlation coefficient was calculated to assess relationship between study variables, (+) sign indicate direct correlation & (-) sign indicate inverse correlation. Cronbach alpha coefficient was calculated to assess the reliability of the scales through their internal consistency. P-value < 0.05 was considered statistically significant, p-value < 0.001 was considered highly statistically significant, and p-value ≥ 0.05 was considered statistically non-significant.

Results:

Table (1) : shows characteristics of the studied children. It was found that 85.1% of the studied children were aged 6 to 12 years with a mean age of 9.86±2.23. Also, it was found that 69.0% of the studied children were males and 79.3% were from rural areas. Concerning the educational level, 80.5% of the studied children were in primary schools. As regard birth order, it was reported that 54% of the allergic disease children were first-born children compared to 35.6% of the control group.

Table(2): Clarifies characteristics of parents of the studied children .Regarding children with allergic diseases , it was found that 93.8 %of their fathers age were 30 to 50 years with mean age 38.40±6.60 and 66.7% of mother age were 25 to 35 years with mean age 33.85±5.39 compared to 94.1 with mean age 41.29±6.24 and 62.1% with mean age 33.98±6.60 for children in the control group father and mother respectively .

Also 64.4 % , 31% of allergic diseases children' mother had secondary and university education respectively , compared to 33.3% ,1.1% of control groups mothers. In addition, It was found that 25.3% of allergic diseases children had positive father – mother consanguinity compared to 17.2 in the control group. It was revealed that 46% of allergic diseases children had insufficient income compared to 21.8% in the control group .

Table (3): reveals types of allergic diseases among the studied children .It was found that 31% of studied children had allergic asthma followed by children with allergic rhinitis who constituted 20.6 % of the studied children then children with multiple allergic diseases which represent 19.5 % of the studied children .Children with Allergic conjunctivitis were 18.3 % and the lowest percentage was to skin allergy which was **10.3% .**

Table (4): represents medications taken by the studied children. It was found that the most common medication taken by children with allergic diseases was anti histamine 64.4% followed by Inhalers by (44.8%) then sublingual or subcutaneous immunotherapy (43.7%). Bronchodilator (32.2%), Mucolytic agent 23.0% ,Anti-inflammatory drugs containing cortisone or corticosteroid thereby (20.7%) .It was also found that 35.6 % of parents don not know that there children taking corticosteroid thereby or not .In addition, it was found that 36.7% of children do not comply with drug regimens as prescribed by their doctors.

Moreover, it was discovered that a higher percentage of parents do not know the name of their child's drugs, as follows: 66.7%, 66.7%, 64.7%, 60.0%, 58.8%, 57.1%, 44.4%, and 35.7%, for anti-allergic, skin soothing ointment, inhalers, expectorant, mucolytic agent, eye drops or ointment, bronchodilator, anti-inflammatory drugs containing cortisone (corticosteroid thereby), and anti-histamine, respectively.

Table (5): illustrates family history of allergic disease in the study group. It was found that 59.8% of allergic disease children have a positive family history. Also, it was revealed that 59.6% of children with positive family history were for allergic asthma, 36.5% for allergic rhinitis, 19.2% for allergic conjunctivitis, and 11.8% for skin allergies.

Table (6): shows follow up, hospitalization and environmental conditions of the study group. It was found that 39.1 % of allergic diseases children follow up on a regular basis while 60.9 % follow up irregularly only when they were diseased , 11.5 % of allergic diseases children had a previous allergic diseases that has already disappeared , 70.0 % of them was skin allergies and 30.0 % was allergic asthma . Concerning Environmental condition surrounding children with allergic diseases it was found that 78.2 % live near a source of dust , 65.5 %live nearby gardens and agricultural lands, 66.7 % exposure or contact with animals , 32.2 % exposure to chemical .

Table (7): represents total mean scores of sleep disorders in the studied children . It was found that total mean score of sleep disorders in children with allergic diseases was 41.16±11.54 compared to 30.82±7.94 in the control group. Also it was observed that there was highly statistically significant difference (P= <0.001) between children with allergic diseases and control groups in all domain of sleep disorders except disorders of arousal domain which nearly have the same result in both groups .

