INSOMNIA AND ITS RELATED FACTORS AMONG EGYPTIAN CHILDREN WITH TRANSFUSION-DEPENDENT HEMOGLOBINOPATHIES: - DESCRIPTIVE STUDY

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Abstract

Background: Insomnia, which may have an effect on the illness's progression, is a symptom of a set of hereditary autosomal recessive hemolytic diseases, including thalassemia and sickle cell disease (SCD). The purpose of this research was to investigate the prevalence of insomnia and the factors that are associated with it in children who suffer from transfusion-dependent forms of hemoglobinopathies.
Subjects and Method: A descriptive research design was utilized.
Setting: Children Hospital of Mansoura University.
Subjects: The studied subjects consisted of 405 children whom selected from above mentioned setting.
Tools: Two tools were used to collect the data of study through **First: -** Socio-demographic characteristics and clinical data of the children and **Second: -** the Insomnia Severity Index (ISI) **Third: -** Hospital anxiety and depression scale (HADS).
Results: The research found that the average age of the children under observation was 11.22 years old, with a standard deviation of 2.39 years. More than 56.3% of the children under observation required blood transfusions. Almost one third of the people who participated in the study (28.40%) had a very severe degree of insomnia, and approximately half of the people who participated in the study (47.90%) had a moderate level of insomnia. There werepositive correlation between Eating habits, Social Interaction, Recreational activities, Anxiety and Depression and Insomnia.
Conclusion: The current study concluded environmental, psychological, and medical and treatment factors were factors causing insomnia among children with Transfusion-Dependent Hemoglobinopathies.
Recommendations: It is important to conduct an assessment of insomnia in children who have transfusion-dependent hemoglobinopathies in order to determine its pattern, factors that affect sleep disturbances, and how a health education programme should be designed and provided for children who have transfusion-dependent hemoglobinopathies, as well as their carers, about the factors causing insomnia in children who have transfusion-dependent hemoglobinopathies and how to deal with them.

Keywords: Insomnia, Transfusion-Dependent, Hemoglobinopathies.

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1. INTRODUCTION

Hereditary disorders of hemoglobin, also known as hemoglobinopathies, are a group of genetic disorders of hemoglobin structure. They primarily comprise two disease groups: sickle cell disease (SCD) and the thalassemias**(Harteveld, C.L. et al., 2022).** These disorders are among the most common hereditary disorders worldwide; the birth rate of people who are homozygous or compound heterozygotes for symptomatic globin disorders revolves around 2.4 per 1000 births, of which 1.96 have SCD and 0.44 have thalassemias**(Layton, D., et al., 2019).**
Sickle hemoglobin (HbS) is caused by a mutation in the b-globin gene. This mutation produces a hydrophobic motif in the deoxygenated HbS tetramer that results in binding between the b1 and b2 chains of two hemoglobin molecules that produces an expanding polymer that fills the red blood cell, disrupting its structure and elasticity (i.e., the process of "sickling") and promoting cellular dehydration, the latter being exacerbated by physical activity and by oxidative cellular stress. The degree of hemoglobin deoxygenation and the intracellular HbS concentration ultimately determine the rate and the extent of HbS polymerization and sickling, the main determinants of disease severity **(Chaparro, C. M., &Suchdev, P. S. 2019).**
The clinical presentations of SCD, both acute and chronic, may be characterized as shown by their

underlying pathophysiological mechanisms, e.g., vasoocclusive or hemolytic. This is relevant for both acute and chronic forms of the disease. **(Kato, G. J., et al., 2018).** Vasoocclusive effects include acute pain crises, acute chest syndrome (ACS), and osteonecrosis. Included in the spectrum of hemolytic disorders are pulmonary hypertension, priapism, and leg ulcers. On the other hand, these disorders are included under hemolytic complications. Despite the fact that acute pain crises are not frequently and immediately connected with end-organ damage, they are exceedingly debilitating and have been linked to a higher death rate in adults with SCD. Acute pain crises are the leading cause of emergency department visits and hospitalizations among children with SCD **(Lydia and Lanzkron, 2021).** Acute chest syndrome, defined as the development of a new localized lung infiltrate, is the second most common reason SCD patients are hospitalized. As part of its etiology, ACS is characterized by pulmonary vasoocclusion, infection, and, in certain cases, fat embolism. Yet, the specific pathophysiology of many cases remains unknown. Sickle cell disease is also linked with an increased risk of stroke, heart disease, pulmonary hypertension, renal disease, and hyperhemolysis; however, these complications occur far less often **(Kavanagh et al., 2022).**

The thalassemias are a group of hereditary diseases characterized by a deficiency or decline in the body's capacity to manufacture normal hemoglobin. Human hemoglobin is always composed of four chains of globin, two of which are beta-like and two of which are alpha-like, at every stage of its production. At the stage known as embryogenesis, embryonic genes are active and make embryonic hemoglobin (Beta2, Delta2) **(Taher et al., 2018).** The defective globin gene that is implicated in the disease determines the kind of thalassemia that a person has. In a person with a-thalassemia, the a-globin genes are impacted, while in b-thalassemia, the b-globin genes are damaged. Patients who have thalassemia can present with a wide variety of clinical manifestations, depending on the amount of normal hemoglobin that is still present in their bodies. These manifestations can range from almost no symptoms at all to severe anemia that requires lifelong blood transfusions and causes complications in multiple organ systems **(Adly& Ismail, 2018).**

