



## Effect of Hemoglobinopathies Disease on Adolescent Eating Behavior at Hereditary Blood Diseases Centre

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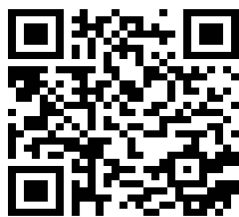
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### Abstract:

**Background:** It is necessary to know the effect of hemoglobinopathy on the nutritional behavior of adolescents, which plays an essential role in their psychological and physical health. Eating behaviors at this age stage play an essential role, especially in adolescence, which have hemoglobinopathies.

**Objective(s):** Objective of the study: To what extent does hemoglobinopathy affect dietary behavior among adolescents in low, moderate, or high at hereditary Blood diseases Centre?

**Methodology:** A descriptive study design was conducted in May 22th, 2023 to February 22th, 2024, for (30) 200 adolescents with hemoglobinopathy were selected at the Hematology Center, Al-Zahra Teaching Hospital and Al-Najaf Al-Ashraf Teaching Hospital in Al-Najaf Al-Ashraf Governorate. Adolescent patients aged 12-18 years with thalassemia and sickle cell anemia was selected. The study questionnaire consisted of two parts, demographic data and a scale. Eating behavior. The reliability of questioner was determined through a pilot study consist from (10) patient and validity through a panel of (12) experts

**Results:** The results of the study were for adolescents aged (12-19) years, numbering 200 male and female patients. According to the Overall Child Eating Behavior Questionnaire (CEBQ) for Adolescents, findings illustrated that a moderate level as described by moderate mean score ( $\pm$ SD) =  $3.25 \pm 0.446$

**Conclusion**The number of patients is 200 adolescents with thalassemia and sickle cell anemia, males and females, who underwent a splenectomy. Their level of the scale was weak compared to their peers, where the results were average.

**Recommendations:** The study recommended focusing attention on patients with hemoglobinopathy, especially enhancing their eating behavior by disseminating multiple programs or protocols that improve their ability in eating behavior, as it plays an important role in this age stage of mental and physical growth and development.

**Keywords:** Effect, Eating behavior, Hemoglopinopathy, Adolescent.

## Introduction:

A class of hereditary blood diseases known as hemoglobinopathies impact the synthesis or structure of hemoglobin, the protein that carries oxygen in red blood cells. Genetic mutations that affect hemoglobin's normal production or function cause these illnesses. (7)

These Conditions are typically inherited in an autosomal recessive fashion, which means that for a child to be impacted, a defective gene must be present in both parents. (7)

The activities, attitudes, and patterns associated with an individual's food consumption are referred to as eating behavior (2). It covers a wide range of topics, including as meal scheduling, food choices, portion sizes, frequency of eating, and the social and environmental influences on eating behaviors. A multitude of physiological, psychological, cultural, and social factors influence eating behavior. Based on the nutritional value of the food ingested, the ratio of nutrients, and the general eating habits of an individual or a group, it can be classified as healthy or unhealthy. (9) The acts, routines, and decisions associated with food consumption are referred to as eating behavior. It includes a range of factors related to what, when, where, and how people eat. A multitude of biological, psychological, social, and environmental elements interact to shape eating behavior (8). In order to maintain optimal nutrition, energy balance, and general health (13), eating behavior is essential. It can differ greatly amongst people and be impacted by external stimuli, emotional states, personal preferences, and cultural conventions. (14) The Child Eating Behavior Questionnaire (CEBQ) is a valuable resource for researching and comprehending the eating habits of kids. (3) Researchers and experts can obtain important data about a child's eating habits by using this questionnaire to learn more about food responsiveness, emotional overeating, enjoyment of food, desire to drink, satiety responsiveness, slow eating, emotional undereating, and fussiness about food. (16) Finding contributing variables: The study assists

in determining the main forces behind adolescents' poor eating patterns by examining a variety of factors that impact eating behaviors, including food marketing, media influence, and school lunches (5). This information can help with the creation of programs and regulations that encourage better eating practices and guard against issues with nutrition. (13) Thalassemia and sickle cell disease are the two hemoglobinopathies that affect people most often. A mutation in the beta-globin gene results in the aberrant hemoglobin known as hemoglobin S (12), which is the cause of sickle cell disease. (6) Under some circumstances, this aberrant hemoglobin makes red blood cells stiff and sickle-shaped, which can result in persistent anemia, organ damage, and vaso-occlusive crises. (15)

