# A Study to Assess the Effectiveness of Structured Teaching Programme on Importance of Iron in Diet among Adolescent Girls at Selected Setting, Chennai

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**ABSTRACT:** *Adolescence is the period between childhood and adulthood and is characterised from the onset of puberty and the termination of physical growth maturation. During this period, the body requires increased need of key nutrients including protein, calcium, iron, folate and zinc. In some cases, the body does not produce a sufficient number of cells which results from an underlying health problem, anaemia that destroys red blood cells including a lack of iron in the diet, heavy menstruation, a lack of folate or vitamin B – 12 in the diet, poor eating habits.With respect to this issue it is very important to run health education programmes for women in order to prevent iron deficiency anemia.*

**OBJECTIVES**
- *To assess the effectiveness of structured teaching programme on importance of iron in diet.*
- *To compare the pre test and post test knowledge on importance of iron in diet among adolescent girls.*
- *To associate the post test knowledge on importance of iron in diet with demographic variables.*

**METHODOLOGY**
 *A quasi experimental research design was used. 30 samples were selected through non probability convenient sampling technique. Data were collected by using structured questionnaire. Data was analyzed by using descriptive and inferential statistics.*

**RESULTS**
The findings of the research revealed that in pre-test 90 % of the samples had inadequate knowledge, 10 % of the samples had moderate knowledge and none of them had adequate knowledge, whereas in post-test 56.6 % of the samples had adequate knowledge, 43.3 % of the samples had moderate knowledge and none of them had inadequate knowledge.

**CONCLUSION**
*The study was aimed to assess the effectiveness of structured teaching programme on knowledge on importance of iron in diet among adolescent girls. It is concluded that adolescent girls had gained adequate and moderate level of knowledge regarding importance of iron in diet.*

**Keywords:** *Adolescent girls, Iron in diet, structured teaching programme.*

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## I.    Introduction

Adolescence is the period between childhood and adulthood and is characterised from the onset of puberty and the termination of physical growth maturation. During this period, the body requires increased need of key nutrients including protein, calcium, iron, folate and zinc.

Iron is an important micronutrient which is essential for various functions in human body. Iron is a mineral found in every cell of the body and is needed to make haemoglobin. The human body needs to make oxygen carrying cell growth, immune function, and cognitive function, mental and physical growth.

In some cases, the body does not produce a sufficient number of cells which results from an underlying health problem, anaemia that destroys red blood cells including a lack of iron in the diet, heavy menstruation, a lack of folate or vitamin B – 12 in the diet, poor eating habits.

With respect to this issue it is very important to run health education programmes for women in order to prevent iron deficiency anemia.  It is also important to conduct health education   programs   for   women before   marriage and enforce an importance of taking iron diet   among adolescent girls.

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## BACK GROUND OF THE STUDY

Iron deficiency is one of the most prevalent nutrient deficiencies in the world, affecting an estimated 2 billion people. **Stulzfus &Dreyfuss.**

Globally, anaemia is the inflexible nutritional problem affecting more than 89% in developing countries having major impact on human health, social and economic development. With a global population of 6,700 million, at least 3,600 million have iron deficiency. India contributes to be one of the highest prevalence rates.

The WHO defined adolescent as the population of 10 – 19 years of age. About 3/4$^{th}$ of adolescent female do not meet the dietary requirement. According to National Nutritional monitoring Bureau Survey (NNMB ) 2006, the prevalence of anaemia in adolescent girls 12 – 14 years is 68.6%, whereas in 15 – 17 years is 69.77%.

The reduction of iron-deficiency anemia is one of the six priorities of the World Health Organization's (WHO's) Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition. These priorities have been adopted as Priority Nutrition Indicators for the United Nation's post-2015 Sustainable Development Goals.

This study will give baseline evidence on the level of adolescence awareness about good dietary practices.

## NEED FOR THE STUDY

Adolescent period is a critical link between childhood and adulthood, characterized by significant physical, psychological, and social transitions. Adolescence is a crucial phase of growth in the life cycle of an individual; also they constitute a vulnerable group in developing countries where they are exposed to greater risk of reproductive morbidity and mortality.

Anemia not only affects the present health status, but also has deleterious effects in the future results in LBW, MMR, under nourished adolescent girls.