Moreover, it was found that disorders of initiating and maintaining sleep are the most common type of sleep disorders that affect children with allergic diseases, followed by sleep–wake transition disorders , disorders of excessive somnolence , sleep breathing disorders , sleep hyperhidrosis and disorders of arousal .

Table (8): describes relation between types of allergic diseases and sleep disorders in children with allergic diseases . It was found that there was highly statistically significant relation (P= 0.001) between types of allergic diseases and sleep disorders especially children with allergic asthma and children with multiple allergic diseases as it was found that 50 % of children who had sleep disorders had allergic asthma and 38.6% of them

had multiple allergic diseases compared to 11.6% , 0.0 % respectively of children who did not have sleep disorders .

Table(9): illustrates correlation between types of allergic diseases and sleep disorders. It was found that there was a highly statistically significant positive correlation between allergic rhinitis and sleep disorders and statistically significant positive correlation between allergic asthma ,multiple allergic diseases and sleep disorders. While statistically significant negative correlation between allergic conjunctivitis and sleep disorders

Figure (1): displays total scores of sleep disorders in the studied children .It was found that 50.6 % of children with allergic diseases had sleep disorders compared to 13.8 % in the control groups .This difference is highly statistically significant**(P = 0.001).**

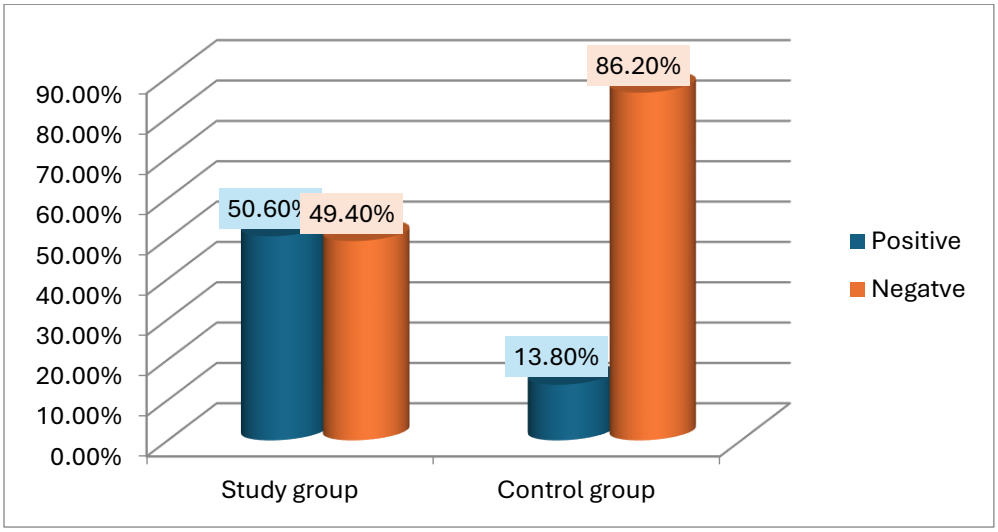

Figure (1): The total scores of sleep disorders in the studied children (n=174).

Table (1): Characteristics of the studied children (n=174) .

	Study group(n=87)		Control group (n=87)		χ^2	p-value
	No.	%	No.	%		
Age (years)						
6-12	74	85.1	74	85.1	FET	0.99
>12	13	14.9	13	14.9		
Mean± SD	9.86±2.23		9.86±2.23		t=0.001	0.99
Gender						
male	60	69.0	60	69.0	FET	0.99
Female	27	31.0	27	31.0		
Residence						
Rural	69	79.3	69	79.3	FET	0.99
Urban	18	20.7	18	20.7		
Education						
Primary	70	80.5	70	80.5	FET	0.99
Preparatory	17	19.5	17	19.5		
Child live with						
Both parent	78	89.7	84	96.6	FET	0.132
One parent	9	10.3	3	3.4		
Number of siblings						
One	28	32.2	10	11.5	11.026	0.012*
Two	36	41.4	49	56.3		
Three	16	18.4	20	23.0		
Four or more	7	8.0	8	9.2		
Birth order						
The first	47	54.0	31	35.6	6.312	0.097
The Second	21	24.1	27	31.0		
The third	14	16.1	23	26.4		
The Fourth or More	5	5.7	6	6.9		

χ 2 : Chi square test FET: Fisher exact test, t:student t-test non-significant(p>0.05), *: statistically significant (p<0.05).