## Methodology:

A descriptive study design was conducted in May 22th, 2023 to February 22th, 2024, for (30) 200 adolescents with hemoglobinopathy were selected at the Hematology Center, Al-Zahra Teaching Hospital and Al-Najaf Al-Ashraf Teaching Hospital in Al-Najaf Al-Ashraf Governorate. Adolescent patients aged 12-19 years with thalassemia and sickle cell anemia was selected. The study questionnaire consisted of two parts, demographic data and a scale. Eating behavior. The reliability of questioner was determined through a pilot study consist from (10) patient and validity through a panel of (12) experts

**Sample of the Study:** The population selected in the research sample A non-probability adolescents aged (12\_\_19) years with hemoglobin disease, thalassemia patients and sickle cell anemia patients, whose number reached 200 male and female patients in blood disease centers in Najaf Governorate.

## Data Analysis:

### A. Analysis of variance (ANOVA):

For equality of Means (testing of coincidence for the different of mean's parameter) Is the method which are used to determine the difference

between the knowledge of patients and their general information

**B. Alpha correlation coefficient (r):** Is computed for the determination of the test and retest reliability of the questionnaire.

**C.The Paired – Sample T- test .**The Paired sample T-test procedure compares the mean of two variables. It computes the differences between values of the two variables for each case and tests whether the average differs from Zero.

$$t = \frac{\sum d}{\sqrt{\frac{n(\sum d^2) - (\sum d)^2}{n-1}}}$$

Where (d) mean of samples, (n) is the sample size and t is a paired sample t-test with (n-1) degrees of freedom.

**D. The (P) Value.** The (P) Value indicates that the degree of high significance at (P ≤ 0.01), significance at (P ≤ 0.05) and no significance at (P > 0.05) to all tables results. (Nieswidomy, 2012).

**Results of the Study:**

The following are included in tables and figures that illustrate the descriptive and inferential statistical method under the goals of the present research findings:

**Table 4-1. Distribution of Adolescents by Socio-Demographic Variables:**

SDVs	Classification	Freq.	%
Age/years	12-13 years	24	12.0
	13-14 years	24	12.0
	14-15 years	29	14.5
	15-16 years	32	16.0
	16-17 years	54	27.0
	17-18 years	37	18.5
	Total	200	100.0
	M±S.D	15.57 2.058	
Sex Types	Male	94	47.0
	Female	106	53.0
	Total	200	100.0
Adolescent Education	Not read or write	41	20.5
	Reads and writes	56	28.0
	Elementary	52	26.0
	Middle School	51	25.5
	Total	200	100.0
Monthly Income/ Iraqi Dinar	Less than 300,000 ID	103	51.5
	From (300,000-600,000) ID	79	39.5
	From (601000_900000) ID	14	7.0
	More than 900,000 ID	4	2.0
	Total	200	100.0
Housing	Urban	146	73.0
	Rural	54	27.0
	Total	200	100.0
Does any of your family members suffer from blood diseases?	Yes	121	60.5
	No	79	39.5
	Total	200	100.0
Types of Diseases	Thalassemia	143	71.5
	sickle Cell Anemia	57	28.5
	Total	200	100.0

Study Sample Consist of (200) adolescents who participated in this study their age (16-17 years) old and constituted 54 (27.0 %) . In regards with adolescent’s sex type, more than half of participants were female adolescents 106 (53.0%). Adolescents education associated findings, most of students expressed Reads and writes 56 (28.0%), followed by monthly income were Less than 300,000 Iraqi dinars accounted for 103 (51.5%), Concerning to the housing most of them were lived at rural area consisted 146 (73.0%), Relatively to the question (Does any of your family members suffer from blood diseases?) the majority of study sample answer with yes accounted 121 (60.5%), Relatively to the types of diseases 143 (71.5%) were have Thalassemia while the remaining with sickle Cell Anemia,

**Table 4-2. Distribution of Adolescents by Hemoglobin Level**

SDVs	Classification	Freq.	%
Blood hemoglobin level	4mg/dl	2	1.0
	6 mg/dl	47	23.5
	7 mg/dl	65	32.5
	8 mg/dl	58	29.0
	9 mg/dl	28	14.0
	Total	200	100.0
	M±S.D	15.57 2.058	

This Table revealed the hemoglobin level among study sample most of them have 7 mg/dl accounted for 65 (32.5%).

