

# The Association between Dietary Habits, Physical Activities and Family Setting in Adolescent Sickle Cell Disease Patients

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## Abstract

**Introduction:** Poor dietary habits and physical activities have been reported in adolescents globally but needs to be explored in sickle cell disease (SCD).

**Methods:** This cross-sectional study of dietary habits and physical activities of adolescent SCD patients was undertaken using a semi-structured interviewer administered questionnaire.

**Results:** The mean age of the 122 respondents was  $15.7 \pm 2.3$  years, of which 51 (41.8%) were males and 77 (63%) were from monogamous homes. Overall, 58% of the adolescents had poor dietary habit and 52 (42.6%) took breakfast daily while 83 (68%) took carbonated drink in the seven days preceding the survey. There was no association between the monogamous, polygamous or single parenthood and dietary habits ( $\chi^2$  (2.67),  $P=0.26$ ). However, participants who lived with their parents were more likely to have better dietary habits ( $\chi^2$  (4.6),  $P=0.03$ ). Participants who ate breakfast or vegetables were less likely to take carbonated drinks ( $\chi^2$  (6.8),  $P=0.009$ ;  $\chi^2$  (4.64),  $P=0.03$  respectively). About half (52%) engage more in physical activities, eighty-six (70%) spent less than 3 hours watching TV daily while eighty-seven (71%) spent 1 day at most playing video game in a week. Those in the monogamous setting were more like to be physically active ( $\chi^2$  (6.5),  $P=0.038$ ). Participants who exercise less watched TV more ( $\chi^2$  (15.9),  $P<0.001$ ) while those who watch TV played less of video games ( $\chi^2$  (14.5),  $P<0.001$ ). Both parent's occupation and mothers' education influenced child's dietary habits ( $P<0.05$ ).

**Conclusion:** Dietary habits and physical activities of adolescent SCD patients are influenced by their family background.

**Keywords:** dietary habits, physical activities, breakfast, carbonated drink, LMIC

## Abstrait

**Introduction:** De mauvaises habitudes alimentaires et activités physiques ont été rapportées chez les adolescents dans le monde, mais doivent être explorées dans la drépanocytose (SCD).

**Méthodes:** Cette étude transversale des habitudes alimentaires et des activités physiques d'adolescents atteints de drépanocytose a été entreprise à l'aide d'un questionnaire semi-structuré administré par un intervieweur.

**Résultats:** L'âge moyen des 122 répondants était de  $15.7 \pm 2.3$  ans, dont 51 (41.8%) étaient des hommes et 77 (63%) provenaient de foyers monogames. Dans l'ensemble, 58% des adolescents avaient de mauvaises habitudes alimentaires et 52 (42.6%) prenaient un petit-déjeuner quotidiennement tandis que 83 (68%) prenaient des boissons gazeuses au cours des sept jours précédant l'enquête. Il n'y avait aucune association entre la monoparentalité, la polygamie ou la monoparentalité et les habitudes alimentaires ( $\chi^2$  (2.67),  $P=0.26$ ). Cependant, les participants qui vivaient avec leurs parents étaient plus susceptibles d'avoir de meilleures habitudes alimentaires ( $\chi^2$  (4.6),  $P=0.03$ ). Les participants qui prenaient un petit-déjeuner ou des légumes étaient moins susceptibles de prendre des boissons gazeuses ( $\chi^2$  (6.8),  $P=0.009$ ;  $\chi^2$  (4.64),  $P=0.03$  respectivement). Environ la moitié (52%) pratiquent davantage d'activités physiques, quatre-vingt-six (70%) passent moins de trois heures à regarder la télévision par jour tandis que quatre-vingt-sept (71%) passent au maximum une journée à jouer à des jeux vidéo par semaine. Les personnes vivant dans un environnement monogame étaient plus susceptibles d'être physiquement actives ( $\chi^2$  (6.5),  $P=0.038$ ). Les participants qui font moins d'exercice regardaient davantage la télévision ( $\chi^2$  (15.9),  $P<0.001$ ) tandis que ceux qui regardaient la télévision jouaient moins aux jeux vidéo ( $\chi^2$  (14.5),  $P<0.001$ ). La profession des parents et l'éducation de la mère ont influencé le régime alimentaire de l'enfant. habitudes ( $P<0.05$ ).

