Effect of Dietary Pattern on the Presence of Iron Deficiency Anemia among Adolescent Girls

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ABSTRACT

Iron deficiency anemia (IDA) affects the vast majority of individuals worldwide. It appears that teenage girls are also more likely to have IDA. This study sought to determine the impact of dietary habits and patterns on teenage girls' iron deficiency anemia. 100 teenage females between the ages of 12 and 18 were the subjects of case-control research. Outpatient clinics were used to identify the 50 anemic cases and the 50 non-anemic controls. 68 percent of anemic people and 80 percent of non-anemic people, respectively, had a Z score between +1 and -2. For their age and sex, more than half of anemic and non-anemic girls had normal BMIs (50.8 percent & 52.5 percent respectively). Comparatively to non-anemic patients, anemic subjects have lower socioeconomic status. Females who were not anemic performed better academically than anemic girls, with significant differences. Girls who were anemic had poorer nutritional habits than non-anemic girls. Females with anemia had more parasites than girls who weren't anemic (64 percent & 34 percent respectively). When compared to non-anemic controls, anemic individuals typically have reduced intakes of calories, and macronutrients, particularly protein and fat, iron, and vitamin C. About 62 and 40 percent, respectively, of anemic girls, drank tea and coffee every day. Last but not least, poor eating habits contributed to the development of IDA. The majority of teenage females consumed inadequate calcium. Adolescent females, especially anemic ones, were strongly advised to receive nutritional instruction.

Key words: *Adolescent- Iron Deficiency Anemia- Dietary Pattern*

INTRODUCTION:

The majority of people worldwide, in both industrialised and developing nations, are affected by nutritional anaemia, which has serious negative effects on human health and varies in prevalence. In terms of the total global illness burden, it ranks as the second most common cause of disability. Iron deficiency anaemia (IDA), which accounts for around 50% of all anemias, is the most prevalent kind of nutritional anaemia. [(**Al-Ghwass, et al., 2011)** and **Chandra et al., 2015)].** Hemoglobin (Hb) and hematocrit measures are the laboratory tests most frequently employed in clinical and public health settings for screening of IDA due to the fact that the majority of anemias in children and women of reproductive age are attributable to iron deficiency. These measurements represent the body's functional iron levels **(CDC 2002).** Other significant risk factors for IDA in low-income nations include poor vitamin C intake, diets high in iron absorption inhibitors, and infrequent meat eating (**Javadzadeh, et al., 2020).** The primary impacts of IDA include an increased risk of maternal and infant mortality, followed by detrimental effects on children's physical and mental development, impaired learning and/or working ability, and influences on teenage and adult reproductive health. **Bandyopadhyay et al., (2017).** Red blood cells with unusually low haemoglobin or hematocrit levels, abnormally tiny size, and a diminished ability to carry oxygen to bodily cells and tissues are the hallmarks of IDA. **WHO (2018)** states that IDA is regarded as a public health issue. **Al-Ghwass, et al., (2016)** and **Chandrasekhar, et al., (2015).** Inadequate vitamin C intake, diets high in iron absorption inhibitors, and infrequent meat consumption are other factors. Due to the time of fast growth and development that occurs throughout adolescence, which results in higher requirements for both micro and macronutrients, it appears that teenage females are also at an increased risk of developing IDA, especially in girls who experience menstruation (**Işk Balc et al., 2017)** and (**Shedole et al., 2012).** Teenage girls also need more iron to compensate for their monthly blood loss (**Sindhuja and Bhuvaneshwari 2022)**. Among terms of disability-adjusted life years, IDA is thought to be the leading global cause of morbidity and death in teenage females (**WHO 2017).** Reduced academic potential, poorer wellbeing and productivity at home or in the community, as well as an increase in maternal and newborn illness and death for teenagers who become pregnant are all disadvantages associated with IDA (**WHO 2011).** Additionally, this group's iron status and haemoglobin levels may be risk factors for maternal anaemia (**DHS, 2014)** and **(Sam and Udaykumar 2017)**. Inadequate consumption of nutrient-rich foods, a lack of access to health care, and ineffective utilisation of the available micronutrients as a result of infectious diseases, particularly malaria and helminthic infections, are all factors that contribute to the high prevalence of IDA in developing countries (**Low et al., 2016).** Additional risk factors for the development of IDA include poor dietary practises and bad eating habits (**USDA 2012)**. Additionally, among the major risk factors in low-income countries are the increased consumption of diets high in phytates and dietary fibres, such as those found in cereals and/or legumes, frequent consumption of foods or beverages like coffee and tea that bind iron at the same time as inadequate vitamin C intake, and the presence of hookworm, schistosomiasis, and malaria, which all increase the risk of IDA by causing intravascular hemolysis with haemoglobin. About 10 to 15 percent of elemental iron is absorbed from heme iron and non-food sources such iron salts or saccharates, whereas less than 5 percent of elemental iron from vegetable sources is absorbed. A lack of iron may cause a source's percentage of iron to be absorbed to double (**Willet, 2015)**. Additionally, there was a substantial unfavourable link between higher tea drinking, particularly after meals, along with the consumption of chips and soft beverages (**Woodruff and Duffield 2007)** and (**Butte, et al (2002).**

