https://www.inosr.net/inosr-experimental-sciences/
Iwumbwe
INOSR Experimental Sciences 12(2):78-92, 2023.

International Network Organization for Scientific Research ISSN: 2705-1692
https://doi.org/10.59298/INOSRES/2023/2.6.1000

Occurrence of Iron Deficiency Anemia and Its Correlating Factors among Female Undergraduate Medical Students at Kampala International University in Western Uganda

Iwumbwe Emmanuel

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda

ABSTRACT

This research aimed to evaluate the prevalence and factors contributing to iron deficiency anemia among undergraduate female medical students at Kampala International University Western Campus (KIU-WC). Employing a cross-sectional study design, data was collected from a sample of undergraduate female medical students at KIU-WC using a simple random sampling method. The information gathered through questionnaires was entered into Microsoft Excel 2013 and analyzed using Stata 12.0. Among the 384 randomly selected respondents, the study revealed an anemia prevalence of 15.89%. The socio-demographic factors significantly associated with anemia included age group (20 – 24 years vs. less than 20 years), mother's education level (high school vs. no education), and primary expenses (social events vs. buying food). Additionally, nutritional behaviors such as frequency of meals per day (3 – 4 meals vs. 1 - 2 meals) and weekly breakfast intake (6 – 7 times vs. 0 – 1 time) were associated with anemia. Comparatively, the prevalence of undernutrition among these female medical students was relatively low compared to similar studies. Notably, age, mother's education level, primary expenses, frequency of meals, and weekly breakfast intake emerged as significant factors associated with anemia among undergraduate female medical students at KIU-WC.

Keywords: Anaemia, Women of reproductive age, Pregnant women, Female medical students, Haemoglobin.

INTRODUCTION

Anaemia can be defined as a condition in which there is a low level of haemoglobin due to either few numbers of red blood cells and/or little haemoglobin in each cell [1, 2]. For female adults, the threshold Hb level for being nonanemic is ≥120 grams per deciliter (g/dL) [3]. The majority of anemia cases are due to iron deficiency, though the proportion varies among population groups and in different areas, according to the prevailing local conditions [4, 5]. Anaemia was one of the most important global health problems with a prevalence of 22.8% in 2019, a decrease from 27.0% in 1990 [6]. While prevalence decreased over this time, total cases of anemia increased from 1.42 billion in 1990 to 1.74 billion in 2019 [6]. Its adverse health consequences affect people of all age groups and can result from non-nutritional and nutritional factors [7-10]. Apart from developing countries, Middle East and North African countries also share the health problem of anemia. The prevalence of anemia among female college students attending the University of Sharjah, United Arab Emirates, and Tayba, Kingdom of Saudi Arabia was 26.7% and 32.2% respectively [11]. In India anemia prevalence among

female university students is 28.6% [12]. The major causes of anaemia in the female student population are heavy menstrual blood loss, parasitic infections, acute and chronic infections, micronutrient deficiency, and hemoglobinopathies [13, 14]. Iron-deficiency anaemia can also be caused by a poor diet/inadequate iron intake, chronic blood loss, or by certain intestinal diseases that affect absorption like celiac disease, or a combination of all these factors [15-17]. In Africa, all the female university students are of childbearing age and the prevalence of anemia among women of childbearing age is 30.2% in Africa [18]. More than 100 million African children are thought to be anaemic and community-based estimates of anemia prevalence in children in settings where malaria is endemic range between 49% and 76% [19] but there is no documentation on the prevalence of anemia among female University students in African settings. In East Africa, anemia continues to be a serious public health problem, the prevalence of anemia in women of reproductive age such as female university students is higher, which ranges from 19.2% in Rwanda to 49% [20, 21]. A recent study in Mwanza, Tanzania reported a prevalence rate of anemia at 77.2% [22]. Uganda is among the countries where there are very high levels of anaemia among women of reproductive age (15-49 years) and pregnant women [23]. Similarly, in Uganda, it is estimated that up to 53% of children under 5 years of age are anemic [24]. However, there is no data regarding the burden of anaemia among female university students in Uganda. The intent of this study was to first affirm the baseline prevalence rates of anemia among female medical undergraduate university students and the associated factors.

METHODOLOGY

Study Design

The study was an Institutional cross-sectional study. It utilized quantitative methods of data collection. This study design was selected because it assisted in easily getting the required data for the study and helped in establishing associations between the dependent variables and independent variables in the study.

Area of Study

The study was conducted at Kampala International University which is in Ishaka Town, a major town in Bushenyi district, located in the north of Bushenyi district, southwest of Mbarara district, and around 78km from Mbarara town which is the biggest city in Western Uganda. Bushenyi district is also located around 361km southwest of Kampala (capital city) by road. Ishaka town's coordinates together with the municipality as all are believed to be 0o 32' 40.00''N, 30o 8' 16.00''E (Latitude: 0.544445, Longitude: 30.137778).

Study Population

All third and fourth-year female undergraduate medical students of Kampala International University constituted the study population.

Sample size determination

The sample size was determined using Fisher's (1990) method in which the sample size was given by the expression

$$n = \frac{Z^2 pq}{d^2}$$

n= Desired sample size

Z= Standard normal deviation usually set as 1.96 for maximum sample size at 95% confidence interval.

P=36.6 % (constant) or 0.366% according to a study on Prevalence and determinants of anaemia among University students living in public hostels, Khartoum state, Sudan [25].

Q= 1-p =1-0.366= 0.634 and,

d=degree of accuracy desired 0.05 or 0.05 probability level (at 95% confidence level)

Therefore, by substitution in the formula,

$$n = \frac{1.96^2 \, x0.366x0.634}{0.05^2}$$

n= 357

Considering a non-response of 10%, the study utilized a sample size of 392 study participants.