An adolescent represents a real opportunity to make a difference in lifelong pattern where they need to be an increased awareness about sources of dietary intake of iron. Despite implementing national nutritional programme, still the prevalence of anemia exists. Total nutrient requirements are increased during adolescence period to support a dramatic growth and development. Eating right food at right time will prevent nutritional deficiencies especially iron deficiency disorders. Therefore, imparting health education will improve their dietary practice and will prevent high anaemia burden.

During the community posting, the investigator found most of the adolescent girls were anaemic and unaware about the importance of iron in diet. So the investigator felt the need to assess the importance of iron in diet through structured teaching among adolescent girls.

## STATEMENT OF THE PROBLEM

A study to assess the effectiveness of structured teaching programme on importance of iron in diet among adolescent girls at selected setting, Chennai.

## OBJECTIVES

- To assess the effectiveness of structured teaching programme on importance of iron in diet.
- To compare the pre test and post test effectiveness on importance of iron in diet.
- To associate the post test knowledge on importance of iron in diet with demographic variables.

## OPERATIONAL DEFINITION

### ASSESS

In this study, assess refers to the process of gathering information expressed by the adolescent girls regarding importance of iron in diet  through structured questionnaire schedule and analysing the data using statistical method.

### EFFECTIVENESS

In this study, effectiveness refers to the significant gain in the knowledge is  determined by statistical difference in the pre test and post test knowledge score on importance of iron in diet among adolescent girls.

## STRUCTURED TEACHING PROGRAMME (STP)

In this study, STP refers to the structured and organized content delivered through     lecture and discussion to acquire knowledge regarding importance of iron in diet.

### IMPORTANCE

It refers to the state of being of great significance of iron in diet.

### IRON DIET

In this study, iron diet refers to the essential mineral that is naturally present in fruits, vegetables and poultry.

**ADOLESCENT GIRLS**
In this study, adolescent girl refers to the girls between the age group at 13 – 18 years.
**HYPOTHESIS**
- $H_{01}$- There is no significant relationship between the pre test and post test knowledge scores on importance of iron in diet among adolescent girls.
- $H_{02}$- There is no association between post tests with demographic variables.
**ASSUMPTION**
- Adolescent girls will have some knowledge on importance of iron in diet.
- Structured teaching programme will provide knowledge about importance of iron in diet.

**DELIMITATION**
- The sample size was delimited to 30 adolescent girls at selected setting.
- The duration of the study was delimited to one week period of data collection.
**PROJECTED OUTCOME**
➢ The study will help the adolescent girls to improve their knowledge regarding importance of iron in diet.

**CONCEPTUAL FRAMEWORK**
A concept is an image or symbolic representation of an abstract idea. **Miller and Huber man (1994)** defined a conceptual framework as a visual or written product, either schematically or in narrative form. A framework is a simply structure of the research idea or concept organized in a manner that make it easy for the investigator to communicate to others. So, conceptual framework is a set of key factors, concepts or variables and the presumed relationship among them. Hence, the conceptual framework developed for this study is based on "**General System Theory" (Ludwig Von Bertalanffy, 1968)**
The general system theory describes a complex system; by examining the interactions between its components as it serves as a model for viewing people as a system and constantly interact with environment.
The systems can be open or closed. Open system mainly consists of three elements,
- Input
- Throughput
- Output

**INPUT**
The system creates and organizes, input in the process known as throughput, which results in a recognition of the input. Input refers to the person as a system. It refers to the demographic variables of the adolescent girls and existing knowledge about importance of iron in diet among adolescent girls at selected setting, Chennai.

**THROUGHPUT**
Throughput refers to structured teaching programme on importance of iron in diet.
**OUTPUT**
Output is any information that leaves the system and enters to the environment through system boundaries. It refers to the assessment of knowledge, which was evaluated as adequate, moderate and inadequate.
**FEEDBACK**
Feedback is the result of output, which direct towards reinforcement to update and improve knowledge on importance of iron in diet.

