

Knowledge about iron deficiency anemia in university girls: A perspective for an educational booklet



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ABSTRACT

Iron deficiency anemia is a prevalent nutritional deficiency observed among young girls globally. In the city of Hail, college students frequently opt for fast food available at their college food mall. The primary objective of this study is to examine the level of knowledge pertaining to Iron-Deficiency Anemia and awareness regarding a diet rich in iron among female university students. The aim is to promote an understanding of preventive measures for this condition. A cross-sectional research design was employed, and a sample of 700 girls aged between 18 and 25 years, who were non-medical undergraduate students at the University of Hail, was selected using the non-probability convenience sampling technique. Notably, undergraduate students enrolled in the Medicine, Nursing, and Science Colleges were excluded from the study. Data collection was performed using a standardized, pre-designed, and pretested questionnaire. The questionnaire encompassed various aspects, including demographic variables, distribution of obstetrics and menstrual history, questions regarding knowledge about anemia, knowledge about iron-rich foods, and health-seeking behavior. The findings of the study revealed that 35.1% of the students exhibited inadequate knowledge about anemia, and a significant proportion (85.9%) displayed inadequate knowledge about incorporating iron-rich foods into their diet. Additionally, 68.7% of the participants experienced heavy blood flow during their periods for a duration of 4-7 days, while 64.1% had a history of anemia. These results emphasize that this particular demographic group, which consists of women of childbearing age, lacks awareness regarding the importance of iron-rich foods and their inclusion in their diet. Consequently, enhancing their dietary habits and increasing their knowledge about iron-rich foods would help prevent the detrimental effects of anemia. Upon the completion of data collection, all study participants were provided with an informational pamphlet containing details about iron deficiency anemia and its preventive measures.

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1. Introduction

Iron deficiency anemia (IDA) is widely recognized as the primary cause of anemia on a global scale (Chaparro and Suchdev, 2019). It arises due to inadequate levels of iron necessary for the production of red blood cells. Anemia can be attributed to various factors such as deficiencies in

vitamins (B12, folate, and A), parasitic infections, inherited co-conditions, and chronic inflammation. Additionally, IDA can develop as a secondary consequence of excessive blood loss, iron malabsorption, insufficient iron intake through the diet, inflammation, and end-stage renal and hepatic failure (Abdo et al., 2019). Consequently, IDA represents a significant health issue, particularly as it pertains to nutritional deficiencies, affecting a considerable number of adolescents worldwide (NHLBI, 2019; WHO, 2021).

The prevalence of IDA in Middle Eastern countries equals its prevalence in other developing countries (25%–35%), much higher than that of industrialized countries (5%–8%). Additionally, IDN

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represents over one-third of people's diseases in the Middle East. A recent cross-sectional study conducted in Saudi Arabian on 683 non-pregnant women aged between 18-40 years showed the prevalence of IDA was 41.6 (Alswailem et al., 2018; Abdo et al., 2019).

Anemia harms growth, development, physical, and capability, performance, and immunity in adolescents and the childbearing period. Therefore, it may result in various pregnancy complications like premature births, low birth weight, and neonatal mortality. Consequently, the nutrition in reproductive period is critical and needed to avoid risks of chronic diseases in progenies later in life (Marshall et al., 2022).

One of the main causes of nutritional problems is a lack of nutritional knowledge about iron-rich food and avoidance of iron supplements. Consequently, improper practices can have long-term consequences (NHLBI, 2019). The cross-sectional study of 210 girls conducted in a northwest district of Delhi, found that schoolchildren had little knowledge of anemia, with only about one-third having heard of it. This study was conducted in a different country, whereas less research on this population was conducted in Saudi Arabia (Singh et al., 2019).

Nutrition education at the university stage has been shown to improve adolescent knowledge regarding anemia prevention. Also, Nutrition education is a long-term strategy because it promotes good nutritional status. Nurses play an important role in health education programs, particularly at the chief prevention level (Sharma and Singh, 2017). Less nutritional knowledge caused teenagers to choose unhealthy food on the outside or only consume snacks. There is a shortage of data and studies that estimate the association between demographic data, obstetric history, and knowledge level about IDA. Therefore, our study aimed to explore the level of knowledge regarding Iron-Deficiency Anemia among Hail University's girls to develop an awareness pamphlet of preventive measures. The aims of this study are as follows:

- To investigate the existing knowledge gaps concerning iron deficiency anemia among female university students.
- To examine the relationship between demographic variables and the level of knowledge regarding iron deficiency anemia among female university students.

