# RESEARCH



# Nutritional, health and socio-demographic determinants of anaemia in adolescent girls in Kumbungu District, Ghana



# Abstract

**Background** Anaemia is a serious health problem among adolescent girls in Ghana. The aims of this study were to measure the prevalence and identify the nutritional, health, and socio-demographic determinants of anaemia in adolescent girls in Kumbungu District, Northern Region, Ghana.

**Method** An analytical cross-sectional study involving 370 adolescent girls residing in Kumbungu district, selected using multi-stage sampling procedure, was conducted. A semi-structured questionnaire, 24-hr dietary recall, food frequency questionnaire, Food Insecurity Experience scale, and anthropometry were used to gather information on socio-demographic characteristics, nutrition knowledge, dietary diversity score, food consumption score, food consumption frequency, household food insecurity, and waist and hip circumferences. Haemoglobin was measured using a portable HemoCue hg 301 + Analyzer. Anaemia in the adolescent girls was defined as haemoglobin concentration less than 12 g/dl. Chi-square test and binary logistic regression analysis were used to identify the determinants of anaemia.

**Results** The mean ( $\pm$  SD) age was 13.95 ( $\pm$  2.94) years, and the majority of the girls were in school (79.5%) and lived in a rural area (81.1%). The mean ( $\pm$  SD) haemoglobin was 11.27 ( $\pm$  1.19) g/dl, and 74.6% of the respondents had anaemia, with 1.6% having severe anaemia. The health determinant of anaemia was frequency of feeling nervous in the past 6 months [Adjusted Odds Ratio (AOR): 2.12: 95% Confidence Interval (CI): 1.17–3.89; p: 0.014], and the socio-demographic determinants were residential community status (AOR: 0.42; 95% CI: 0.24–0.75; p: 0.003), and fathers' educational qualification (AOR: 2.57, 95% CI: 1.17–5.65, p: 0.019). No nutritional determinants of anaemia were identified for this study population.

**Conclusion** The prevalence of anaemia was very high and the frequency of feeling nervous in the past 6 months, residential community status, and fathers' educational qualification were associated with anaemia among adolescent girls in Kumbungu district, Ghana. The prevalence of anaemia measured highlights the need for intensification of anaemia prevention and management interventions in the district.

**Keywords** Anemia, Adolescents, female, Nutrition determinants, Determinants of Health, Social Determinants of Health, Kumbungu, Ghana

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# Introduction

Anaemia in adolescence is a problem of public health significance. Globally, anaemia prevalence was estimated at 29.4% among females in their reproductive age by World Health Organization (WHO) [1]. About 50% of adolescent girls living in Sub-Saharan Africa are anaemic [2], and anaemia prevalence of 26.4% was estimated among non-pregnant adolescent girls aged 15 to 19 years in Ghana [3]. Anaemia reduces the ability of blood to transport oxygen throughout the body [4] and results in reduced immunity, impaired physical performance and poor neurodevelopment in adolescence [5, 6].

The main cause of anaemia is inadequate dietary iron intake resulting from consuming iron-poor foods. Among adolescents, anaemia is most frequently caused by nutritional deficiencies due to rapid growth and physical changes, high iron requirements associated with adolescence, and high infection and worm infestation rates [7, 8]. According to a number of research studies, the individual determinants of anaemia in adolescent girls include nutritional status, dietary diversity score, age, educational status, marital status, occupation, religion, wealth status, and socio-economic status, while the household-level determinants include food insecurity, toilet facility type, drinking water source, and proximity to health facility [9-12]. Apart from the individual and household characteristics, area level characteristics such as residential area classification (rural, peri-urban, urban) of adolescent girls also influence their risk of anaemia [11, 13].

To address the high number of cases of anaemia among adolescent girls in the country, Ghana commenced the first phase of weekly Girls' Iron-Folic Acid Tablet Supplementation (GIFTS) programme for girls aged 15–19 years in Volta, Bono, Ahafo, Upper East and Northern regions in December 2018 [14]. The GIFTS Programme provides free weekly Iron-Folic Acid (IFA) supplements to adolescent females in school and out of school in an effort to raise their haemoglobin levels and reduce anaemia risk. A longitudinal study conducted on the participants of GIFTS revealed that supplementation with IFA increased haemoglobin levels and reduced the risk of anaemia [15].

In most developing countries including Ghana, anaemia prevention interventions are mostly targeted to infants, young children, pregnant women, and lactating women leaving adolescents to their fate. As with the other indicators of malnutrition, the Northern Region bears the most burden of anaemia, 64.6% of adolescent girls were estimated to be having anaemia [16]. However, little is documented on prevalence and determinants of anaemia among adolescent girls in the Kumbungu District in the Northern Region. This study sought to fill this knowledge gap and contribute to evidence base on anaemia in the district. The objectives of this study were to assess the prevalence and identify nutritional, health and socio-demographic determinants of anaemia in adolescent girls in Kumbungu District, Ghana.

# Methods

# Study design, site, population and subjects

An analytical cross-sectional study involving adolescent girls in Kumbungu district, Northern region, Ghana was carried out. The Kumbungu District is in the Northern region and has an estimated population of 46,171 and a population density of 89 people per square kilometer. Of this population, 13,631 are adolescents comprising 75% males and 25% females who attend school [17]. Dagombas are the indigenous people making up about 95% of the district's population; however, persons of Gonja and Ewe ethnicities engage in fishing activities along the White Volta. The predominant religions practised are Islamic and traditional religions, but there are pockets of Christians throughout the district. The study was conducted among adolescent girls in six communities in two selected sub-districts. The six communities are Wuba, Gbugli and Zangbalun in Dalun sub-district and Gumo, Kanfehiyili and Cheshegu in Gupanarigu sub-district.

# Sample size and sampling technique

Sample size was determined using single population proportion formula [18]. Using a critical value of 95% confidence level of 1.96, prevalence of anaemia in adolescent girls in Northern Region 64.6% [16], and margin of error of 0.05, a minimum sample of 370 was estimated. Probability proportional to size was used to determine the sample size for each of the 6 communities that participated in the study i.e., 60 participants were selected from each of the five communities and 70 participants in the remaining one community. Both the communities and subjects were selected using simple random sampling. On each data collection day, balloting was done with 'yes' or 'no' written on pieces of papers, folded into a container, and the participants were allowed to pick. Any participant who selected 'yes' and consented to participate in the study was interviewed.

# Data collection

Data were collected in March and April, 2022. A semistructured questionnaire, 24-hr dietary recall, food frequency questionnaire, Food Insecurity Experience scale, and anthropometry were used to gather information on socio-demographic characteristics, nutrition knowledge, dietary diversity score, food consumption score, food consumption frequency, household food insecurity, and waist and hip circumferences. The nutrition knowledge and IFA practices sub-scale of the investigatorconstructed semi-structured questionnaire underwent

content and face validations. Content validation was carried out when composing the statements used to measure the girls' nutrition knowledge and IFA practices in a focus group discussion by a team of ANC nurses who were conversant with the education given to women on nutrition, iron, folic acid, and anaemia in pregnancy in antenatal clinics in Ghana. Face validation involved pretesting the questionnaire on adolescent girls in another community and revising unclear questions until the girls were satisfied that the questions could adequately measure their nutrition knowledge and IFA practices. The Cronbach's alpha for the nutrition knowledge sub-scale is 0.76. The questionnaires were presented in face-to-face interviews with adolescent girls in their homes in English language or the local language spoken in the study area (Dagbani). Haemoglobin was measured using a portable HemoCue hg 301+Analyzer [19]. 10 µL capillary blood sample was taken by pricking the tip of the index finger with a sterilized disposable lancet and the blood was put on the optical window of the micro cuvette through capillary action. The displayed haemoglobin level was observed and recorded. Participants' waist and hip circumferences were measured to the nearest 0.1 cm using a tape measure. Waist circumference was measured at the mid-point (navel), and hip circumference was measured at the maximum circumference of the hip in a horizontal plane. The interview took 20 min on the average to complete per study participant. At the end of the day during the fieldwork, the completed questionnaires were checked by supervisors to ensure that all questions were answered. The data were collected by 4 research assistants (including a candidate for MPhil Public Health Nutrition and a phlebotomist) and two lecturers of the Department of Nutritional Sciences, School of Allied Health Sciences, University for Development Studies, Tamale, Ghana. Prior to the data collection exercise, there was a 3-day training workshop to enable the enumerators understand the questions and to sharpen their data collection skills.

# Study questionnaires and definition of variables

Anaemia Anaemia in adolescence was the outcome variable and was defined as haemoglobin concentration less than 12 g/dl. The haemoglobin level was further categorized based on WHO classification as normal ( $\geq$ 12 g/dl), mild anaemia (11.0-11.9 g/dl), moderate anaemia (8.0-10.9 g/dl) and severe anaemia (<8 g/dl) [20].

Household food security Food insecurity was assessed using Food Insecurity Experience Scale (FIES). The FIES was established by Food and Agriculture Organization Voices of the Hunger for estimating food insecurity prevalence. FIES is a food insecurity severity experience matrix that depends on immediate responses of respondents to questions about their access to sufficient food. The eight questions in this scale required respondents to answer 'yes' (scored 1) or 'no' (scored 0) concerning their access to sufficient food for the past one year. The scores were aggregated (plausible range 0-8), and the raw score was used to classify the households into food secure (raw score  $\leq 3$ ) and food insecure (raw score  $\geq 4$ ) categories [21].