## II.    Review Of Literature
A literature is an organized written presentation of that has been published on a topic by scholars (Burns and Groove, 2004)
This chapter mainly deals with the review done in related materials for this study from various sources like texts, journals and internet etc.
The literature review consists of

**PART A: GENERAL INFORMATION REGARDING IMPORTANCE OF IRON IN DIET**
Iron is a mineral that is naturally present in many foods, added to some food products, and available as a dietary supplement. Iron is an essential component of hemoglobin, an erythrocyte (red blood cell) protein that transfers oxygen from the lungs to the tissues

Iron is of great importance in human nutrition. The adult human body contains 3 to 4 g of iron of which 70% is present in the blood as circulating iron and the rest as storage iron. Each gram of haemoglobin contains about 3.34mg of iron.

## FUNCTIONS
* Hemoglobin formation
* Muscle function
* Brain function
* Regulation of body temperature
* Boost immune system

## DAILY REQUIREMENT OF IRON

| AGE GROUP | IRON (mg) |
|---|---|
| • Infant | 0.5mg/kg body weight |
| • 1-12 years | 15-18mg |
| • 13-18 boys | 25 |
| • 13-18 girls | 28 |
| • Man(average) | 17 |
| • Women | 21 |
| • Pregnancy | 35 |

## SOURCESS OF IRON
Diet provides iron in two forms
➢ Haem iron
➢ Non- haem iron
### HEME IRON
Iron associated to protein, globin found in flesh foods such as liver meat, fish and poultry.
### NON- HEME IRON
It is tightly bound to organic molecules in the form of ferric iron. They are vegetable origin such as green leafy vegetables, cereals, legumes, oil seeds, dried fruits and jaggery.

## IRON LOSS
Iron loss occurs 1-2 mg daily through urine, sweat, bile, skin, intestinal, urinary tracts, menstrual blood loss, pregnancy and lactation.
## IRON DEFICIENCY
Three stages of iron deficiency have been described
* First stage is characterized by decreasing storage of iron without any other detectable abnormality.
* Second stage is Latent iron deficiency.
* Third stage is known as nutritional anemia
## SYMPTOMS
* Apathy
* Pallor skin / Brittle nails
* Fatigue
* Breathlessness on exertion
* poor appetite
## PREVENTION AND TREATMENT
* Growing children, menstruating girls and pregnant women should get supplementary iron to combat iron deficiency anemia.

## PART-B: STUDIES RELATED TO IMPORTANCE OF IRON IN DIET
**Samia  Abd Elhekeeem H. Hanan Abd Elwahab EL Sayad et al., (2019)** conducted a research study on knowledge, attitude and prevention of iron deficiency anaemia among 300 pregnant women at eight health centers at Tabuk region. The samples of 300 pregnant women were selected and data collected by self administered questionnaire and modified likert scale. The study findings revealed (66.7%) had poor knowledge and (70%) of them had neutral attitude toward iron deficiency anaemia. The study recommended implementing health education programme at antenatal clinics to improve their knowledge and practice on dietary consumption.

**Lisa Daniel, Rachel W Taylor, et al., (2018)** conducted a randomised controlled research study on impact of a modified version of baby – led weaning on iron intake and status among 206 participants. The study

findings revealed differences in dietary iron intake between the control and the experimental groups which are not significant at 7 to 12 months of age. The study recommended reducing the risk iron deficiency in infants where their parents are given advice to offer high iron foods with each meal.

**Sudarsan Krishna Swamy, Dharmagat Bhattarai,et al., (2017)** conducted a cross sectional study among 90-180 days age of exclusively breast fed infants at the out- patient department  of a tertiary care centre at India. The samples of 296 breast fed infants were selected. The findings revealed that the prevalence of iron deficiency is about  4 and 5 months of age inter predominately breast fed, term infants was (21.4%) and (36.4%) respectively. The study recommended iron supplementation for well- babies to start from 4 months of age instead of recommending at 6 months by national iron plus initiative report.

**Sahar M Yakout, Nabia Taha, et al., (2016)** conducted experimental research study to assess the effect of iron supplementation and nutritional education among a group of anaemic pregnant women at Riyadh. The samples of 100 pregnant women were selected and followed until delivery. The study revealed (90%) of pregnant women had Hb level less than 11 gm/dl in the last trimester. The study recommended routine iron supplementation should be given during early pregnancy to reduce iron deficiency anaemia during pregnancy.

