



## Effectiveness of Instruction Program on Adolescent Girls' Dietary Habits Diagnosed with Iron Deficiency Anemia

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### ABSTRACT

**Objective(s):** To evaluate the eating habits of adolescent females' students and determine the effectiveness of an instructional program on those students about iron deficiency anemia according to serum iron level.

**Methodology:** Pre-experimental design, one group (pre-test and post-test) was carried out in this study at secondary schools in Kirkuk City for the period of April 11 to December 27, 2022. A non-probability (purposive) sample of (62) female students has been selected based on specific criteria. The study tool (a questionnaire) has been designed and constructed based on an extensive review of available literature and related studies. Face validity of the instrument is established through a panel of (13) experts in the different fields. These experts have more than 7 years of experience in their specialist and asked to review and evaluate the instrument format for its content, clarity and adequacy. On basis of their comments and suggestions, some modification was made and changes were performed. Then, the questionnaire was considered valid after taking into consideration their suggestions and recommendations. An instructional program of dietary habits has been given for students with iron deficiency anemia. Descriptive and Inferential statistics was employed to analyze the study data.

**Results:** Pre-test results from the study revealed that 54.8% of students had moderate Iron Deficiency Anemia. While the students' iron levels returned to normal in the posttest (53.2%). The majority of students (59.7%) had poor eating habits at the time of the pretest. While a healthy dietary pattern is present among most of the students (66.1%) at the posttest.

**Conclusion:** This study concluded that the nutrition education program proved a long-lasting strategy to build a good nutritional status and improves public awareness of this problem among the females' adolescents.

**Recommendations:** More work and creative solutions are needed to create and implement programs to prevent and control iron deficiency anemia in our country. A screening program for Iron Deficiency Anemia in adolescent girls and screening for iron deficiency in high-risk groups should be considered.

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## فاعلية البرنامج الإرشادي في العادات الغذائية لليافاعات المشخصات بفقر الدم الناجم بعوز الحديد

المستخلص:

**الاهداف:** تقويم عادات الغذاء للمراهقات وتقييم فعالية البرنامج الإرشادي للمراهقات حول فقر الدم الناجم عن نقص الحديد وفقاً لمستوى الحديد في الدم.

**منهجية البحث:** تم استخدام البحث الكمي و تصميم الدراسة التجريبية ، أجريت الدراسة على الطالبات المراهقات الملتحقات بمدارس كركوك الثانوية في الفترة من 11 نيسان 2022 حتى 27 كانون الأول 2022. تم تطبيق عينة غير احتمالية (هادفة) للحصول على أهداف الدراسة . وبلغت عينة الدراسة (62) طالبة شاركت في الدراسة. تم بناء و تصميم أداة الدراسة (الاستبيان) من خلال مراجعة شاملة للأدبيات المتوفرة والدراسات ذات الصلة . تم إثبات الصلاحية للأداة من خلال لجنة مكونة من (13) خبيراً في مختلف المجالات. يتمتع هؤلاء الخبراء بأكثر من 7 سنوات من الخبرة في اختصاصهم وطلب منهم مراجعة وتقييم تنسيق الأداة من حيث محتواها ووضوحها وكفايتها. على أساس تعليقاتهم واقتراحاتهم ، تم إجراء بعض التعديلات والتغييرات. تم تقديم برنامج تعليمي حول العادات الغذائية للطالبات المصابات بفقر الدم الناجم عن عوز الحديد . تم استخدام الإحصاء الوصفي والاستنتاجي لتحليل بيانات الدراسة .

**النتائج:** كشفت نتائج الاختبار الأولي من الدراسة أن (54.8%) من الطالبات لديهن فقر الدم الناجم عن نقص الحديد معتدل. في حين عادت مستويات الحديد لدى الطالبات إلى طبيعتها في الاختبار البعدي (53.2%). غالبية الطالبات (59.7%) لديهن عادات غذائية سيئة في وقت الاختبار القبلي. بينما يوجد نمط غذائي صحي في الاختبار اللاحق (66.1%). غالبية الطالبات (80.6%) يعانون من الصداع ، (82.3%) لديهم دورة شهرية تتراوح أعمارهم بين 13 و 14 عاماً ، و (29%) لديهم تاريخ مرضي لمرض فقر الدم الناجم عن عوز الحديد.