Minimum dietary diversity-women The respondents were asked to recall the foods and drinks they had consumed in the previous 24-hr before the interview. Based on the information provided, it was determined if they had eaten from the 10 food groups or not irrespective of the quantities [22]. The food groups are grains, roots and tubers; meat, poultry and fish; dairy; eggs; pulses; nuts and seeds; dark green leafy vegetables; other vegetables; other fruits; and other vitamin A-rich fruits and vegetables. For each food group they ate from they got a score of "1" otherwise a score of "0". The individual dietary diversity score was calculated by summing up all the ten food groups to get the overall score for each participant (plausible range 0-10). Respondents who consumed at least five of the ten food groups met the minimum dietary diversity-women criterion and those who consumed less than five food groups did not [22]. Minimum dietary diversity-women is a measure of access to micronutrient-rich foods.

*Food consumption score:* The number of days foods were consumed from eight food groups in a 7-day period by the respondents was recorded, each food group frequency was multiplied by the food group weight, and the scores added up [23]. The overall score ranges potentially ranges from 0 to 112. The food groups are main staples; pulses; vegetables; fruits; meat, egg, and sea food; milk; sugar; and fats and oils and the food group weights are 2, 3, 1, 1, 4, 4, 0.5, and 0.5 respectively. The composite score was divided into three categories of food consumption: poor (0.0-21.0), borderline (21.5-35.0), and acceptable (>35.0) [23].

*Waist-to-hip ratio* The waist-to-hip ratio was calculated by dividing waist circumference by hip circumference, and the respondents whose waist-to-hip ratio was more than 0.85 were classified as having abdominal obesity, otherwise they were classified as not having abdominal obesity [24, 25].

*Physical activity* The question "Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?" [26] was used to measure physical activity level. Respondents who were physically active for at least 5 days were classified as physically active, otherwise they were classified as physically inactive. *Nutrition knowledge index* Nine statements on general nutrition and anaemia were read out to the respondents and they were expected to determine if each statement was true or false, Supplementary File S1. These statements were on importance of dietary diversity for good health; benefits of iron-rich foods, and fruits; signs and symptoms of iron deficiency; and consequences of iron deficiency anaemia. The scores for the nine statements were aggregated and the sum ranging from 0 to 9 used to classify them into two categories using the natural mean of the score (4.5).

*Practices on iron-folic acid* Seven questions bothering on participation in the GIFTS programme, whether the IFA supplement was taken when missed, the experiences of the respondents after taking the IFA supplement, whether their families encouraged them to take the IFA supplement, and their perceptions on the IFA supplements were explored.

*Malaria and worm infestation* The participants were asked if they had experienced malaria and/or worm infestation in the last 6 months prior to the survey and if they did whether they received treatment.

Self-rated health: The question: "In general would you say that your health is excellent, very good, good, moderate, bad or very bad?" was used to measure self-rated health [27]. The responses were grouped into two categories (1) Good/very good/excellent and (2) Very bad/bad/ moderate.

General health: General health was measured using the question: "In the past 6 months, have you had the following problems: headache, stomach ache, backache, feeling low, feeling irritable or bad tempered, feeling nervous, difficulties in getting to sleep and dizziness?" The five responses were grouped into (1) Rarely or seldom, (2) Sometimes and (3) Fairly/very often.

Socio-demographic and economic characteristics of respondents Residential community status was classified as rural or peri-urban, age was measured as a continuous variable but grouped as 10-14 years and 15-19 years, and educational level was categorized into "no education", "primary school", "junior high school", and "secondary/ vocational school". The religion practised, marital status and ethnicity were categorized into two levels each i.e., "Christian" and "Islam", "single, never married" and "married", and "Dagomba" and "others" respectively. The occupation of parents was categorized into "farmer", "trader" and "others". The educational status of the parents were "no education", "primary school", "junior high school", "secondary/vocational school", and "Higher National Diploma and above". Household size was grouped into 3-6, 7-10, and 11+.

*Perceived socio-economic status* The socio-economic status of the families was measured using a question from Healthy Behaviours in School aged Children survey *"How well off do you think your family is?"* [28]. The five response options were grouped into three as low ("not at all" and "not particularly"), middle ("fairly") and high ("rather" and "very").

# Statistical analysis

Stata 15 IC (Stata Corp) was used to analyze the data. Descriptive statistics (frequencies and percentages for categorical variables and means and standard deviations for continuous variables) were used to present the results. Chi-square test and logistic regression modelling were used to identify the nutritional, health and socio-demographic determinants of anaemia. The factors significantly associated with anaemia in bivariable analyses were then entered simultaneously into a multivariable logistic regression model to identify the independent determinants of anaemia in adolescent girls. P-value<0.05 was regarded as statistically significant. Model fit was evaluated using Hosmer-Lemeshow goodness of fit test.

# Results

# Socio-demographic and economic characteristics of respondents

The mean ( $\pm$ SD) age of the respondents was 13.95 ( $\pm$ 2.94) years and majority were between the ages of 10 and 14 years (55.7%). The majority of the respondents lived in rural areas (81.1%), were students (79.5%), had no mobile phone (84.6%), and belonged to the low perceived socio-economic status index (64.6%), Table 1. The vast majority of respondents, 97.8% were single or never married, 98.9% belonged to the Dagomba tribe, and 85.7% practised Islam. The majority of the fathers (84.9%) and mothers (52.4%) of the respondents were farmers, and also majority did not have any form of formal education (father 80.0%, mother 87.0%).

# Consumption from food groups and food frequency

Almost all the respondents (99.5%) ate grains, roots, and tubers, while only 8.6% each ate dairy and other fruits (Table 2). The vast majority of respondents (95.9%) consumed flesh foods (meat, poultry, and fish) and other vegetables (97.6%), while less than one-fifth consumed pulses (beans, peas, and lentils) (13.8%), and eggs (4.1%). Dark green leafy vegetables (58.6%), and other vitamin A-rich fruits and vegetables (44.1%) were consumed by about half of the subjects.

According to a 7-day food frequency questionnaire, 75.1% of respondents consumed staples on more than 5 days per week, while 61.1% consumed pulses on 1-3 days per week (Table 3). Vegetables were consumed by

	Table 1	Socio-demographic characteristics of respondents	
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Characteristic	Frequency	Percent
Status of community		
Rural	300	81.1
Peri-urban	70	18.9
Age group (years)		
10–14	206	55.7
15–19	164	44.3
Education		
No education	77	20.8
Primary school	154	41.6
Junior High School	109	29.5
Secondary/vocational school	30	8.1
Religion		
Christian	53	14.3
Islam	317	85.7
Marital status		
Single, never married	362	97.8
Married	8	2.2
Ethnicity		
Dagomba	368	98.9
Others	2	1.0
Occupation of mother		
Farmer	194	524
Trader	153	41.4
Others	23	62
Education of father	20	0.2
No education	296	80.0
Primary school	27	73
Junior High School	17	46
Secondary/vocational school	22	5.9
Higher National Diploma and above	8	2.2
Education of mother	0	2.2
No education	322	87.0
Primary school	21	5.7
lunior High School	17	46
Secondary/vocational school	9	2.4
Higher National Diploma and above	1	0.3
Occupation of father	·	0.5
Farmer	314	84 9
Trader	27	73
Others	29	7.5
Household size	27	7.0
3-6	92	74.9
7–10	184	2 1.J 49 7
11+	94	25.4
Perceived socio-economic status	51	25.1
	230	64.6
Middle	110	20.7
High	21	∠ <i>J.1</i> 5.7
Respondent has a phone	<u>ک</u> ا	۱.ر
No	313	84.6
Voc	57	15 /
	1	1.3.4

 Table 2
 Percentage of respondents who ate from the 10 food

groups in the previous 24 h before survey						
Food group	Frequency	Percent				
Grains, roots and tubers	368	99.5				
Other vitamin A-rich fruits and vegetables	163	44.1				
Meat, poultry and fish	355	95.9				
Dairy	32	8.6				
Dark green leafy vegetables	217	58.6				
Other vegetables	361	97.6				
Other fruits	32	8.6				
Eggs	15	4.1				
Pulses	51	13.8				
Nuts and seeds	169	45.7				

51.1% of respondents for 4–5 days per week. Meat, eggs, and seafood were consumed by 48.6% of respondents on 4–5 days per week. Only 25.9% of respondents consumed milk on 1–3 days per week, while sugar was consumed on >5 days per week by 64.6% of respondents. The majority (48.1%) of respondents consumed fats and oils for 1–3 days per week, while about one-third (33.8%) consumed beverages 1–3 times per week.

# Nutritional factors and nutrition knowledge index

A greater majority of the respondents were food insecure (89.7%) but had acceptable food consumption score (81.9%) and a little more than half (57.3%) met the dietary diversity requirement by eating foods from at least five of the ten food groups, Table 4. Also, a little more than half (56.5%) of the respondents had high nutrition knowledge.