Insomnia in children and adolescents should be perceived as a symptom or cluster of symptoms that can result from a wide variety of potential causes, just like many other presenting complaints that are common in the pediatric population, such as headaches or shortness of breath. Insomnia can be caused by a variety of factors, including mental health conditions, physical health conditions, and environmental factors. Insomnia in children can have a variety of causes, some of which are primarily medical (for example, medication-related or pain-induced), while others are primarily behavioral (for example, associated with a lack of a regular sleep schedule or negative sleep-onset associations). In many cases, childhood insomnia is the result of a combination of these factors **(Güneş, S. 2019).** A number of factors, including frequent treatment procedures that include blood transfusion once or twice monthly and hospital visits to follow up, the side effects of long-term blood transfusion and other medications, decreased life expectancy as a long-term effect of treatment that affects bone growth, hepatomegaly, and splenomegaly, and expected complications from disease or treatment procedures can be attributed to insomnia in children who have transfusion-dependent hemoglobinopathies. In addition, the lengthy and excruciatingly painful treatment sessions, such as those used to remove iron because an excess of iron can be a complication of receiving frequent blood transfusions, and a painful procedure that lasts for eight hours and involves injecting chelators using a chelation pump, add to the list of contributing factors. The kid's blood responses might put them in danger for shortness of breath and fever, both of which are associated issues that could alter the child's sleep pattern since the youngster would be preoccupied with the possibility that they could die **(Hisam et al., 2018).**

Either way, from a clinical perspective, the most common signs of childhood insomnia, especially in younger children, include bedtime refusal or difficulties, trouble going to sleep after "lights out," or frequent or extended night wakings that require parental involvement. In general, the working definition of childhood insomnia is comparable to that of insomnia in adults (for example, significant difficulty initiating or maintaining sleep) **(Morin, 1993).**

Sleep is one of the less talked-about things that might affect how a child's brain grows and develops. According to studies conducted on the pediatric population as a whole, neurodevelopmental impairment may be caused by both insufficient time spent sleeping and poor sleep quality. Due to symptoms of the illness that interfere with sleep, such as discomfort and enuresis, children who have SCD often have disruptions in both the quantity and quality of their sleep **(Bouya et al., 2021).** The neurodevelopmental risks that are posed by sleep problems in children with SCD are poorly understood; however, it is possible that the impairment they cause could be even greater than that which is seen in children who are developing typically due to the additional underlying neurological vulnerability that is present in these children. Considering the high frequency of sleep disruptions in children with SCD, if it is discovered

that short duration or poor quality sleep are risk factors for neurodevelopmental impairment, the majority of these children might be harmed. This is because of the high incidence of sleep disturbances. It is essential to reduce the risk of unfavourable neurodevelopmental outcomes for children with SCD if they are to reach their full academic and personal potential as well as their ideal health and quality of life **(Meltzer et al., 2021).**

It is possible that the diagnosis of insomnia in children is more difficult than it is in adults for a variety of reasons. To begin, the patient seldom presents with a complaint of being unable to sleep; rather, the concerns of caregivers and their subjective observations of a child's sleep patterns and behaviors are typically what are used to identify sleep disturbances in the clinical environment **(Williamson et al., 2019).** Parents of children are more likely to notice and, as a result, be aware of sleep troubles than parents of school-aged children and teenagers. The capacity and willingness of parents to detect and report sleep problems in children also varies among age groups **(Stores, 2022).**

In addition, sleep problems in the pediatric population must be viewed in the context of the normal developmental trajectory across childhood and appropriate developmental norms; "normal" bedtime behavior, time to sleep onset, and sleep duration vary significantly between 6-month-old infants, 6-year-old school-aged children, and 16-year-old adolescents **(Hauri, 2021).**

Not only do culturally-based differences in values and beliefs regarding the meaning, relative importance, and role of sleep in daily life, as well as sleep practices (such as sleeping space and the timing of sleep periods, solitary sleep versus bed-sharing, and the use of transitional objects), have a profound effect on how a parent defines a sleep "problem," but they also have a profound effect on the relative acceptability of various treatment strategies. Cultural differences in values and beliefs regarding the meaning, relative importance **(Spruyt, 2019).** Insomnia in children may have a number of repercussions, the most significant of which may be stress and lack of sleep for the child's primary caregiver, in addition to or in place of the kid experiencing direct repercussions (such as daytime drowsiness or behavioral issues). Some studies, for instance, have shown evidence of secondary consequences of children's sleep disorders on parents, such as maternal depression, as well as on the stress levels and overall functioning of families **(Meltzer et al., 2021).** This problem is especially prevalent in households where one or more of the children have a chronic medical condition or neurodevelopmental disorder. For these families, the added burden of chronic insomnia and weariness on the primary caregiver may be substantial.

2. AIM OF STUDY

There were two aims to this study.

1. Assess the insomnia of children with transfusion dependent hemoglobinopathies.
2. Explore associations between Insomnia, Sociodemographic and Clinical Characteristics of studied sample.

- **Research design:**

The design used at this study is a Descriptive design.