**Table 4-3. Distribution Adolescents Child Eating Behavior Questionnaire (CEBQ)**

**A. Food Responsiveness Part:**

List	Questions	Weighted	Freq.	%	M.s ±SD	Ass.
1	Always order food	never	8	4.0	3.63±1.13 9	Moderate
		Rarely	23	11.5		
		Some time	62	31.0		
		Often	48	24.0		
		Always	59	29.5		
2	If I had the choice, I would eat most of the time-	never	36	18.0	2.87±1.28 6	Moderate
		Rarely	45	22.5		
		Some time	56	28.0		
		Often	36	18.0		
		Always	27	13.5		
3	Even if my stomach is full, I will find a place for my favorite food	never	54	27.0	2.73±1.33 0	Moderate
		Rarely	31	15.5		
		Some time	49	24.5		
		Often	48	24.0		
		Always	18	9.0		
B	Emotional Over-eating:					
4	I eat when I feel angry	never	47	23.5	2.59±1.37 2	Moderate
		Rarely	70	35.0		
		Some time	35	17.5		
		Often	14	7.0		
		Always	34	17.0		

5	I eat more when I have nothing to do-	34	17.0	17.0	3.00±1.33 8	Moderate
		44	22.0	22.0		
		42	21.0	21.0		
		48	24.0	24.0		
		32	16.0	16.0		
C	Enjoyment of Food:					
6	I love -food--	never	2	1.0	4.29±0.88 8	High
		Rarely	4	2.0		
		Some time	34	17.0		
		Often	55	27.5		
		Always	105	52.5		
7	Interested in food	Rarely	19	9.5	4.10±0.96 7	High
		Some time	27	13.5		
		Often	69	34.5		
		Always	85	42.5		
		Rarely	19	9.5		
L	Questions	Weighted	Freq.	%	M.s ±SD	Ass.
8	Watch meal times-	never	31	15.5	3.26±1.39 3	Moderate
		Rarely	32	16.0		
		Some time	41	20.5		
		Often	47	23.5		
		Always	49	24.5		
D	Desire to Drink:					
9	Always order drinks--	never	9	4.5	3.59±1.15 7	Moderate
		Rarely	25	12.5		
		Some time	63	31.5		
		Often	46	23.0		
		Always	57	28.5		
10	If I have the chance, I will always drink-	never	13	6.5	3.36±1.09 8	Moderate
		Rarely	22	11.0		
		Some time	81	40.5		
		Often	48	24.0		
		Always	36	18.0		
E	Satiety Responsiveness:					
11	I have a big appetite	never	2	1.0	3.69±1.05 2	High
		Rarely	26	13.0		
		Some time	60	30.0		
		Often	55	27.5		
		Always	57	28.5		
12	I finish my meal quickly-	never	33	16.5	3.09±1.34 0	Moderate
		Rarely	38	19.0		
		Some time	42	21.0		
		Often	53	26.5		
		Always	34	17.0		
13	Leave food on the plate at the	never	19	9.5		

	end of the meal-	Rarely	51	25.5	3.19±1.24	Moderate
		Some time	35	17.5		
		Often	64	32.0		
		Always	31	15.5		
14	I get full before my meal is over.	never	18	9.0	3.35±1.21	Moderate
		Rarely	29	14.5		
		Some time	59	29.5		
		Often	53	26.5		
		Always	41	20.5		
15	Get full easily -	never	18	9.0	3.57±1.24	Moderate
		Rarely	24	12.0		
		Some time	35	17.5		
		Often	72	36.0		
		Always	51	25.5		
<b>L is</b>	<b>Questions</b>	<b>Weighted</b>	<b>Freq.</b>	<b>%</b>	<b>M.s ±SD</b>	<b>Ass.</b>
16	I can't eat a meal if I've had a snack before-	never	21	10.5	3.29±1.26	Moderate
		Rarely	34	17.0		
		Some time	52	26.0		
		Often	52	26.0		
		Always	41	20.5		
<b>F</b>	<b>Slowness in Eating:</b>					
17	Eat slowly-	never	33	16.5	3.27±1.43	Moderate
		Rarely	33	16.5		
		Some time	33	16.5		
		Often	49	24.5		
		Always	52	26.0		
18	It took over 30 minutes to finish my meal--	never	23	11.5	3.32±1.35	Moderate
		Rarely	38	19.0		
		Some time	44	22.0		
		Often	42	21.0		
		Always	53	26.5		
<b>G</b>	<b>Emotional Under-Eating:</b>					
19	I eat less when I'm angry-	never	36	18.0	2.72±1.24	Moderate
		Rarely	61	30.5		
		Some time	48	24.0		
		Often	33	16.5		
		Always	22	11.0		
20	I eat less when I'm angry--	never	4	2.0	3.86±1.12	High
		Rarely	23	11.5		
		Some time	50	25.0		
		Often	44	22.0		
		Always	79	39.5		
21	I eat more when I'm happy-	never	8	4.0	3.76±1.14	High
		Rarely	21	10.5		
		Some time	48	24.0		