**الاستنتاجات:** وجدت هذه الدراسة أن معظم المشاركين (طالبات المراهقات) يمكنهن تحديد الأطعمة التي تحتوي على الحديد ، لكنهم يفتقرون إلى المدخول المناسب من الحديد ، بسبب عادات الأكل والنمط الغذائي.

**التوصيات:** مطلوب المزيد من الجهود والحوار المبتكرة لتطوير وتنفيذ برامج للوقاية من فقر الدم الناجم عن نقص الحديد ومكافحته. برامج التثقيف الغذائي.

**الكلمات المفتاحية:** برنامج إرشادي، العادات الغذائية، اليافاعات، فقر الدم الناجم بعوز الحديد.

### Introduction

Iron deficiency refers to the reduction of iron stores that precedes overt iron deficiency anemia or persists without progression. Iron-deficiency anemia is a more severe condition in which low levels of iron are associated with anemia and the presence of microcytic hypochromic red cells <sup>(1)</sup>.

Iron deficiency anemia (IDA) is a global health problem. It involves populations of all age groups and sexes <sup>(2)</sup>.

The high prevalence of Iron Deficiency Anemia among adolescents could also be explained by the lack of appropriate knowledge, attitudes, and practice regarding healthy nutrition <sup>(3)</sup>.

Anemia in adolescence causes reduced physical and mental capacity and diminished concentration in work and educational performance, and it also poses a major threat to safe future motherhood in girls <sup>(4)</sup>.

Dietary intake during adolescence contributes to lifelong eating habits and the development of early risk factors for disease in adulthood. WHO estimates the number of anemic people worldwide to be a staggering two billion, with approximately 50% of all

anemia attributable to iron deficiency<sup>(5)</sup>.

Adolescent diet affects both dietary patterns and the development of early disease risk factors in adults. One of the most crucial investments any society can make is to support the healthy development of teenagers. For the creation of effective educational and other intervention programs for teenagers, a deeper comprehension of food and eating habits is necessary<sup>(6)</sup>.

In Iraq, female adolescents constitute 24 percent total population. They are considered the future to safe guard our developing society. They have gained little attention within the health sector. Furthermore, little information is available on their health-related behaviors; therefore, such information is needed to highlight areas where they have gained little attention within the health sector. Furthermore, little information is available on their health-related behaviors; therefore, such information is needed to highlight areas where there is lack of data that makes it difficult to assess the importance of a potentially crucial issue related to the health and development of this age group <sup>(7)</sup>.

Prevention of iron-deficiency anemia among adolescent girls needs specific actions

like encouraging consumption of iron-rich foods through dietary change, nutritional education, treatment and prevention of parasitic infections, and weekly iron supplementation are needed<sup>(8)</sup>.

The current study aims to determine the effectiveness of an instructional program on adolescent girls about iron deficiency anemia.

### **Methodology**

**Pre-experimental design**, one group (pre-test and post-test) was carried out in this study at secondary schools in Kirkuk City for the period of April 11 to December 27, 2022.

A non-probability (purposive) sample of (62) female students has been selected based on the following criteria:

- Age group between 10 and 19 years, and who were willing to participate in the study.
- having an abnormal serum iron level (after laboratory investigation by researcher survey).
- Hereditary blood diseases were excluded from this study.
- Not menstruating at the time of the serum iron test.
- Hadn't had any recent surgery at least six months prior to the serum iron test.

Prior to data collection, the consent of students who were willing to participate in the study was obtained, and the Scientific Research Ethics Committee of the Baghdad College of Nursing granted ethical approval.

An instructional program of dietary habits has been given for students with iron deficiency anemia. It was divided into lectures, videos, and brochures and lasted for approximately 45 minutes. The content of the lectures was based on the WHO guidelines titled "Nutrition Anemia: Tools for Effective Prevention and Control" (WHO, 2017). PowerPoint presentations and videos were used to present the educational material, and the brochures were distributed at the end of each session. Lectures contained accurate,

updated, acceptable, and simple information about the definition of Iron Deficiency Anemia, manifestations, risk factors, consequences, epidemiological description, the association between dietary habits and Iron Deficiency Anemia, the benefits of performing good alternative habits and being free from Iron Deficiency Anemia, and sources of food that are related to Iron Deficiency Anemia.