2. Subjects and methods

The research design adopted is a cross-sectional design to achieve the study's aim.

Non-probability convenience sampling technique was used to select study participants from the Hail University Colleges. The target population consisted of all undergraduate students who fulfill the inclusion criteria, namely: (1) undergraduate

students at Levels 1 to 8 studying in the non-medical program; (2) undergraduate students who can read and write English; and (3) Students who are voluntarily participating in the study.

All undergraduate medical, nursing, and science students were excluded from the survey. The recommended sample size is 694, however, the researchers increased the sample size to 700 to overcome the dropout and unresponsive.

The researchers used the following three tools to collect research data.

- Tool 1: Demographic data: Such as age, education level, college, height, Weight, marital status, and Hb level. The researchers estimate Body mass index (BMI) using the following formula: $BMI = \text{weight in Kg} / \text{height in M}^2$. The participant whose $BMI < 18.5$ were classified as underweight, $18.5-25$ were normal weight, those $> 25-30$ were overweight, and those over 30 were obese.
- Tool 2: Health history about chronic diseases, anemia, a blood disorder, blood transfusion, family health history, use of oral contraceptive pills, use of an intra-uterine device, menstrual period, menstrual frequency, heavy blood flow during menstruation, and following dietary regimen. The answer yes takes a score of "1" whereas, the answer no takes a score of zero.
- Tool 3: Knowledge of anemia adapted from a standardized Questionnaire recommended by Singh et al. (2019). This tool concluded with nine questions about knowledge about anemia and 11 questions about knowledge about Iron-rich foods. The total score assumed and categorized into adequate knowledge for the score ≥ 60 whereas, the score of < 60 was considered inadequate.

Using Cronbach Alpha, the said instrument is found to be reliable as indicated by the value of 0.790. The questionnaire was translated into Arabic language and validated by a group of three experts specialized in medical-surgical nursing.

2.1. Procedure for data collection

Phase 1: Formal permission was obtained from the concerned authority to conduct the main study.

A pilot study was conducted on a group of 70 participants (10%). This was done before the data was collected to assess the feasibility and applicability of the tools. The pilot specimen was excluded from the search.

Phase 2: The study sample was selected based on sample selection criteria. The sample size is 700. Consent was obtained from each participant after giving assurance of confidentiality. A questionnaire was distributed among students and students were asked to rate their answers. It took 15 minutes to complete the questionnaire. The researchers were actively present and provided clarification to the students when necessary.

After collecting and analyzing the data and finding out the weaknesses and misinformation about anemia disease and Iron rich food, the researchers distributed an educational pamphlet addressing the correct information about the disease (definition of anemia, clinical manifestations, diagnostic tests, complications, nutrition, and medication to correct anemia and information on Iron rich food.

2.2. Statistical analysis

Data collected and outcome measures coded, entered, and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. According to the type of data qualitative represent number and percentage, and the quantitative continues group is represented by mean±SD, the following tests were used to test differences for significance; Difference and association of qualitative variable by Chi-square test (X²). Predictors by logistic regression Differences between quantitative independent groups by t-test. P value was set at <0.05 for significant results and <0.001 for high significant results.

3. Results

Table 1 shows that 57% of the participants are between the age group of 21-23 years, and 24.4% were from the college of Education. Among them

73.7% were single, 65.1% were within normal body mass index, most of them that are 82.4% were not having a history of chronic diseases, 49.1% had checked their hemoglobin level within 3 months period among them 64.1 % of them were having a history of anemia, 18% of study participants had a history of blood transfusion.