**Conclusion:** Les habitudes alimentaires et les activités physiques des adolescents atteints de drépanocytose sont influencées par leur milieu familial.

**Mots-clés:** habitudes alimentaires, activités physiques, petit-déjeuner, boisson gazeuse, PRFI

## Introduction

Sickle cell disease (SCD) is a monogenic disorder of haemoglobin synthesis, it is characterized by different types of crises and frequent hospitalization. These crises and the frequent hospitalization discourages participation of the patients in rigorous physical activities. A prominent stigmata of the disease is stunted growth which could be attributed to inadequate nutrition, though other factors which are haematologic, endocrine and metabolic also play significant roles [1]. Poor dietary habits have been shown to play significant roles in non-communicable diseases [2,3] but there is a need to explore the dietary habits of adolescent patients with sickle cell disease as well, especially in low-middle income countries where the disease is commonest. However, low calorie intake along with micro and macro nutrient deficiency has been reported in children with SCD, and these have been inversely correlated with the days of hospitalization [4]. A large proportion of the population globally are in adolescence with more than a quarter living in developing countries [5]. Also, majority of sickle cell disease patients are in adolescence as a result of the reduced life span caused by the disease [6]. Negative health behaviours like bad dietary habits and poor physical activity are common among adolescents [7] but it is not known to what extent adolescent SCD participate in these dietary habits. These negative health habits which are mostly documented for developed countries [7,8] are now being observed in developing countries [5,9]. The aim of this descriptive study is to document dietary habits and physical activities in adolescent sickle cell disease patients.

## Methods

### *Study Design, Population and Setting*

This is a cross-sectional study of dietary habits and physical activities of consenting consecutive adolescents (11-19 years of age) sickle cell disease patients from the Aglow sickle cell club, Ijaiye, Abeokuta and the Iyesubomi sickle cell club, Ijebu-Ode both in Ogun state, Nigeria. The sample size was determined using Leslie Kish formula for cross-sectional survey based studies (10) and an estimated health risk behavior of adolescent SCD patients of 77.7% (11). The calculated minimum sample size was 266 but the number of available respondents was 122. Thereafter the power of the study was calculated to be 85% which is adequate.

### *Instrument for data collection*

Data was collected using a semi-structured interviewer administered questionnaire. The questionnaire was adapted from a validated instrument, the Youth Risk Behavior Questionnaire (YRBS 2017) created by the centre for disease control and prevention (CDC) in the 1980s [12]. The instrument contains 9 and 5 questions on dietary habits and physical activities respectively, the response options are ordinal polytomous and expresses the frequency of the activities in the past seven days. Section A of the questionnaire collected information on socio-demographic characteristics, this included the family type i.e. if participants were from a monogamous, polygamous home or a single parent home. The section B collected information on health risk behaviours (dietary habits and physical activities).

The respondents reported the number of times they consumed fruits, processed fruit juices, green salad, potatoes, carrots, other vegetables, carbonated sugary drink in the last seven days. Each question had seven options which included 0 time, 1-3 times and 4-6 times in the last seven days, 1 time, 2 or 3 times per day. They were also asked how many days they skipped breakfast and the number of milk glasses they drank.

On physical activities, they were asked how many hours they spent watching TV on school days, and the number of days spent playing video/computer games in the preceding week, using computer for non-school work or their phones on social media. They were also asked the number of days and duration spent on physical education (PE) classes in a week and the number of team sport they are involved in the community or school. An individual was considered physically active if they spent at least 1 hour in a day exercising (walking, running, biking or dancing, playing football).