In the human life cycle, adolescence is a sensitive time for the onset of nutritional deficiencies, especially IDA (**WHO 2017)**. 24,8 percent of people worldwide are impacted by it. Egyptian females aged 5 to 19 are somewhat more likely than boys in the same age range to be anaemic, with 21% of girls and 18% of boys receiving the anaemic case diagnosis, respectively **WHO,**

(2011). Adolescent girls are also dealing with a number of dietary issues that not only influence their growth and development but also their ability to support themselves as adults. Inadequate iron intake, poor diet, parasitic infections, irregular eating patterns brought on by body image concerns, and menstrual blood loss among girls, especially those between the ages of 12 and 15, put adolescent girls at risk for developing IDA. This risk is especially high for girls between the ages of 12 and 15, as this is the time period where the peak of the iron requirement occurs (**Chandrasekhar et al, 2016).** Adolescent girls' main IDA prevention may be accomplished by educating them about their sex-specific nutritional needs, particularly the advantages of iron-rich foods and healthy eating and lifestyle choices (**Shedole, et al., 2017)**.

Dietary tactics can boost iron levels and aid in IDA recurrence prevention. Lean meat, fish, and poultry diet can be increased to boost iron status since they contain more iron and help the body absorb the less accessible plant sources of iron (e.g., grains, dried peas and beans, spinach). The absorption of iron from non-heme sources is increased when vitamin C-rich foods including guava, citrus and fortified fruit juices, lemon, citrus fruit, strawberries, cantaloupe, green peppers, broccoli, and cabbage are consumed with meals. In comparison to non-heme iron, heme iron is two to three times more absorbable (**Skikne and Baynes 1994).** The types of additional foods consumed at the same meal have a significant impact on the bioavailability of non-heme iron. Heme iron and vitamin C increase the absorption of iron; tannins (found in tea), phytates (found in bran), and calcium hinder it (in dairy products) (**Bothwell, 1995) and (Siegenberg, et al., 1991).** Fish, poultry, and meat are excellent sources of bioavailable iron. Although "enhancers" such the organic acids citric, malic, or ascorbic acid (i.e., vitamin C) may promote the absorption of iron from these diets, plant sources of iron are often less efficiently absorbed (**Allen, 2008).** Additionally, combining meals containing non-haem iron with foods containing haem iron from animal sources may boost the total bioavailability and absorption of iron from a meal. These foods include beef, lamb, hog, liver, and chicken (**Tontisirin, et al, 2002).** The bioavailability and absorption of iron can also be enhanced by food processing techniques such as soaking, fermentation, germination, heat processing, and mechanical processing (**Hotz and Gibson, 2007).** Last but not least, avoiding recognised combinations of non-haem iron inhibitors, including tea or coffee with meals, will increase iron absorption (**Tontisirin, et al, 2002).** The optimum method for boosting iron status will involve a variety of tactics, including increasing the number of iron-rich foods in the diet, adding "enhancers," avoiding "inhibitors," and taking advantage of advantageous processing procedures.

The purpose of this study was to determine how dietary habits and patterns affected the presence of iron deficiency anemia in adolescent girls.

Study design:

Observational case control study.

SUBJECTS AND METHODS:

Case-control research was undertaken on 100 teenage girls between the ages of 12 and 18; 50 anemic cases and 50 non-anemic controls were chosen from the outpatient clinics of the National Nutrition Institute in Cairo, Egypt.

***Inclusion criteria*:**

- Adolescent females aged from 12 to 18 years.
- Free from chronic diseases such as diabetes, cancer, renal diseases or liver diseases, etc.
- No recent surgery carried out for the last 6 months at least.
- Not receiving long-acting medical treatment such as insulin and antipsychotic drugs.
- Not smoking or receiving iron supplements for at least 3 months before.

Methods:

According to **WHO, (2011)** criteria for IDA diagnosis, adolescent females with hemoglobin concentrations below 12 g/dl were classified as anemic, and those who had hemoglobin concentrations over 12 g/dl were chosen as non-anemic. **WHO (2005),** reported that anthropometric assessment using Z-scores for age, sex, weight, and height. Data on sociodemographic and medicine were compiled. All subjects underwent thorough dietary evaluations to determine their dietary patterns, which included 24-hour recall, food frequency, and dietary history. The analyzed data from the 24-hour recall was then compared to the suggested daily allowances for each subject's age and sex for calories, macronutrients, and specific micronutrients. Hemoglobin and helminth levels were assessed biochemically and compared to normal ranges.