Sampling Techniques

The researcher utilized a simple random sampling procedure to obtain the sample size for the study. The researcher gave all potential respondents who met the study criteria an opportunity to participate in the study by picking papers from an enclosed box and any respondents who picked a paper with the word YES written on were requested to participate in the study. This continued until the total of 392 respondents was achieved.

Inclusion Criteria

All undergraduate female medical students who were registered with the university with a valid identification card and who consented to take part in the study were included.

Exclusion Criteria

- Female undergraduate medical students who refused to consent.
- Female undergraduate medical students who were not registered with the university.
- Female undergraduate medical students taking drugs can cause anemia.

Research Instruments

Data was collected using an approved self-administered interview questionnaire which consisted of both open and closed-ended questions. This tool has been selected because the study involves participants who were all literate and thus able to read, write, and understand English used to develop the questionnaire.

Data Collection Procedure

Before kicking off the process of data collection, the researcher obtained a letter from the dean faculty of clinical medicine and the researcher used the letter to seek permission from the deputy vice chancellor and Director of Academic Affairs. The researcher approached the study participants in their respective classes and the purpose of this study was fully explained to them. All the questions from study participants were responded to by the researcher after which written informed consent was sought from the study participants. Those who consented to participate were given self-administered questionnaires to fill out. This improved efficiency and confidentiality during data collection.

Determination of hemoglobin levels

Capillary blood samples were collected from each study participant to determine hemoglobin concentration using a HemoCue Hb 201 analyzer. HemoCue cuvettes were required for the analyzer. The Hb-201+ cuvettes contained a sodium deoxycholate dried reagent that lysed red blood cells to release free Hb and form a stable azide methemoglobin which was detected at 570 nm and 880 nm. One drop of capillary blood was carefully collected in a microcuvette from a finger prick after the first drop of blood was wiped off with cotton wool. The filled microcuvette was loaded in the cuvette holder of the calibrated HemoCue Hb201 analyzer and after a few seconds, the hemoglobin measurement was displayed. Then the results were recorded on the questionnaire. However, the blood indices were not done.

Quality Assurance and Quality Control

A pre-test was conducted on 5% of the sample. Based on the pre-test, modification was made to the questionnaire. Data collected from the pretest was not included in the final data analysis. The data compilation system and data completeness were checked and strictly controlled by the principal investigator and supervisors. Double data entering, and random checking were done to ensure the validity of the study.

Data analysis

Data was cleaned, coded, and entered using Epidata 3.1 and was exported to STATA version 14.0 for analysis. A descriptive analysis was performed to summarize the data, followed by bivariate logistic regression analyses. A test for normality (Kolmogorov) was used to establish if the variables are normally distributed. Anemia was categorized using the WHO classification into; severe anemia (Hb <7.0 g/dl), moderate anemia (Hb level 7.0–9.9 g/dl), mild anemia (Hb level 10.0–10.9 g/dl), and no anemia (Hb levels ≥11 g/dl). Univariable analysis was conducted to describe the background

characteristics of the study participants. Continuous variables, which included haemoglobin levels and age were summarized using proportions, means, and standard deviations. In both bivariable analysis and multivariate analysis, the association between independent variables and anemia was examined. The outcome variable was categorized into two; anemia (Hb levels < 11 g/dl) and no anemia (Hb levels ≥ 11 g/dl). A logistic regression model was used to estimate Odds ratios (OR) as a measure of association for the relationship between independent variables and anemia as the primary outcome. A value of $P < 0.05$ was considered indicative of statistical significance.

Ethical Consideration

A letter of introduction was obtained from Kampala International University's Faculty of Clinical Medicine, introducing the researcher to the Director of Academic Affairs and seeking permission to carry out the study. Respondents were assured of maximum confidentiality and only numbers instead of names were used to identify the respondents. The information collected did not contain individual identity so as to avoid a breach of confidentiality. Completed questionnaires were coded, and the information collected was kept in lockable safes only accessible to the principal investigator for use. The study only commenced after the objectives of the study had been well explained to participants and they had consented to participate in the study.

RESULTS

Socio-Demographic Characteristics of Respondents

Table 1 below shows the socio-demographic characteristics of the respondents that were included in the sample. The mean age of the respondents was 21.3 years with a standard deviation of 2.7 years, the minimum age was 16 years and the maximum age was 30 years. Among the 384 respondents, the maximum number of respondents 236 (61.46%) were in the age group of 20 - 24 years, 105 (27.34%) were in the age group of 16 - 19 years, 34 (8.85%) were in the age group of 25 - 28 years meanwhile the least number 09 (2.34%) were in the age group of 29 – 32. The majority of the respondents 116 (30.21%) were Anglicans, 98 (25.52%) belonged to the catholic denomination, 51 (13.28%) were Muslims, 21 (5.47%) were Born Again whereas the least number of study participants 04 (1.04%) belonged to other religions. From the collected data it was found that the majority of respondents 233 (60.68%) were residing in university hostels, 103 (26.82%) resided from private accommodation meanwhile the minority 48 (12.50%) were residing from home.