Table (2): Characteristics of parents of the studied children (n=174).

	Study group(n=87)		Control group (n=87)		χ^2	p-value
	No.	%	No.	%		
Father age (years)						
<30	4	4.9	0	0.0	9.059	0.011*
30-50	76	93.8	80	94.1		
>50	1	1.2	5	5.9		
Mean± SD	38.40±6.60		41.29±6.24		t= -2.895	0.059
Father education						
Illiterate	13	16.0	7	8.2	13.121	0 .011*
Primary	1	1.2	4	4.7		
Preparatory	2	2.5	3	3.5		
Secondary	46	56.8	32	37.6		
University	19	23.5	39	45.9		
Father job						
Governmental employee	18	22.2	20	23.5	8.043	0.045*
Free	47	58.0	60	70.6		
Not working	3	3.7	2	2.4		
other	13	16.0	3	3.5		
Mother age						
25-35	58	66.7	54	62.1	0.577	0.749
35-45	27	31.0	30	34.5		
>45	2	2.3	3	3.4		
Mean± SD	33.85±5.39		33.98±6.60		t= -0.151	0 .880
Mother education						
Illiterate	2	2.3	1	1.1	1.405	0.843
Preparatory	1	1.1	1	1.1		
Primary	1	1.1	56	64.4		
Secondary	56	64.4	29	33.3		
University	27	31.0	1	1.1		
Mother job						
Employee	13	14.9	22	25.3	3.778	0.151
Housewife	73	83.9	65	74.7		
Other	1	1.1	0	0.0		
Family income						
Sufficient	47	54.0	68	78.2	FET	0.001**
Insufficient	40	46.0	19	21.8		
Consanguinity						
No	65	74.7	72	82.8	FET	0.266
Yes	22	25.3	15	17.2		
If answer is yes What is the degree						
The fourth	14	63.6	12	80.0	FET	0.466
The fifth	8	36.4	3	20.0		
Crowding Index						
<2	73	83.9	66	75.9	FET	0.256
>2	14	16.1	21	24.1		

χ^2 : Chi square test FET: Fisher exact test, t:student t-test non-significant(p>0.05), *: statistically significant (p<0.05), **: statistically highly significant (p<0.001).

Table (3): Types of allergic diseases among the studied children (n=87).

Types of allergic disease*	No.	%
Allergic asthma	27	31
Allergic rhinitis	18	20.6
Allergic conjunctivitis	16	18.3
Skin allergy	9	10.3%
Multiple allergy	17	19.5

Table(4): Medications taken by the studied children (n=87).

	Yes		No		Don't know		Drug name			
							know		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Anti- histamine	56	64.4	31	35.6	0	0.0	36	64.3	20	35.7
Bronchodilator	28	32.2	58	66.7	1	1.1	12	42.9	16	57.1
Anti-inflammatory drugs containing cortisone(corticosteroid thereby)	18	20.7	38	43.7	31	35.6	10	55.6	8	44.4
Mucolytic agent	20	23.0	66	75.9	1	1.1	8	40.0	12	60.0
Inhalers	39	44.8	48	55.2	0	0.0	13	33.3	26	66.7
Expectorant	17	19.5	67	77.0	3	3.4	6	35.3	11	64.7
Anti-allergic and skin soothing ointment	12	13.8	75	86.2	0	0.0	4	33.3	8	66.7
Eye drops or ointment	17	19.5	70	80.5	0	0.0	7	41.2	10	58.8
Taking the medication regularly as prescribed by the doctor	55	63.3	32	36.7	0	0.0	0.0	0.0	0.o	0.0
Taking sublingual / subcutaneous immunotherapy	38	43.7	49	56.3	0.0	0.0	0.0	0.o	0.0	0.0
Taking a dose of sublingual / subcutaneous immunotherapy regularly and on time (n=38)	34	85.0	4	15.0	0.0	0.0	0.0	0.o	0.0	0.0

Table (5): Family history for Allergic disease in the study group (n=87).