Table 2 presents the findings that a majority of the subjects (87.6%) reported not using oral contraceptive pills and not utilizing the intra-uterine device (90%), which demonstrated a significant association with sufficient knowledge about anemia. Additionally, among the study participants, 57.4% reported experiencing irregular menstrual periods, with a monthly frequency of menstruation occurring once a month (59.4%). Furthermore, 68.7% of the participants reported a period duration between 4-7 days and 58.1% reported heavy blood flow during their periods. Notably, a considerable proportion of the participants did not consume iron tablets (74.1%) or deworming tablets (89.6%) within the last six months.

Table 3 illustrates the distribution of subjects within the sample, revealing that 64.9% displayed adequate knowledge regarding anemia, while only 14.1% exhibited adequate knowledge concerning iron-rich food. Table 4 shows a significant association with adequate knowledge among students of Computer Science and Engineering, HB checker and have 1-2 children, chronic disease, and also among iron tablet takers.

Table 1: Frequency and percentage of participants according to their demographic variables (n=700)

Variables	Categories	N	%
Age	18-20	149	21.2
	21-23	399	57.0
	23-25	152	21.8
	Mean±SD	21.62±1.64	
Education College	College of Business	116	16.6
	College of Arts	171	24.4
	College of Education	143	20.4
	College of engineering	72	10.3
	College of Computer Science and Engineering	157	22.4
	College of Community	41	5.9
Education level	1 st and 2 nd	149	21.3
	3 rd and 4 th	399	57.0
	5 th and 6 th	152	21.7
	Single	516	73.7
Marital	Married	182	26.0
	Divorced	2	.3
	No children.	528	75.4
If married	Less than 2	141	20.1
	More than 2	31	4.4
	Underweight	64	9.1
	Normal weight	456	65.1
BMI	Overweight and obese	180	25.7
	Mean±SD	23.45±4.13	
History of chronic diseases	No	577	82.4
	Yes	123	17.6
Family history	No	351	50.1
	Yes	349	49.9
Check HB 10.08±1.27	No	356	50.9
	Yes	344	49.1
History of anemia	No	251	35.9
	Yes	449	64.1
History of blood disorder	No	632	90.3
	Yes	68	9.7
History of blood transfusion	No	574	82.0
	Yes	126	18.0

Table 2: Frequency and percentage of samples according to their obstetric and menstrual history distribution among studied group (n=700)

Variables	Categories	N	%
Use of oral contraceptive pills	No	613	87.6
	Yes	87	12.4
Use of intra-uterine device	No	633	90.4
	Yes	67	9.6
Menstrual period regularity	Regular	298	42.6
	Irregular	402	57.4
Menstrual frequency	Once	416	59.4
	Twice	277	39.6
	More	7	1.0
Duration of period	1-3	31	4.4
	4-7	481	68.7
	> 7	188	26.9
Blood clotting during menstruation	No	293	41.9
	Yes	407	58.1
Heavy blood flow during menstruation	No	317	45.3
	Yes	383	54.7
Have you consumed Iron tablets	Yes	126	18.0
	No	519	74.1
Have you consumed deworming tablets within the last 6 months	Yes	181	25.9
	No	627	89.6
	Yes	73	10.4

Table 3: Knowledge distribution among studied group

Variables	Categories	N	%
K1 (Knowledge about anemia)	Inadequate	246	35.1
	Adequate	454	64.9
K2 (Knowledge about iron-rich foods)	Inadequate	601	85.9
	Adequate	99	14.1

Table 5 shows the significant association between inadequate knowledge among married with more than 2 babies, mothers who are overweight, family

history of anemia, and consuming iron tablets and not taking deworming tablets.

Table 6 shows Engineering and community college were significantly associated with anemia, married with high parity and HB checker was significantly associated with anemia also normal weight, heavy bleeding during menstruation, blood disorder, blood transfusion, and deworming tablets significantly associated with anemia.