**Rekha Kumari, Kalpana Singh (2015)** conducted a cross sectional research study on prevalence of iron deficiency anaemia in adolescent girls in a tertiary care hospital. The samples of 200 adolescent girls were selected.  The study findings revealed (50%) of them were anaemic, out of which (43.3%) were mild (3.3%) were moderate and (3.3%) were severely affected. The study recommended to plan and implements the policy for prevention of IDA and ID.

**Tesfaye M, Yemane T, et al., (2015)** conducted a cross sectional study on anaemia and iron deficiency among school adolescent at Bonga town, Southwest Ethiopia. The samples of 408 adolescents were selected and data collected by structured interview method. The study findings revealed overall prevalence of anaemia is (15.2%) of which (83.9%) comprised of   mild anaemia. The study recommended planning school – based interventions to reduce the burden of anaemia among school adolescents.
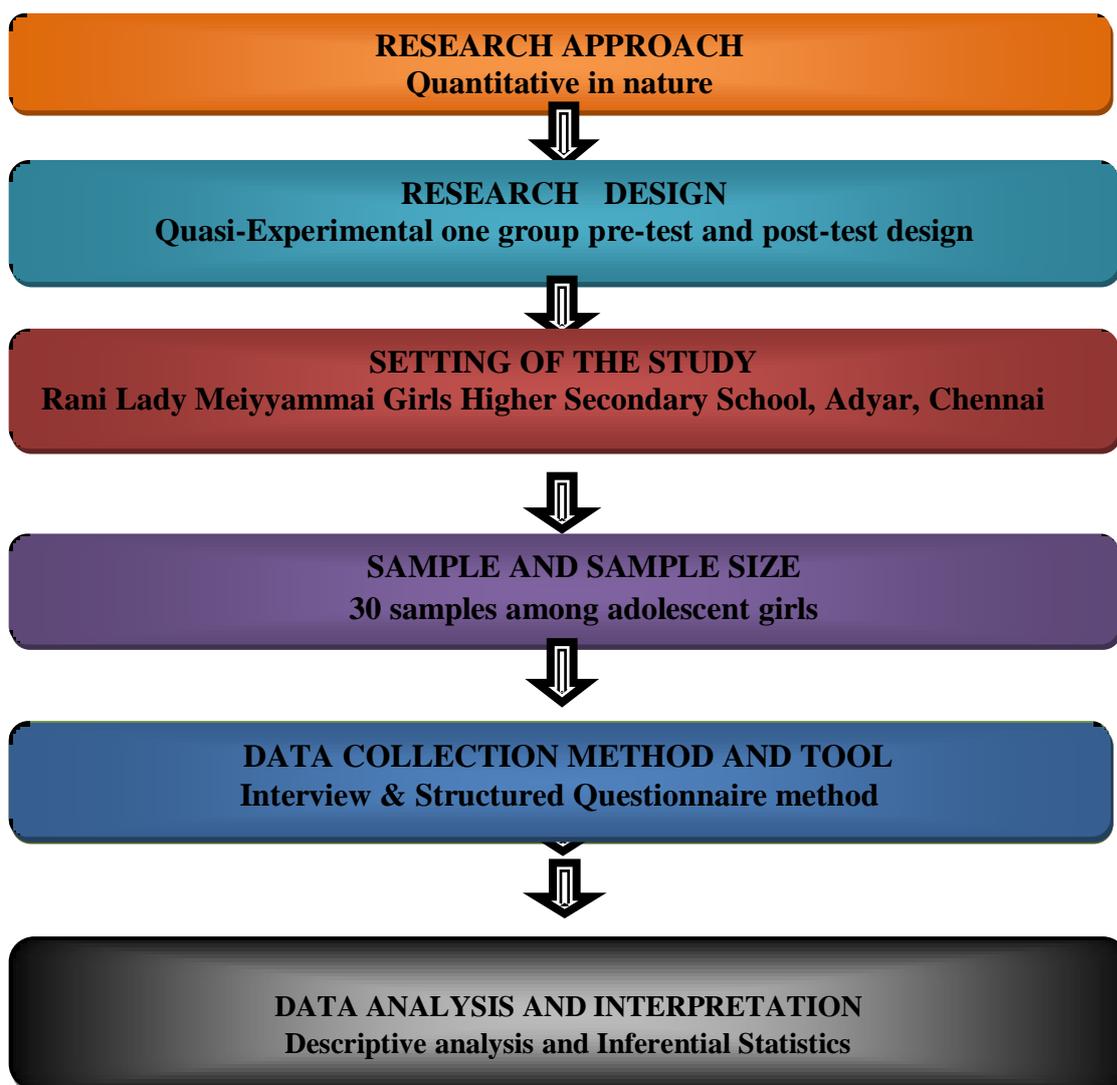
## III. Research Methodology