# Nutritional, health and socio-demographic determinants of anaemia

The mean ( $\pm$ SD) haemoglobin was 11.27 ( $\pm$ 1.19) g/dl, and 74.6% of the respondents had anaemia, with 40.8%, 32.2% and 1.6% having mild, moderate and severe anaemia respectively. The nutritional, health and sociodemographic factors of adolescent girls were compared to their anaemia status. None of the nutritional factors of the respondents was associated with their anaemia status (Table 5). The frequency of feeling nervous in the last 6 months (p=0.029), residential community status (p=0.005), and fathers' educational level (p=0.039) were significant in both bivariable (Tables 6 and 7) and multivariable (Table 8) analyses. Respondents who felt nervousness fairly/very frequently in the previous 6 months were two times more likely to be anaemic compared to those who felt nervous rarely or seldomly [Adjusted Odds Ratio (AOR)=2.12, 95% 95% Confidence Interval (CI): 1.17-3.89, p=0.014]. Adolescents from peri-urban communities were 58% less likely to be anaemic compared to those from rural communities (AOR=0.42, 95% CI: 0.24-0.75, p=0.003). Again, adolescents whose fathers had no formal education were about three times more

# Table 3 Food frequency in the last 7 days

Variable	Frequency	Percent
Main staples		
Never	1	0.3
1–3 days	5	1.4
4–5 days	86	23.2
>5 days	278	75.1
Pulses		
Never	82	22.2
1–3 days	226	61.1
4–5 days	50	13.5
>5 days	12	3.2
Vegetables		
Never	1	0.3
1–3 days	25	6.8
4–5 day	189	51.1
>5 days	155	41.9
Fruits		
Never	78	21.1
1–3 days	220	59.5
4–5 days	47	12.7
>5 days	25	6.8
Meat, egg, and sea food		
Never	6	1.6
1–3 days	71	19.2
4–5 days	180	48.6
>5 days	113	30.5
Milk		
Never	257	69.5
1–3 days	96	25.9
4–5 days	10	2.7
>5 days	7	1.9
Sugar		
Never	1	0.3
1–3 days	48	13.0
4–5 days	82	22.2
>5 days	239	64.6
Fats & Oils		
Never	8	2.2
1–3 days	178	48.1
4–5 days	133	35.9
>5 days	51	13.8
Beverages (tea, coffee)		
Never	80	21.6
1–3 days	125	33.8
4–5 days	74	20.0
>5 days	91	24.6

likely to be anaemic compared to those whose fathers had higher education (secondary/vocational school or above) (AOR=2.57, 95% CI: 1.17–5.65, p=0.019). With respect to the evaluation of the fit of the logistic regression model, the insignificant p-value (p=0.92) obtained suggests that the model fitted the data well.

# Table 4 Percentages of respondents for selected nutritional factors

Variable	Frequency	Porcont	95% Con-
	requency	reicent	fidence Interval
Minimum Dietary Diversity- Women (Yes)	212	57.3	52.1–62.4
Food consumption score (Acceptable)	303	81.9	77.6–85.7
Household food insecurity (Yes)	332	89.7	86.2–92.6
Nutrition knowledge index (High)	209	56.5	51.3–61.6
Participation in Girls' Iron Folic Acid Tablet Supplementation programme (Yes)	175	47.3	42.1–52.3

Table 5	Nutritional factors of respondents as determinants c	f
anaemia		

Variable	Total	Anaemia, No, Freq (%)	Anaemia, Yes, Freq (%)	Test statistics
Consumption of iron-rich foods (meat, poultry and fish)				X2=2.9; p=0.089
No	15	1 (6 7)	14 (93 3)	
Yes	355	93 (26.2)	262 (73.8)	
Frequency of consump- tion of iron-rich foods (meat, poultry and fish)		,		X2=0.2; p=0.672
≤3	77	21 (27.3)	56 (72.7)	
3+	293	73 (24.9)	220 (75.1)	
Minimum Dietary Diversity-Women				X2=0.3; p=0.605
No	158	38 (24.1)	120 (75.9)	
Yes	212	56 (26.4)	156 (73.6)	
Food consumption score				X2=0.1; p=0.762
Borderline	67	18 (26.9)	49 (73.1)	
Acceptable	303	76 (25.1)	227 (74.9)	
Household food insecurity				X2=2.9; p=0.087
No	38	14 (36.8)	24 (63.2)	
Yes	332	80 (24.1)	252 (75.9)	
Nutrition knowledge index				X2=2.0; p=0.155
Low	161	35 (21.7)	126 (78.3)	
High	209	59 (28.2)	150 (71.8)	
Participates in Girls' Iron- Folic Acid Tablet Supple- mentation Programme				X2=2.4; p=0.118
Yes	175	51 (29 1)	124 (70.9)	
No	195	43 (22.1)	152 (77.9)	

# Discussion

The determinants of anaemia in adolescent girls were studied in Kumbungu district, Ghana. A significant proportion of the subjects were identified to have anaemia (74.6%). Following bivariable and multivariable studies of