Table 1: Table showing socio-demographic characteristics of Respondents

CATEGORY	OPTIONS	FREQUENCY (n=384)	PERCENTAGE
Age in years	16 - 19	105	27.34
	20 - 24	236	61.46
	25 - 28	34	8.85
	29 - 32	09	2.34
Religion	Catholic	98	25.52
	Anglican	116	30.21
	Muslim	51	13.28
	SDA	21	5.47
	Born Again	94	24.48
	Others	04	1.04
	Female	122	31.77
Residence	University hostels	233	60.68
	At home	48	12.50
	Private accommodation	103	26.82

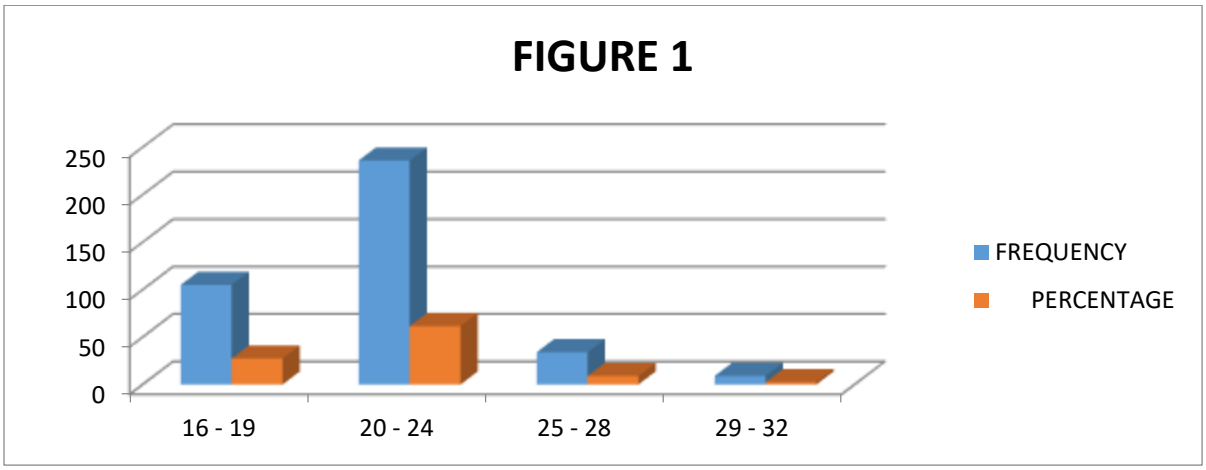

Figure 1: A bar graph showing the age distribution of study respondents

Prevalence of Anemia among Undergraduate Female Medical Students at KIU-WC

Table 2: The prevalence of Anemia

Anemia	Frequency	Percentage (%)
Yes	61	15.89
No	323	84.11
Total	**384**	**100.00**

From table 2 above, out of the 384 respondents sampled, the majority 323 (84.11%) were found to be non-anemic meanwhile the minority 61 (15.89%) were found to be having anemia.

$$THE\ PREVALENCE\ OF\ ANEMIA = \frac{NUMBER\ OF\ RESPONDENTS\ WITH\ ANEMIA}{TOTAL\ NUMBER\ SAMPLED} \times 100\%$$

$$= \frac{61}{384} \times 100\%$$

$$= 15.89\%$$

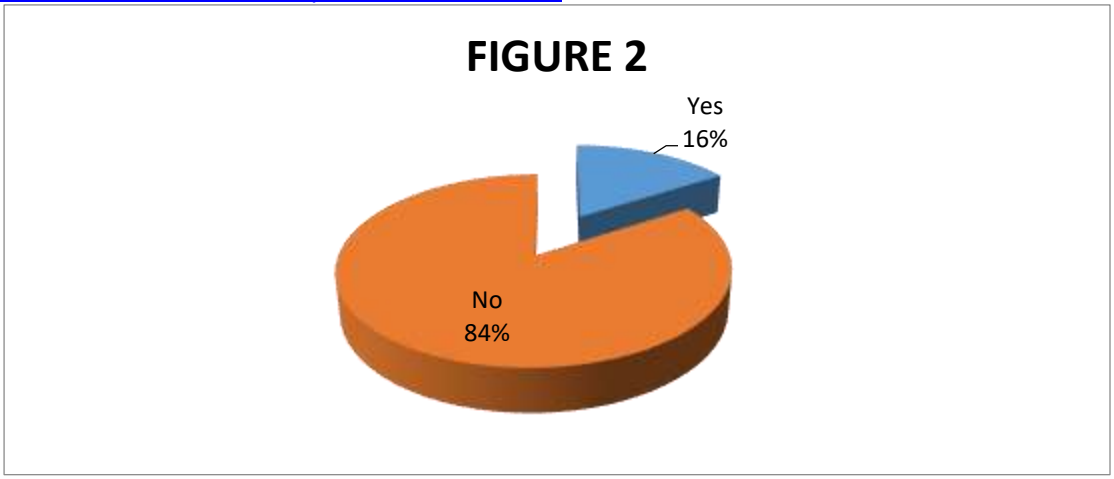

Figure 2: A pie chart showing the prevalence of Anemia

The Social Demographic Factors Associated With Iron Deficiency Anemia Among Female Undergraduate Medical Students of KIU-WC.

Table 3 shows a bivariate logistic regression analysis of socio-demographic factors associated with anemia among female undergraduate medical students of Kampala International University's western campus. The age of the female students, Mother's education level and Things the most amount of money is spent on were the socio-demographic factors significantly associated with anemia. Those who were in the age group of 20 – 24 years were 8 times more likely to have anemia than their counterparts who were less than 20 years (cOR 8.57, 95%CI 1.64-44.86, p=0.011). Participants whose mothers had high school levels of education were 88% less likely to have anemia compared to participants whose mothers were uneducated (cOR 0.12, 95%CI 0.02 – 0.61, p=0.011). Female undergraduate medical students who spent most of their money on social events were 11 times more likely to have anemia than those who spent most of their money on buying food (cOR 11.25, 95%CI 2.46-51.52, p=0.02).