The study tool (a questionnaire) has been designed and constructed based on an extensive review of available literature and related studies. The questionnaire consists of the following parts:

**Part I:** Socio-demographic information for students and their families.

**Part II:** This part related to student health status.

**Part III:** Students history of Iron Deficiency Anemia and laboratory investigations" (blood investigation for serum iron level).

**Part IV:** Evaluation of Students' Dietary Habits.

Face validity of the instrument is established through a panel of (13) experts in the different fields. These experts have more than 7 years of experience in their specialist and asked to review and evaluate the instrument format for its content, clarity and adequacy. On basis of their comments and suggestions, some modification was made and changes were performed. Then, the questionnaire was considered valid after taking into consideration their suggestions and recommendations for modification and final drafts of the questionnaire and instructional programs is completed to be most appropriate to gathering data from the sample of the study. Through the use of the split-half technique, internal consistency and dependability have been applied to the study instrument. The correlation coefficient of Cronbach's alpha is calculated. The result showed acceptable reliability depending on the value of the coefficient test, which was 0.780.

The data collection process has been carried out. Pre-test from April 11th to May

20th, 2022. Post-test from October 15th to October 19th, 2022.

Laboratory investigation of serum iron and a diagnosis of "iron deficiency anemia," a serum iron state was gathered for the purpose of the study

The sample collection period lasted about two months (pre-test) and one month (post-test). A dietary habits instruction program was given to students about iron deficiency anemia, supported by instructional posters, and serum iron levels were checked again after about 3 months (post-test).

Descriptive statistics of mean, frequencies, standard deviation (SD), and percentages were employed to analyze the demographic data. Inferential statistics were used to compare the mean scores of all dependent variables. Prior to doing the necessary statistical analysis, the assumptions of normality and homogeneity of variance of the variable were examined and verified for using inferential statistics.

**Result**  
**Table (1): Distribution of the Sample According to their Socio-demographic Characteristics**  
**(n= 62)**

| No.   | Characteristics                  | Frequency                | Percent |       |
|-------|----------------------------------|--------------------------|---------|-------|
| 1     | Age group                        | 11-13                    | 9       | 14.5  |
|       |                                  | 14-16                    | 26      | 41.9  |
|       |                                  | 17-18                    | 27      | 43.5  |
|       |                                  | Total                    | 62      | 100.0 |
| 2     | Students birth order             | First                    | 17      | 27.4  |
|       |                                  | Second                   | 19      | 30.6  |
|       |                                  | Third                    | 5       | 8.1   |
|       |                                  | Fourth or more           | 21      | 33.9  |
|       |                                  | Total                    | 62      | 100.0 |
| 3     | Family income                    | Adequate                 | 39      | 62.9  |
|       |                                  | Some adequate            | 9       | 14.5  |
|       |                                  | Inadequate               | 14      | 22.6  |
|       |                                  | Total                    | 62      | 100   |
| 4     | Crowding index                   | Less than 3 person/ room | 31      | 50.0  |
|       |                                  | 3 person / room          | 19      | 30.6  |
|       |                                  | 5 person/room            | 12      | 19.4  |
|       |                                  | 7 person or more/room    | 0       | 0     |
|       |                                  | Total                    | 62      | 100   |
| 5     | Students absenteeism             | No absenteeism           | 18      | 29.0  |
|       |                                  | 1-3 day/ month           | 34      | 54.8  |
|       |                                  | 4 days or more/ month    | 10      | 16.1  |
|       |                                  | Total                    | 62      | 100.0 |
| 6     | Student achievement in classroom | Poor                     | 12      | 19.4  |
|       |                                  | Satisfactory             | 15      | 24.2  |
|       |                                  | Good                     | 35      | 56.5  |
|       |                                  | Total                    | 62      | 100   |
| 7     | Type of family                   | Nuclear                  | 17      | 27.4  |
|       |                                  | Extended                 | 45      | 72.6  |
|       |                                  | Total                    | 62      | 100   |
| 8     | Father education                 | Unable to read and write | 3       | 4.8   |
|       |                                  | Read & write             | 0       | 0     |
|       |                                  | Elementary school        | 10      | 16.1  |
|       |                                  | Secondary school         | 12      | 19.4  |
|       |                                  | Institute                | 12      | 19.4  |
|       |                                  | College                  | 25      | 40.3  |
| Total | 62                               | 100                      |         |       |

This table indicated that the majority of students were 17–18 years old. 21 (33.9%) of students have a fourth birth order. Most students have an adequate family income. 31 (50%) of students have less than three people in the room as crowding index. More than half of students have 1-3 days of absence per month absence per month. 35 (56.6%) of students have good classroom achievement. The majority of students have extended family of students have extended family, 25(40.3%) and 20 (32.3%) of students have college-level father and mother education, respectively. 31 (50%) or half of fathers are employees, and 32 (51.6%) of mothers have free work.