 Table 6
 Health-related variables of respondents as determinants of anaemia

Had mation which the last 6 months         X2 = 0.5, p = 0.448           Wis         X2 = 0.5 (2.40)         Test (7.40)           No         200         P = 0.00, p = 0.000           Wes         Value         Value         Value           Perform         200, p = 0.000         Value         Value         Value           No         200, p = 0.000         Value         Value         Value         Value           Own         200, p = 0.000         Value         Value         Value         Value         Value           Own         200, p = 0.000         Value         Value         Value         Value         Value           Own         200, p = 0.010         Value         Value         Value         Value         Value         Value           No         120         48 (2.40)         120 (2.01)         Table (7.00)         Value	Variable	Total	Anaemia, No, Freq (%)	Anaemia, Yes, Freq (%)	Test statistics
No.         121         52 (240)         165 (600)           No         24 07.51         11/07.30           Hed worm infestation within the last 6 months         72 - 00.5 (0.993)           Yes         168         63 (25.6)         152 (74.4)           Deworm dwithin the last 6 months         72 - 00.5 (0.9 - 0.958)         Yes	Had malaria within the last 6 months				X2=0.6; p=0.448
No         111725         22:02; p = 0.393           How worm infestation within the last 6 months         125:02         125:07.40           No         200; p = 0.039           No         200; p = 0.039           Ves         135:02         151:07.40           No         323:02         40:03.51         170:07.07           Self-rate health status         22:02; p = 0.024         100:00           Self-rate health status         22:02; p = 0.024         100:00           Societters/very poor         173         46:026         127:07.30           Started health status         22:02; p = 0.024         100:00         12:02; p = 0.024           No         100:00         12:00         12:00; p = 0.021           No         100:00         12:00         12:00; p = 0.021           No         100:00         12:00; p = 0.021         100:00           No         100:00         12:00; p = 0.021         100:00           Sometimes         100:00         12:00; p = 0.021         100:00           Sametimes         100:00         12:00; p = 0.021         100:00           Sametimes         100:00         12:00; p = 0.021         100:00           Sametimes         100:00         12:00; p = 0	Yes	217	52 (24.0)	165 (76.0)	
Hed worm infestation within the last 6 months         22         31         25.3         151 (74.8)           No         202         31         25.3         151 (74.8)           Deworm within the last 6 months         22         30         177 (74.7)           No         0.53         177 (74.7)         23         34         25.6         777 (74.7)           Self-orted enth status         22         30         177 (74.7)         23         34         25.6         177 (74.7)           Self-orted enth status         22         30         177 (74.7)         23         34         25.6         177 (74.7)         23         32         31.6         31.1         32	No	153	42 (27.5)	111 (72.5)	
No         125, (26.)         125, (26.)         125, (26.)           Decommed within the last 6 months         X2=0.0, p=0.938           Yes         133         34 25.6)         99 (74.4)           No         260 62.33         177 (47.7)         2=0.2, p=0.624           Self-rate health status         X2=0.2, p=0.624         127 (34.7)         X2=0.2, p=0.624           Modenato/poorVery poor         173         46 (26.9)         126 (75.6)         X2=0.4, p=0.812           Vis         Sometimes         50 (26.9)         136 (73.1)         X2=0.4, p=0.812           No         184         50 (26.9)         136 (73.1)         X2=0.4, p=0.812           No         184         50 (26.9)         136 (73.1)         X2=0.4, p=0.812           Sometimes         164         72 (26.0)         777 (40.0)         Tailrykey often         15 (22.4)         22.76.1           Failrykey often         254         6 (27.8)         12.27.6)         72.22.p=0.904           Failrykey often         15 (22.0)         777 (40.0)         Tailrykey often         27.24.p=0.308           Fairlykey often         15 (22.0)         12.07.13         X2=0.2.p=0.904           Fairlykey often         15 (22.0)         12.07.13         X2=0.2.p=0.904 <td>Had worm infestation within the last 6 months</td> <td></td> <td></td> <td></td> <td>X2=0.0; p=0.939</td>	Had worm infestation within the last 6 months				X2=0.0; p=0.939
NoDotDisplay and the set of anotherX = 0.2Dewormed within the last 6 monthsX = 0.0(3.3)Y = 0.0(3.4)No2.30.0(3.3)Y = 0.0(3.4)No2.30.0(3.3)Y = 0.0(3.4)Self-rated meth statusX = 0.0(3.4)Y = 0.0(3.4)Kenden strico Accer poor1.946 (24.4)140 (75.6)Moderatiz/DocArcer poor1.946 (24.6)1.00 (7.1)No1.00 (7.1)46 (25.6)1.00 (7.1)Pres1.0840 (23.5)1.00 (7.1)Rately or seldon finadache in the last 6 monthsX = 0.0(3.6)2.00 (7.1)Frequency of experiencing standard che in the last 6 monthsX = 0.0(2.7)X = 0.0(2.7)Farely or seldon2.10 (24.6)2.02 (7.5)X = 0.0(2.7)Sometimes1.00 (20.4)2.00 (7.1)X = 0.0(2.7)Frequency of experiencing standard che in the last 6 monthsX = 0.0(2.7)X = 0.0(2.7)Farely or seldon2.10 (20.3)2.20 (7.3)X = 0.0(2.7)Frequency of experiencing backache in the last 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency of experiencing backache in the last 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency of experiencing backache in the last 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency of experiencing backache in the last 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency of experiencing law fields 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency of experiencing law fields 6 monthsX = 0.0(2.1)X = 0.0(2.1)Frequency o	Yes	168	43 (25.6)	125 (74.4)	
Dewarned within the last 6 months         V2=00; p=0:958           Yes         133         34 (25.3)         1977 (4A)           Self-rated health status         X2=02; p=0:024           Excellent/very good/good         48 (4A)         149 (75.6)           Madenate/poor/very poor         173         46 (2b.6)         136 (73.1)           Excellent/very good/good         184         47 (29)         136 (73.1)           Prequency of experiencing headache in the last 6 months         X2=02; p=0:031         X2=02; p=0:031           Frequency of experiencing stomach ache in the last 6 months         X2=02; p=0:040         147 (73.9)           Sometimes         164         27 (2b.0)         777 (40)           Frequency of experiencing stomach ache in the last 6 months         X2=02; p=0:040           Frequency of experiencing backache in the last 6 months         X2=02; p=0:040           Frequency of experiencing backache in the last 6 months         X2=02; p=0:040           Fairly/very often         13< 81 (2b.3)	No	202	51 (25.2)	151 (74.8)	
Yes         133         34 (25.6)         99 (74.4)           No         237         6 (25.3)         1.77 (74.7)           Excellent/very good/good         197         44 (24.4)         140 (75.6)           Moderate/coor/very poor         177         46 (26.6)         127 (73.4)           Started menstruation         X2 = 0.2, p = 0.624         X2 = 0.4, p = 0.517           Yes         186         50 (26.9)         136 (73.1)           No         184         44 (23.9)         140 (75.6)           Frequency of experiencing headache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing stomach ache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing backache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing backache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing backache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing backache in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing in the last 6 months         X2 = 0.2, p = 0.81           Frequency of experiencing in	Dewormed within the last 6 months				X2=0.0; p=0.958
No         257         60 (25.3)         177 (74.7)           Self-nated, leading         X2=02; p=0.624           Self-nated, leading         X2=02; p=0.624           Modentate/poor/very goor         173         46 (26.6)         127 (74.6)           Modentate/poor/very goor         173         46 (26.6)         136 (73.1)         X2=0.2; p=0.621           No         184         50 (25.9)         136 (73.1)         X2=0.4; p=0.521           Requery of experiencing headache in the last 6 months         X2=0.4; p=0.521         X2=0.4; p=0.521           Frequency of experiencing stomach ache in the last 6 months         X2=0.2; p=0.901           Frequency of experiencing backache in the last 6 months         X2=0.2; p=0.901           Sometimes         24 (26.2)         26 (27.3)         77.400           Sometimes         24 (26.2)         26 (27.3)         72.41; p=0.308           Rarely or seldom         315         83 (26.3)         23 (27.5)           Sometimes         104 (27.3)         22.41; p=0.308         23 (27.5)	Yes	133	34 (25.6)	99 (74.4)	
Self-rated health status       X2=02; p=0624         Excellent/very good/good       197       48 (244)       149 (756)         Moderate/poor/very poor       173       48 (246)       127 (734)         Starter       X2=04; p=0512       X2=04; p=0512         Yes       184       44 (239)       140 (761)         No       184       44 (239)       140 (761)         Frequency of experiencing headache in the last 6 months       X2=03; p=0694       X2=03; p=0094         Farely or seldom       67       15 (22,4)       52 (776)       X2=02; p=0094         Farely or seldom       67       15 (22,4)       62 (738)       X2=02; p=0094         Sametimes       64       22 (262)       62 (738)       X2=02; p=0094         Barely or seldom       32       9 (28.1)       23 (719)       X2=02; p=0094         Sometimes       184       22 (262)       62 (738)       X2=02; p=0308         Farely or seldom       32       9 (28.1)       23 (719)       X2=02; p=0308         Farely or seldom       131       10 (738)       32 (73)       X2=03; p=0583         Sometimes       142       10 (238)       32 (74)       X2=11; p=0583         Barely or seldom       197       48 (244)	No	237	60 (25.3)	177 (74.7)	