***A- Anthropometric Measurements*:**

Anthropometric measurements were carried out according to **Jelliffe, (1966);** weight and height were measured and BMI was calculated according to the following formula: BMI = weight (kg)/height (m^2).

- **Weight:** a participant was weighed wearing light clothes and without shoes, using beam balance to the nearest 0.1 kg.
- **Height:** was measured with the subject's head in the Frankfort plane and without shoes to the nearest 0.1 cm.

Assessment of Weight and Height Status:

- Height status was assessed using height for age and sex Z- scores. The following categories of height status were determined:
- Stunting: <-2SD. - Normal: -2 to + 2SD. - Tall: > + 2SD.
- Wasting: <- 2SD. - Normal: -2 to + 2SD. - Overweight: > + 2SD.
- Weight status for adolescent girls from 12-18 years was assessed using body mass index "BMI"/age and sex. The following categories of weight status were determined:

- **Normal (+1: -2 Z score), Over (> +1: +2 Z score), Obese (> +2 Z scores) or Thin (< -2 Z score).**

***B- Biochemical*:**

Blood Samples:

A venous blood sample was collected from each of the selected subjects. With the collected blood, haemoglobin was determined according to ***Bain et al., (2012)***

Stool analysis:

Took fresh stool samples to detect parasites in the stools. Under a microscope, parasitic illnesses like amoeba ascariasis, hookworm, and pinworm were identified by looking for worm larvae or eggs in the faces. The procedure involved dyeing a sample of sieved faces and seeing it under a microscope. To calculate the number of eggs, the total amount of stained eggs was counted.

C- Clinical Assessment:

If any are found during a clinical examination, they should be noted on a checklist of typical clinical signs of significant nutritional deficits. In order to identify any signs of nutritional inadequacy, a comprehensive medical history was obtained from the parents and all adolescent females underwent a full physical examination from head to toe.

D- Dietary Assessment (dietary questionnaire):

Methods used for measuring the food consumption of the families were classified into two major groups:

1- Quantitative daily consumption (Twenty-four-hour recall) method:

In this procedure, each mother was asked to recollect the precise foods and drinks her child had consumed over the previous 24 hours. Consumption amounts of foods and beverages were in standard household measurements and translated to grams. The **National Nutrition Institute's (2006)** food composition tables were used to calculate each child's daily intake of calories and nutrients. By comparing the child's calorie and nutrient consumption with the recommended daily allowances (RDA) for his age category, the adequacy of the diet that was consumed was evaluated. Analysis was based on the percentage of RDA for nutrients and energy (50%, 50–75, 75–100, and > 100%).

2- Qualitative Method for Assessment of Dietary pattern "Food Frequency Questionnaire" and Diet History Questionnaire:

This method was used to obtain qualitative descriptive information about some dietary practices plus usual food and beverage consumption pattern per week (less than 3 times per week or equal to or more than 3 times per week or daily intake). Recommended Daily Allowances

(**FAO/WHO/UNU, 2004)** of iron were based on its bioavailability according to the daily diet content of hem iron source in grams (Meat, poultry, and fish) or ascorbic acid (mg):

- Low bioavailability: < 30 g of hem iron source or < 25 mg of ascorbic acid.
- Intermediate bioavailability: 30-90 g of hem iron source or 25 -75 mg of ascorbic acid.
- High bioavailability: > 90 g of hem iron source or > 75 mg ascorbic acid.

Statistical analysis:

Data were statistically described in terms of mean ± standard deviation (±SD), or frequencies (number of cases) and percentages when appropriate.
Statistical analysis was performed using MINITAB 16 software. The following tests were used: Frequency distributions, per-centage distributions, Means ± standard deviation, t-tests, and chi-square test.

RESULTS AND DISCUSSION:

Because anemic individuals often had lower socioeconomic levels than healthy subjects, **table (1)** results showed significant variations in socioeconomic levels between anemic and non-anemic adolescent girls. According to **Tayel and Ezzat (2015),** who studied a sample of 11:16-year-old students in Alexandria, the high prevalence of anemia among learner in rural compared to urban schools can be explained by the fact that adolescents living in rural areas are more susceptible to parasitic infections and have lower economic statuses than their urban counterparts. Another study by **Verma and Baniya (2022)** found that girls with lower socioeconomic status were more likely to have anaemia than those of older age and higher socioeconomic status. Another study conducted in Kenya in 2011 by **Abuya, et al., (2011)** observed a strong correlation between social-economic status and child nutritional status. Contrary to this finding, **Assaf (2015)** discovered that adolescents in rural versus urban schools had significantly lower overall prevalence of IDA. In addition, **Chaturvedi et al. (2017)** confirmed that neither educational nor economic status appeared to have a significant impact on the prevalence of anemia in adolescent girls. Additionally, the findings demonstrated significant differences between anemic and non-anemic girls in terms of their educational performance levels, with the majority of non-anemic girls having great performance levels than most anemic girls having acceptable levels. These findings concur with those of **Mohamed, et al., (2018)** who found that, while exactly half (50%) of the non-anemic group received very good scores in a school report, the highest percentage of students in the anemic group (36.7 percent) obtained good scores, with a statistically significant difference between the two groups. The findings corroborated those of **Jauregui (2014),** who came to the conclusion that there is a significant relationship between Hb level and academic performance, as well as those of **Isik, et al., (2012)** who stated that IDA is one of the common problems among students that can have a negative impact on their academic achievement. This could be because brain enzymes associated with behavior and cognition are the first bodily systems to be impacted by IDA (**Abbaszadeh and Soleimani, 2011).** More research has revealed that teenagers with anemia perform less well on standardized arithmetic tests and have impaired verbal learning and recall (**Jitendra, et al., 2014)**. Teenagers with IDA may experience diminished learning capacity, awareness, and concentration **(Stang and Story 2015)**. However, the findings of earlier studies did not agree with those of **Ferrari et al., (2011),** who came to the conclusion that neither intelligence nor educational performance among European adolescents showed significant associations with iron status. They explained this by looking at the results of just one test to measure educational realization.

Regarding several food habits, the findings indicated that anemic girls had worse dietary habits than non-anemic girls since most anemic girls eat less than three meals daily, don't usually eat breakfast, and drink tea and/or coffee direct after meals every day. These data are compatible with research on Italian teenagers by **Ferrari, et al. (2011),** who showed that 80% of anemic individuals skipped breakfast. **Chaturvedi, et al. (2017),** discovered a stronger link between post-meal tea and coffee drinking and a higher frequency of IDA in females. Moreover, **Tayel and Ezzat (2015)** noted that Egypt's high prevalence of IDA among adolescents is primarily caused by poor dietary habits. Only about 10% of anemic adolescent girls ate three meals a day, according to **Mohamed et al. (2018),** but over 75% skipped one or more. This may be because they exceed breakfast or dinner with their families. Furthermore, a study conducted in Egypt by **Elkady, et al., (2020)** found that anemic patients' risk of H. pylori infection was considerably increased by eating less frequently, drinking tea, and eating a high-protein diet. The same outcome was also reported by a Malaysian study carried out by **Foo, et al., (2004)**. As claimed by **Mohamed, et al., (2018),** drinking tea immediately after meals was a prevalent practice among anemic adolescent girls in Egypt and many families. As maintained by **Thankachan et al., (2008),** one of the primary variables that restrict iron absorption, particularly in low-income families who depend on a plant-based diet, is drinking tea right following meals. Additionally, a finding from **Fan (2016)** showed the majority of IDA cases consuming tea just after meals were consistent with the findings of the current study. On the other hand, **Lestari et al., (2020),** came to the conclusion that post-meal consumption of hem sources and non-hem, fruit, vegetables, and tea was connected with anemia occurrence in teenage girls. **Rahfiludin, et al. (2021)** also claimed that consuming tea or drinking tea and/or coffee was not associated with IDA.

Statistical information from **table 2,** the majority of the subjects under study were of average height for their age and gender, with about 70% of anemic girls and 82% of non-anemic girls having Z scores between +2 and -2. However, there were more stunted subjects among anemic girls than non-anemic ones, with 18% having -2 Z scores compared to only 4% of non-anemic girls. These findings are consistent with those of **Kounnavong, et al., (2020),** who found that 11.8 percent of anemic participants stunted. While, a study by **Lestari, et al. (2020)** found that teenage girls with underweight nutritional status had higher anemia rates (10.7%) than those with overweight nutritional status (2.4 percent). A similar study was conducted by **Kurniawan, (2006)** who found that the greater number of adolescent girls, who suffered from anemia had underweight nutritional status (44.2%). A study was conducted by **Kanodia, (2016),** in Nepal involved 433 adolescent girls and found no significant relationship between nutritional status and anemia.

Regarding weight status, results showed that most of the subjects had normal BMI per age and sex as 68% of anemic and 80% of non-anemic had between +1: -2 Z scores respectively. These results agreed with **Chaturvedi, et al, (2017)** who concluded that the plurality (91.7%) of girls have normal BMI. More than half of anemic and non-anemic girls had normal BMIs for their ages, (50.8

% & 52.5 % respectively) according to research by **Mohamed et al., (2018).** These findings corroborated those of **Kounnavong, et al., (2020)**, who found that among the study subjects, 14.9% had BMIs greater than a +2 Z score per age and sex, while 3.7% were underweight. The opposite was discovered by **Seyoum, et al., (2019),** who discovered that 35% of adolescent girls were underweight.