**Table (2): Students Laboratory Investigation for the Degree of Anemia Among Anemic Cases**

| No. | Item       | Levels   | Pre-test (n=62) |       | Post-test (n=62) |       |
|-----|------------|----------|-----------------|-------|------------------|-------|
|     |            |          | f               | %     | f                | %     |
| 1   | Serum iron | Normal   | 0               | 0     | 33               | 53.2  |
|     |            | Mild     | 17              | 27.4  | 18               | 29.0  |
|     |            | Moderate | 34              | 54.9  | 8                | 13    |
|     |            | Severe   | 11              | 17.7  | 3                | 4.8   |
|     |            | Total    | 62              | 100.0 | 62               | 100.0 |

Degree of anemia among anemic cases, A total of 136 students were enrolled in the study, including sixty-two students diagnosed with Iron Deficiency Anemia. The finding (pre-test) before the instructional program indicated that 17 (27.4%) of students have mild Iron Deficiency Anemia, 34 (54.8%) moderate Iron Deficiency Anemia, and 11 (17.7%) severe Iron Deficiency Anemia. While in the posttest, 33 (53.2%) of the students are normal, 18 (29%) have mild Iron Deficiency Anemia, 8 (13% have moderate Iron Deficiency Anemia), and 3 (4.8%) have severe Iron Deficiency Anemia. A blood sample was taken to determine the iron concentration.

**Table (3): Significant Differences in Secondary Schools Females Students' Dietary Habits between the Pre-test and Post test Period**

| No. | Items                   | Response      | Pre-test (n=62) |      |      |      | Post-test (n=62) |      |      |       | T test | P value | Sig. |
|-----|-------------------------|---------------|-----------------|------|------|------|------------------|------|------|-------|--------|---------|------|
|     |                         |               | f               | %    | M    | Eva. | f                | %    | M    | Eval. |        |         |      |
| 1   | Number of meals daily   | One           | 33              | 53.2 | 1.59 | P    | 8                | 12.9 | 2.34 | G     | 6.104  | .000    | HS   |
|     |                         | Two           | 21              | 33.9 |      |      | 25               | 40.3 |      |       |        |         |      |
|     |                         | Three or more | 8               | 12.9 |      |      | 29               | 46.8 |      |       |        |         |      |
| 2   | Taking breakfast        | No            | 25              | 40.3 | 1.69 | F    | 6                | 9.7  | 2.32 | F     | 5.801  | .000    | HS   |
|     |                         | Sometimes     | 31              | 50.0 |      |      | 30               | 48.4 |      |       |        |         |      |
|     |                         | Always        | 6               | 9.7  |      |      | 26               | 41.9 |      |       |        |         |      |
| 3   | Snacks intake           | No            | 31              | 50.0 | 1.61 | P    | 8                | 13   | 2.31 | F     | 6.210  | .000    | HS   |
|     |                         | Sometimes     | 24              | 38.7 |      |      | 27               | 43.5 |      |       |        |         |      |
|     |                         | Always        | 7               | 11.3 |      |      | 27               | 43.5 |      |       |        |         |      |
| 4   | Fast foods intake R     | No            | 11              | 17.7 | 1.74 | F    | 25               | 40.3 | 2.21 | F     | 3.863  | .000    | HS   |
|     |                         | Sometimes     | 24              | 38.8 |      |      | 25               | 40.3 |      |       |        |         |      |
|     |                         | Always        | 27              | 43.5 |      |      | 12               | 19.4 |      |       |        |         |      |
| 5   | Fruits intake           | No            | 29              | 46.8 | 1.72 | F    | 10               | 16.1 | 2.22 | F     | 4.285  | .000    | HS   |
|     |                         | Sometimes     | 21              | 33.9 |      |      | 28               | 45.2 |      |       |        |         |      |
|     |                         | Always        | 12              | 19.3 |      |      | 24               | 38.7 |      |       |        |         |      |
| 6   | Fresh vegetables intake | No            | 27              | 43.5 | 1.69 | F    | 12               | 19.4 | 2.19 | F     | 3.986  | .000    | HS   |
|     |                         | Sometimes     | 27              | 43.5 |      |      | 26               | 41.9 |      |       |        |         |      |
|     |                         | Always        | 8               | 13   |      |      | 24               | 38.7 |      |       |        |         |      |