Excellent/very good/good         197         48 (24.4)         149 (75.6)           Moderate/poor/very poor         173         46 (26.6)         127 (73.4)           Started mestruation         X2=0.4, p=0.512         X2=0.4, p=0.512           Yes         186         50 (25.9)         136 (73.1)           No         184         44 (23.9)         140 (76.6)           Frequency of experiencing headache in the last 6 months         X2=0.4, p=0.821           Fasely or seldom         199         52 (26.1)         147 (73.9)           Sometimes         104         27 (26.0)         77 (74.0)           Fally/very often         63         15 (22.4)         52 (77.6)           Frequency of experiencing stomach ache in the last 6 months         X2 (26.2)         62 (73.8)           Faily/very often         32         9 (28.1)         23 (71.9)           Sometimes         42         10 (23.8)         32 (76.2)           Faily/very often         13         11 (7.7)         12 (92.0)           Sometimes         107         31 (29.0)         76 (71.0)           Faily/very often         13         11 (7.7)         12 (92.3)           Frequency of experiencing initiality in the last 6 months         52 (62.3)         136 (74.7) <td>Self-rated health status</td> <td></td> <td></td> <td></td> <td>X2=0.2; p=0.624</td>	Self-rated health status				X2=0.2; p=0.624
Moderate/poor/very poor         173         46 (26.6)         127 (73.4)           Started menstruation         X2=0.4; p=0.512           Yes         136         50 (26.9)         136 (73.1)           No         194         42 (29)         140 (76.1)           Frequency of experiencing headache in the last 6 months         X2=0.4; p=0.821           Rarely or seldom         164         27 (26.0)         77 (74.0)           Faith/very often         63 (24.8)         191 (75.2)         74.2           Faith/very often         22         9 (28.1)         23 (27.3)         74.2           Faith/very often         32         9 (28.1)         32 (73.7)         72.2.4; p=0.308           Farely or seldom         315         83 (26.3)         222 (73.7)         74.2           Somettines         42         10 (23.8)         32 (76.7)         74.2           Farely or seldom         315         83 (26.3)         32 (76.7)         74.2           Somettines         173         48 (24.4)         149 (75.6)         74.2           Farely or seldom         315         83 (26.3)         22 (73.7)         74.2           Somettines         173         48 (24.4)         149 (75.6)         74.2	Excellent/verv good/good	197	48 (24.4)	149 (75.6)	<i>,</i> ,
Started menstruation     X2=0.4; p=0.512       Yes     186     50 (26.5)     136 (73.1)       No     184     44 (23.9)     140 (76.1)       Frequency of experiencing headache in the last 6 months     X2=0.4; p=0.821       Barely or seldom     199     52 (26.1)     147 (73.9)       Frequency of experiencing stomach ache in the last 6 months     X2=0.2; p=0.904       Frequency of experiencing stomach ache in the last 6 months     X2=0.2; p=0.904       Frequency of experiencing stomach ache in the last 6 months     X2=0.2; p=0.904       Frequency of experiencing backache in the last 6 months     X2=0.2; p=0.904       Farly/very often     32     9 (28.1)       Somettimes     84     22 (26.2)     62 (73.8)       Farly/very often     315     83 (26.3)     322 (73.7)       Frequency of experiencing backache in the last 6 months     X2=0.4; p=0.308       Barley or seldom     315     83 (26.3)     322 (76.2)       Farly/very often     13     1(7.7)     12 (92.3)       Frequency of experiencing invitability in the last 6 months     X2=0.8; p=0.657       Farly/very often     13     1(7.7)     12 (92.3)       Frequency of experiencing invitability in the last 6 months     X2=0.3; p=0.657       Farly/very often     12     34 (27.6)       Somettimes     16 (25.2)	Moderate/poor/very poor	173	46 (26.6)	127 (73.4)	
Yes18650 (26.9)136 (73.1)No18444 (23.9)140 (75.1)No18444 (23.9)140 (75.1)Rarely or seldom19952 (26.1)147 (73.9)Sometimes10427 (26.0)77 (74.0)Frequency of experiencing stomach ache in the last 6 monthsX2 = 0.2; p = 0.904Rarely or seldom25463 (24.8)191 (75.2)Sometimes8422 (26.2)22 (73.0)Frequency of experiencing backache in the last 6 monthsX2 = 2.6; p = 0.308Rarely or seldom31583 (26.3)222 (73.7)Frequency of experiencing backache in the last 6 monthsX2 = 2.4; p = 0.308Rarely or seldom1311 (7.7)12 (92.3)Sometimes4210 (23.8)33 (76.2)Faithylvery often131 (7.7)12 (92.3)Sometimes10731 (29.0)76 (71.0)Faithylvery often12844 (25.3)136 (74.7)Sometimes10731 (29.0)76 (71.0)Sometimes10731 (29.0)76 (71.0)Frequency of experiencing initability in the last 6 monthsX2 = 0.8; p = 0.657Rarely or seldom1824 (25.3)136 (74.7)Sometimes1624 (21.5)51 (72.5)Frequency of experiencing initability in the last 6 monthsX2 = 0.2; p = 0.029Rarely or seldom18856 (28.3)142 (71.7)Sometimes19856 (28.3)142 (71.7)Sometimes19856 (28.3)14	Started menstruation			(,	$X_2 = 0.4$ ; p = 0.512
No         184         44 (23)         140 (76.1)           Frequency of experiencing headache in the last 6 months         X2=0.4; p=0.821           Barely or seldom         199         52 (26.1)         147 (73.9)           Faithylvery often         63         15 (22.4)         52 (27.6)           Faithylvery often         63         15 (22.4)         52 (27.6)           Frequency of experiencing stomach ache in the last 6 months         X2=0.2; p=0.904           Rarely or seldom         254         63 (24.8)         191 (75.2)           Sometimes         84         22 (26.2)         62 (73.8)           Faithylvery often         31         83 (26.3)         232 (7.3)           Frequency of experiencing backache in the last 6 months         X2=2.4; p=0.308         322 (7.3)           Frequency of experiencing low feelings in the last 6 months         X2=2.13; p=0.583         322 (7.3)           Frequency of experiencing low feelings in the last 6 months         X2=0.11; p=0.583         322 (7.3)           Frequency of experiencing low feelings in the last 6 months         X2=0.11; p=0.583         322 (7.3)           Frequency of experiencing low feelings in the last 6 months         X2=0.8; p=0.657         336 (74.7)           Sometimes         107         31 (29.0)         76 (7.10)         72=0.8; p=0	Yes	186	50 (26 9)	136 (73 1)	
Trequency of experiencing headache in the last 6 months         X2=0.4; p=0.821           Rarely or seldom         199         52 (26.1)         147 (7.9)           Farely or seldom         67         15 (22.4)         52 (7.6)           Frequency of experiencing stomach ache in the last 6 months         X2=0.2; p=0.904         Rarely or seldom         24         63 (24.8)         191 (75.2)           Sometimes         84         22 (26.2)         62 (7.8)         7.8         7.8           Farely or seldom         33         83 (6.3)         232 (7.7)         7.8         7.8           Foreuency of experiencing backache in the last 6 months         X2=2.4; p=0.308         7.8         7.7         7.8           Frequency of experiencing backache in the last 6 months         X2=2.1; p=0.904         7.8         7.7         7.7           Sometimes         42         10 (23.8)         32 (7.7)         7         7.7	No	184	44 (23.9)	140 (76 1)	
Frequency of experiencing inclusion in the last of months         199         52 (26.1)         147 (73.9)           Sometimes         104         27 (26.0)         77 (74.0)           Fairly/very often         63 (24.8)         191 (75.2)           Sometimes         84         22 (26.2)         62 (73.8)           Fairly/very often         23         9 (28.1)         23 (77.9)           Frequency of experiencing backache in the last 6 months         X2 = 2.4; p = 0.308           Rarely or seldom         315         83 (26.3)         32 (76.2)           Fairly/very often         13         1 (7.7)         12 (92.3)           Rarely or seldom         315         83 (26.3)         32 (76.2)           Fairly/very often         13         1 (7.7)         12 (92.3)           Frequency of experiencing low feelings in the last 6 months         X2 = 1.1; p = 0.583           Rarely or seldom         19         48 (24.4)         149 (75.6)           Sometimes         107         31 (29.0)         76 (71.0)           Fairly/very often         123         44 (27.6)         89 (72.4)           Frequency of experiencing inritability in the last 6 months         X2 = 0.8; p = 0.657         89 (72.4)           Fairly/very often         123         44 (27.6) <td>Frequency of experiencing headache in the last 6 months</td> <td></td> <td></td> <td>110 (7 011)</td> <td><math>X_{2} = 0.4 \cdot n = 0.821</math></td>	Frequency of experiencing headache in the last 6 months			110 (7 011)	$X_{2} = 0.4 \cdot n = 0.821$
Hardy Or Schoom       192       50 (2000)       77 (740)         Fairly/very often       67       15 (22.4)       52 (77.6)         Frequency of experiencing stomach ache in the last 6 months       X2 = 0.2; p = 0.904       Rarely or seldom       254       63 (24.8)       191 (75.2)         Sometimes       84       22 (26.2)       62 (73.8)       Fairly/very often       23       9 (28.1)       23 (73.7)         Frequency of experiencing backache in the last 6 months       X2 = 2.4; p = 0.308       32 (66.2)       Fairly/very often       10 (23.8)       32 (76.2)         Frequency of experiencing low feelings in the last 6 months       X2 = 1.1; p = 0.583       Sanctimes       42       10 (23.8)       32 (76.1)       Fairly/very often       13       1 (7.7)       12 (92.3)       T       Fairly/very often       13       1 (7.7)       12 (92.3)       T       Fairly/very often       16       1 (2.9)       7 (71.0)       Fairly/very often       Fairly/very often       1 (2.9)       7 (71.0)       Fairly/very often       5 (20.7)       5 (77.3)       T       Fequency of experiencing inritability in the last 6 months       X2 = 0.8; p = 0.657       Fairly/very often       1 (2.9)       3 (2.06.1)       5 (78.5)       Fairly/very often       1 (2.9)       5 (78.6)       5 (78.6)       5 (78.6)       5 (78.6)	Rarely or seldom	199	52 (26 1)	147 (73 9)	λ2 = 0.1, p = 0.021