### *Ethical Consideration*

Ethical approval for the study was obtained from the State Health and Research Ethics Committee (SHREC), Ministry of Health, Ogun State, Nigeria (HPRS/381/329). In addition, permission was obtained from the Medical Directors of the hospitals where the sickle cell clubs are domiciled. Informed consent was obtained from all the participants and also from the care-givers of participants as well as assent from those who were below 18 years

### Data Analysis and Management

STATA statistical software version 13 (Stata Corp, College Station, Texas, USA) was used to enter, code and analyze the data. Study variables were summarized using descriptive statistics, frequencies and percentages to evaluate the distribution of the responses. Healthy dietary habits were classified into two broad groups; those who did not eat vegetables, milk, and breakfast or took carbonated drinks at least once in the preceding seven days were classified as unhealthy. While for physical activities, those who did no exercise, watched more than one hour of TV, or spent at least one day playing video games were considered less physically active. The outcome variables which were the dietary habits and physical activities were compared with the sociodemographic characteristics and other categorical variables using Chi square inferential statistics. Statistical significance was determined at alpha level of  $p < 0.05$  for two tailed test.

### Results

The number of adolescents that responded to the questionnaire was 122, of which 51 (41.8%) were males. The mean age of the respondents was  $15.7 \pm 2.3$  years and 80 (65.6%) were over 14 years. Only one respondent was still in primary school while 8 (6.6%) were in tertiary institution and others were in the secondary school (Table 1). Majority, 77 (63%) were from monogamous homes (Table 1).

**Table 1: Socio-demographic Characteristics of Adolescent Sickle Cell Disease Patients**

Socio-demographic Variable	Frequency (%)
<b>Age (Years)</b>	
11-14	42 (34.4)
15-19	80 (65.6)
<b>Gender</b>	
Male	51 (41.8)
Female	71 (41.8)
<b>Educational level</b>	
Primary	1 (0.8)
Junior Secondary	6 (4.9)
Senior Secondary	107 (87.7)
Tertiary	8 (6.6)
<b>Family Type</b>	
Monogamous	77 (63.1)
Polygamous	38 (31.2)
Single parent	7 (5.7)

Three quarters reported their haemoglobin type as HbSS while the remaining 25% were not sure of their haemoglobin type.

On the average 58% of the adolescent had poor dietary habit. Seventy (57.3%) took milk at least thrice in the preceding week with 29 (23.8%) taking milk twice a day. Breakfast was taken every day by 52 (42.6%) while 39 (32%) did not take carbonated drink in the past seven days. There was no difference in the dietary habits of males compared to females ( $\chi^2(0.08)$ ,  $P=0.8$ ). Though there was no association between family type and dietary habits ( $\chi^2(2.67)$ ,  $P=0.26$ ), participants who lived with either or both parents were more likely to have better dietary habits ( $\chi^2(4.6)$ ,  $P=0.03$ ). Participants who ate breakfast or vegetables were less likely to take carbonated drinks ( $\chi^2(6.8)$ ,  $P=0.009$ ;  $\chi^2(4.64)$ ,  $P=0.03$  respectively). There was no association between eating breakfast and eating vegetables or taking milk nor between eating vegetables and taking milk ( $P=0.6; 0.1; 0.2$  respectively).

About half (52%) were physically active in the past seven days, eighty-six (70%) spent less than 3 hours watching TV in a day while eighty-seven (71%) played video game in a day in the past week. Fifty-nine (48.4%) respondents did not exercise in the last seven days while 57 (47.1%) and 29 (23.8%) did not play video games nor watch TV respectively. Female and student participants were less likely to be physically active than male and the employed ( $\chi^2(4.2)$ ,  $P=0.041$ ;  $\chi^2(6.5)$ ,  $P=0.039$ ) respectively. Those in monogamous family settings were more likely to be physically active than those in polygamous family settings or of single parentage ( $\chi^2(6.5)$ ,  $P=0.038$ ). Participants who exercise were less likely to watch TV ( $\chi^2(15.9)$ ,  $P<0.001$ ) while those who watch TV were less likely to play video games ( $\chi^2(14.5)$ ,  $P<0.001$ ). However, exercise had no association with playing video games ( $\chi^2(0.038)$ ,  $P=0.84$ ) neither was there association between physical education class nor taking part in sporting activities ( $\chi^2(3.7)$ ,  $P=0.052$ ). Adolescents who are more likely to have a poor dietary habit are also more likely to be less physically active ( $OR=1.4$ ). Physical activities and dietary habits were not associated with the level of education of the mother or the father. Adolescents who had artisans or professionals as fathers or mothers were more likely to take milk than those whose parents were unemployed ( $P=0.021$ ;  $P=0.034$  respectively) (Table 2, 3). Also, mothers who had formal education are more likely to give milk to their children ( $P=0.006$ ) (Table 4) but the