Figure 1's findings revealed that the prevalence of parasites was higher in anemic girls than other healthy girls, with ameba presence being the most common in the two groups (64 percent of anemic girls had at least one sort of parasite, compared to just 36 percent of non-anemic girls). These findings assured those of studies by **Verma et al. (2013); Mohamed, et al. (2018),** which demonstrated that anemia was more common in school-age girls who had intestinal parasite infections than in non-infected girls. Anemia in the early teenage group may be caused by parasite infestation in addition to food choices. This could result from the fact that the majority of intestinal parasites have been linked to blood loss and/or red cell damage according to **Chaturvedi et al. (2017).**

Table 3's findings related to the role of dietary intake showed that there were significant differences between anemic and non-anemic girls, with nearly half of anemic girls (48%) having unacceptable consumption, particularly from energy and carbohydrates, and more than half of non-anemic girls receiving adequate amounts (58% and 56%), respectively. Likewise, there was a major difference in the amount of protein consumed, with nearly three-quarters of non-anemic girls (72%) consuming enough protein compared to only 46% of anemic girls. Further, findings found that more than half of both groups consumed insufficient fat. These data are compatible with those of **Merita, et al., (2018)** who found that average fat consumption was below recommended daily allowances (RDA), which may result in insufficient energy. This finding was also supported through an Indonesian study by **Astuti (2010),** which found that the majority of the participants (82.7%) consumed insufficient amounts of fats and that the average intake of protein was low compared to the RDA. Low protein consumption may be related to adolescent girls' propensity for snacking. A substantial link between protein intake and IDA was shown in prior studies.

Results of **table 4** revealed that anemic girls consumed less iron and vitamin C than non-iron deficiency girls, with anemic girls having levels that were respectively unsafe and unacceptable in 16 percent and 46 percent of cases, while non-anemic girls had levels that were only 2 percent and 6 percent of cases. When comparing iron inadequacy and non-anemic girls who consumed acceptable iron, 56 percent, and 28 percent, respectively, were respectively consumed enough iron. With regard to vitamin C, there were significant differences between anemic and non-anemic girls. Around 24 % and 38 % of anemic girls consumed vitamin C at unsafe and unacceptable levels, respectively, while 38 % of non-anemic girls consumed vitamin C at acceptable levels and only 12 percent did so. These results are in accordance with those of **Mohammed et al., (2018**), who revealed that around one-fifth of anemic adolescent females consumed less vitamin C than was required. The same study also demonstrated that the non-anemic girls consumed a lot of vitamin C every day. The intake of students who were anemic, however, was noticeably lower. Additionally, non-heme iron, which has a lower bioavailability, made up the majority of the iron consumed by the most investigated participants

As most anemic and non-anemic girls received an inappropriate amount of calcium (about 88 percent and 58 percent of them, respectively), **Figure 2** indicated no statistically significant differences in calcium intake adequacy. While only 4% of anemic girls and 28% of non-anemic girls' intake an adequate amount of calcium. These findings are consistent with those of **Rahayu and Indarto (2020),** who explored that the mean daily intakes of energy, iron, calcium, and zinc in both groups fell below the RDA. The case group also had a lower intake of energy, vitamin C, and zinc than the control group, though these differences were not statistically significant.

Findings in **table 5** regarding the frequency of consumption of certain foods that may limit iron absorption showed that most anemic girls eat these foods more frequently than normal girls, with about 62 percent and 40 percent of anemic girls drinking tea and/or coffee daily, respectively. While only around 42% and 26% of non-anemic people used it daily. The same was true for junk food and soft drinks, which were consumed daily by anemic girls at a rate of 60 and 44 percent, respectively, compared to only 24 and 26 percent of control girls. In addition to their high daily intake, many anemic girls also consumed these meals more than three times per week: 24 percent, 28 percent, 26 percent, and 32 percent, respectively, took tea, coffee, junk food, and soft drinks. While just 8%, 18%, 20%, and 22% of non-anemics ate these items more than three times each week, respectively. These outcomes are in line with those of **Mazher (2015),** who discovered that drinking tea or coffee after meals is a routine practice for 13% of respondents and reduces the bioavailability of dietary iron. These findings corroborated those **of Mohamed, et al., (2018)** who reported that only half (47.5%) of anemic students drank tea and that less than a fifth (19.2%) of non-anemic students enjoyed it. IDA is linked to poor eating habits, such as low consumption of iron-rich foods or foods that enhance iron absorption (such as vitamin C-rich foods), and high consumption of foods that inhibit iron absorption. Additionally, about half (51.0 percent) of anemic students and only (22.4 percent) of non-anemic students consumed tea more than once per day with a statistically significant difference between both groups. According to **Chaturvedi et al., (2017),** 32% of respondents frequently drank tea or coffee after meals, and there was a stronger correlation between this behavior and a greater chance of IDA in adolescent girls.