		Often	57	28.5		
		Always	66	33.0		
I	Food Fussiness = FF					
22	Refuse new foods at first	never	10	5.0	3.23±1.04 5	Moderate
		Rarely	36	18.0		
		Some time	77	38.5		
		Often	52	26.0		
		Always	25	12.5		
23	Enjoy tasting foods--	never	34	17.0	2.92±1.29 3	Moderate
		Rarely	44	22.0		
		Some time	55	27.5		
		Often	38	19.0		
		Always	29	14.5		
		never	34	17.0		
↳	Questions	Weighted	Freq.	%	M.s ±SD	Ass.
24	Eat less when you are tired--	never	17	8.5	3.63±1.13 9	Moderate
		Rarely	35	17.5		
		Some time	85	42.5		
		Often	27	13.5		
		Always	36	18.0		
25	Enjoy a wide variety of foods-	never	7	3.5	3.51±1.16 0	Moderate
		Rarely	37	18.5		
		Some time	55	27.5		
		Often	50	25.0		
		Always	51	25.5		
26	It's hard to please me with meals--	never	23	11.5	3.35±1.34 4	Moderate
		Rarely	34	17.0		
		Some time	47	23.5		
		Often	42	21.0		
		Always	54	27.0		
27	I decide I don't like food even without tasting it—FF	never	35	17.5	3.15±1.38 9	Moderate
		Rarely	32	16.0		
		Some time	42	21.0		
		Often	49	24.5		
		Always	42	21.0		

"(MS) Mean of Scores, (SD) Standard deviation, Level of Assessment (low =1-2.33., Moderate=2.33. -3.66, High=3.67-5)"

Table 4-3. Distribution Adolescents Child Eating Behavior Questionnaire (CEBQ) under "(MS) Mean of Scores, (SD) Standard deviation, Level of Assessment (low =1-2.33., Moderate=2.33. -3.66, High=3.67-5)" , which revealed that Food Responsiveness Part within Moderate level of assessment, Emotional Over-eating , show that all of items were Moderate level of assesment,

Enjoyment of Food (I love food, Interested in food) within high level of assesment , while (Watch meal times-) ere Moderate level of assesment, Desire to Drink part all of items Desire to Drink were Moderate level of assesment. Satiety Responsiveness part all of items were at moderate level of assesment except (I have a big appetite) were within high

level , Slowness in Eating part were moderate, Emotional Under-Eating:( I eat less when I'm angry) were moderate while the remaining of this

part were high, Final part Food Fussiness all of its items were within moderate level.

**Table 3-4: Overall Child Eating Behavior Questionnaire (CEBQ) for Adolescents:**

<i>Child Eating Behavior Questionnaire (CEBQ)</i>	<i>M.s ±SD</i>	<i>Assessment</i>
<i>A. Food responsiveness</i>	<i>3.08±0.866</i>	<i>Moderate</i>
<i>B. Emotional over-eating</i>	<i>2.80±1.153</i>	<i>Moderate</i>
<i>C. Enjoyment of food</i>	<i>3.35±0.428</i>	<i>Moderate</i>
<i>D. Desire to drink = DD</i>	<i>3.47±0.900</i>	<i>Moderate</i>
<i>E. Satiety responsiveness = SR</i>	<i>3.36±0.609</i>	<i>Moderate</i>
<i>F. Slowness in eating = SE</i>	<i>3.30±1.050</i>	<i>Moderate</i>
<i>G. Emotional under-eating = EUE</i>	<i>3.44±0.710</i>	<i>Moderate</i>
<i>H. Food fussiness = FF</i>	<i>3.22±0.609</i>	<i>Moderate</i>
<i>Overall Child Eating Behavior Questionnaire (CEBQ)</i>	<i>3.25±0.446</i>	<i>Moderate</i>

"(MS) Mean of Scores, (SD) Standard deviation, Level of Assessment (low =1-2.33., Moderate=2.33. -3.66, High=3.67-5)"

Table (3.4) offer According to the Overall Child Eating Behavior Questionnaire (CEBQ) for Adolescents, findings illustrated that a moderate level as described by moderate mean score (±SD) = 3.25 (±0.446).