Table 3: Bivariate logistic regression of socio-demographic factors associated with Anemia

VARIABLE	CATEGORY	ANEMIA		cOR	95% CI	P- VALUE
		NO (n=323)	YES (n=61)			
Age in Years	<20	19 (18.10)	86 (81.90)	1.00		
	20 - 24	33 (13.98)	203 (86.02)	8.57	1.64-44.86	**0.011**
	25 - 28	07 (20.59)	27 (79.41)	1.08	0.18-6.44	0.930
	29 - 32	02 (22.22)	07 (77.78)	2.17	0.14-32.53	0.576
Religion	Catholic	12 (12.24)	86 (87.76)	1.00		
	Anglican	20 (17.24)	96 (82.76)	3.55	0.59-21.24	0.166
	Muslim	08 (15.69)	43 (84.31)	1.63	0.11-22.98	0.719
	SDA	02 (9.52)	19 (90.48)	2.60	0.28-23.81	0.398
	Born Again	19 (20.21)	75 (79.79)	1.30	0.10-17.73	0.844
	Others	00 (0.00)	04 (100.00)	1.48	0.32-6.90	0.621
	Female	15 (12.30)	107 (87.70)	0.52	0.14-1.94	0.329
Residence	University hostels	32 (13.73)	201 (86.27)	1.00		
	At home	08 (16.67)	40 (83.33)	0.85	0.19-3.70	0.825
	Private	21 (20.39)	82 (79.61)	3.60	0.55-23.64	0.182
Household size	3 - 7	149	35	1.00		
	8 - 12	141	20	0.60	0.3 – 1.10	0.097
	13 - 17	19	04	0.90	0.29 – 2.80	0.85
	18 - 22	14	02	0.61	0.13 – 2.80	0.52
Monthly household income	100,000 – 600,000	152	32	1.00		
	601,000-1,101,000	85	15	0.84	0.43 – 1.64	0.61
	1,102,000-1,602,000	23	03	0.62	0.18 – 2.19	0.46
	1,603,000 and above	63	11	0.83	0.39 – 1.75	0.39
Mother's education	No education	85	18	1.00		
	Elementary	62	13	0.99	0.45 – 2.17	0.98
	High School	115	17	0.12	0.02 – 0.61	**0.011**
	University	61	13	1.01	0.46 – 2.21	0.99
Mother's job status	Having a job	183	26	1.00		
	Jobless	140	35	1.76	1.01 – 3.06	0.05
Father's education	No education	60	12			
	Elementary	39	07	0.90	0.33 – 2.48	0.84
	High School	119	22	0.92	0.43 – 1.99	0.84
	University	105	20	0.95	0.44 – 2.08	0.90
Father's job status	Having a job	242	41	1.00		
	Jobless	81	20	1.46	0.81 – 2.63	0.21
Things most money is spent on	Food	211	33	1.00		
	Clothes	24	12	0.52	0.14-1.94	0.329
	Social events	55	10	11.25	2.46-51.52	**0.002**
	Transport	10	00	1.00		
	Others	23	06	0.52	0.17 – 1.62	0.05
	No	308	55	0.45	0.17 – 1.20	0.11

The p-value is significant at the 0.05 level

The Nutrition Behavioral Factors Associated with Iron Deficiency Anemia among Female Undergraduate Medical Students at KIU-WC.

A bivariate logistic regression was done using Stata 12.0 to determine the association between nutrition behavioral factors and anemia. Results of the analysis showed that the number of meals taken a day and the number of breakfasts taken in a week were significantly associated with anemia. Female medical students who took 3 – 4 meals a day were 63% less likely to have anemia than their counterparts who took 1 -2 meals a day (cOR 0.37, 95%CI 0.15 – 0.93, p=0.035). On the other hand, female undergraduate medical students who took breakfast 6 – 7 in a week were 61% less likely to have anemia compared to those who took breakfast 0 – 1 time in a week (cOR 0.39, 95%CI 0.19 – 0.81, p=0.01).

Table 4; Bivariate logistic regression between nutritional health factors and Anemia

VARIABLE	CATEGORY	ANEMIA		cOR	95% CI	P VALUE
		NO (n=323)	YES (n=61)			
Money spent on food per month	10,000 – 50,000	129	20	1.00		
	51,000 – 100,000	140	30	1.38	0.75 – 2.55	0.30
	101,000 – 150,000	19	06	2.04	0.73 – 5.71	0.18
	151,000 and above	35	05	0.92	0.32 – 2.63	0.88
Place of purchasing food	Supermarket	71	09	1.00		
	Venders	214	45	1.66	0.77 – 3.56	0.19
	Others	38	07	1.45	0.50 – 4.21	0.49
Ever missed breakfast	Yes	227	47	1.00		
	No	96	14	0.70	0.37 – 1.34	0.29
Time of suffering from hunger	Start of semester	11	04	1.00		
	End of semester	258	49	0.52	0.16 – 1.71	0.28
	Others	54	08	0.41	0.10 – 1.59	0.19
Longest time gone without food in hours	1 - 6	78	16	1.00		
	7 - 12	199	36	0.88	0.46 – 1.68	0.70
	13 - 18	02	00	1.00		
	19 - 23	02	00	1.00		
	24 - 48	42	09	1.04	0.43 – 2.57	0.92
Ever gone to bed hungry	Yes	176	39	1.00		
	No	147	22	0.68	0.38 – 1.19	0.18
Not enough food	Yes	201	46	1.00		
	No	122	15	0.54	0.29 – 1.00	0.05
Failed to eat preferred food	Yes	247	53	1.00		
	No	76	08	0.49	0.22 – 1.08	0.08
Number of meals taken a day.	1-2	135	33	1.00		
	3-4	172	28	0.37	0.15 – 0.93	**0.035**
	5-7	16	00	1.00		
Number of breakfasts taken in a week	0 -1	58	20	1.00		
	2 - 3	64	06	1.22	0.33 – 4.60	0.764
	4 - 5	80	19	0.69	0.34 – 1.41	0.31
	6 - 7	119	16	0.39	0.19 – 0.81	**0.01**
Number of snacks taken a day	0 - 1	230	50	1.00		
	2 - 3	80	09	0.52	0.24 – 1.10	0.09
	4 - 6	06	00	1.00		
The kinds of snacks	Sweet & chocolates	206	39	1.00		
	Nuts	75	18	1.27	0.68 – 2.35	0.45
	Crisps	42	04	0.50	0.17 – 1.48	0.21