CONCLUSION:

Girls who are anemic and those who do not posse anemia have significant dietary and lifestyle disparities. Because IDA is linked to poor eating practices, such as consuming a lot of tea, coffee, and junk food while eating little iron-rich food or food that promotes iron absorption (such as foods high in vitamin C). Therefore, nutritional education interventions—especially for anemic girls—were strongly advised.

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Table 1: distribution of socioeconomic, educational performance level and some dietary practices among anemic and non-anemic subjects

Parameters		Anemic		Non-anemic		Total		P value
		No	%	No	%	No	%	
Socioeconomic level	**Low**	15	30.0	9	18.0	24	24.0	0.081
	Moderate	24	48.0	35	70.0	59	59.0	
	High	11	22.0	6	12.0	17	17.0	
Educational performance Level	**Acceptable**	19	38.0	5	10.0	24	24.0	0.012
	Good	6	12.0	9	18.0	15	15.0	
	Very Good	9	18.0	15	30.0	24	24.0	
	Excellent	16	32.0	21	42.0	37	37.0	
No of meals per day	**≥ 3 meals**	18	36.0	33	66.0	51	51.0	0.002
	< 3 meals	32	64.0	17	34.0	49	49.0	
Taking breakfast	**Yes**	21	42.0	38	76.0	59	59.0	0.001
	No	29	58.0	12	24.0	41	41.0	
Drinking tea and/or coffee after meal directly	**Yes**	27	54.0	15	30.0	42	42.0	0.000
	No	15	30.0	8	16.0	23	23.0	
	At any time	6	12.0	7	14.0	13	13.0	
	Don't drink	2	4.0	20	40.0	22	22.0	

Table 2: distribution of anthropometry z-score among anemic and non-anemic subjects

Parameters		Anemic		Non-anemic		Total		P value
		No	%	No	%	No	%	
Height per age & sex	**Normal (+2: -2 Z score)**	35	70.0	41	82.0	76	76.0	0.082
	tall (> +2 Z score)	6	12.0	7	14.0	13	13.0	
	stunted (< -2 Z score)	9	18.0	2	4.0	11	11.0	
BMI* per age & sex	**Normal (+1: -2 Z score)**	34	68.0	40	80.0	74	74.0	0.505
	Over (> +1: +2 Z score)	5	10.0	4	8.0	9	9.0	
	Obese (> +2 Z scores)	4	8.0	3	6.0	7	7.0	
	Thin (< -2 Z score)	7	14.0	3	6.0	10	10.0	

Figure 1: Presence of parasites according to anemic and non-anemic subjects

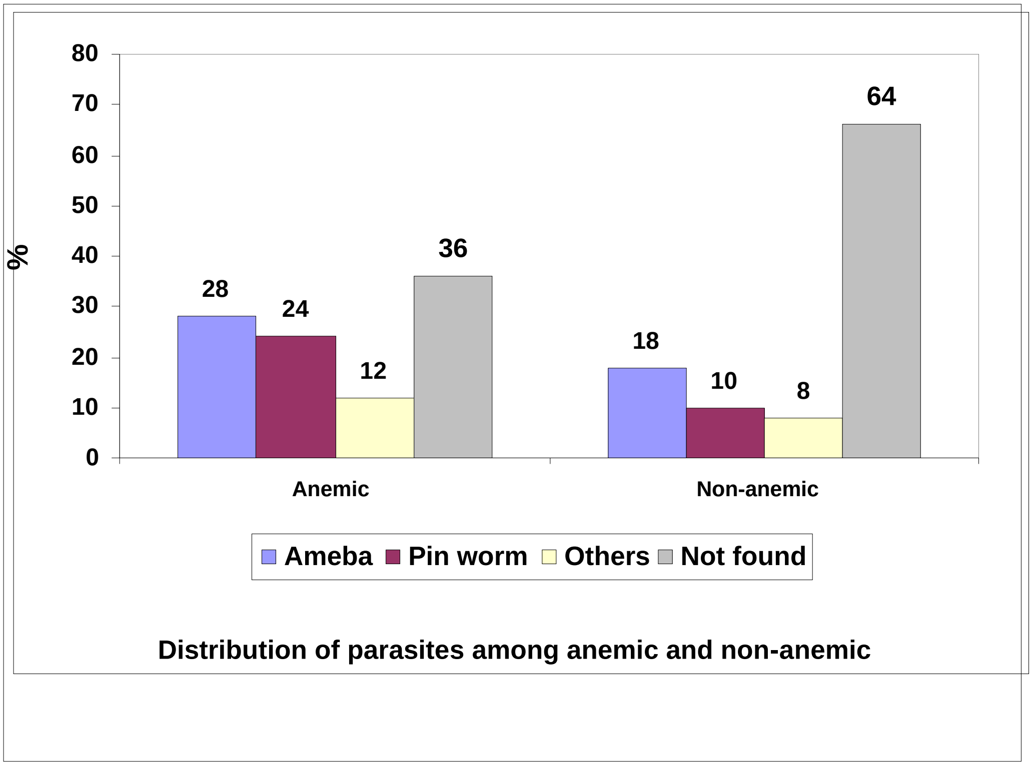

Table 3: distribution of calories and macronutrients adequacy among anemic and non-anemic subjects