	NO.	%
Family history		
Yes	52	59.8
No	35	40.2
Family history for Allergic disease for (n=52)*		
Allergic asthma	31	59.6
Allergic rhinitis	19	36.5
Allergic conjunctivitis	10	19.2
Skin allergy	6	11.8

*: not mutually exclusive

Table (6): Follow up, hospitalization and environmental conditions of the study group (n=87).

	No	%
follow up		
Regularly	34	39.1
Irregularly	53	60.9
Suffering from any type of allergic disease before and it has disappeared now		
Yes	10	11.5
No	77	88.5
If the answer is yes What		
Allergic asthma	3	30.0
skin allergy	7	70.0
Has your child been hospitalized before		
Yes	26	29.9
No	61	70.1
Environmental condition		
Nearby gardens	57	65.5
Factors	1	1.1
Source of dust	68	78.2
Exposure to		
Chemical	28	32.2
Insect sides	12	13.8
Animal contact	58	66.7
cosmetics	8	9.2

Table (7): The total mean scores of sleep disorders in the studied children (n=174).

Score	Study group(n=87)	Control group (n=87)	t-test	p-value
	Mean± SD			
Disorders of initiating and maintaining sleep	16.48±4.95	12.52±3.48	6.087	<0.001**
Sleep breathing disorders	5.97±3.04	3.54±1.42	6.755	<0.001**
Disorders of arousal	3.73±1.37	3.64±1.10	0.485	0.628
Sleep–wake transition disorders	11.71±3.90	9.39±3.11	4.337	<0.001**
Disorders of excessive somnolence	11.04±4.99	8.39±3.54	4.042	<0.001**
Sleep hyperhidrosis	3.91±2.83	2.72±1.73	3.352	<0.001**
Total score	41.16±11.54	30.82±7.94	6.878	<0.001**

**: statistically highly significant (p<0.01)

Table (8): Relation between types of allergic diseases and sleep disorders of children .

Types of allergic disease	Sleep disorders				χ^2 (p-value)
	Negative =43		Positive =44		
	No.	%	No.	%	
Allergic asthma	5	11.6	22	50.0	53.033 (0.001**)
Allergic rhinitis	16	37.2	2	4.5	
Allergic conjunctivitis	14	32.6	2	4.5	
Skin allergy	8	18.6	1	2.3	
Multiple allergy	0	0.0	17	38.6	

χ 2 : Chi square test **: statistically highly significant (p<0.001).

Table (9): Correlation between types of allergic diseases and sleep disorders.

Types of allergic disease	Sleep disorders	
	r	p
Allergic asthma	0.236	0.028*
Allergic rhinitis	0.303	0.004**
Allergic conjunctivitis	-0.222	0.039*
Skin allergy	-0.053	0.625
Multiple allergy	0.241	0.025*

r: correlation coefficient, non-significant(p>0.05), *: statistically significant (p<0.05), **: statistically highly significant (p<0.001).

Discussion:

Sleep can be problematic at all ages, but particularly during infancy, childhood, and adolescents **(Rigney et al .,2019).**Unhealthy sleep in children and adolescents has been continually recognized as a major health issue and has received great attention in recent years by researchers, healthcare providers, families caregivers, and school nurses/counselors **(Ranum et al., 2020)**

There are several medical factors that can affect sleep, including chronic illnesses, such as nocturnal asthma and atopic dermatitis **(Theodorus et al., 2020).**Conditions like asthma, allergies, or sleep apnea can interfere with a child's sleep **(Leandro , 2023).**