The p-value is significant at the 0.05 level

DISCUSSION

The study was carried out among female undergraduate medical students at Kampala International University, Western campus. The study was done to establish the prevalence of anaemia and associated factors.

The prevalence of iron deficiency anemia among female undergraduate medical students of Kampala International University-Western Campus

This study showed that the prevalence of anemia among female undergraduate medical students was 15.89%. The prevalence of anaemia found in the present study is almost similar to the results of a study done by Vibhute et al. [26] who found that anaemia prevalence was 18%. The probable reason why the study findings are almost similar is because both studies were conducted in similar settings and in both studies, only female students were sampled. The prevalence of anemia found in the present study is lower than the prevalence found in a study done among University Students in the Noakhali Region, Bangladesh which revealed that 55.3% of students were anaemic [27]. The discrepancy in the study findings could have risen due to the fact that the present study sampled only female undergraduate medical students meanwhile the previous study sampled both female and male students. Chinchole and Najan [28] conducted their study among medical students and found the prevalence of anaemia to be 46.25%. This is higher than the prevalence of anaemia which was found in the present study. The disagreement in the study findings could be due to the fact that the previous study had a small sample size of only 80 meanwhile the present study had a bigger sample size of 384 participants. On the contrary, the prevalence of anaemia found in the present study is higher compared to the results of a study in Yemen at Sana'a University which showed that anaemia was prevalent among 4.5% of medical students [29]. The discrepancy in the study findings could be because of the variation in study participants in that the previous study only sampled final-year medical students whereas the present study sampled female undergraduate medical students. The result of the present study is not in agreement with what was found in a study done among Saudi University female students which showed that the overall prevalence of mild (10–11 g/dL), moderate (7–10 g/dL), and severe (Hb <7 g/dL) anaemia was 45%, 49%, and 6%, respectively [30]. In a study done to investigate the nutritional status and anaemia among female medical students of Oman medical college, 58.7% had anaemia [31]. This is much higher than the prevalence of anaemia which was found in the present study. The prevalence of anaemia found in the present study is not in line with the results of a systematic review and meta-analysis of studies done in Ethiopia which showed a prevalence of 23% [19]. The disagreement in the study findings can be explained by the fact that the previous study was done among school-age children meanwhile the present study was done among female undergraduate medical students.

Social demographic factors associated with iron deficiency anemia female undergraduate medical students of Kampala International University - Western campus.

Results of the present study showed that the age of the participants, the Mother's education level, and Things the most amount of money spent were the socio-demographic factors significantly associated with anemia. Age of the participants: This study showed that participants who were in the age group of 20 – 24 years were 8 times more likely to have anemia than their counterparts who were less than 20 years old. This finding is in line with the results of a study done in Bangladesh which showed that age was associated with anemia as students aged 20-22 years were more anemic (43.4%) than other age groups [27]. Furthermore, the results of the present study are in agreement with the results of a study done in Pakistan which revealed that age was a predictor of anemia among the study participants [31]. Additionally, this study has similar findings to the findings of a study done in Sudan which showed that age was significantly associated with the level of anemia [25]. Contrary to what

was found in the present study, the results of a study conducted in Saudi Arabia, showed that there was no statistical association between anemia and age [32]. As well, Nassar et al. [29] conducted their study and found no statistically significant association between anemia and age. The findings of the two previous studies are in disagreement with the results of the present study probably because the present study was conducted in a third world country. Mothers' Education Level: Participants whose mothers had a high school level of education were 88% less likely to have anemia compared to participants whose mothers were uneducated. The result of the present study is in line with the result of a study done in Ethiopia which indicated that participants born to mothers who were unable to read and write were more likely to be anemic compared to their counterparts [33]. Similar to the findings of the present study, the result of a cross-sectional study conducted in Namutumba district, Uganda showed that respondents' education level was associated with anemia [34]. Contrary to the result of the present study, a cross-sectional study done in the Bushenyi district of western Uganda never found any significant association between education level and anemia status [35]. Much as the previous study and the present study were both conducted from the same district, the discrepancy in the study findings could be due to the fact that the present study was conducted in a University setting whereas the previous study was conducted in a community. Things the most amount of money is spent on: Female undergraduate medical students who spent most of their money on social events were 11 times more likely to have anemia than those who spent most of their money on buying food. This could be explained by the fact that some students spend the money that they are supposed to use for buying food on buying other things like clothes, and social events and they end up having inadequate food to eat which can result in undernutrition and anemia.

Nutrition behavioral factors associated with iron deficiency anemia female undergraduate medical students of Kampala International University –WC.