Table 4: Relation between socio-demographic characteristics and knowledge about anemia

Variables	Knowledge of anemia		X ²	P		
	Inadequate	Adequate				
College	College of Business	N	37	79	31.2	0.0**
		%	31.9%	68.1%		
	College of Arts	N	61	110		
		%	35.7%	64.3%		
	College of education	N	58	85		
		%	40.6%	59.4%		
	College of Engineering	N	28	44		
		%	38.9%	61.1%		
	College of Computer Science and Engineering	N	36	121		
		%	22.9%	77.1%		
	College of Community	N	26	15		
		%	66.4%	33.6%		
HB check	No	N	138	218	4.16	0.041*
		%	38.8%	61.2%		
	Yes	N	108	236		
		%	31.4%	68.6%		
If married	No	N	172	356	8.52	0.014*
		%	32.6%	67.4%		
	1-2	N	57	84		
		%	40.4%	59.6%		
	>2	N	17	14		
		%	54.8%	45.2%		
Chronic disease	No	N	215	362	6.46	0.011*
		%	37.3%	62.7%		
	Yes	N	31	92		
		%	25.2%	74.8%		
Iron tablet	No	N	206	313	18.22	0.00**
		%	39.7%	60.3%		
	Yes	N	40	141		
		%	22.1%	77.9%		
deworming tablets	No	N	218	409	0.36	0.54
		%	34.8%	65.2%		
	Yes	N	28	45		
		%	38.4%	61.6%		

*: Significant at p-value < 0.05; **: Highly significant at p-value < 0.01

Table 5: Relation between sociodemographic characteristics and knowledge about iron-rich food

Variables	Knowledge of iron-rich food			X ²	P				
		Inadequate	Adequate						
If married	No	N %	459 86.9%	69 13.1%	6.22	0.044*			
	1-2	N %	120 85.1%	21 14.9%					
	>2	N %	22 71.0%	9 29.0%					
	Underweight	N %	47 73.4%	17 26.6%					
	BMI	Normal	N %	393 86.2%			63 13.8%	10.07	0.006*
		Overweight and obese	N %	161 89.4%			19 10.6%		
N %			311 88.6%	40 11.4%					
Family history	No	N %	290 83.1%	59 16.9%	4.37	0.036*			
	Yes	N %	454 87.5%	65 12.5%					
Iron tablet	No	N %	147 81.2%	34 18.8%	4.33	0.037*			
	Yes	N %	529 84.4%	98 15.6%					
Deworming tablets	No	N %	72 98.6%	1 1.4%	10.95	0.001**			
	Yes	N %							

*: Significant at p-value < 0.05

Table 6: Univariate analysis for predictors of anemia

		N	Without anemia		With anemia		X ²	P	
College	College of Business	N %	41 35.3%	75 64.7%	18.71	0.005*			
	College of Arts	N %	71 41.5%	100 58.5%					
	College of Education	N %	59 41.3%	84 58.7%					
	College of Engineering	N %	12 16.7%	60 83.3%					
	College of Computer Science and Engineering	N %	58 36.9%	99 63.1%					
	College of Community	N %	10 25.4%	31 74.6%					
	Level	1 st – 2 nd	N %	125 41.9%			173 58.1%	3.39	0.075
		3 rd – 4 th	N %	86 31.6%			186 68.4%		
5 th – 6 th		N %	40 30.8%	90 69.2%					
Age	18-20	N %	33 22.1%	116 77.9%	3.23	0.059			
	21-23	N %	175 43.9%	224 56.1%					
	23-25	N %	43 28.3%	109 71.7%					
Marital	Single	N %	204 39.5%	312 60.5%	12.07	0.002*			
	Married	N %	46 25.3%	136 74.7%					
	Divorced	N %	1 50.0%	1 50.0%					
HB check	No	N %	143 40.2%	213 59.8%	5.85	0.016*			
	Yes	N %	108 31.4%	236 68.6%					
Married	No	N %	208 39.4%	320 60.6%	11.69	0.003*			
	1-2	N %	35 24.8%	106 75.2%					
	>2	N %	8 25.8%	23 74.2%					
BMI_G	Underweight	N %	27 42.2%	37 57.8%	16.95	0.00**			
	Normal	N %	139 30.5%	317 69.5%					
	Overweight & obese	N %	85 47.2%	95 52.8%					
Use of oral contraceptive pills	No	N %	234 38.2%	379 61.8%	11.5	0.001**			
	Yes	N %	17 19.5%	70 80.5%					
Use of intra-uterine device	No	N %	229 36.2%	404 63.8%	0.29	0.58			
	Yes	N %	22 32.8%	45 67.2%					
Menstrual period regularity	Regular	N %	106 35.6%	192 64.4%					