|   |   |           |    |      |      |   |    |      |      |   |       |      |    |
|---|---|-----------|----|------|------|---|----|------|------|---|-------|------|----|
| 7 | Drinking alarm drink like(tea and coffee)immediately after meal R | No        | 5  | 8.1  | 1.58 | P | 25 | 40.3 | 2.22 | F | 5.715 | .000 | HS |
|   |   | Sometimes | 26 | 41.9 |      |   | 26 | 42   |      |   |       |      |    |
|   |   | Always    | 31 | 50.0 |      |   | 11 | 17.7 |      |   |       |      |    |
| 8 | Follow diet regimen at the last six months R                      | No        | 8  | 12.9 | 1.54 | P | 24 | 38.8 | 2.13 | F | 4.726 | .000 | HS |
|   |   | Sometimes | 18 | 29.0 |      |   | 22 | 35.4 |      |   |       |      |    |
|   |   | Always    | 36 | 58.1 |      |   | 16 | 25.8 |      |   |       |      |    |
| 9 | Are you vegetarian R  | No        | 15 | 24.2 | 1.74 | F | 38 | 61.3 | 2.5  | G | 5.370 | .000 | HS |
|   |   | Sometimes | 16 | 25.8 |      |   | 17 | 27.4 |      |   |       |      |    |
|   |   | Always    | 31 | 50.0 |      |   | 7  | 11.3 |      |   |       |      |    |