Parameters		Anemic		Non-anemic		Total		P value
		No	%	No	%	No	%	
Calories	**Unsafe**	13	26.0	6	12.0	19	19.0	0.001
	Unacceptable	24	48.0	11	22.0	35	35.0	
	Acceptable	11	22.0	29	58.0	40	40.0	
	Over consumption	2	4.0	4	8.0	6	6.0	
Carbohydrate	**Unsafe**	12	24.0	7	14.0	19	19.0	0.001
	Unacceptable	24	48.0	10	20.0	34	34.0	
	Acceptable	12	24.0	28	56.0	40	40.0	
	Over consumption	2	4.0	5	10.0	7	7.0	
Protein	**Unsafe**	5	10.0	1	2.0	6	6.0	0.001
	Unacceptable	16	32.0	3	6.0	19	19.0	
	Acceptable	23	46.0	36	72.0	59	59.0	
	Over consumption	6	12.0	10	20.0	16	16.0	
Fat	**Unsafe**	16	32.0	8	16.0	24	24.0	0.081
	Unacceptable	13	26.0	10	20,0	23	23.0	
	Acceptable	14	28.0	26	52.0	40	40.0	
	Over consumption	7	14.0	6	12.0	13	13.0	

< 50% unsafe consumption 50-<75% unacceptable consumption
75-<120% acceptable consumption ≥ 120% over consumption

Table 4: distribution of Iron and Vitamin C adequacy among anemic and non-anemic subjects

Parameters		Anemic		Non-anemic		Total		P value
		No	%	No	%	No	%	
Iron	**Unsafe**	8	16.0	1	2.0	9	9.0	0.000
	Unacceptable	23	46.0	3	6.0	26	26.0	
	Acceptable	14	28.0	28	56.0	42	42.0	
	Over consumption	5	10	18	36.0	23	23.0	
Vitamin C	**Unsafe**	12	24.0	6	12.0	18	18.0	0.007
	Unacceptable	19	38.0	8	16.0	27	27.0	
	Acceptable	12	24.0	19	38.0	31	31.0	
	Over consumption	7	14.0	17	34.0	24	24.0	

< 50% unsafe consumption 50-75 unacceptable consumption
75-120% acceptable consumption ≥ 120% over consumption

Figure 2: distribution of calcium adequacy among anemic and non-anemic subjects

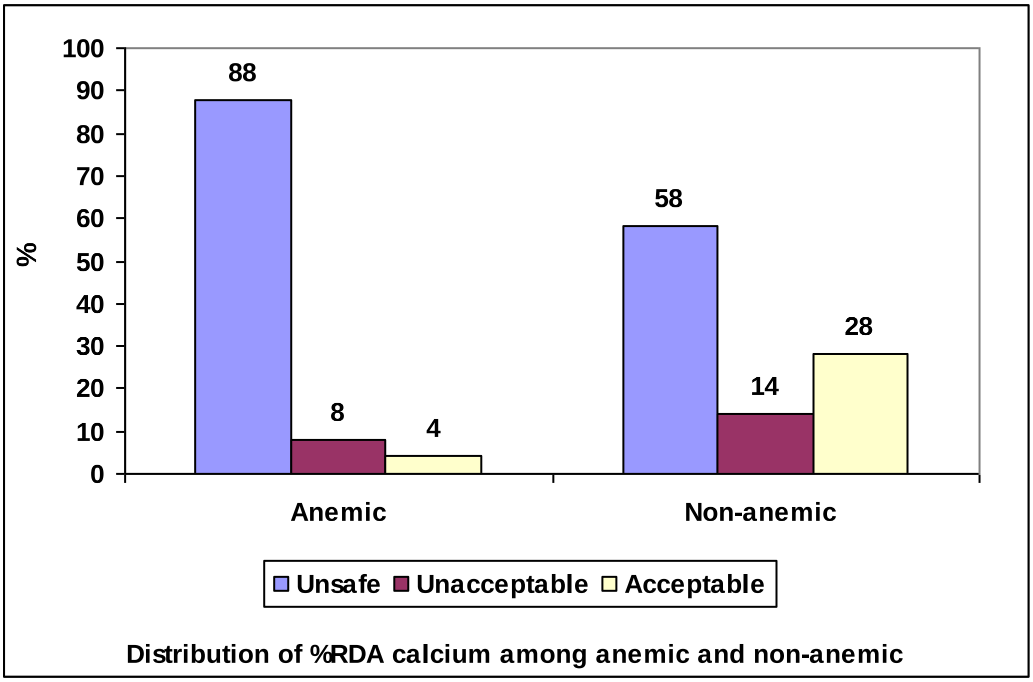

Table 5: distribution of some foods that may inhibit iron absorption according to anemic and non-anemic subjects.