Menstrual frequency	Irregular	N	145	257	0.019	0.89
		%	36.1%	63.9%		
	Once	N	147	269	0.24	0.88
		%	35.3%	64.7%		
Twice	N	101	176	5.06	0.08	
	%	36.5%	63.5%			
Duration of period	More	N	3	4	5.06	0.08
		%	42.9%	57.1%		
	1-3	N	13	18	5.06	0.08
		%	41.9%	58.1%		
3-7	N	183	298	5.06	0.08	
	%	38.0%	62.0%			
>7	N	55	133	5.06	0.08	
	%	29.3%	70.7%			
Blood clot	No	N	103	190	0.68	0.71
		%	35.2%	64.8%		
Yes	N	148	259	0.68	0.71	
	%	36.4%	63.6%			
Heavy blood	No	N	144	173	23.06	0.00**
		%	45.4%	54.6%		
Yes	N	107	276	23.06	0.00**	
	%	27.9%	72.1%			
Chronic disease	No	N	235	342	33.87	0.00**
		%	40.7%	59.3%		
Yes	N	16	107	33.87	0.00**	
	%	13.0%	87.0%			
Blood disorder	No	N	242	390	16.75	0.00**
		%	38.3%	61.7%		
Yes	N	9	59	16.75	0.00**	
	%	13.2%	86.8%			
Blood transfusion	No	N	236	338	38.32	0.00**
		%	41.1%	58.9%		
Yes	N	15	111	38.32	0.00**	
	%	11.9%	88.1%			
Family history	No	N	117	234	1.95	0.16
		%	33.3%	66.7%		
Yes	N	134	215	1.95	0.16	
	%	38.4%	61.6%			
Iron tablet	No	N	187	332	0.02	0.87
		%	36.0%	64.0%		
Yes	N	64	117	0.02	0.87	
	%	35.4%	64.6%			
Deworming tablets	No	N	239	388	13.36	0.00**
		%	38.1%	61.9%		
Yes	N	12	61	13.36	0.00**	
	%	16.4%	83.6%			
Total		N	251	449		
		%	35.9%	64.1%		

*: Significant at p-value < 0.05; **: Highly significant at p-value < 0.01

Table 7 shows the total score of the participant's knowledge about anemia and Iron rich food had a sig negative correlation with age and BMI. Table 8 portrays there are significant positive correlations between knowledge of anemia and knowledge regarding iron-rich food. Table 9 clarifies that Heavy blood flow during menstruation, Blood transfusion and not taking deworming tablets were independent predictors for anemia.

4. Discussion

The researchers aimed in this study to explore the level of knowledge regarding Iron-Deficiency Anemia among Hail University's girls to develop an awareness pamphlet of preventive measures. The participants in this study were 700 undergraduate students. Nearly half of them had a history of anemia. These findings are in line with the Study among 1638 childbearing women conducted in Riyadh, Saudi Arabia (AlQuaiz et al., 2013). In another study of healthy young University students from four regions in Saudi Arabia conducted among 474 females, 34% of participants were diagnosed with this showed that undergraduate girls have a high prevalence of Iron deficiency anemia (Owaidah et al., 2020).

Table 7: Correlation between knowledge regarding anemia, knowledge regarding iron-rich food, and certain sociodemographic

		Age year	HB	BMI
KN anemia	r	-.196**	.046	-.182*
	p	.005	.227	.030
KN iron	r	-.192**	.066	-.179*
	p	.007	.081	.037

*: Significant at p-value < 0.05; **: Highly significant at p-value < 0.01

Table 8: Correlation between knowledge regarding anemia, knowledge regarding iron-rich food

		KN anemia	KN Iron	Practice	Attitude
KN Iron	r	.242**	1	-.028	.140**
	p	.000		.454	.000