Number of meals taken a day: Results of this study showed that female medical students who took 3 – 4 meals a day were 63% less likely to have anemia than their counterparts who too 1 -2 meals a day. The result of the present study is in line with the result of a study done by Jahan et al. [36] who found that anaemia varied in different populations and young females are at risk due to their nutritional behaviors. Medical students spend their lives in a very high competitive and challenging environment. Similar to what was found in the present study, findings from a Saudi Arabia study showed that the high prevalence of iron deficiency anemia among female University students was attributed to the lifestyle of female students as well as to their dietary habits [30]. Therefore, female students should never skip meals as it is essential for their cognitive functions and physical activities. Alzaheb and Al-amer [32] conducted a study and found that factors associated with an elevated anemia risk were inadequate iron and vitamin C intakes, and infrequent (≤2 times per week) consumption of red meat. The inadequacies in these nutrients could have resulted from poor dietary habits such as skipping some meals which was found to be significantly associated with anaemia in the current study. Number of breakfasts taken in a week: This study showed that female undergraduate medical students who took breakfast 6 – 7 in a week were 61% less likely to have anemia compared to those who took breakfast 0 – 1 time in a week. A growing body of evidence highlights the importance of the biological clock as a modulator of energy balance and metabolism, recent studies in humans have shown that ingested calories are apparently utilized more efficiently in the morning than in the evening [37]. A small new randomized controlled trial

published in the Journal of Physiology found out that regularly eating a substantial meal morning meal directly affects how fat cells function in the body by changing the activity of genes involved in fat metabolism and insulin resistance [38]. The findings of the study suggest that eating breakfast every morning may help lower people's risk for type 2 diabetes and cardiovascular disease. Insulin resistance and poor carbohydrate and fat metabolism are the hallmarks of type 2 diabetes [39-42].

CONCLUSION

The findings suggest that the prevalence of under nutrition among undergraduate female medical students in KIU-WC was relatively low as compared to other studies. The findings further suggest that Age, Mother's education level and Things the most amount of money was spent on were the socio-demographic factors significantly associated with anemia. Lastly, Number of meals taken a day and Number of breakfast taken in a week were significantly associated with anemia

Recommendations

Based on the findings of the research, it is recommended that the following measures be put in place to help the medical students cope with under nutrition:

- There is need to implement nutrition education to university students by giving emphasis for need to have balanced diet and the importance of avoiding under nutrition.
- The students should be given financial guidance so that they can know how to budget for their money in order to avoid spending a lot of money on other things and being left with very little money for buying food.
- Parents should be advised to give their daughters enough money when coming to campus so as the students can take a balanced diet.
- The university administration should design sessions of nutritional education so that the students can learn about the importance of having regular meals.

REFERENCES

1. Obeagu, E. I., Nimo, O. M., Bunu, U. M., Ugwu, O. P.C. and Alum, E.U. (2023). Anaemia in children under five years: African perspectives. *Int. J. Curr. Res. Biol. Med.*, (1): 1-7. http://dx.doi.org/10.22192/ijcrbm.2023.08.01.001.
2. Ifeanyi, O. E. and Uzoma, O. G. (2018). An update on Anaemia, Iron, Folic acid and Vitamin B 12 in Pregnancy and Postpartum. *Int. J. Curr. Res. Med. Sci*, **4**(5):62-70.
3. Obeagu, E. I., Ali, M. M., Alum, E. U., Obeagu, G. U., Ugwu, O. P. C. and Bunu, U. M. (2023). An Update of Aneamia in Adults with Heart Failure. *INOSR Experimental Sciences*, **11**(2):1-16. https://doi.org/10.5281/zenodo.7791916
4. Alum, E. U., Ugwu, O. P. C., Aja, P. M., Obeagu, E. I., Inya, J. E., Onyeije, P. E., Agu, E. and Awuchi, C. G. (2023). Restorative effects of ethanolic leaf extract of *Datura stramonium* against methotrexate-induced hematological impairments, Cogent Food & Agriculture, 9:1, DOI: 10.1080/23311932.2023.2258774. https://doi.org/10.1080/23311932.2023.2258774
5. Aja, P. M., Uzuegbu, U. E., Opajobi, A. O., Udeh, S. M.C., Alum, E. U., Abara, P. N., Nwite, F. and Ibere, J. B. (2017). Comparative Effect of Ethanol Leaf-Extracts of *Ficus capensis* And *Moringa oleifera* on some haematological indices in normal Albino Rats. *Indo American Journal of Pharmaceutical Sciences*, **4(2):** 471-476. https://www.iajps.com/pdf/february2017/38.%20(1).pdf
6. Gardner, W. and Kassebaum, N. (2020). Global, regional, and

national prevalence of anemia and its causes in 204 countries and territories, 1990–2019. *Current Developments in Nutrition*, *4*(Supplement_2), 830.