**Table 2: Association between Fathers' Occupation and Dietary Habits of Adolescent Sickle Cell Disease Patients in the Past Seven days**

<b>Dietary Habit (N=122)</b>	<b>Professionals (%)</b>	<b>Artisans (%)</b>	<b>Unemployed (%)</b>	<b>Total</b>	<b>X<sup>2</sup></b>	<b>P-value</b>
<b>Drank juice</b>					0.157	0.925
Yes	19 (34.5)	21 (33.3)	1 (25.0)	41		
No	36 (65.5)	42 (66.7)	3 (75.0)	81		
<b>Eaten fruits</b>					1.512	0.470
Yes	32 (58.2)	43 (68.3)	1 (25.0)	76		
No	23 (41.8)	20 (31.7)	3 (75.0)	46		
<b>Eaten greensalad</b>					5.579	0.061
Yes	11(20.0)	23 (36.5)	0 (0.0)	34		
No	44 (80.0)	40 (63.5)	4 (100)	88		
<b>Eaten potatoes</b>					5.869	0.053
Yes	21 (38.2)	37 (58.7)	1 (25.0)	59		
No	34 (61.8)	26 (41.3)	3 (75.0)	63		
<b>Eaten carrot</b>					2.085	0.353
Yes	25 (45.5)	37 (58.7)	2 (50.0)	64		
No	30 (54.5)	26 (41.3)	2 (50.0)	58		
<b>Eaten other vegetables</b>					3.115	0.539
Yes	42 (76.4)	50 (79.4)	2 (50.0)	94		
No	12 (21.8)	13 (20.6)	2 (50.0)	27		
Don't know	1 (1.8)	0 (0.0)	0 (0.0)	1		
<b>Drank soda</b>					0.912	0.634
Yes	35 (63.6)	45 (71.4)	3 (75.0)	83		
No	20 (36.4)	18 (28.6)	1 (25.0)	39		
<b>Drank milk</b>					11.525	0.021
Yes	39 (38.8)	47 (74.6)	0 (0.0)	86		
No	16 (29.1)	15 (23.8)	4 (100.0)	35		
Don't know	0 (0.0)	1 (1.6)	0 (0.0)	1		
<b>Eaten breakfast</b>					0.190	0.909
Yes	43 (78.2)	51 (81.0)	3 (75.0)	97		
No	(21.8)	19 (19.0)	1 (25.0)	32		

**Table 3: Association between Mothers' Occupation and Dietary Habits of Adolescent Sickle Cell Disease Patients in the Past Seven days**

Dietary Habit (N=122)	Professionals (%)	Artisans (%)	Unemployed (%)	Total	X <sup>2</sup>	P-value
<b>Drank juice</b>					1.955	0.376
Yes	11 (44.0)	30 (31.3)	0 (0.0)	41		
No	14 (56.0)	66 (68.8)	1 (100.0)	81		
<b>Eaten fruits</b>					2.766	0.251
Yes	14 (56.0)	64 (66.7)	0 (0.0)	78		
No	11 (44.0)	32 (33.3)	1 (100.0)	44		
<b>Eaten greensalad</b>					4.452	0.108
Yes	3 (12.0)	31 (32.3)	0 (0.0)	34		
No	22 (88.0)	65 (67.7)	1 (100.0)	88		
<b>Eaten potatoes</b>					2.999	0.223
Yes	9 (36.0)	50 (52.1)	0 (0.0)	59		
No	16 (64.0)	46 (47.9)	1 (100.0)	63		
<b>Eaten carrot</b>					2.753	0.252
Yes	10 (40.0)	53 (55.2)	1 (100.0)	64		
No	15 (60.0)	43 (44.8)	0 (0.0)	58		
<b>Eaten other vegetables</b>					7.575	0.108
Yes	16 (64.0)	78 (81.3)	0 (0.0)	94		
No	9 (36.0)	17 (21.2)	1 (100.0)	27		
Don't know	0 (0.0)	1 (1.0)	0.0	1		
<b>Drank soda</b>					3.216	0.200
Yes	15 (60.0)	68 (70.8)	0 (0.0)	83		
No	10 (40.0)	28 (29.2)	1 (100.0)	39		
<b>Drank milk</b>					8.745	0.068
Yes	13 (52.0)	73 (76.0)	0 (0.0)	86		
No	12 (48.0)	22 (22.9)	1 (100.0)	35		
Don't know	0 (0.0)	1 (1.0)	0 (0.0)	1		
<b>Eaten breakfast</b>					6.774	0.034
Yes	17 (68.0)	80 (83.3)	0 (0.0)	97		
No	8 (32.0)	16 (16.7)	1 (100.0)	25		