*: Significant at p-value < 0.05

Table 9: Multivariate logistic regression for independent predictors of anemia

Variables	Wald	P	OR	95% CI for	
				Lower	Upper
Engineering and community college	1.405	0.236	1.067	0.959	1.187
Married	0.100	0.751	1.101	0.608	1.992
Check CBC	0.070	0.791	1.047	0.744	1.474
High parity	0.906	0.341	1.268	0.777	2.069
Heavy blood flow during menstruation	11.734	0.001**	1.797	1.285	2.513
Blood disorder	3.485	0.062	2.071	0.964	4.447
Blood transfusion	20.229	0.00**	3.930	2.165	7.135
Deworming tablets	4.484	0.034*	2.077	1.056	4.086
Normal weight	2.117	0.324	1.718	0.539	8.957

Our study result showed a high percentage of students with irregular menstrual periods and frequency of Menstruation twice a month and more frequency in the menstrual cycle. We the researchers of this study feel that this could be the reason for having a history of anemia among 64.1% of study participants. The etiology of anemia among women of reproductive age is menstrual blood loss because these women are at high risk. Many of the research studies support that Menstruation is one of the main causes of iron deficiency in women (Blanco-Rojo et al., 2014).

Awareness about good diet and balanced diet is limited among young girls. In general, girls while they are with their friends, love to eat a lot of fried foods, pizza, and burgers and are not actively involved in physical activities too. This is the scenario among our study participants. This finding is in line with the study done by Shill et al. (2014). Their study also found that junk food consumption was significantly high and food habits were not proper. In our study, 25.7% were overweight and obese with BMI above 25. Obesity decreases iron absorption (Saad and Qutob, 2022) Multiple studies have revealed that overweight increase the risk of iron deficiency anemia among girls (Mujica-Coopman et al., 2015; Pinhas-Hamiel et al., 2003).

Our study also reported adequate knowledge (64.9%) regarding anemia. However, the percentage of inadequate knowledge about iron-rich foods (85.9%) is very high and these results are supported by the study done by Johnson et al. (2016) also, showed that in the pretest 53.3% had inadequate knowledge and 46.7% had moderate knowledge on prevention of iron deficiency anemia. These results are in the same line with Singh et al. (2019), who indicated that there was a lack of study subjects' knowledge regarding anemia. Moreover, it was mentioned by M'Cormack and Drolet (2012) that women of reproductive age have inadequate knowledge of IDA and its prevention.

Among the study participants in computer science and engineering courses, 77.1% had adequate knowledge of iron deficiency anemia, it shows these students with higher Education were able to be aware of iron deficiency anemia. These results are in line with Theng et al. (2017) revealed a high level of knowledge on the consumption of iron supplements among pregnant women in Kuala Terengganu and it was due to the point that the pregnant women had a higher education.

We observed a significant Negative correlation between age and BMI. This result was supported by Zimmermann et al. (2008) who studied the relationship between obesity and iron deficiency. In their study, 22% of the women were considered overweight, and 20% were iron deficient. Awareness about good diet and balanced diet is limited among young girls. A study was done on the prevalence of Iron-deficiency Anemia among University Students in the Noakhali Region, Bangladesh, by Shill et al. (2014) also recommended conducting an awareness

program to improve their knowledge of iron deficiency and its preventive measures.

Therefore, it is felt a need to provide an educational program for young girls regarding iron deficiency anemia.

This research has found that most of the female students in the study sample who were anemic reported inadequate intakes of iron-rich diet. Awareness strategies need to be in-corporate into their extracurricular activities at the College level. Spreading knowledge of, iron deficiency anemia and related complications will motivate individuals to take iron rich balanced diet. This is an important step in preventing, iron deficiency-related complications. The reproductive age group of women must be exposed to discussions on obesity and anemia. Screening for anemia with increased BMI should be recommended

5. Conclusion

In order to effectively manage self-care and prevent iron deficiency anemia among young girls, the acquisition of knowledge is crucial. Therefore, it is imperative to intensify efforts in developing and implementing educational programs that empower individuals to adopt iron-rich diets and enhance their understanding of iron deficiency anemia. These findings have significant implications for the design of health education programs, emphasizing the necessity of focusing on knowledge dissemination and self-care management in addressing iron deficiency anemia among young girls.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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