Parameters		Anemic		Non-anemic		Total		P value
		No	%	No	%	No	%	
Tea	**Daily**	31	62.0	21	42.0	52	52.0	0.000
	Weekly > 3 times	12	24.0	4	8.0	16	16.0	
	Weekly ≤ 3 times	5	10.0	5	10.0	10	10.0	
	None	2	4.0	20	40.0	22	22.0	
Coffee (various)	**Daily**	20	40.0	13	26.0	33	33.0	0.049
	Weekly > 3 times	14	28.0	9	18.0	23	23.0	
	Weekly ≤ 3 times	10	20.0	11	22.0	21	21.0	
	None	6	12.0	17	34.0	23	23.0	
Junk foods	**Daily**	30	60.0	12	24.0	42	42.0	0.000
	Weekly > 3 times	13	26.0	10	20.0	23	23.0	
	Weekly ≤ 3 times	5	10.0	22	44.0	27	27.0	
	None	2	4.0	6	12.0	8	8.0	
Soft drinks	**Daily**	22	44.0	13	26.0	35	35.0	0.021
	Weekly > 3 times	16	32.0	11	22.0	27	27.0	
	Weekly ≤ 3 times	9	18.0	14	28.0	23	23.0	
	None	3	6.0	12	24.0	15	15.0	

تأثير النمط الغذائي على وجود انيميا نقص الحديد بين الفتيات المراهقات

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الملخص العربي:

يؤثر فقر الدم الناجم عن نقص الحديد (IDA) على الغالبية العظمى من الأفراد في جميع أنحاء العالم. يبدو أن المراهقات أكثر عرضة للإصابة بمرض IDA. هدفت هذه الدراسة إلى تحديد تأثير العادات والأنماط الغذائية على فقر الدم الناجم عن نقص الحديد لدى الفتيات المراهقات. خضع 100 مراهقة تتراوح أعمارهم بين 12 و 18 عامًا لأبحاث التحكم في الحالات.من العيادات الخارجية للمعهد القومي للتغذية حدد 50 حالة فقر الدم و 50 حالة ضابطة ليس لديها فقر الدم. 68 في المائة من مرضى فقر الدم و 80 في المائة من الأشخاص غير المصابين بفقر الدم ، على التوالي ، حصلوا على درجة Z بين +1 و -2. بالنسبة للعمر والجنس ، كان لدى أكثر من نصف الفتيات المصابات بفقر الدم وغير المصابات بفقر الدم مؤشر كتلة جسم طبيعي (50.8 في المائة و 52.5 في المائة على التوالي). بالمقارنة مع المرضى غير المصابين بفقر الدم ، فإن الأشخاص المصابين بفقر الدم لديهم حالة اجتماعية واقتصادية أقل. الإناث اللواتي لم يعانين من فقر الدم كان أداءهن الأكاديمي أفضل من الفتيات المصابات بفقر الدم ، مع وجود اختلافات كبيرة. كان لدى الفتيات المصابات بفقر الدم عادات غذائية أسوأ من الفتيات غير المصابات بفقر الدم. الإناث المصابات بفقر الدم لديهن طفيليات أكثر من الفتيات غير المصابات بفقر الدم (64 في المائة و 34 في المائة على التوالي). عند المقارنة بالضوابط غير المصابة بفقر الدم ، عادة ما يكون لدى الأفراد المصابين بفقر الدم تناول كميات منخفضة من السعرات الحرارية والمغذيات الكبيرة ، وخاصة البروتينات والدهون والحديد وفيتامين سي. ويشرب حوالي 62 و 40 في المائة على التوالي من الفتيات المصابات بفقر الدم الشاي والقهوة كل يوم. أخيرًا : الممارسات الغذائية غير الجيدة تعتبر عامل خطورة اضافي لوجود انيميا نقص الحديد. معظم الفتيات المراهقات يتناولن مأخوذ غذائي غير كافى من الكالسيوم. توجد حاجة ماسة للتدخل بالتثقيف التغذوي للفتيات المراهقات خاصة من لديهن انيميا نقص الحديد

الكلمات الدالة: *المراهقات – انيميا نقص الحديد – النمط الغذائي*