**3.5. Significant Differences in Child Eating Behavior Questionnaire (CEBQ) with regard their Hemoglobin Level (n=200)**

<i>CEBQ</i>	<i>Source of variance</i>	<i>Sum of Squares</i>	<i>d.f</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
<i>Hemoglobin Level</i>	<i>Between Groups</i>	<i>.003</i>	<i>1</i>	<i>.003</i>	<i>.002</i>	<i>0.961</i>
	<i>Within Groups</i>	<i>216.392</i>	<i>198</i>	<i>1.093</i>		
	<i>Total</i>	<i>216.395</i>	<i>199</i>			

*d.f: Degree of freedom, F: F-statistic.*

Table (3.12) The findings indicated that there were no statistically significant differences in the Child Eating Behaviour Questionnaire (CEBQ) in relation to hemoglobin level, with a p-value of 0.961

## Discussion:

### Table (3.1) .of Adolescents by Socio-Demographic Variables:

Table (4.1) offers the demographic characteristic of the Study Sample Consist of (200) adolescents who participated in this study their age (16-17 years) old and constituted 54 (27.0 %). In regards with adolescent's sex type, more than half of participants were female adolescents 106 (53.0%). The researcher's point of view Adolescence is a time of increasing independence, social interactions, and personal choices, including food choices. Adolescents with hemoglobinopathies may face additional psychosocial factors that can affect their eating behavior, such as stigma, body image concerns, and adherence to treatment regimens. This study disagree with Asmahan (2023) she said majority of adolsecents (60%) are male, with the 12–14 age group accounting for 42.9% of the total.

Education associated findings, most of students expressed Reads and writes 56 (28.0) Followed by monthly income were Less than 300,000 Iraqi dinars accounted for 103 (51.5%),. According to the findings, this statistic (Shareef & Obaid, 2015). They report that over half have less than 30,000 ID, over half have between 30,000 and 60,000 ID, over a fifth have between 60,000 and 900.000 ID, and over a tenth have more than 900.000 ID.

Concerning to the housing most of them were lived at rural area consisted 146 (73.0%), this study agree with El-said,(2021). the majority of student live in rural area (83.9%) .

Relatively to the question (Does any of your family members suffer from blood diseases?) the majority of study sample answer with yes accounted 121 (60.5%). Study agree with Badr (2022). He said that the largest percentage of hemoglobinopathy is hereditary (77.5%).

Relatively to the types of diseases 143 (71.5%) were have Thalassemia while the remaining with sickle Cell Anemia, study disagree with Barrera.(2019). Hb disorder (83% sickle cell disorder and 17% thalassemia).

### Table (3-2) .Distribution of Adolescents by Hemoglobin Level.

The table (3\_2).demonstrations the statistical the hemoglobin level among study sample most of them have 7 mg/dl accounted for 65 (32.5) This study agree with Utsugisawa.(2022). Hb levels are usually toward the lower limit of normal, and the RBCs are microcytic. This type is rarely accompanied by anemia

### Table (3-3). Distribution Adolescents Child Eating Behavior Questionnaire (CEBQ).

Table 3-3. Distribution Adolescents Child Eating Behavior Questionnaire (CEBQ) under "(MS) Mean of Scores, (SD) Standard deviation, Level of Assessment (low =1-2.33., Moderate=2.33. -3.66, High=3.67-5)" , which revealed that Food Responsiveness Part within Moderate level of assesement, Emotional Over-eating , show that all of items were Moderate level of assesement, Enjoyment of Food (I love food, Interested in food) within high level of assesement , while (Watch meal times-) ere Moderate level of assesement, Desire to Drink part all of items Desire to Drink were Moderate level of assesement. Satiety Responsiveness part all of items were at moderate level of assessment except (I have a big appetite) were within high level , Slowness in Eating part were moderate, Emotional Under-Eating:( I eat less when I'm angry) were moderate while the remaing of this part were high, Final part Food Fussiness all of its items were within moderate level. This result is in line with a study Goodman (2020).