- **Setting:**

The study was conducted at the in-patient Hematology department and out-patienthematology clinic of Children Hospital of Mansoura University. Children Hospital of Mansoura University consists of 13 units and 8 wards. Children Hospital of Mansoura University serve sick children in six governorates in the North Delta: Dakahlia, Port Said, Damietta, Sharqia, Gharbia and Kafr El Sheikh

- **Study subjects:**

A convenience sample of 405 children with thalassemia who attend the previous setting was selected for this study. All children with age ranging from 8 years to 18 years who attend to previous setting for six months from the first of February 2021 to the 28 th of February 2022 constituted 405 children. ***These subjects was meet the following criteria:***

a) Age: between 8 to 18 years.
b) Gender: both sexes will be included in the study.
c)Children should attend regularly to out-patient clinic and in-patient department of Children Hospital of Mansoura University.
d)Children who is blood transfusion dependent

Exclusion criteria:

1.Patients with Mental retardation.
2.Patients with co-morbidity illness.

DATA COLLECTION TOOLS: -

The following tools were used to collect the necessary information for the study:

Tool (1) Socio-demographic characteristics and clinical data of the children:

This sheet was designed by the researcher after the review of the literature for the collection of socio-demographic data from children and their caregivers which include: -

a) *Socio-demographic data* of children that included - child's age, gender, child order and level of education.

b)*Clinical data of children with hematological disorders such as:* - onset of the disease, duration of illness, frequency of blood transfusion, presence

of any disease as diabetes mellitus, heart disease (cardiomegaly) and bone deformities (fractures or osteoporosis) and presence of thalassemia through the family, number of brothers or sisters affected with thalassemia relative relationship between parents.

Tool (2) Insomnia Severity Index (ISI): -

The Insomnia Severity Index **(Morin 1993)** was developed based on criteria that were outlined in the DSM-IV-TR **(APA 1994)** and the **International Classification of Sleep Disorders [ICSD] (1990).** However, the Insomnia Severity Index has been transferred to more recent editions of the classification criteria **(Gagnon et al., 2013).** **Suleiman and Yates (2011)** provided the translation for this instrument. It comprises seven questions that are meant to quantify the effect of nighttime and daytime components of insomnia, and it measures those components on a scale of five points over the course of two weeks. The first three items measure difficulties in falling asleep (item #1), staying asleep (item #2), and waking up early in the morning (item #3); the last four items measure sleep dissatisfaction (item #4), sleep-related problems in daytime functioning (item #5), noticeability of daytime functioning problems (item #6), and distress associated with insomnia (item #7). Items 1 through 3 range from 0 (none) to 4 (very severe); item 4 ranges from 0 (very satisfied) to 4 (very dissatisfied); item 5 ranges from 0 (not at all interfering) to 4 (very much interfering); item 6 ranges from 0 (not noticeable) to 4 (very noticeable); and item 7 ranges from 0 (not worried) to 4 (very much worried). The presence of sleep problems is indicated by higher scores. All of the questions were given the same amount of weight, and the total scores were summed together. A score of 0–7 indicated that there was no clinically significant insomnia; 8–14 indicated subthreshold insomnia; 15–21 indicated clinical insomnia (moderate to severe); and 22–28 indicated clinical insomnia (severe).

Tool (3) Hospital anxiety and depression scale (HADS): -

In 1983, Zigmond and Snaith collaborated on the Hospital Anxiety and Depression Scale (HADS) in order to quantify the levels of anxiety and depression that are present in a general medical population of patients. Validation of the scale was performed on children eight years of age and older. The questionnaire has seven questions for anxiety and seven questions for depression, and takes 2–5 minutes to complete. It is essential that the items pertaining to anxiety and depression be assessed independently, despite the fact that they are scattered throughout the questionnaire. El-Rufaie and Absood (1995) conducted a validation study on the Arabic translation of the HAD scale. The following is a brief overview of cut-off scores:

8–10 Mild
11–14 Moderate
15–21 Severe

STATISTICAL ANALYSIS:

In order to do statistical analysis on the data, version 26 of the Statistical Package for the Social Sciences (SPSS) was used. For quantitative variables, the data were coded and summarized using descriptive statistics such as frequency, percentage distribution, mean, and standard deviation. Chi Square was used to compare qualitative variables, and the correlation coefficient (r) was used to test whether or not quantitative variables were correlated with one another. If the p-value was less than 0.05, the study was regarded as statistically significant.

ETHICAL CONSIDERATIONS: -

The consent to participate in the study was obtained verbally from each child as well as their caregivers. All of the children and the adults who were responsible for them were given information regarding their right to reject or withdraw their consent at any time. The youngsters were given their right to privacy. The Research Ethics Committee of the Faculty of Nursing at Mansoura University provided the ethical committee that was used in this study.

3. RESULTS

Table (1): Distribution of the studied Children according to their sociodemographic characteristics

Characteristics	Frequency (N = 405)	Percentage %
Age		
8 yrs :< 12 yrs	242	59.8 %
12 yrs :< 15 yrs	114	28.1 %
15 yrs : 18 yrs	49	12.1 %
Mean ± S.D	11.22 ± 2.395	
Gender		
Male	176	43.5 %
Female	229	56.5 %
Educational Level		
Primary	241	59.5 %

Preparatory	118	29.1 %
Secondary	46	11.4 %
Child order		
First	277	68.4 %
Second	107	26.4 %
Third	19	4.7 %
Other	2	0.5 %
Medical Diagnosis		
Beta Thalassemia Major	367	90.6 %
Sickle Cell Anemia	38	9.4 %
Transfusion times per Month		
Once Monthly	228	56.3 %
Twice Monthly	177	43.7 %
Child's age when the disease was detected (Months)		
Less than one year	318	78.5 %
More than one year	87	21.5 %
Mean ± S.D = 7.49 ± 3.06		

Table (1) shows the frequency distribution of the studied children according to their socio-demographic and clinical characteristics. It appears from the table that two-thirds (59.8%) of the studied children were in the age range of 8 to less than 12 years, with a mean age of 11.22 ± 2.39. In addition, it was shown that female children represented a higher percentage (56.5%). Also, in child order, more than two-thirds (68.4%) of studied children were the first child. Concerning the educational level, two thirds of the studied children (59.5%) were in primary school.