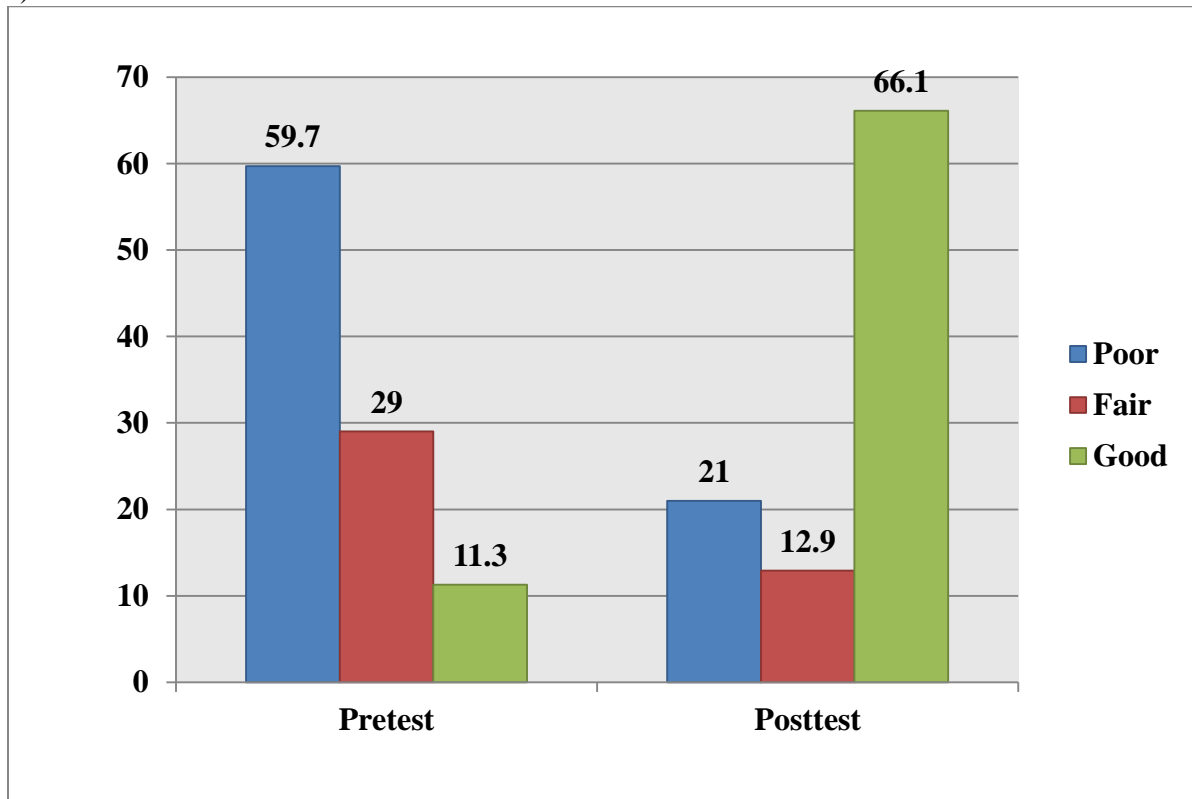
|    |   |           |    |      |      |   |    |      |      |   |       |      |    |
|----|---|-----------|----|------|------|---|----|------|------|---|-------|------|----|
| 10 | Eat un usual material/thing like (cast, clay, soil, paint, ice, starch) R | No        | 10 | 16.1 | 1.64 | P | 37 | 59.7 | 2.4  | G | 5.951 | .000 | HS |
|    |   | Sometimes | 20 | 32.3 |      |   | 13 | 21.0 |      |   |       |      |    |
|    |   | Always    | 32 | 51.6 |      |   | 12 | 19.4 |      |   |       |      |    |
| 11 | Consumption liver   | No        | 31 | 50.0 | 1.53 | P | 12 | 19.4 | 2.24 | F | 6.008 | .000 | HS |
|    |   | Sometimes | 29 | 46.8 |      |   | 23 | 37.1 |      |   |       |      |    |
|    |   | Always    | 2  | 3.2  |      |   | 27 | 43.5 |      |   |       |      |    |
| 12 | Consumption red meat  | No        | 15 | 24.2 | 1.81 | F | 13 | 21.0 | 2.14 | F | 3.075 | .003 | HS |
|    |   | Sometimes | 44 | 71.0 |      |   | 27 | 43.5 |      |   |       |      |    |
|    |   | Always    | 3  | 4.8  |      |   | 22 | 35.5 |      |   |       |      |    |
| 13 | Consumption poultry   | No        | 10 | 16.1 | 1.92 | F | 13 | 21.0 | 2.23 | F | 2.492 | .015 | S  |
|    |   | Sometimes | 47 | 75.8 |      |   | 22 | 35.5 |      |   |       |      |    |
|    |   | Always    | 5  | 8.1  |      |   | 27 | 43.5 |      |   |       |      |    |
| 14 | Consumption fish  | No        | 18 | 29.0 | 1.77 | F | 13 | 21.0 | 2.17 | F | 3.409 | .001 | HS |
|    |   | Sometimes | 40 | 64.5 |      |   | 25 | 40.3 |      |   |       |      |    |
|    |   | Always    | 4  | 6.5  |      |   | 24 | 38.7 |      |   |       |      |    |
| 15 | Consumption egg   | No        | 25 | 40.3 | 1.66 | P | 11 | 17.7 | 2.27 | F | 5.293 | .000 | HS |
|    |   | Sometimes | 33 | 53.2 |      |   | 23 | 37.1 |      |   |       |      |    |
|    |   | Always    | 4  | 6.5  |      |   | 28 | 45.2 |      |   |       |      |    |
| 16 | Consumption green vegetables  | No        | 24 | 38.7 | 1.68 | F | 14 | 22.6 | 2.15 | F | 4.267 | .000 | HS |
|    |   | Sometimes | 34 | 54.8 |      |   | 25 | 40.3 |      |   |       |      |    |
|    |   | Always    | 4  | 6.5  |      |   | 23 | 37.1 |      |   |       |      |    |
| 17 | Consumption beans   | No        | 8  | 12.9 | 1.94 | F | 10 | 16.1 | 2.19 | F | 2.343 | .022 | S  |
|    |   | Sometimes | 50 | 80.6 |      |   | 30 | 48.4 |      |   |       |      |    |
|    |   | Always    | 4  | 6.5  |      |   | 22 | 35.5 |      |   |       |      |    |
| 18 | Consumption wheat bread   | No        | 28 | 45.2 | 1.60 | F | 13 | 21.0 | 2.26 | F | 6.284 | .000 | HS |
|    |   | Sometimes | 31 | 50.0 |      |   | 20 | 32.3 |      |   |       |      |    |
|    |   | Always    | 3  | 4.8  |      |   | 29 | 46.8 |      |   |       |      |    |