In regard to the Food Responsiveness Part there is a moderate level in all items number (1, 2, and 3). The totals mean of score Food Responsiveness moderate level .This finding is consistent with a study Behar etal (2021) they said in his research that the person who Food Responsiveness moderate level.

In concerning to Emotional Over-eating moderate level in all items number (4, 5) the totals mean of score is moderate. This finding is consistent with a study Goodman etal (2020). they said in his

research that the person who to Emotional Over-eating moderate level.

In regard to, Enjoyment of Food (I love food, Interested in food) within high level of assesment , while (Watch meal times-) ere Moderate level of assessment. This result is in line with Dalrymple etal (2020). which found that Enjoyment of Food high level in adolescent.

In regard to the Desire to drink moderate level in all items number (9, 10) the totals mean of score is moderate this result is in line with Nouhi etal (2020). He said in their study that the level Desire to drinks among children was moderate. Energy Intake: Caloric beverages, such as sugary sodas, fruit juices, or energy drinks, can add significant calories to the diet. The desire to drink these types of beverages can contribute to increased energy intake, which may lead to weight gain or an imbalanced diet if not compensated for by other dietary adjustments.

In concerning to Satiety Responsiveness part all of items were at moderate level of assessment except (I have a big appetite) were within high level this finding is disagree with a study Gao etal (2020). which found that children who Satiety Responsiveness that level high.

In regard to the Slowness in Eating, there is a moderate level in all items. The total mean of score for the Slowness in eating component is moderate. . This result is in line with a study (Obregón etal 2024). Which found that most children suffer from slow eating, with a rate that was moderate for their academic statistics.

In concerning to Emotional Under-Eating( I eat less when I'm angry) were moderate while the remainig of this part were high. This result is in line with a study (Kininmonth etal 2021).Which found Children are more susceptible to eating moodiness, as the percentage in their studies was moderate according to their statistical results

In regard to the Food Fussiness all of its items were within moderate level. This finding is consistent with a study ( Nouhi etal. 2020). They mentioned in their study that the Food Fussiness in children was moderate or relatively high

### **Table 3-4: Overall Child Eating Behavior Questionnaire (CEBQ) for Adolescents**

Table (3.4) offer According to the Overall Child Eating Behavior Questionnaire (CEBQ) for Adolescents, findings illustrated that a moderate level as described by moderate mean score ( $\pm$ SD) = 3.25 ( $\pm$ 0.446). This result is in line with a study (Hil etal, 2018). As their study was on the relationship of stress with eating behaviors among children and adolescents, the final relationship was relatively.

### **Table (3.5). Significant Differences in Child Eating Behavior Questionnaire (CEBQ) with regard their Hemoglobin Level (n=200).**

Table (3.12) the findings indicated that there were no statistically significant differences in the Child Eating Behaviors Questionnaire (CEBQ) in relation to hemoglobin level, with a p-value of 0.961. This result is in line with a study Utami etal,(2022). They indicated through their research that there is no significant, statistically significant relationship between hemoglobin level and nutritional behavior, in addition to the relationship between anemia and eating behaviors

### **Conclusion:**

The study showed in general that the effect of hemoglobinopathy on eating behavior was moderate of Adolescents. The statistical results were moderate. There is a significant difference in the eating behaviors of adolescents with hemoglobinopathy due to the surrounding environment, their influence on their healthy peers, or demographic factors. The defect in eating control was more influential in everyone in case of hemoglobin disorder than in their unaffected or healthy peers.The study found that if caregivers intervene in programs that develop eating behavior types of healthy eating, it will have a positive impact. It was noted through the study that demographic factors had an impact on the affected adolescents, especially the level of education and the level of hemoglobin in the blood.

### **Recommendations:**

It is necessary to create a health system with nutritional value in hospitals, or especially hematology centers, which contributes to improving eating behaviors among those suffering from hereditary blood diseases Educating parents and affected children on a healthy eating system to improve their eating behaviors and nutritional status, whether inside or outside hematology centers. Conducting several studies to enhance therapeutic and environmental conditions for adolescents with hemoglobinopathies to improve their eating behaviors and nutritional status.

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