Concerning age ,the findings of the present study indicated that the majority of the studied children's age range from 6 -12 years with a mean score and standard deviation of 9.86±2.23 which indicated that the school age group is the most affected group . As regard gender , the result of the current study show that much more than half of the studied children (69.0%) were male. This can be explained by the influence of sexual hormones, different lifestyles adopted by men and women, micro biota diversity, diet distinctions, professional options, and adherence to treatment, among others**(Rosário et al ., 2021).**

This result was supported with a study conducted by **Yu et al ., (2019),** in Guangzhou primary and middle school students about Prenatal and neonatal factors involved in the development of childhood allergic diseases and reported that boys have a higher risk of asthma, dermatitis, rhinitis, and eczema in all age groups relative to girls. Similarly, **Mohammed et al ., (2020)** who conducted study about prevalence of bronchial asthma among school aged children in Elmaraghah Center in Sohag Governorate found that males had 1.1 times risk of developing asthma than females.

Also in the same line , **Dastoorpoor et al ., (2022)** who conducted a study about assessing the prevalence and severity of asthma, rhinitis, and eczema among school children (6–7 and 13–14 years old) in Khuzestan, Iran: a cross-sectional survey , found that the prevalence and severity were significantly higher in boys than in girls in total and in the age group of 6–7 years. Meanwhile, in girls aged 13–14, the prevalence and severity were significantly higher than in boy .

Possible explanation may be due to that at a young age more boys develop asthma, this changes rapidly with girls' sexual maturation, leading to a lifelong female dominance in allergy ,additional obesity synergizes with

asthma development in girls, not on boys of the same age **(Jensen , 2017).** Epidemiologic and experimental studies suggest that female sex hormones enhance the immunological responses, likely leading to exaggerated disease, whereas testosterone dampens the same responses. These effects increase the risk of allergic diseases in adult females **(Rosário et al ., 2021)**

As regard residence, it was found that more than three quadrants of studied children were from rural area (79.3 %). This result may be explained by **(Bosch et al ., 2011) .** Reported that total allergenic pollen abundance was higher in rural and semi-rural areas than in urban areas , allergenic pollen exposure is higher in rural areas than in urban areas.

From the researcher point of view ,rural areas may have higher levels of pollens and animal allergens, which can trigger allergic responses in susceptible individuals. Wood-burning stoves, burning rice straw ,exposure to mold, or other indoor pollutants in rural homes can contribute to poor indoor air quality, respiratory issues and allergies. Socioeconomic Factors ; poverty , lower socioeconomic status ,limited access to healthcare in some rural area can lead to underdiagnoses or poor management of allergic conditions , also make rural children more likely to be go to governmental hospital than urban children who may be go to private clinic or hospitals.

Also, there are several modern changes and factors: Modern agricultural practices involve the use of pesticides, herbicides, and fertilizers. Reliance on biomass fuels for cooking and heating can lead to poor indoor air quality and increased allergen exposure.

In the same vein , **Mohammed et al ., (2020)** who conducted study about prevalence of bronchial asthma among school aged children in Elmaraghah Center in Sohag Governorate found that children who lives in rural area had 1.5 times risk of developing asthma than who lives in urban area. The younger age the higher prevalence of asthma.

The current study found that more than half of children with allergic diseases had a positive family history. More than half of those with positive family history had a family history of allergic asthma 59.6 % , and slightly higher than one-third of them have a family history of allergic rhinitis. As regard consanguinity among parents, it was found that one quarter of children with allergic diseases had positive father-mother consanguinity compared to one fifth of children in the control group. This can be explained by the fact that allergic diseases caused by complex interactions between genetic and environmental factors (**Wang et al., (2023) .**

This finding was congruent with **Abdelmotaleb et al . (2020)** who studied prevalence of childhood bronchial asthma and its risk factors in Kom Hamada district, Beheira Governorate, Egypt and found that around one quarter (24.1%) of the parents had positive consanguinity and that a positive family history of asthma was significantly associated risk factors for asthma development . In additional . it was reported that there was highly significantly association between asthma and family history of asthma (56.7%) ,family history of rhinitis (47.3%) and significant association between family history of dermatitis.