|    |                            |                  |    |      |      |   |    |      |      |   |       |      |    |
|----|----------------------------|------------------|----|------|------|---|----|------|------|---|-------|------|----|
| 19 | Consumption dates          | No               | 25 | 40.4 | 1.65 | P | 8  | 12.9 | 2.26 | F | 6.398 | .000 | HS |
|    |                            | Sometimes        | 34 | 54.8 |      |   | 30 | 48.4 |      |   |       |      |    |
|    |                            | Always           | 3  | 4.8  |      |   | 24 | 38.7 |      |   |       |      |    |
| 20 | Consumption melon          | No               | 27 | 43.5 | 1.61 | P | 15 | 24.2 | 2.18 | F | 5.406 | .000 | HS |
|    |                            | Sometimes        | 32 | 51.6 |      |   | 21 | 33.9 |      |   |       |      |    |
|    |                            | Always           | 3  | 4.9  |      |   | 26 | 41.9 |      |   |       |      |    |
| 21 | Consumption pepper         | No               | 35 | 56.5 | 1.48 | P | 14 | 22.6 | 2.26 | F | 6.104 | .000 | HS |
|    |                            | Sometimes        | 24 | 38.7 |      |   | 18 | 29.0 |      |   |       |      |    |
|    |                            | Always           | 3  | 4.8  |      |   | 30 | 48.4 |      |   |       |      |    |
| 22 | Consumption nuts           | No               | 26 | 41.9 | 1.63 | P | 9  | 14.5 | 2.21 | F | 5.711 | .000 | HS |
|    |                            | Sometimes        | 33 | 53.2 |      |   | 31 | 50.0 |      |   |       |      |    |
|    |                            | Always           | 3  | 4.9  |      |   | 22 | 35.5 |      |   |       |      |    |
| 23 | Consumption dark chocolate | No               | 17 | 27.4 | 1.76 | F | 9  | 14.5 | 2.31 | F | 5.008 | .000 | HS |
|    |                            | Sometimes        | 43 | 69.4 |      |   | 25 | 40.3 |      |   |       |      |    |
|    |                            | Always           | 2  | 3.2  |      |   | 28 | 45.2 |      |   |       |      |    |
|    | Overall dietary pattern    | Poor (1-1.66)    | 37 | 59.7 | 1.68 | F | 13 | 21.0 | 2.25 | F | 12.43 | .000 | HS |
|    |                            | Fair (1.67-2.33) | 18 | 29.0 |      |   | 8  | 12.9 |      |   |       |      |    |
|    |                            | Good (2.34-3)    | 7  | 11.3 |      |   | 41 | 66.1 |      |   |       |      |    |
|    |                            | Total            | 62 | 100  |      |   | 62 | 100  |      |   |       |      |    |

F=frequency, %= percentage, M=mean, Eva.: Evaluation (P=poor=1-1.66, F=fair=1.67-2.33, G=good=2.34-3)

The finding in this table indicated that there is significant deference between the pretest and post-test in all items of the dietary habits. At the pretest the overall evaluation was poor (59.7%) for most of the students. While, at the post test the dietary habits have become good for most of the students (66.1%) good dietary habits. The findings from our study indicate that adolescents from

secondary schools showed the highest factors scores of healthy dietary habits(after instructional program).



Evaluation (P=poor=1-1.66, F=fair=1.67-2.33, G=good=2.34-3)

The items have been rated and scored according to the following patterns: Three point likert scales was used for rating the items as always,sometimes,and never. The three point type likert scale were scored as (3)for always,(2) for sometimes, and (1) for never in all items

**Figure1. Distribution of students dietary habits at the pretest and post-test**

### Discussion

The age group enrolled in this study (Table 1) lies in the adolescent period (11–19) years. The present study revealed a higher prevalence of anemia among the studied females at the age of 17–18 years (43.5%). This result was similar to a study carried out by the Ramadi government: Prevalence of iron deficiency anemia among adolescents and intermediate school pupils in Ramadi District. revealed that the prevalence of IDA was 40.5% among female teenagers (ages 16 to 18)<sup>(9)</sup>. Our study result does not agree with a study done in Turkey (Prevalence and Risk Factors of Anemia among Adolescents in Denizli, Turkey). The study found that student adolescent girls aged between 12 and 16) years had a high prevalence of iron deficiency anemia

(10).