Jamba (19)         Jamba (19)         Jamba (19)         Jamba (19)         Jamba (19)           Faily/very often         66         15 (22.4)         52 (77.6)           Rarely or seldom         254         63 (24.8)         191 (75.2)           Faily/very often         32         9 (28.1)         23 (71.9)           Frequency of experiencing backache in the last 6 months         X2 = 2.4: p = 0.308           Rarely or seldom         132         9 (28.1)         23 (72.7)           Sometimes         42         10 (73.8)         32 (76.2)           Faily/very often         13         83 (26.3)         32 (76.2)           Faily/very often         13         17.7)         12 (92.3)           Prequency of experiencing low feelings in the last 6 months         X2 = 1.1: p = 0.583           Rarely or seldom         197         48 (24.4)         149 (75.6)           Sometimes         107         31 (29.0)         76 (71.0)           Fairly/very often         182         46 (25.3)         136 (74.7)           Sometimes         163         14 (21.5)         51 (78.5)           Fairly/very often         123         34 (27.6)         89 (72.4)           Fairly/very often         123         34 (27.6)         89 (67.2)<	Sometimes	104	27 (26.0)	77 (74.0)	
Trequency of experiencing stomach ache in the last 6 months       X2 = 02: p = 0.904         Rarely or seldom       254       63 (24.8)       191 (75.2)         Sometimes       84       22 (26.2)       62 (7.8)         Frequency of experiencing backache in the last 6 months       X2 = 0.2: p = 0.904         Rarely or seldom       315       83 (26.3)       232 (71.9)         Frequency of experiencing backache in the last 6 months       X2 = 2.4: p = 0.308         Rarely or seldom       315       83 (26.3)       232 (73.7)         Sometimes       42       10 (23.8)       32 (76.2)         Frequency of experiencing low feelings in the last 6 months       X2 = 1.1: p = 0.583       72 (71.9)         Rarely or seldom       197       48 (24.4)       149 (75.6)         Sometimes       107       31 (29.0)       76 (71.0)         Faitr/very often       12       34 (27.6)       88 (72.4)         Frequency of experiencing inritability in the last 6 months       X2 = 0.8: p = 0.657       73         Sometimes       12       34 (27.6)       142 (71.7)       50 (73.4)         Sometimes       12       34 (27.6)       142 (71.7)       50 (73.4)       74 (72.7)         Sometimes       19       16 (28.8)       142 (71.7)       50	Eairly/yery often	67	27 (20.0) 15 (22.4)	52 (776)	
Frequency of experiencing ionidariation in the last of monthal         XZ = 0.2, p = 0.504           Rarely or seldom         254         63 (24.8)         191 (75.2)           Sometimes         84         22 (26.2)         62 (73.8)           Fairly/very often         32         9 (28.1)         232 (73.7)           Frequency of experiencing backache in the last 6 months         X2 = 0.2, p = 0.508         X2 = 0.2, p = 0.508           Fairly/very often         315         83 (26.3)         32 (76.2)           Fairly/very often         13         1 (77)         12 (92.3)           Perquency of experiencing low feelings in the last 6 months         X2 = 1.1; p = 0.583           Farely or seldom         197         48 (24.4)         149 (75.6)           Sometimes         107         31 (29.0)         76 (71.0)           Fairly/very often         163         14 (21.5)         51 (76.5)           Fairly/very often         182         46 (25.3)         136 (74.7)           Sometimes         163         14 (21.5)         51 (76.5)           Fairly/very often         182         46 (25.3)         142 (71.7)           Sometimes         19 (32.8)         39 (72.4)         19 (32.8)           Frequency of experiencing intribuity in the last 6 months	Fraguency of experiencing stomach acho in the last 6 menths	07	13 (22.4)	52 (77.0)	$V_{2} = 0.2; n = 0.004$
name         2.44         2.42         1.42         2.42 <th< td=""><td>Proju or coldom</td><td>254</td><td>62 (21 0)</td><td>101 (75 2)</td><td>λz=0.2, μ=0.904</td></th<>	Proju or coldom	254	62 (21 0)	101 (75 2)	λz=0.2, μ=0.904
solution         64         22 (202)         62 (73.6)           Fairly/very often         32         9 (28.1)         23 (71.9)           Frequency of experiencing backache in the last 6 months         X2 = 2.4; p = 0.308           Rarely or seldom         315         83 (26.3)         232 (73.7)           Sometimes         42         10 (23.8)         32 (76.2)           Frequency of experiencing low feelings in the last 6 months         X2 = 1.1; p = 0.583           Rarely or seldom         197         48 (24.4)         149 (75.6)           Sometimes         107         31 (29.0)         76 (71.0)           Frequency of experiencing initability in the last 6 months         X2 = 0.3; p = 0.657         76 (71.0)           Frequency of experiencing initability in the last 6 months         X2 = 0.3; p = 0.657         76 (71.0)           Frequency of experiencing nervousness in the last 6 months         X2 = 0.3; p = 0.657         76 (71.0)           Frequency of experiencing nervousness in the last 6 months         X2 = 0.3; p = 0.657         76 (71.0)           Frequency of experiencing nervousness in the last 6 months         X2 = 7.1; p = 0.029         76 (71.0)           Frequency of experiencing difficulty in sleeping in the last 6 months         X2 = 7.1; p = 0.029         76 (71.0)           Frequency of experiencing difficulty in sleeping in	Competitions	204	05 (24.0)	(73.2)	
Trainfywery otder229 (26,1)25 (7,3)X2=24; p=0.308Frequency of experiencing backache in the last 6 monthsX2=24; p=0.308Rarely or seldom31583 (26,3)232 (73,7)Sometimes4210 (23,8)32 (76,2)Fairly/very often131 (7,7)12 (92,3)Frequency of experiencing low feelings in the last 6 monthsX2=1,1; p=0.583Rarely or seldom19748 (24,4)149 (75,6)Sometimes10731 (29,0)76 (71,0)Fairly/very often61 5 (22,7)51 (77,3)Frequency of experiencing irritability in the last 6 monthsX2=0.8; p=0.657Rarely or seldom18246 (25,3)136 (74,7)Sometimes6514 (21,5)51 (78,5)Fairly/very often12334 (27,6)89 (72,4)Sometimes5819 (32,8)39 (67,2)Frequency of experiencing nervousness in the last 6 monthsX2=1,5; p=0.469Rarely or seldom30882 (26,6)31 (79,5)Fairly/very often3181 (32,7)58 (73,4)Sometimes398 (20,5)31 (79,5)Fairly/very often398 (20,5)31 (79,5)Fairly/very often234 (17,4)19 (82,6)Sometimes7618 (23,7)58 (76,3) <td>Sometimes</td> <td>04 22</td> <td>22 (20.2)</td> <td>02 (73.0)</td> <td></td>	Sometimes	04 22	22 (20.2)	02 (73.0)	
Frequency of experiencing backache in the last 6 months $X_2 = 2, 2; p = 0.508$ Rarely or seldom31583 (26.3)322 (73.7)Sometimes4210 (23.8)32 (76.2)Fairly/very often131 (7.7)12 (92.3)Rarely or seldom19748 (24.4)149 (75.6)Sometimes10731 (29.0)76 (71.0)Fairly/very often6615 (22.7)51 (77.3)Frequency of experiencing irritability in the last 6 monthsX2 = 0.8; p = 0.657Rarely or seldom18246 (25.3)136 (74.7)Sometimes6514 (21.5)51 (78.5)Fairly/very often12334 (27.6)89 (72.4)Rarely or seldom19856 (28.3)142 (71.7)Sometimes5819 (32.8)39 (67.2)Fairly/very often11419 (16.7)95 (83.3)Frequency of experiencing difficulty in sleeping in the last 6 monthsX2 = 1.5; p = 0.469Rarely or seldom19856 (28.3)142 (71.7)Sometimes5819 (32.8)39 (67.2)Fairly/very often11419 (16.7)95 (83.3)Frequency of experiencing difficulty in sleeping in the last 6 monthsX2 = 1.5; p = 0.469Rarely or seldom30882 (26.6)31 (79.6)Fairly/very often234 (17.4)19 (82.6)Frequency of experiencing difficulty in sleeping in the last 6 monthsX2 = 1.5; p = 0.469Rarely or seldom3088 (20.5)31 (79.5)Fairly/very often53	Fairly/very often	32	9 (28.1)	23 (71.9)	V2 24 0.200
Nately of seldom       315       83 (26.3)       223 (73.7)         Sometimes       42       10 (23.8)       32 (76.2)         Frequency of experiencing low feelings in the last 6 months       X2=1.1; p=0.583         Rarely or seldom       197       48 (24.4)       149 (75.6)         Sometimes       107       31 (29.0)       76 (71.0)         Frequency of experiencing inritability in the last 6 months       X2=0.2;       76 (71.0)         Frequency of experiencing inritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       198       56 (28.3)       142 (71.7)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5) <td>Frequency of experiencing backache in the last 6 months</td> <td>215</td> <td>02 (26.2)</td> <td>222 (727)</td> <td>X2=2.4; p=0.308</td>	Frequency of experiencing backache in the last 6 months	215	02 (26.2)	222 (727)	X2=2.4; p=0.308
Sometimes         42         10 (23.8)         32 (76.2)           Fairly/very often         13         1 (7.7)         12 (92.3)           Frequency of experiencing low feelings in the last 6 months         X2=1.1; p =0.583           Rarely or seldom         197         48 (24.4)         149 (75.6)           Sometimes         107         31 (29.0)         76 (71.0)           Fairly/very often         161         15 (22.7)         51 (78.5)           Fairly/very often         182         46 (25.3)         136 (74.7)           Sometimes         65         14 (21.5)         51 (78.5)           Fairly/very often         182         46 (25.3)         136 (74.7)           Sometimes         65         14 (21.5)         51 (78.5)           Fairly/very often         182         46 (25.3)         132 (71.7)           Sometimes         65         19 (32.8)         39 (67.2)           Fairly/very often         198         56 (28.3)         142 (71.7)           Sometimes         58         19 (32.8)         39 (67.2)           Fairly/very often         124         56 (28.3)         142 (71.7)           Sometimes         58         19 (32.8)         39 (67.2)           Fairly/very often<	Rarely or seldom	315	83 (26.3)	232 (73.7)	
Fairly/very often       1 (7.7)       1 (7.7)       1 (7.7)         Frequency of experiencing low feelings in the last 6 months       X2=1.1; p=0.583         Rarely or seldom       197       48 (24.4)       149 (75.6)         Sometimes       107       31 (29.0)       76 (71.0)         Fairly/very often       66       15 (22.7)       51 (77.3)         Frequency of experiencing inritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       14 (21.7)         Sometimes       198       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       129       8 (20.5)       31 (79.5)	Sometimes	42	10 (23.8)	32 (76.2)	