The current study found that more than half of the children with allergic diseases were first-born children compared to more than one third of children of the control group .This has been interpreted as evidence from the microbiota hypothesis, which says that higher early-childhood microbial exposure caused by siblings protects against immunological hypersensitivity**(Luukkonen et al .,2024).**

This result may be supported by **Huang et al . (2023)**in their study about Risk assessment of allergic diseases among preschool children in Guangzhou, China: a cross-sectional study , found that first-born children had a higher risk of developing the allergic diseases and the risk of allergic disease in early childhood is increased by several uncontrolled factors, including male gender, birth order, and preterm. Similarly , in a study carried by **Lisik et al ., (2023)** found that the presence of siblings and being second-born or later may decrease the lifetime risk of atopic dermatitis and food allergy.

The findings of the present study indicate that nearly one-eighth of children with allergic diseases had a previous allergy disease that has already disappeared. Skin allergies represent the largest proportion of them account for around two thirds and allergic asthma constitute the other third . This can be explained by phenomenon known as the " atopic march" is the natural history of allergic diseases. Atopic diseases of

different organs and causal allergens develop sequentially with age .Atopic dermatitis generally develops first, followed by immunoglobulin E (IgE)-mediated food allergy (FA), allergic asthma (AA), and allergic rhinitis (AR), which result in increased sensitization to food and/or environmental allergens as some symptoms become more prominent over time, while others subside **(Tsuge et al., 2021).**

According to environmental condition surrounding children with allergic diseases , the current study results revealed that three-quarters of children with allergic diseases live near a source of dust , and greater more than half of them live nearby gardens and agricultural lands , and exposure or contact with animals . Also it was found that nearly one third of them exposure to chemical .

This result may be due to the fact that Al Sharqia Governorate in Egypt is an agricultural region where farming is a primary occupation and where close contact with animals and agricultural activities are part of daily life. This means that children often live near or on farms, where dust from soil, plowing, and harvesting is prevalent . Many rural areas have unpaved roads that generate dust when vehicles pass over them. In agricultural settings, dust from fields, particularly during dry seasons or when fields are plowed, can be widespread. Children in rural areas often come into contact with farm animals, such as cows, goats, chickens, and sheep. This exposure can lead to allergic reactions to animal dander, feathers, and other allergens. While industrial pollution is low, natural environmental allergens such as dust and pollen are more common.

In contrast , **Al Dhduh et al ., (2015)** who conducted study about prevalence and severity of allergic diseases among Egyptian pediatric in different Egyptian areas reported that higher percentage of students with asthma symptoms lives nearby factories, nearby coffee shops and higher percent of them living with or exposed to animals (26.1%, 65.5% and 62.7% respectively). This difference may be due to different in environmental factors and lifestyle as Al Sharqia Governorate is a more rural and agricultural area compared to the urban environment of Cairo Governorate in which the other study conducted .

The current study show that that more than half of children with allergic diseases experienced sleep disorders compared to slightly more than one-eighth of children in the control group with mean and standard deviation for children with allergic diseases 41.16±11.54 compared to 30.82±7.94 for children in the control group. The difference was highly statistically significant (P= <0.001

This result might be due to the fact the fact that asthma and allergic rhinitis symptoms are frequently experienced during nighttime hours because of many factors, including a dip in cortisol levels at night that affects inflammatory cytokines and other mediators. Also, nighttime disturbances, such as nasal congestion in patients with AR, airway obstruction in patients with asthma, and an increased sensation of itching for patients with AD, might be related to circadian fluctuations in inflammatory mediators. Examples: in patients with AR, circadian rhythms can lead to a peak in nasal congestion during the early morning hours, adversely affecting sleep quality **(Koinis et al ., 2012).**

Furthermore, histamine, an inflammatory mediator released during allergic reactions, might contribute to disturbed sleep because it is involved in the regulation of the sleep-wake cycle and arousal but also can induce symptoms of rhinitis, directly leading to sleep disruption. Typical sleep-related problems seen in patients with AR include sleep-disordered breathing, sleep apnea, and snoring, all of which are associated with nasal congestion/obstruction. Additional symptoms, such as coughing in patients with asthma and AR symptoms experienced at night, can also increase discomfort and sleep disruption **(Koinis et al ., 2012).**

In the same line, a study conducted by **Alshehri et al ., (2022)** about the quality of sleep in allergic children and their parents found that more than half of children with allergic diseases experience sleep disorders. Similarly, **Sherrey et al., (2022)** in a study of allergic disease, sleep problems, and psychological distress in children recruited from the general community indicated that univariate analyses revealed that the total sleep problem score was substantially elevated in all allergic disease groups compared with children without allergic disease.