According to medical diagnosis, the majority of studied children (90.6 %) suffer from beta thalassemia major. More than half of the studied children (56.3%) have a blood transfusion rate of once a month. The mean age of children when the disease was diagnosed was 7.49 ± 3.06

Table (2): Distribution of the studied Children according to their Clinical characteristics

Characteristics	Frequency (N = 405)	Percentage %
The first time a blood transfusion (Months) Mean ± S. D	7.49 ± 3.06	
Was the disease detected urgently?		
Yes	361	89.1 %
No	44	10.9 %
Does the child have a splenomegaly?		
No	157	38.8 %
Yes	248	61.2 %
Does the child have a cardiomegaly?		
No	348	85.9 %
Yes	57	14.1 %
Does the child have a Hepatomegaly?		
No	271	66.9 %
Yes	134	33.1 %
Does the child have a Osteoporosis?		
No	299	73.8 %
Yes	106	26.2 %
Does the child have a Bone Deformity?		
No	258	63.7 %
Yes	147	36.3 %
Is there a consanguinity relationship between the spouses?		
No	188	46.4 %
Yes	217	53.6 %
Degree ofconsanguinity (N=217)		
Third Degree	190	87.6 %
Fourth Degree	27	12.4 %
Does anyone in the family or relatives have this disease?		
No	246	60.7 %
Yes	159	39.3 %

What is the relationship of a family member or relative who affected with the disease to the affected child? (N = 159)		
Father / Mother	16	10.0 %
Brother / Sister	85	53.5 %
Paternal uncle / Maternal uncle	33	20.8 %
Aunt / Maternal aunt	2	1.3 %
Grand Father / Grand Mother	1	0.6 %
Cousins	21	13.2 %
Cousins	1	0.6 %
Other	0	0.0 %
How many brothers or sisters have the same disease? (N = 85)		
One Brother	27	31.8 %
One Brother (Died)	5	5.9 %
One Brother and One Sister	9	10.6 %
One Brother and One Sister (Died)	2	2.3 %
One Sister	37	43.5 %
One Sister (Died)	4	4.7 %
Two Brothers	1	1.2 %
Eating habits		
Normal eating pattern	36	8.9 %
Anorexia	224	55.3 %
Food Refusal	145	35.8 %
Social Interaction		
Normal	194	47.9 %
Social withdrawal	211	52.1 %
Recreational activities		
Indoor activities	217	53.6 %
Outdoor activities	188	46.4 %

Table (2) shows the distribution of the studied children according to their clinical data. It was found that the mean age of children when blood was transfused for the first time was 7.49 ± 3.06. The majority of the studied children's (89.1%) related disease was detected urgently. Concerning the other complications associated with the disease, two thirds of studied children (61.2%) have splenomegaly, the majority of them (85.9 %) don't have cardiomegaly, two thirds of studied children (66.9%) don't have hepatomegaly, approximately three-quarters of studied children (73.8%) don't have osteoporosis, and two thirds of them (63.7%) don't have bone deformities. More than half of them (53.6%) have a consanguinity relationship between the spouses, and for the majority of those (87.6%), the degree of consanguinity between spouses is third degree.

Two thirds of the studied children's caregivers (60.7%) reported that family members and relatives have the same disease, more than half of them (53.5%) have a brother or sister with the same disease. According to those who reported having a brother or sister with the same disease, more than a third of them (43.5%) have at least one sister affected by the same disease.

More than half of the studied children (55.3%) suffer from anorexia. Regarding social interaction, more than half of the studied children (52.1%) struggle with social withdrawal. In relation to recreational activities, more than half of the studied children (53.6%) prefer indoor activities.

Table (3): Relation between Insomnia Severity Index of the studied children with the socio-demographic characteristics

Characteristics	Mean ± S. D	X^2	P value
Age			
8 yrs :< 12 yrs	14.14 ± 0.59		
12 yrs :< 15 yrs	16.96 ± 2.50	34.88	**P** =< 0.001
15 yrs : 18 yrs	22.31 ±0.47		
Gender			
Male	16.20 ± 2.66	5.60	**P** =< 0.001
Female	18.33 ±3.61		
Educational Level			
Primary	14.18 ± 0.96		
Preparatory	17.07 ± 2.56	40.47	**P** =< 0.001
Secondary	22.33 ± 0.47		
Child order		204.85	

First Second Third	17.64 ± 3.46 16.96 ± 3.22 14.25 ± 0.50		**P** = 0.048
Medical Diagnosis Beta Thalassemia Major Sickle Cell Anemia	 17.17 ± 3.26 23.00 ± 0.00	224.87	**P** =< 0.001
Transfusion times per Month Once Monthly Twice Monthly	 16.98 ± 3.99 17.63 ± 3.12	34.56	**P** = 0.029
Was the disease detected urgently? Yes No	 17.59 ± 3.44 15.59 ± 2.32	156.28	**P** = 0.024