**Table 4: Association between Mothers' Education and Dietary Habits of Adolescent Sickle Cell Disease Patients in the Past Seven days**

<b>Dietary Habit (N=122)</b>	<b>Tertiary (%)</b>	<b>Secondary (%)</b>	<b>Primary (%)</b>	<b>No Formal Education (%)</b>	<b>Total</b>	<b>X<sup>2</sup></b>	<b>P-value</b>
<b>Drank juice</b>						1.894	0.595
Yes	18 (40.0)	13 (27.1)	8 (36.4)	2 (28.6)	41		
No	27 (60.0)	35 (72.9)	14 (63.6)	5 (71.4)	81		
<b>Eaten fruits</b>						2.963	0.397
Yes	27 (60.0)	35 (72.9)	12 (54.5)	4 (57.1)	78		
No	18 (40.0)	13 (27.1)	10 (45.5)	3 (42.9)	44		
<b>Eaten green salad</b>						1.069	0.785
Yes	11 (24.4)	13 (27.1)	8 (36.4)	2 (28.6)	34		
No	34 (75.6)	35 (72.9)	14 (63.6)	5 (71.4)	88		
<b>Eaten potatoes</b>						2.816	0.421
Yes	22 (48.9)	24 (50.0)	8 (36.4)	5 (71.4)	59		
No	23 (51.1)	24 (50.0)	14 (63.6)	2 (28.6)	63		
<b>Eaten carrot</b>						2.363	0.501
Yes	25 (55.6)	25 (52.1)	9 (40.9)	5 (71.4)	64		
No	20 (44.4)	23 (47.9)	13 (59.1)	2 (28.6)	58		
<b>Eaten other vegetables</b>						3.333	0.766
Yes	33 (73.3)	36 (75.0)	19 (86.4)	6 (85.7)	94		
No	11 (24.4)	12 (25.0)	3 (13.6)	1 (14.3)	27		
Don't know	1 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	1		
<b>Drank soda</b>						4.413	0.220
Yes	31 (68.9)	36 (75.0)	11 (50.0)	5 (71.4)	83		
No	14 (31.1)	12 (25.0)	11 (50.0)	2 (28.6)	39		
<b>Drank milk</b>						18.276	0.006
Yes	25 (55.6)	40 (83.3)	18 (81.8)	3 (42.9)	86		
No	20 (44.4)	8 (16.7)	3 (13.6)	4 (57.1)	35		
Don't know	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	1		
<b>Eaten breakfast</b>						2.977	0.395
Yes	33 (73.3)	38 (79.2)	20 (90.9)	6 (58.7)	97		
No	12 (26.7)	10 (20.8)	2 (9.1)	1 (14.3)	25		

father's education had no effect on the child's dietary habit.

### Discussion

Overall, it appeared that the dietary habit of sickle cell disease patients is average since a third to half had a healthy diet daily including not taking carbonated drinks. Furthermore, about half did not exercise or engage in physical education in school, a similar proportion did not play video games and only spent 1-2 hours watching TV in a day. The home setting played a significant role in the dietary habits of the participants and their engagement in physical activities, with those in a monogamous setting having healthier habits than those in polygamous setting or of single parentage. Of great importance is the observation that participants who ate breakfast or vegetables were less likely to take carbonated drinks. Again, exercising appears to preclude watching of TV, also more participants watch TV than play video games.