**RESEARCH APPROACH**
**Quantitative in nature**

⇩

**RESEARCH DESIGN**
**Quasi-Experimental one group pre-test and post-test design**

⇩

**SETTING OF THE STUDY**
**Rani Lady Meiyyammai Girls Higher Secondary School, Adyar, Chennai**

⇩

**SAMPLE AND SAMPLE SIZE**
**30 samples among adolescent girls**

⇩

**DATA COLLECTION METHOD AND TOOL**
**Interview & Structured Questionnaire method**

⇩

**DATA ANALYSIS AND INTERPRETATION**
**Descriptive analysis and Inferential Statistics**

**FIG 2: Schematic representation of Research Methodology**

## IV. DATA ANALYSIS AND INTERPRETATION

Data analysis and interpretation is the core step of research process. The importance of analysis and interpretation of the collected data is to systematically organize, classify and summarize it.

In this chapter a detailed analysis of the collected data has been done as per the objectives stated earlier.

The data obtained were classified and presented under the following sections

**SECTION-I:** Frequency and percentage distribution of the demographic variables among adolescent girls.

**SECTION-II:** Frequency and percentage distribution of the pre and post test level of knowledge regarding importance of iron in diet among adolescent girls.

**SECTION-III:** Overall frequency and percentage of the samples based on the level of knowledge on importance of iron in diet among adolescent girls.

**SECTION- IV:** Comparison of pre test and post test knowledge score on importance of iron in diet among adolescent girls.

**SECTION-V:** Association of the post test level of knowledge on importance of iron in diet with demographic variables.

## SECTION- I
**TABLE 1: FREQUENCY AND PERCENTAGE DISTRIBUTION OF THE SAMPLES BASED ON THE DEMOGRAPHIC VARIABLES.**
**Table-1.1: Frequency and percentage distribution of the samples based on the age, standard of studying, religion, and dietary habits.**

n=30

| S.NO | DEMOGRAPHIC VARIABLES | FREQUENCY | PERCENTAGE (%) |
|---|---|---|---|
| 1) | **Age in years** <br> a)      13-14 years <br> b)      15-16years <br> c)      17-18years <br> d)      19-20 years | <br> 24 <br> 6 <br> 0 <br> 0 | <br> 80 <br> 20 <br> 0 <br> 0 |
| 2) | **Standard of studying** <br> a)      $7^{th}$ std <br> b)      $8^{th}$ std <br> c)      $9^{th}$ std <br> d)      $10^{th}$ std | <br> 0 <br> 15 <br> 15 <br> 0 | <br> 0 <br> 50 <br> 50 <br> 0 |
| 3) | **Religion** <br> a)      a)  Hindu <br> b)      b)  Muslim <br> c)      c)  Christian <br> d)      d)  Others | <br> 21 <br> 1 <br> 8 <br> 0 | <br> 70 <br> 3.4 <br> 26.6 <br> 0 |
| 4) | **Dietary habits** <br> a)      Vegetarian <br> b)      Non vegetarian | <br> 10 <br> 20 | <br> 33.4 <br> 66.6 |

**Table 1.1** showed that majority (80%) of the samples were in the age group of 13-14 years, 50% of the equal numbers of samples were studying in $8^{th}$ and $9^{th}$ std, 70% of the samples were Hindus, whereas 66.6% were non vegetarians.