Statistical Significant at P < 0.05
High Statistical Significant at P < 0.001

Table (3) shows the relation between Insomnia Severity Index of the studied children and their socio-demographic profile. Concerning the studied children's age, it was found that the highest mean score of insomnia was for the age group from 15 to 18 years (22.31 ± 0.47), in the same order. Regarding gender, it was found that the highest mean score was for females (18.33 ± 3.61). In relation to educational level, the highest score was found for those in the secondary educational level (22.33 ± 0.47). For those who are the first in their child order, they have the highest score (17.64 ± 3.46).

The table also shows that the studied children with sickle cell anemia had the highest mean score (23.00 ± 0.00). Also, those who had blood transfusions twice monthly scored the highest mean score (17.63 ± 3.12; For those who detected their disease urgently, the highest mean score was theirs (17.59 ± 3.44). A statistically significant association was found between insomnia mean scores and socio-demographic characteristics.

Table (4): Relation between Insomnia Severity Index of the studied children with the clinical characteristics

Characteristics	Mean ± S. D	X^2	P value
Does the child have a splenomegaly? No Yes	 16.19 ± 2.96 17.98 ± 3.46	32.99	**P** =< 0.001
Does the child have a cardiomegaly? No Yes	 17.17 ± 3.32 18.83 ± 3.57	101.37	**P** = 0.007
Does the child have a Hepatomegaly? No Yes	 16.28 ± 2.77 18.91 ± 3.59	3.33	**P** =< 0.001
Does the child have a Osteoporosis? No Yes	 16.86 ± 3.18 18.58 ± 3.58	24.33	**P** =< 0.001
Does the child have a Bone Deformity? No Yes	 16.70 ±3.16 18.40 ± 3.50	4.39	**P** =< 0.001
Does anyone in the family or relatives have this disease? No Yes	 18.40 ± 3.59 15.39 ± 1.70	28.50	**P** =< 0.001
Number of brothers or sisters have the same disease. One Brother / Sister Two Brothers / Sisters	 15.91 ± 0.84 14.00 ± 0.00	22.73	**P** = 0.004
Eating habits Normal eating pattern Anorexia Food Refusal	 16.53 ± 2.86 17.23 ± 3.17 18.87 ± 3.33	29.51	**P** =< 0.001
Social Interaction Normal Social withdrawal	 16.27 ± 2.96 18.13± 3.50	32.29	**P** =< 0.001
Recreational activities Indoor activities Outdoor activities	 17.80 ± 3.09 15.41 ± 1.52	27.62	**P** =< 0.001

Statistical Significant at P < 0.05
High Statistical Significant at P < 0.001

Table (4) illustrates the relation between Insomnia Severity Index of the studied children and their clinical characteristics. Concerning studied children who suffered from other complications rather than the main disease, it was found that the highest mean score of insomnia was for those who have splenomegaly (17.98 ± 3.46). In addition, the highest mean score of insomnia was for those who suffer cardiomegaly and splenomegaly (18.83 ± 3.57).

The highest mean score for insomnia was for those who suffer from hepatomegaly, osteoporosis, and bone deformities. For hepatomegaly (18.91 ± 3.59), for osteoporosis (18.58 ± 3.58), and for bone deformity (18.40 ± 3.50).

For those who don't have any family members or relatives with the same disease, the mean score for insomnia was high (18.40 ± 3.59). The studied children who have one brother or sister affected by the same disease scored a higher mean score than those who have two brothers or sisters affected by the same disease (15.91 ± 0.84). A statistically significant association was found between insomnia mean scores and clinical characteristics. According to eating habits, children with food refusal have the highest mean ± S.D (18.87 ± 3.33). Children with social withdrawal and those who prefer indoor activities record high mean ± S.D for insomnia (18.13± 3.50 & 17.80 ± 3.09) respectively.

Table (5): Shows Frequency distribution of studied children according to their level of Insomnia (Insomnia Severity Index)

Parameter / Variable	N	%
0–7 = No clinically significant insomnia	0	0 %
8–14 = Subthreshold insomnia	96	23.70 %
15–21 = Clinical insomnia (moderate severity)	194	47.90 %
22–28 = Clinical insomnia (severe)	115	28.40 %

According to **table [5],** it reveals that nearly one-third of the study sample (28.40 %) has severe insomnia, nearly half of study sample (47.90 %) have moderate insomnia, and nearly one quarter of study sample (23.70%) has subthreshold insomnia.

Table (6): Shows Frequency distribution of studied children according to their level of Anxiety and Depression Hospital anxiety and depression scale (HADS)

	Anxiety		Depression	
	N (405)	%	N (405)	%
Mild	84	20.74 %	73	18.02%
Moderate	153	37.78 %	149	36.79%
Severe	168	41.48 %	183	45.19 %

According to **table [6],** it reveal that near to the half of studied sample (41.48 % & 45.19 %) have severe anxiety and depression respectively and around one third of studied sample (37.78 % &36.79 %) have moderate anxiety and depression respectively.