Also a study by **Wasilewska et al ., (2009)** about sleep disorders in childhood and adolescence, with special reference to allergic diseases reported that allergic diseases are accompanied by different sleep disorders included dyssomnias and parasomnias, e.g. bedtime resistance, disrupted sleep or sleep-disordered breathing.

In addition, **Oh et al ., (2015)** who conducted a study about sleep disturbance in children with allergic disease indicated that children with allergic disease from early children may have poor sleep quality than those without .

The sub-dimensions of this scale were evaluated. The result of the current study revealed that there was highly statistically significant difference (P= <0.001) between children with allergic diseases and children in the control groups in all domains of sleep disorders except arousal-related sleep disorders that were nearly equal. It was also found that the most common domain that affect children with allergic disease were disorders of initiating and maintaining sleep with mean score16.48±4.95 compared to 12.52±3.48 in the control group followed by sleep wake transition disorders with mean score 11.71±3.90 compared to 9.39±3.11.

In the same line **Metbulut et al ., (2024)** who conducted a study about evaluation of sleep disorders in childhood allergic diseases found that disorders of initiating and maintaining sleep was the most common domain that affected children with allergic diseases with mean score 13.4±4.5 followed by sleep-wake transition disorders with mean score 9.7±4. Similarly, **Alshehri et al ., (2022)** reported that among the different sleep disorders, the disorders of initiating and maintaining the sleep and the sleep wake transition disorders were the most altered .

This is in contrary with **Oh et al ., (2015)** which found that parasomnia symptoms were common in young children (ages 2 to 5 years) than in the control group (P< 0.05). Symptoms of sleep-disordered breathing were more common in early adolescent children (ages 11 to 12 years) than in the control group (P< 0.05).

The result of the current study confirm the basic hypothesis that there was relationship between types of allergic disease and sleep disorders .The relation was highly statistically significant (P= 0.001) . It was also observed that children with allergic asthma have reported to have the highest frequency followed by children with multiple allergic diseases .As it was found that half of children with sleep disorders had allergic asthma and more than one third of them had multiple allergic diseases.

This may be explained by the growing evidence supporting an association between sleep disorders and allergy-related outcomes. In patients with seasonal allergies, issues such as fatigue and sleep disorders, in addition to disease-specific symptoms, are exacerbated during the pollen season. This may be related to nasal congestion caused by allergic rhinitis. Mechanical obstruction caused by nasal congestion may lead to sleep apnea **(Xi et al ., 2022).**

This result was in congruent with **Chen et al ., (2021)** in their study about associations of sleep characteristics with atopic disease: a cross-sectional study among Chinese adolescents and reported that sleep problems and sleep hygiene, especially sleep-disordered breathing, sleep physiology, and sleep environment, were essentially connected with all atopic diseases in adolescents and they are associated with a higher risk of allergic diseases .

Similarly, **Wang et al ., (2017)** who carried out study about sleep disorders and allergic diseases in chinese toddlers reported that presence of certain sleep disorders was associated with higher risk of having allergic diseases in Chinese toddlers.

Moreover , **Urrutia et al ., (2017)** nearly had the same result who conducted a study about sleep disorders in Latin-American children with asthma and/or allergic rhinitis and normal controls , and found a significant association between asthma and sleep disturbances in children with frequent symptoms and children with isolated asthma showed higher impairment of sleep when compared with those with asthma associated to allergic rhinitis .