Frequency of experiencing low feelings in the last 6 months       X2=1.1; p=0.533         Rarely or seldom       197       48 (24.4)       149 (75.6)         Sometimes       107       31 (29.0)       76 (71.0)         Fairly/very often       66       15 (22.7)       51 (77.3)         Frequency of experiencing irritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243	Fairly/very often	13	1 (/./)	12 (92.3)	
Rarely or seldom       197       48 (24.4)       149 (75.6)         Sometimes       107       31 (29.0)       76 (71.0)         Fairly/very often       66       15 (22.7)       51 (77.3)         Frequency of experiencing irritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Sometimes       76       18 (23.7)       58 (76.3)         Farey or seldom       241       67 (27.8)       174 (72.2)      <	Frequency of experiencing low feelings in the last 6 months			/	X2 = 1.1; p = 0.583
Sometimes         107         31 (29.0)         76 (71.0)           Fairly/very often         6         15 (22.7)         51 (77.3)           Frequency of experiencing irritability in the last 6 months         X2=0.8; p=0.657           Rarely or seldom         182         46 (25.3)         136 (74.7)           Sometimes         65         14 (21.5)         51 (78.5)           Fairly/very often         123         34 (27.6)         89 (72.4)           Frequency of experiencing nervousness in the last 6 months         X2=7.1; p=0.029           Rarely or seldom         198         56 (28.3)         142 (71.7)           Sometimes         58         19 (32.8)         39 (67.2)           Fairly/very often         114         19 (16.7)         95 (83.3)           Frequency of experiencing difficulty in sleeping in the last 6 months         X2=1.5; p=0.469           Rarely or seldom         308         82 (26.6)         226 (73.4)           Sometimes         39         8 (20.5)         31 (79.5)           Fairly/very often         23         4 (17.4)         19 (82.6)           Sometimes         76         18 (23.7)         58 (76.3)           Frequency of experiencing dizziness in the last 6 months         X2=2.8; p=0.243           Ra	Rarely or seldom	19/	48 (24.4)	149 (75.6)	
Fairly/very often       66       15 (22.7)       51 (77.3)         Frequency of experiencing irritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       198       56 (28.3)       142 (71.7)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Posicall	Sometimes	107	31 (29.0)	76 (71.0)	
Frequency of experiencing irritability in the last 6 months       X2=0.8; p=0.657         Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       9 (17.0)       44 (83.0)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)       22=0.2; p=0.655         No       233       61 (26	Fairly/very often	66	15 (22.7)	51 (77.3)	
Rarely or seldom       182       46 (25.3)       136 (74.7)         Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2 = 7.1; p = 0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2 = 1.5; p = 0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Prequency of experiencing dizziness in the last 6 months       X2 = 2.8; p = 0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)	Frequency of experiencing irritability in the last 6 months				X2=0.8; p=0.657
Sometimes       65       14 (21.5)       51 (78.5)         Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2 = 7.1; p = 0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2 = 1.5; p = 0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2 = 2.8; p = 0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2 = 0.2; p = 0.655       No	Rarely or seldom	182	46 (25.3)	136 (74.7)	
Fairly/very often       123       34 (27.6)       89 (72.4)         Frequency of experiencing nervousness in the last 6 months       X2 =7.1; p = 0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2 =1.5; p = 0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2 =2.8; p = 0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       33       9 (17.0)       44 (83.0)         Physically active in the last week       X2 =0.2; p = 0.655       No         No       233       61 (26.2)       172 (73.8)	Sometimes	65	14 (21.5)	51 (78.5)	
Frequency of experiencing nervousness in the last 6 months       X2=7.1; p=0.029         Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       23       4 (17.4)       19 (82.6)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       23       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)	Fairly/very often	123	34 (27.6)	89 (72.4)	
Rarely or seldom       198       56 (28.3)       142 (71.7)         Sometimes       58       19 (32.8)       39 (67.2)         Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)	Frequency of experiencing nervousness in the last 6 months				X2=7.1; p= <b>0.029</b>
Sometimes         58         19 (32.8)         39 (67.2)           Fairly/very often         114         19 (16.7)         95 (83.3)           Frequency of experiencing difficulty in sleeping in the last 6 months         X2=1.5; p=0.469           Rarely or seldom         308         82 (26.6)         226 (73.4)           Sometimes         39         8 (20.5)         31 (79.5)           Fairly/very often         23         4 (17.4)         19 (82.6)           Frequency of experiencing dizziness in the last 6 months         X2=2.8; p=0.243           Rarely or seldom         241         67 (27.8)         174 (72.2)           Sometimes         76         18 (23.7)         58 (76.3)           Fairly/very often         53         9 (17.0)         44 (83.0)           Physically active in the last week         X2=0.2; p=0.655         X2=0.2; p=0.655           No         233         61 (26.2)         172 (73.8)           Yes         137         33 (24.1)         104 (75.9)           Diagnosed with anaemia in the last 3 months         X2=2.1; p=0.149           Yes         27         10 (37.0)         17 (63.0)	Rarely or seldom	198	56 (28.3)	142 (71.7)	
Fairly/very often       114       19 (16.7)       95 (83.3)         Frequency of experiencing difficulty in sleeping in the last 6 months       X2 = 1.5; p = 0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2 = 2.8; p = 0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2 = 0.2; p = 0.655       X2 = 0.2; p = 0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2 = 2.1; p = 0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Sometimes	58	19 (32.8)	39 (67.2)	
Frequency of experiencing difficulty in sleeping in the last 6 months       X2=1.5; p=0.469         Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       27       10 (37.0)       17 (63.0)	Fairly/very often	114	19 (16.7)	95 (83.3)	
Rarely or seldom       308       82 (26.6)       226 (73.4)         Sometimes       39       8 (20.5)       31 (79.5)         Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       No         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       27       50 (37.0)       259 (75.5)	Frequency of experiencing difficulty in sleeping in the last 6 months				X2=1.5; p=0.469
Sometimes       39       8 (20.5)       31 (79.5)         Fairly/Very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       No         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Rarely or seldom	308	82 (26.6)	226 (73.4)	
Fairly/very often       23       4 (17.4)       19 (82.6)         Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Sometimes	39	8 (20.5)	31 (79.5)	
Frequency of experiencing dizziness in the last 6 months       X2=2.8; p=0.243         Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Fairly/very often	23	4 (17.4)	19 (82.6)	
Rarely or seldom       241       67 (27.8)       174 (72.2)         Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Frequency of experiencing dizziness in the last 6 months				X2=2.8; p=0.243
Sometimes       76       18 (23.7)       58 (76.3)         Fairly/very often       53       9 (17.0)       44 (83.0)         Physically active in the last week       X2=0.2; p=0.655         No       233       61 (26.2)       172 (73.8)         Yes       137       33 (24.1)       104 (75.9)         Diagnosed with anaemia in the last 3 months       X2=2.1; p=0.149         Yes       27       10 (37.0)       17 (63.0)         No       343       84 (24.5)       259 (75.5)	Rarely or seldom	241	67 (27.8)	174 (72.2)	
Fairly/very often     53     9 (17.0)     44 (83.0)       Physically active in the last week     X2=0.2; p=0.655       No     233     61 (26.2)     172 (73.8)       Yes     137     33 (24.1)     104 (75.9)       Diagnosed with anaemia in the last 3 months     X2=2.1; p=0.149       Yes     27     10 (37.0)     17 (63.0)       No     343     84 (24.5)     259 (75.5)	Sometimes	76	18 (23.7)	58 (76.3)	
Physically active in the last week         X2=0.2; p=0.655           No         233         61 (26.2)         172 (73.8)           Yes         137         33 (24.1)         104 (75.9)           Diagnosed with anaemia in the last 3 months         X2=2.1; p=0.149           Yes         27         10 (37.0)         17 (63.0)           No         343         84 (24.5)         259 (75.5)	Fairly/very often	53	9 (17.0)	44 (83.0)	
No         233         61 (26.2)         172 (73.8)           Yes         137         33 (24.1)         104 (75.9)           Diagnosed with anaemia in the last 3 months         X2=2.1; p=0.149           Yes         27         10 (37.0)         17 (63.0)           No         343         84 (24.5)         259 (75.5)	Physically active in the last week				X2=0.2; p=0.655
Yes     137     33 (24.1)     104 (75.9)       Diagnosed with anaemia in the last 3 months     X2=2.1; p=0.149       Yes     27     10 (37.0)     17 (63.0)       No     343     84 (24.5)     259 (75.5)	No	233	61 (26.2)	172 (73.8)	
Diagnosed with anaemia in the last 3 months         X2=2.1; p=0.149           Yes         27         10 (37.0)         17 (63.0)           No         343         84 (24.5)         259 (75.5)	Yes	137	33 (24.1)	104 (75.9)	
Yes 27 10 (37.0) 17 (63.0) No 343 84 (24.5) 250 (75.5)	Diagnosed with anaemia in the last 3 months				X2 = 2.1; p = 0.149
No 343 84 (24 5) 250 (75 5)	Yes	27	10 (37.0)	17 (63.0)	
	No	343	84 (24.5)	259 (75.5)	