Table (7): Relation between level of Anxiety and Depression Hospital anxiety and depression scale of the studied children with their socio-demographic characteristics

Characteristics	Anxiety			Depression		
	Mean ± S. D	X^2	P value	Mean ± S. D	X^2	P value
Age						
8 yrs :< 12 yrs	13.13 ± 0.59			12.07 ± 0.59		
12 yrs :< 15 yrs	15.86 ± 2.50	52.70	< 0.001	14.89 ± 2.50	55.28	< 0.001
15 yrs : 18 yrs	19.21 ± 0.47			20.24 ±0.47		
Gender						
Male	15.10 ± 2.66	17.87	< 0.001	14.13 ± 2.66	37.81	< 0.001
Female	17.23 ± 3.61			16.26 ±3.61		
Educational Level						
Primary	15.17 ± 0.96			12.11 ± 0.96		
Preparatory	16.09 ± 2.56	45.88	< 0.001	15.01 ± 2.56	20.63	< 0.001
Secondary	20.44 ± 0.47			20.26 ± 0.47		
Child order						
First	16.54 ± 3.46	89.37	0.048	15.57 ± 3.46	71.59	0.048
Second	15.86 ± 3.22			14.89 ± 3.22		
Third	13.24 ± 0.50			12.18 ± 0.50		

Medical Diagnosis Beta Thalassemia Major Sickle Cell Anemia	16.14 ± 3.26 20.00 ± 0.00	93.44	< 0.001	15.10 ± 3.26 20.93 ± 1.17	82.18	< 0.001
Transfusion times per Month Once Monthly Twice Monthly	15.88 ± 3.99 16.53 ± 3.12	39.61	0.029	14.91 ± 3.99 15.56 ± 3.12	43.40	0.029
Was the disease detected urgently? Yes No	16.49 ± 3.44 14.68 ± 2.32	47.63	0.024	15.52 ± 3.44 13.52 ± 2.32	87.46	0.024

Statistical Significant at P < 0.05
High Statistical Significant at P < 0.001

Table (7) shows the relation between level of Anxiety and Depression Hospital anxiety and depression scale of the studied children with the socio-demographic characteristics. Concerning the studied children's age, it was found that the highest mean score of insomnia was for the age group from 15 to 18 years (19.21 ± 0.47) for anxiety and (20.24 ±0.47) for depression. Regarding gender, it was found that the highest mean score for females (17.23 ± 3.61) for anxiety and (16.26 ±3.61) for depression. In relation to educational level, the highest score was found for those in the secondary educational level (20.44 ± 0.47) for anxiety and (20.26 ± 0.47) for depression). For those who are the first in their child's order, they have the highest score (16.54 ± 3.46) for anxiety and (15.57 ± 3.46) for depression.

The table also shows that the studied children with sickle cell anemia had the highest mean scores (20.00 ± 0.00) for anxiety and (20.93 ± 1.17) for depression. Also, those who had blood transfusions twice monthly scored the highest mean score (16.53 ± 3.12) for anxiety and (15.56 ± 3.12) for depression. For those who detected their disease urgently, the highest mean score was theirs (16.49 ± 3.44) for anxiety, and (15.52 ± 3.44) for depression. A statistically significant association was found between insomnia mean scores and socio-demographic characteristics.

Table (8): Relation between level of Anxiety and Depression Hospital anxiety and depression scale of the studied children with their Clinical characteristics

	Anxiety			**Depression**		
Characteristics	**Mean ± S. D**	X^2	**P value**	**Mean ± S. D**	X^2	**P value**
Does the child have a splenomegaly? No Yes	16.19 ± 2.96 17.98 ± 3.46	32.99	0.001	16.26 ± 2.96 18.02 ± 3.46	32.99	0.001
Does the child have a cardiomegaly? No Yes	17.17 ± 3.32 18.83 ± 3.57	101.37	0.007	17.25 ± 3.32 18.97 ± 3.57	101.37	0.007
Does the child have a Hepatomegaly? No Yes	16.28 ± 2.77 18.91 ± 3.59	3.33	< 0.001	16.37 ± 2.77 18.98 ± 3.59	3.33	< 0.001
Does the child have a Osteoporosis? No Yes	16.86 ± 3.18 18.58 ± 3.58	24.33	< 0.001	16.92 ± 3.18 18.67 ± 3.58	24.33	< 0.001
Does the child have a Bone Deformity? No Yes	16.70 ±3.16 18.40 ± 3.50	4.39	< 0.001	16.83 ±3.16 18.52 ± 3.50	12.39	< 0.001
Does anyone in the family or relatives have this disease? No Yes	18.40 ± 3.59 15.39 ± 1.70	28.50	< 0.001	18.78 ± 3.59 15.39 ± 1.70	28.50	< 0.001
Number of brothers or sisters have the same disease. One Brother / Sister Two Brothers / Sisters	15.91 ± 0.84 14.00 ± 0.00	22.73	0.004	15.91 ± 0.84 14.00 ± 0.00	31.50	0.004
Eating habits Normal eating pattern Anorexia Food Refusal	16.53 ± 2.86 17.23 ± 3.17 18.87 ± 3.33	29.51	< 0.001	16.53 ± 2.86 17.23 ± 3.17 18.87 ± 3.33	36.51	< 0.001