Our study participants showed better dietary habits when compared with the pooled estimate of other Low-Middle income countries (LMIC). The study from the LMIC showed a pooled estimate of 50.3%, (CI 45.6;55.0) for consumption of carbonated drink (every day in the past 30 days) (13) compared with 32% and 34.4% (66.4%) of our study population who did not take or took carbonated drinks 1-3 times respectively in the preceding 7 days. A pooled estimate of 74.4% (CI 71.8;77.0) [13] was obtained for low fruits and vegetable intake in LMIC compared with 66.3% and 36.1% who had not taken fruits or vegetables respectively among our respondents. However, the consumption of fruits and vegetables was worse than that of Italian adolescents in whom 54.1% did not consume fruits and vegetables daily [7]. This could be attributed to poor economic resources available to the families, another plausible reason could be cultural. It should be noted that the upper limit of the age of participants in the LMIC and Italian cohorts is younger than that of our study participants, 15 years versus 19 years. Many of our participants being in the late adolescent phase, may already be spending more of their time outside the home, perhaps in paid employment and will want to spend their limited resources on what is less expensive.

But the consumption of carbonated drinks is similar between our adolescents and the Italian population, 25.5% versus 27.2% respectively [7]. Breakfast has been considered an indicator of healthy eating habit because of its many nutritional

and health benefits [14] but this is the most omitted meal by adolescents [15,16]. Breakfast was eaten every day of the week by 43% of our participants while 20% did not eat breakfast in any of the 7 days before the study. The percentage of our cohort that skipped breakfast is lower than the 35% of Ghanaian adolescents, though their participants were not sickle cell disease patients [16]. This poor dietary habit was observed to be more common among girls and increases with age in the Italian participants [7]. The reason why skipping breakfast may not be common among adolescent SCD patients could be because their parents dote over them ensuring that they inculcate good healthy habits because of the disease condition. The eating of breakfast may also explain the high percentage that drank milk since milk is likely to go with beverages taken for breakfast. It therefore appears that the SCD patients fair better in their dietary habits.

According to the recommendation by WHO, an adolescent who engages in 60 minutes of moderate or vigorous physical activity in a day is considered to have a good level of physical fitness [17]. About half (52%) of our study participants were physically active in the preceding 7 days and at least 70% spent less than three hours watching TV in a day or less than two days playing video game in a week. Despite the challenges of their health, majority of the patients can be considered active. This is in contrast to 63% of Nepalese adolescents who were considered not physically active. Also, the likelihood of a person with poor dietary habit being physically inactive is similar between our patients and Italian adolescents (OR 1.4 Vs 1.55 respectively). This confirms the believe that students who are highly motivated consume healthier foods and are more active [18]. Underweight was more prevalent than overweight in adolescents who were not physically active [19], encouraging physical activity among SCD patients may therefore be helpful in boosting not only their health but also their stature.

Studies have associated poor family setting and low socioeconomic status with poor dietary and inadequate physical activities among adolescents [7,13,18]. Our study supports this showing that adolescents from polygamous or single parent homes were less likely to be physically active. Though family setting did not affect the dietary habits of our patients but living with their parents was positively associated with good dietary habits. This buttresses the finding that family support and the habit of eating together every day as a family is positively associated with better diet among adolescents [20].

The strength of this study is that it addressed dietary habits of SCD adolescent patients unlike other studies which predominantly looked at nutrients in these patients. The shortcomings of this study are that it did not simultaneously study the dietary and physical activities of non-SCD adolescents from the same population, especially since there is no sufficient data on dietary and physical activities of Nigerian adolescents. Again, the use of different tools by different studies did not allow good comparisons across studies.

In summary, this study showed that dietary habits and engagement in physical activities by SCD patients can be classified as being above average in comparison to adolescents from other LMIC. More of our patients ate breakfast and consumed less of carbonated drinks than adolescents from other low resource countries. Like other studies, poor dietary habits also negatively impacted the physical activities of our adolescent. Furthermore, there is an association between the family setting and the dietary habit and how physically active the participants were. Patients from monogamous families fared better than patients from polygamous or single parent homes. It is necessary to explore if these findings will in any way impart on the severity of the crises observed in these patients.

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