# Table 6 (continued)

Variable	Total	Anaemia, No, Freq (%)	Anaemia, Yes, Freq (%)	Test statistics
Abdominal obesity				X2=0.5; p=0.480
No	197	53 (26.9)	144 (73.1)	
Yes	173	41 (23.7)	132 (76.3)	

# Table 7 Socio-demographic factors as determinants of anaemia

Variable	Total	Anaemia, No, Freq (%)	Anaemia, Yes, Freq (%)	Test statistics
Status of residential community				X2=7.9; p= <b>0.005</b>
Rural	300	67 (22.3)	233 (77.7)	
Peri-urban	70	27 (38.6)	43 (61.4)	
Education				X2=1.9; p=0.587
No education	77	18 (23.4)	59 (76.6)	
Primary school	154	40 (26.0)	114 (74.0)	
Junior High School	109	31 (28.4)	78 (71.6)	
Secondary/vocational school or above	30	5 (16.7)	25 (83.3)	
Religion				X2=0.2; p=0.618
Christianity	53	12 (22.6)	41 (77.4)	
Islam	317	82 (25.9)	235 (74.1)	
Ethnicity				X2=0.0; p=0.985
Dagomba	366	93 (25.4)	273 (74.6)	
Others	4	1 (25.0)	3 (75.0)	
Fathers' occupation				X2=4.4; p=0.111
Farmer	314	74 (23.6)	240 (76.4)	
Trader	27	11 (40.7)	16 (59.3)	
Others	29	9 (31.0)	20 (69.0)	
Mothers' occupation				X2=2.3; p=0.318
Farmer	194	43 (22.2)	151 (77.8)	
Trader	153	44 (28.8)	109 (71.2)	
Others	23	7 (30.4)	16 (69.6)	
Fathers' education				X2=8.4; p= <b>0.039</b>
No education	296	66 (22.3)	230 (77.7)	
Primary school	27	9 (33.3)	18 (66.7)	
Junior High School	17	6 (35.3)	11 (64.7)	
Secondary/vocational School or above	30	13 (43.3)	17 (56.7)	
Mothers' education				X2=0.7; p=0.873
No education	322	83 (25.8)	239 (74.2)	
Primary school	21	5 (23.8)	16 (76.2)	
Junior High School	17	3 (17.6)	14 (82.4)	
Secondary/vocational school or above	10	3 (30.0)	7 (70.0)	
Household size				X2=3.3; p=0.343
3–6	92	19 (20.7)	73 (79.3)	
7–10	184	52 (28.3)	132 (71.7)	
11–14	47	9 (19.1)	38 (80.9)	
15+	47	14 (29.8)	33 (70.2)	
Perceived socio-economic status				X2=0.5; p=0.785
Low	239	62 (25.9)	177 (74.1)	-
Middle	110	28 (25.5)	82 (74.5)	
High	21	4 (19.0)	17 (81.0)	
Respondent has a mobile phone				X2=0.0; p=0.864
No	313	79 (25.2)	234 (74.8)	
Yes	57	15 (26.3)	42 (73.7)	

Table 8	Multivariable determinants of anaemia in adolescent
girls	

Characteristics	Adjusted Odds Ratio	95% Confi- dence Inter- val of AOR	P- Val- ue
Residential community status			
Rural	1.00		
Peri-urban	0.42	0.24-0.75	0.003
Frequency of experiencing ner- vousness in the past 6 months			
Rarely or seldom	1.00		
Sometimes	0.79	0.42-1.52	0.486
Fairly/very often	2.12	1.16-3.88	0.014
Fathers' educational status			
Beyond secondary/vocational school	1.00		
No education	2.57	1.17-5.65	0.019
Primary school	1.50	0.50-4.50	0.470
Secondary/vocational school	1.38	0.39–4.86	0.613

putative determinants of anaemia, frequency of feeling nervous in the preceding six months, residential community status, and fathers' educational status were found to be independent determinants of anaemia in the adolescent girls.

Anaemia is very common among adolescent girls. Globally, WHO estimated anaemia prevalence to be 29.4% among females in their reproductive age [1], and on the African continent, anaemia prevalence ranges from 11.1% [29] to 39.0% in Ethiopia [30], is 26.5% in Kenya [9], and 29% in Rwanda [31] in adolescents. The highest prevalence recorded so far on the continent (77%) from our review is in Sudan [32]. In Ghana, anaemia prevalence among adolescent females ranges from 24% [14] to 64.6% [16], and in between these are 26.4% in the Micronutrient Survey [3], 49.5% [33], and 50.3% [34]. The highest rate of 64.6% [16] was reported in adolescent girls in Northern Ghana.

The varying rates of anaemia in adolescent girls in Ghana and Africa could be attributed to differences in the amounts of iron-rich foods consumed, uptake of IFA supplementation, access to health services, and sociodemographic and economic characteristics of subjects. The high prevalence of anaemia reported in the study area could be due to persistent inadequate intake of ironrich foods and low rate of participation in the GIFTS programme. The WHO advises all women of reproductive age (15–49 years) to take intermittent IFA supplements when the prevalence of anaemia surpasses 20% but only 47.3% of the girls in Kumbungu District participate in the GIFTS programme. A previous study has reported improved haemoglobin and low level of anaemia among participants of GIFTS [15] so the haemoglobin status of the girls would have been better if participation in the programme was better.

The general health status of the adolescent girls may have implications for the risk of anaemia. The frequency of feeling nervous in the past 6 months has been identified as a health determinant of anaemia in the study population. Teenagers who experienced nervousness frequently compared to those who did not in the preceding six months have a higher risk of anaemia. Iron is an essential element in brain metabolism and its deficiency can cause changes in neurotransmitter homeostasis, decrease myelin production, impair synaptogenesis, and decline the function of the basal ganglia leading to impaired cognitive functions and psychomotor development [5]. Iron deficiency in children is linked to poor health and serious neurological damage, including mental, motor, social, emotional, neurophysiological, and neurocognitive dysfunction [35]. In adulthood, anaemia has been associated with psychiatric disorders (depression, anxiety disorders, sleep disorders, and psychotic disorders). An epidemiological study reported an increased risk for psychiatric disorders comparing iron deficiency and non-iron deficiency groups (adjusted hazard ratio 1.52, 95% CI=1.45-1.59) [36]. On the other hand, nervousness can have a negative impact on iron levels resulting in anaemia, as nervous individuals tend to select and consume less nutritious meals which contain less iron and vitamin C which aids in the absorption of iron. The emerging link between iron deficiency and mental illness needs further investigation and elucidation of the mechanism involved to provide a basis for prevention and treatment of anaemia.

The socio-demographic determinants of anaemia in the study population are community of residence, and the father's educational level. The risk of anaemia is higher among the girls staying in rural areas compared to those in peri-urban areas. Similar to our finding, anaemia has been reported to be more common among adolescent girls living in rural areas than those living in urban areas in Ethiopia [11] and India [13]. This observation could be due to better economic conditions and availability of income earning opportunities for families in the urban areas compared to the rural areas, and the lack of information on nutrition by the girls staying in the rural areas. The positive association between higher levels of incomes and household food security may translate into availability of iron-rich foods in the homes and reduce the risk of anaemia in the girls in the peri-urban areas. Teenagers whose fathers had no formal education were shown to have a higher risk of anaemia compared to those whose fathers had some form of education, and a similar finding was also reported for a group of adolescent girls in Kenya [9]. However, it was also previously found that, a teenager's risk of anaemia negatively correlates with the mother's level of education [37, 38]. Due to the impact of education on work prospects and potential dietary

effects, a parent's educational level is likely to predict their child's nutritional status. Therefore, the fathers' education might have influenced how much iron was consumed, either through well-informed decisions or increased salaries making iron-rich foods (i.e., meat and fish) more readily available in the households.

The study did not identify any nutritional determinants of anaemia. While consumption of iron-rich foods, individual dietary diversity, food consumption score, household food security, participation in GIFTS programme and nutrition knowledge could be linked to anaemia status of adolescents, that is not the case for this study population. Further research is warranted to help unravel the reason for this observation. Also, since this study did not assess all nutritional determinants of anaemia, it is possible that the unmeasured nutritional determinants may be relevant in anaemia etiology in this study population.

# Strengths and limitations

This study has some strengths and limitations. By way of strength, we included a host of variables reported in previous studies to be associated to or could be reasonably linked to anaemia among adolescent girls, and haemoglobin measurement was carried out by the investigators. On limitations, other haematological parameters of iron status i.e., ferritin and total iron binding capacity were not measured; intake of iron-rich foods was not quantitatively measured; and the cross-sectional study design used could not establish a causal link between anaemia and its determinants in this study population.

# Conclusion

The prevalence of anaemia was high and the frequency of feeling nervous in the past 6 months was identified as a health determinant of anaemia while the residential community status, and fathers' educational level were identified as socio-demographic determinants of anaemia among the adolescent girls in Kumbungu District, Ghana. None of the nutritional factors of the girls was associated to their anaemia status. The high prevalence of anaemia measured highlights the need for intensification of anaemia prevention and management interventions in the district.

#### Abbreviations

AOR	Adjusted Odds Ratio
CI	Confidence Interval
GIFTS	Girls Iron Folic-Acid Tablet Supplementation
IFA	Iron-Folic Acid
WHO	World Health Organization

## Supplementary Information

The online version contains supplementary material available at https://doi. org/10.1186/s40795-023-00749-2.

Supplementary Material 1

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We are grateful to the adolescent girls who responded to the questionnaire.

#### Authors' contributions

AW designed the study and analysed the data, MK oversaw the data collection and generated the database, AAR drafted the manuscript. All authors contributed to the writing of the manuscript and reviewed the final version.

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The study did not receive any funding.

#### **Data Availability**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### Declarations

# Ethics approval and consent to participate

The research process complied with the ethical principles of Helsinki Declaration. The Committee on Human Research, Publication, and Ethics at Kwame Nkrumah University of Science and Technology, and Komfo Anokye Teaching Hospital, Kumasi, provided ethical approval (Ref. No. CHRPE/ AP/005/22). The Kumbungu District Health Directorate granted permission for the study to be conducted. The subjects aged 18 or 19 years signed written informed consent form before being enrolled into the study. The parents of those who were under the age of 18 years or could not read or write signed the written informed consent form to allow their children to participate in the study.

#### **Consent for publication**

Not applicable.

## **Competing interests**

The authors declare that they have no competing interests.

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