Social Interaction Normal Social withdrawal	16.27 ± 2.96 18.13± 3.50	32.29	< 0.001	16.27 ± 2.96 18.13± 3.50	49.29	< 0.001
Recreational activities Indoor activities Outdoor activities	17.80 ± 3.09 15.41 ± 1.52	27.62	< 0.001	17.80 ± 3.09 15.41 ± 1.52	62.62	< 0.001

Statistical Significant at P < 0.05
High Statistical Significant at P < 0.001

Table (8) shows the relation between level of Anxiety and Depression Hospital anxiety and depression scale of the studied children with the Clinical characteristics. Concerning studied children who suffered from other complications rather than the main disease, it was found that the highest mean score of insomnia was for those who have splenomegaly (17.98 ± 3.46) for anxiety and (18.02 ± 3.46) for depression. In addition, the highest mean score of insomnia was for those who suffer from cardiomegaly (18.83 ± 3.57), anxiety, and depression (18.97 ± 3.57).

The highest mean score for insomnia was for those who suffer from hepatomegaly, osteoporosis, and bone deformities. For hepatomegaly (18.91 ± 3.59) for anxiety and (18.98 ± 3.59) for depression; for osteoporosis (18.58 ± 3.58) for anxiety and (18.67 ± 3.58); and for bone deformity (18.40 ± 3.50) for anxiety and (18.52 ± 3.50) for depression.

For those who don't have any family members or relatives with the same disease, the mean score for insomnia was high (18.40 ± 3.59) for anxiety and (18.78 ± 3.59) for depression. The studied children who have one brother or sister affected by the same disease scored a higher mean score than who have two brothers or sisters with the same disease (15.91 ± 0.84) for anxiety and depression. According to eating habits, children with food refusal have the highest mean ± S.D (16.53 ± 2.86) for anxiety and depression. Children with social withdrawal and those who prefer indoor activities record high mean ± S.D for insomnia (16.27 ± 2.96 & 17.80 ± 3.09) for anxiety and depression, respectively. A statistically significant association was found between insomnia mean scores and clinical characteristics.

Table (9): Correlation between sociodemographic and clinical characteristics of studied children and insomnia scores

Variable	Insomnia	
	r	Sig
Age	0.938	0.000
Gender	0.310	0.000
Educational Level	0.803	0.000
Child Order	-0.135	0.047
Transfusion times per Month	0.887	0.001
Disease detected urgently	0.157	0.020
Child have a splenomegaly	0.242	0.000
Child have a cardiomegaly	0.179	0.008
Child have a Hepatomegaly	0.383	0.000
Child have a Osteoporosis	0.237	0.000
Child have a Bone Deformity	0.248	0.000
Family members or relatives who have this disease	-0.413	0.000
Number of brothers or sisters have the same disease	-0.603	0.000
Eating habits	0.718	0.000
Social Interaction	0.456	0.000
Recreational activities	0.629	0.000
Anxiety	0.811	0.003
Depression	0.903	0.012

r: - Pearson Correlation
Statistical Significant at P < 0.05
High Statistical Significant at P < 0.001

Table (9) illustrates the correlation between the sociodemographic and clinical characteristics of the studied children and their insomnia scores. There is a positive correlation between insomnia and age, gender, and educational level. Transfusion times per month, Disease detected urgently, Child have a splenomegaly, child have a cardiomegaly, child have a hepatomegaly, child have osteoporosis,

child have a osteoporosis, Child have a bone deformity, eating habits, social interaction, recreational activities, anxiety, and depression. There is a negative correlation between insomnia and child order Family members or relatives who have this disease and the number of brothers or sisters who have the same disease. There is statistical significance between insomnia scores and all other variables.

4. DISCUSSION

Sleep in children with transfusion-dependent hemoglobinopathies has been described in some form previously, but there have been no studies describing the general sleep habits and behaviors of children with transfusion-dependent hemoglobinopathies and the relationship between sociodemographic variables, disease variables, and sleep in this population, although sleep has been implicated as an important factor in other childhood chronic illnesses. The purpose of the current study was to describe insomnia, sleep habits, and behaviors in a sample of children with transfusion-dependent hemoglobinopathies and examine the contributions of sociodemographic factors and disease severity to sleep problems in these children.

According to the relation between Insomnia Severity Index of the studied children with the socio-demographic and clinical characteristics. It was found that highest mean score of insomnia was for age group from 15 to 18 years, with high statistically significant difference. The researcher argued that these results came due to the symptoms caused by the hematological disorders, like delayed growth and puberty and bone deformities, especially facial bone deformities, which were considered as major problems for the adolescents. Based on Erikson's theory of development, this school age children are very active, develop a sense of industry, enjoy team play, need to practice physical activity, and a lack of these help in development sense of Identity and considered stressor in children with transfusion-dependent hemoglobinopathies, which results in sleep disturbance.

These results are near to **Van Dyk, Krietsch, Kin and Byars`s study (2022),** as they confirmed that the adolescents had high mean ±SD while using insomnia severity index to detect insomnia among the studied sample.

About gender, it was found that highest mean score for female with high statistically significant difference. As the females thinks more about their disease and how it would affect their future life and how to cope with it and if the others accept them and help to live normal life. The same was in the studies done by **Otte et al., (2019)** and **Chehri et al., (2020)** as they confirmed that females got the highest mean± SD. While on the contrary, **Hinds et al., (2021) & Zhou and Recklitis (2020)** detected in their study that the male adolescents got the highest mean± SD.