Concerning students birth order (33.9%) of them have a fourth birth order. (54.8%) of students have 1-3 days per month of absenteeism. 35 (56.6%) of students have good classroom achievement.

This outcome differed from research carried out in Egypt in El-Behira Governorates among Egyptian prep school girls based on dietary habits and awareness of iron deficiency anemia. The majority of students were found to be either the first or second children in their family. More than one-third of the pupils demonstrated satisfactory achievement, according to the teachers' reports of the kids' performance. also demonstrates the insufficient monthly household income<sup>(11)</sup>.

Concerning parents' education, nearly

40% of fathers and mothers who had attended college made up, respectively, 32.3% of the student body. This result agrees with the result of an Indian study among adolescent girls with iron deficiency and iron deficiency anemia at a tertiary care hospital<sup>(12)</sup>.

Family type :(72.6%) of students have an extended family type . This frequency is similar to a study done in Morocco; dietary habits in adolescents are linked to lifestyle, family, and psychosocial factors <sup>(13)</sup>.

Family income: (62.9%) of students have adequate family income. As regards crowding index, it was observed that more than half (50%) had a crowding index of three persons per room. Overcrowding has caused many health problems. A risk factor for Iron Deficiency Anemia is known to be low socioeconomic status. However, our result was not accepted by the study done in Basra/Al-Madinah City (A Comparison Study Based on Parents' Knowledge, Attitude, and Practice). The overall prevalence of IDA in their study is 60.0 percent, suffering from a low scale of S.E.S. <sup>(14)</sup>.

Table (2): At the pretest, overall, 37 (59.7%) of students had poor dietary habits, 18 (29) had fair dietary habits, and 7 (11.3%) had good dietary habits. This study found that most participants (students of adolescent girls) can identify foods containing iron but lack appropriate iron intake because of eating habits and dietary patterns. This finding is not similar to a study done in Malaysia (Dietary Patterns and Associated Factors Among Adolescents in Malaysia: Findings from the Adolescent Nutrition Survey 2017)<sup>(15)</sup>. While, at the post-test (after the instructional program), overall, 13 (21% of students) have poor dietary patterns, 8 (12.9%) have fair dietary patterns, and 41 (66.1%) have good dietary patterns.

The findings from the current study indicate that adolescents from secondary schools showed the highest scores for healthy dietary patterns (after the instructional program). These findings indicate that nutritional education can improve knowledge of healthy nutrition and

lifestyle choices. Focusing on nutritional education and correcting current dietary habits in adolescents may result in dietary changes that can ultimately improve iron intake.

Degree of anemia among anemic cases (table 2), the finding indicated that in the pretest, the students had 17 (27.4%) mild Iron Deficiency Anemia, 34 (54.9%) moderate Iron Deficiency Anemia, and 11 (17.7%) severe Iron Deficiency Anemia. While in the posttest, 33 (53.2%) of the students are normal, 18 (29%) have mild Iron Deficiency Anemia, 8 (13% have moderate Iron Deficiency Anemia), and 3 (4.8%) have severe Iron Deficiency Anemia. This result does not agree with a study in India on the prevalence of iron deficiency and iron deficiency anemia in adolescent girls in a tertiary care hospital .Of the total, 43.3% were mildly, 3.3% were moderately, and 3.3% were severely affected by anemia <sup>(16)</sup>.

## Conclusions

This study concluded that the nutrition education program proved a long-lasting strategy to build a good nutritional status and improves public awareness of this problem among the females adolescents.

## Recommendations

More work and creative solutions are needed to create and implement programs to prevent and control iron deficiency anemia in our country. A screening program for Iron Deficiency Anemia in adolescent girls and screening for iron deficiency in high-risk groups should be considered. Nutrition education in schools is essential.

## Conflict of Interest

None.

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