7. Alum, E. U., Oyika, M. T., Ugwu, O. P. C., Aja, P. M., Obeagu, E. I., Egwu, C. O. and Okon, M. B. (2023). Comparative analysis of mineral constituents of ethanol leaf and seed extracts of *Datura stramonium*. *IDOSR Journal of Applied Sciences,* **8**(1):143-151. https://doi.org/10.59298/IDOSR/2023/12.1.7906.
8. Ekpono, E. U., Aja, P. M., Ibiam, U. A., Alum, U. E and Ekpono, U. E. (2019). Ethanol Root-extract of *Sphenocentrum jollyanum* Restored Altered Haematological Markers in *Plasmodium berghei*-infected Mice. *Earthline Journal of Chemical Sciences,* **2**(2):189-203. https://doi.org/10.34198/ejcs.2219.189203.
9. Obeagu, E. I., Bot, Y. S., Obeagu, G. U., Alum, E. U. and Ugwu, O. P. C. (2023). Anaemia and risk factors in lactating mothers: a concern in Africa. *International Journal of Innovative and Applied Research,* **11**(2): 15-17. Article DOI: 10.58538/IJIAR/2012 DOI URL: http://dx.doi.org/10.58538/IJIAR/2012.
10. Orji, O. U., Ibiam, U. A., Aja, P. M., Ezeani, N., Alum**,** E. U. and Edwin, N. (2015). Haematological Profile of *Clarias gariepinus* (Burchell 1822) Juveniles Exposed to Aqueous Extract of *Psychotria microphylla* leaves. IOSR-JESTFT, **9 (9):**79-85**.** https://www.iosrjournals.org/iosr-jestft/papers/vol9-issue9/Version-1/M09917985.JESTFT%20[ZSEP08].pdf
11. Hanafi, M. I., Abdallah, A. R. and Zaky, A. (2013). Study of hemoglobin level and body mass index among preparatory year female students at Taibah University, Kingdom of Saudi Arabia. *Journal of Taibah University Medical Sciences*, *8*(3), 160–166.
12. Vibhute, N. A., Shah, U., Belgaumi, U., Kadashetti, V., Bommanavar, S. and Kamate, W. (2019). Prevalence and awareness of nutritional anemia among female medical students in Karad , Maharashtra , India : A cross - sectional study. *Journal of Family Medicine and Primary Care*, *8*, 8–11. http://doi.org/10.4103/jfmpc.jfmpc.
13. Obeagu, E. I., Babar, Q. and Obeagu, G. U. (2021). Megaloblastic anaemia-a review. *Int J Curr Res Med Sci.*, **7**(5):17-24.
14. Alum, E. U., Aja, W., Ugwu, O. P. C., Obeagu, E. I. and Okon, M. B. (2023). Assessment of vitamin composition of ethanol leaf and seed extracts of *Datura stramonium*. *Avicenna J Med Biochem.*, 11(1):92-97. doi:10.34172/ajmb.2023.2421.
15. Offor, C. E., Ugwu, O. P. C. and Alum, E. U. (2015). Determination of ascorbic acid contents of fruits and vegetables. *Int J Pharm Med Sci.*, 5(1):1-3. doi: 10.5829/idosi.ijpms.2015.5.1.1105.
16. Asghari, S., Mohammadzadegan-tabrizi, R. and Rafraf, M. (2020). Prevalence and predictors of iron - deficiency anemia : Women ' s health perspective at reproductive age in the suburb of dried Urmia Lake , Northwest of Iran. *Journal of Education and Health Promotion |*, *9*, 1–6. http://doi.org/10.4103/jehp.jehp.
17. Alum, E. U., Obeagu, E. I., Ugwu, O. P. C., Samson, A. O., Adepoju, A. O., Amusa, M. O. (2023). Inclusion of nutritional counseling and mental health services in HIV/AIDS management: A paradigm shift. Medicine, 102:41(e35673). http://dx.doi.org/10.1097/MD.0000000000035673
18. Al-zahrani, A. A., Al-shammari, N. H. and Al-zahrani, R. A. (2020).

Prevalence of Iron-Deficiency Anemia and its Associated Risk Factors in Female Undergraduate Students at Prince Sultan Military College of Health Sciences, 126–133. http://doi.org/10.4103/joah.joah.

19. Tezera, R., Sahile, Z., Yilma, D., Misganaw, E. and Mulu, E. (2018). Prevalence of anemia among school-age children in Ethiopia : a systematic review and meta-analysis. *Systematic Reviews, 7*(80), 1–7. http://doi.org/https://doi.org/10.1186/s13643-018-0741-6
20. Hakizimana, D., Nisingizwe, M. P., Logan, J. and Wong, R. (2019). Identifying risk factors of anemia among women of reproductive age in Rwanda–a cross-sectional study using secondary data from the Rwanda demographic and health survey 2014/2015. *BMC Public Health*, *19*(1), 1–11.
21. Debelo, O. and Shiferaw, Y. (2019). Correlates of Anemia Status Among Women of Reproductive Age in Ethiopia. *Available at SSRN 3463707*.
22. Kejo, D., Petrucka, P. M., Martin, H., Kimanya, M. E. and Mosha, T. C. (2018). Prevalence and predictors of anemia among children under 5 years of age in Arusha District, Tanzania. Pediatric Health Med Ther., 5;9:9-15. doi: 10.2147/PHMT.S148515.
23. Hamson, K., Ngonzi, J., Julius, M., Emmanuel, B. and Ronald, M. (2016). Prevalence , Morphological Types and Factors Associated With Anemia among Mothers Attending Antenatal Clinic at Mbarara Regional Referral Hospital, South Western Uganda, *25*, 115–121.
24. Mbule, M. A., Byaruhanga, Y. B., Kabahenda, M. and Lubowa, A. (2013). Determinants of anaemia among pregnant women in rural Uganda. Rural Remote Health, 13(2):2259.
25. Medani, K. E. (2014). Prevalence and determinants of anaemia among University students living in public hostels , Khartoum state , Sudan Prevalence and determinants of anaemia among University students living in public hostels , Khartoum state , Sudan. *Int. J. Pharm. Med. Res.*, 12-24.
26. Vibhute, N. A., Shah, U., Belgaumi, U., Kadashetti, V., Bommanavar, S. and Kamate, W. (2019). Prevalence and awareness of nutritional anemia among female medical students in Karad, Maharashtra, India: a cross-sectional study. *Journal of Family Medicine and Primary Care,* 8(7):2369–2372. doi: 10.4103/jfmpc.jfmpc_353_19.
27. Shill, K. B., Karmakar, P., Kibria, G., Das, A., Rahman, M. A., Hossain, M. S. and Sattar, M. M. (2014). Prevalence of Iron-deficiency Anaemia among University Students in Noakhali Region , Bangladesh. *J HEALTH POPUL NUTR.*, 32(1), 103–110.
28. Chinchole, S. B. and Najan, A. B. (2017). Prevalence of anemia among medical students at medical college. *International Journal of Medical Science and Public Health*, *6*(9), 1442–1444. http://doi.org/10.5455/ijmsph.2017.0719213072017.
29. Nassar, M. Y., Hudna, A. S., Abdurubbu, F., Mohammed, A. and Maresh, A. (2021). Anemia and Its Associated Factors among Final-Year Medical Students at Sana â€™a University , Yemen. *Yemeni J Med Sci.*, *15*, 8–13. http://doi.org/https://doi.org/10.20428/YJMS.15.1.A2
30. Nasir, N. and Hassan, A. (2022). The prevalence of iron deficiency anemia in a Saudi University female students. *Journal of Microscopy and Ultrastructure*, *3*(1), 25–28. http://doi.org/10.1016/j.jmau.2014.11.003.
31. Province, B. S., Jamali, N. H., Mahesar, H. and Bhutto, M. A.