Regarding the educational level, the highest score was found for those in the secondary educational level, with a highly statistically significant difference. The researcher explained that this result is logical as the studied age group, between 15 and 18 years old, who got the mean± SD are in secondary level of education. The researcher linked these results with Erikson theory and the fact that at the age of the preparatory level, around 10 years old the children started to understand and care for themselves and start comparing themselves to others if they were doing well in different skills **(Bergbom, Nyström &Nåden, 2022)** and the disease would alter their performance. Also, **Chehri et al.** confirmed in their study in 2020 that the high mean± SD was for the high school educated adolescents, which equals the secondary educational level in this study.

For those who is the first in their child order, they have highest score. Additionally, the studied children with Sickle Cell Anemia had the highest mean score with high significantly difference. the results come in line with a study done in 2022 by **Yildirim et al.** who stated that score of Insomnia Severity Index was high in the participants who were first child with high statistically significant difference and the other age groups. These results are in agreement with the results of **Valrie et al.,** in 2018 who detected in their study that the studied sample with Sickle Cell disease got the highest mean ±SD.

Also, those who had blood transfusion twice monthly scored highest mean score. The researcher believes this result is due to two reasons first:- thinking of how to schedule two dates of blood transfusion times, which of course alters their daily routine and their companions. Second: - the participants stated that cost of hematological disease includes missed school days, social isolation, stigmatization, and psychological sequelae.

For those detected their disease urgently, the highest mean score was. There is a statistically significant association between insomnia mean scores and socio demographic characteristics. The researcher explains that it is normal when discovering serious diseases such as blood disorders, causing sleep disturbances for the patient due to anxiety and thinking about the disease and how it will affect the life or may end it quickly.

Concerning studied children who suffered from other complications rather than the main disease, it was found that highest mean score of insomnia was for who have splenomegaly. In addition, the highest mean score of insomnia was for those who suffer cardiomegaly. The researcher explains these

results as the studied children and their families thought that the hepatomegaly, cardiomegaly and splenomegaly even osteoporosis are additional diseases beside the main disease and need another treatment plan and financial coast.

The highest mean score for insomnia was for those who suffer from hepatomegaly, osteoporosis, and bone deformity. These results are in agreement with a study by **Vaughan et al.,** done in 2022, as they confirmed high scores on the Insomnia Severity Index when applied to young adults diagnosed with blood cancer and different organ enlargements.

For those who don't have any family members or relatives with the same disease, the mean score of insomnia was high. In the opinion of the researcher, this is logical because people know that such diseases are hereditary and wonder how it could happen to their child without a family history. This is opposite to the results of the studied children who have one brother or sister affected by the same disease and scored a higher mean score than those who have two brothers or sisters affected by the same disease. That explains why studied children who had one or more brothers or sisters with the same disease already had idea about it, were coping with it, and had plans for how to deal with it. Besides, a statistically significant association was found between insomnia mean scores and clinical characteristics.

The results also shows that the studied children with Sickle Cell Anemia had the highest mean score with high statistically significant difference between the Sickle Cell Anemia diagnosed studied sample and the Thalassemia diagnosed group these results are inconsistent with the results by **Eghbali et al., (2022)** as they demonstrated no significant differences between the Thalassemia participants Insomnia Severity Index score, level of anxiety and depression and the other hematological disorders participants.

Additionally, the recent results clarified that there was a statistically significant difference between levels of insomnia among studied children. The study results showed that, the studied children had Subthreshold insomnia, Clinical insomnia (moderate severity), Clinical insomnia (severe) (23.70 % - 47.90 % - 28.40 %) respectively. These results is in the same line with **Mirret, M. D., Marwa, A., &Hewida, A. H. (2019)** results which demonstrated that near three quarter (74%) of children have mild sleep disturbance, followed by 16% of children have moderate sleep disturbance, while only 10% of them have severe sleep disturbance.

5. CONCLUSION

According to the findings of the present research, children and adolescents who have transfusion-dependent hemoglobinopathies may have a higher risk of experiencing sleep difficulties. As a result, evaluating children suffering from transfusion-dependent hemoglobinopathies for sleep disorders at their regularly scheduled clinical checkups is of the utmost importance. Insomnia has been linked in previous research to lower cognitive and academic performance, as well as higher rates of mental illnesses such as behavioral issues, depressive symptoms, and anxiety symptoms. Children with transfusion-dependent hemoglobinopathies may have a more difficult time working normally during the day, developing normally, and effectively coping with the symptoms of their condition if they suffer from insomnia. While evaluating patients with this disease category, it is especially important to pay attention to sleep issues such as insomnia when conducting routine clinical exams. In addition, the management of children's sleep issues might increase the likelihood that they will comply with their therapy. It is possible to increase the quantity and quality of sleep by working together with one's parents to create a sleeping environment that is more suitable (for example, by making the surroundings calmer). On the other hand, suggestions that can be made during routine clinical appointments to increase the child's sleep efficacy include educating parents and children about effective sleep and the significance of bedtime routines. Educating parents and children about effective sleep and the significance of bedtime routines.

RECOMMENDATIONS:

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

- Health education program should be designed and provided for children with SCD.
- Further studies with children with SCD are needed to assess the effect of controlling factors causing sleep disturbances among children with SCD on their sleeping patterns.
- Replication of the current study on large sample of children and at different hospitals settings to be able to generalize the results of the current study.

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