The results of this study indicated that there was highly statistically significant positive correlation between allergic rhinitis and sleep disorders. In addition ,It was found statistically significant positive correlation between allergic asthma **(r= 0.236) (P =0.028,** multiple allergic diseases **(r= 0.241) (P =0.025)** and sleep disorders .This result can be rationalized that nocturnal symptoms of asthma such as cough, wheezing, or breathlessness may disrupt sleep quality in asthmatic children (**Yuksel et al ., 2007).**

Also, allergic rhinitis can disrupt sleep through inflammatory process of the nasal passage, causing nasal congestion, which increases airway resistance and leads to mouth breathing, sleep disturbance, and weariness.

Also, chronic inflammation in the nasal cavity and nasopharynx fosters enlargement of tonsils and adenoids and can also promote the evolution of an elongated face due to oral breathing rather than nasal breathing. In addition, inflammatory mediators of the allergic process, such as histamine and some cytokines, directly affect the central nervous system by disrupting sleep rhythms. All increase risk for the presence of a smaller and more collapsible upper airway. In light of the increased nasal airflow resistance, AR considers risk factors for OSA (**D'Elia et al ., 2022)**

In the same line **(Yuksel et al ., 2007).** who carried out study about evaluation of sleep quality and anxiety–depression parameters in asthmatic children and their mothers and found that there was a significantly positive correlation between asthma symptom score and sleep disturbing factors sub score. Similarly , **Estanislau et al ., (2021)** who conducted a study about association between asthma and sleep hours in Brazilian adolescents and reported that

there was positive association between short sleep duration and the presence of asthma and severity of symptoms, and suggest a possible bi-directionality relation of this association.

Moreover , **Krouse et al ., (2008)** carried out a study about assessing sleep quality and daytime wakefulness in asthma using wrist actigraphy, assessed the sleep/wake cycles using wrist actigraphy of individuals with mild to moderate/persistent asthma and controls for seven consecutive days, and observed a strong positive association between quality of sleep and the level of asthma control.

Also In the same vein, **Lee et al ., (2021)** in their study about association between allergic rhinitis-related factors and sleep duration in adolescents: Korea National Health and Nutrition Examination Survey V (2010–2012) reported that endoscopic findings of allergic rhinitis showed a positive association with inappropriate sleep duration in males (odds ratio = 1.52, p = 0.008).

Similarly**, Loekmanwidjaja et al ., (2018)** who carried out a study about sleep disorders in children with moderate to severe persistent allergic rhinitis ,reported that there was moderate correlations observed for the respiratory distress subscale vs. nasal symptom score (r=0.32) and vs. extra-nasal symptom score (r=0.32) and revealed that the intensity of sleep disturbances found in these subscales nocturnal respiratory disorders and daytime sleepiness correlated with objective markers of allergic rhinitis severity.

The result of the current study revealed that there was statistically significant negative correlation between allergic conjunctivitis and sleep disorders . In contrary **Li et a ., (2023) ,** in their study about Impaired sleep quality in children with allergic conjunctivitis and their parents and finding that allergic conjunctivitis has a negative association with sleep quality in children and their parents, especially in those children with severe follicle formation and keratitis.

Conclusion:

Based upon the findings of the present study, it was concluded that children with allergic diseases were more vulnerable to sleep disorders than non-allergic children. Not only children with allergic diseases have sleep disorders but although non allergic children. Also there were highly statistically significant relationship between types of allergic diseases and sleep disorders.

Recommendation:

In the light of the findings of the current study, the following recommendations are suggested:

- Promoting early screening and diagnosis of these issues to provide timely support and intervention program for children .
- Encouraging collaboration between allergists, pediatricians, psychologists, and sleep specialists to provide comprehensive care plan that include management strategies for both the allergic disease and its impact.
- Providing educational or training program for parents on how to manage allergic diseases , sleep issues ,accommodate any necessary adjustments and how to recognize early signs of such problem for early intervention.

- Developing educational programs for parents and schools to raise awareness about the impact of allergies on sleep and the challenges faced by children with allergies and their impact on health and well-being and provide strategies for supporting them in the school environment

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