(2016). Prevalence of Iron Deficiency Anaemia in School and College Going Students of District Shaheed. *Open Journal of Blood Diseases*, *6*, 67–78. http://doi.org/10.4236/ojbd.2016.64010.

32. Alzaheb, R. A. and Al-amer, O. (2016). The Prevalence of Iron Deficiency Anemia and its Associated Risk Factors Among a Sample of Female University Students in Tabuk , Saudi Arabia. *Clinical Medicine Insights: Women's Health*, *10*, 1–8. http://doi.org/10.1177/1179562X17745088.
33. Tura, M. R., Egata, G., Fage, S. G. and Roba, K. T. (2020). Prevalence of Anemia and Its Associated Factors Among Female Adolescents in Ambo Town , West Shewa, Ethiopia. J Blood Med., 11:279-287. doi: 10.2147/JBM.S263327. P
34. Kuziga, F., Adoke, Y. and Wanyenze, R. K. (2017). Prevalence and factors associated with anaemia among children aged 6 to 59 months in Namutumba district , Uganda : a cross- sectional study. *BMC Pediatrics*, 1–9. http://doi.org/10.1186/s12887-017-0782-3.
35. Kikafunda, J. K., Lukwago, F. B. and Turyashemererwa, F. (2014). Anaemia and associated factors among under-fives and their mothers in Bushenyi district , Western Uganda, (May 2009). http://doi.org/10.1017/S1368980009005333.
36. Jahan, F., Qasim, R. and Siddiqui, M. A. (2018). Nutritional status and Anaemia among Female Medical Students of Oman Medical College. *International Journal of Medical Science and Health Research*, 2(3), 59–67.
37. Ruddick-Collins, L. C., Johnston, J. D., Morgan, P. J. and Johnstone, A. M. (2018). The Big Breakfast Study: Chrono-nutrition influence on energy expenditure and bodyweight. *Nutrition Bulletin.*, 43(2), 174–183.
38. Sutton, E. F., Beyl, R., Early, K. S., Cefalu, W. T., Ravussin, E. and Peterson, C. M. (2018). Early time-restricted feeding improves insulin sensitivity, blood pressure, and oxidative stress even without weight loss in men with prediabetes. *Cell Metabolism*, *27*(6), 1212–1221.
39. Agbafor, K. N., Onuoha, S. C., Ominyi, M. C., Orinya, O. F., Ezeani, N. and Alum, E. U. (2015). Antidiabetic, Hypolipidemic and Antiathrogenic Properties of Leaf Extracts of Ageratum conyzoides in Streptozotocin-Induced diabetic rats. *International Journal of Current Microbiology and Applied Sciences*, **4 (11):** 816-824. http://www.ijcmas.com. https://www.ijcmas.com/vol-4-11/Agbafor,%20K.%20N,%20et%20al.pdf
40. Uti, D. E., Igile, G. O., Omang, W. A., Umoru, G. U., Udeozor, P. A., Obeten, U. N., Ogbonna, O. N., Ibiam U. A., Alum, E. U., Ohunene, O. R., Chukwufumnanya, M. J., Oplekwu, R. I. and Obio, W. A. (2021). Anti-Diabetic Potentials of Vernonioside E Saponin; A Biochemical Study. *Natural Volatiles and Essential Oils*, **8(**4): 14234-14254. https://www.nveo.org/index.php/journal/article/view/3067
41. Alum, E. U., Umoru, G. U., Uti, D. E., Aja, P. M., Ugwu, O. P., Orji, O. U., Nwali, B. U., Ezeani, N., Edwin, N. and Orinya, F. O. (2022). Hepato-protective effect of Ethanol Leaf Extract of *Datura stramonium* in Alloxan-induced Diabetic Albino Rats. *Journal of Chemical Society of Nigeria,* 47 (3): 1165 – 1176. https://doi.org/10.46602/jcsn.v47i5.819.
42. Ugwu, O. P.C., Alum, E. U., Okon, M. B., Aja, P. M., Obeagu, E. I. and Onyeneke, E. C. (2023). Ethanol root extract and fractions

of *Sphenocentrum jollyanum* abrogate hyperglycemia and low body weight in Streptozotocin-induced diabetic Wistar albino Rats, *RPS Pharmacy and Pharmacology Reports*, 2,1-6. https://doi.org/10.1093/rpsppr/rqad010

CITE AS: Iwumbwe Emmanuel (2023). Occurrence of Iron Deficiency Anemia and Its Correlating Factors among Female Undergraduate Medical Students at Kampala International University in Western Uganda. INOSR Experimental Sciences 12(2):78-92. https://doi.org/10.59298/INOSRES/2023/2.6.1000