**Table-1.2: Frequency and percentage distribution of the samples based on the type of family, residence and source of information had obtained.**

n=30

| S.NO | DEMOGRAPHIC VARIABLES | FREQUENCY | PERCENTAGE (%) |
|---|---|---|---|
| 5) | **Type of family** <br> a)      Joint family <br> b)      Nuclear family | <br> 3 <br><br> 27 | <br> 10 <br><br> 90 |
| 6) | **Residence** <br> a)      Urban <br> b)      Rural | <br> 30 <br> 0 | <br> 100 <br> 0 |
| 7) | **Do you have formal information about iron rich diet?** <br> a)      Yes <br> b)      No | <br><br> 20 <br> 10 | <br><br> 66.7 <br> 33.3 |
| 8) | **If yes, specify the source of information?** <br> a)      Books <br> b)      News paper <br> c)      Television <br> d)      Internet | <br><br> 15 <br> 3 <br> 2 <br> 1 | <br><br> 50 <br> 10 <br> 6.7 <br> 3.3 |

**Table 1.2** showed that majority (90%) of the samples were nuclear family, (100%) of the samples were the urban residential, 66.7% of the samples were got formal information about iron rich diet, and whereas 50% of the samples got formal information from books.

## SECTION-II

**TABLE 2: FREQUENCY AND PERCENTAGE DISTRIBUTION OF THE SAMPLES BASED ON THE KNOWLEDGE ON IMPORTANCE OF IRON IN DIET**
**Table 2.1: Frequency and percentage distribution of the samples knowledge on iron and production of iron in the body.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.1:1 | **Iron** | | | | |
| | a)     Mineral | 10 | 33.3 | 27 | 90 |
| | b)     Trace elements | 6 | 20 | 0 | 0 |
| | c)     Enzyme | 7 | 23.3 | 3 | 10 |
| | d)     Acid | 7 | 23.3 | 0 | 0 |
| 2.1:2 | **Iron produced in the body** | | | | |
| | a)     Liver | 13 | 43.3 | 3 | 10 |
| | b)     Thyroid | 2 | 6.6 | 1 | 3.3 |
| | c)     Pancreas | 10 | 33.3 | 1 | 3.3 |
| | d)     Red blood cells | 5 | 16.6 | 25 | 83.3 |

**Table 2.1:1** showed that majority (33.3% ) of the samples stated that the iron is mineral in the pre test, whereas in 90% of the samples stated iron is mineral in the post test.
**Table 2.1:2** showed that majority (43.3%) of the samples stated that iron is produced in the liver in pre test, whereas 83.3% of the samples stated red blood cells produce the iron in the post test.

**TABLE 2.2: Frequency and percentage distribution of the samples knowledge on iron storage in the body and iron absorption in the body.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.2:3. | **Iron storage in the body** | | | | |
| | a)     Endocrine system | 10 | 33.3 | 0 | 0 |
| | b)     Liver, spleen, marrow, skeletal muscle | 4 | 13.3 | 30 | 100 |
| | c)     Brain | 6 | 20 | 0 | 0 |
| | d)     Eyes | 10 | 33.3 | 0 | 0 |
| 2.2:4 | **Iron absorption in the body** | | | | |
| | a)     Stomach | 11 | 36.3 | 2 | 6.6 |
| | b)     Thyroid | 12 | 40 | 0 | 0 |
| | c)     Uterus | 2 | 6.6 | 0 | 0 |
| | d)     Duodenum and small intestine | 5 | 16.6 | 28 | 93.3 |

**Table 2.2:3** showed that majority (33.3%) of the samples stated that the iron storage occurs in endocrine system in the pre test, whereas 100% of the samples stated liver, spleen, marrow and skeletal muscle stores iron in the post test.
**Table 2.2:4** showed that majority (40%) of the samples stated that the iron absorption occurs in thyroid in the pre test, whereas 93.3% of the samples stated duodenum and small intestine absorbs the iron in the post test.

**TABLE 2.3: Frequency and percentage distribution of the samples based on the knowledge regarding functions of iron and the normal level of haemoglobin level for female.**
n=30
**Table 2.3:5** showed that majority (50%) of the samples stated that the functions of iron are essential for skeletal

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.3:5 | **Functions of iron** | | | | |
| | a)     Essential for skeletal structure | 15 | 50 | 0 | 0 |
| | b)     Formation of hemoglobin | 6 | 20 | 30 | 100 |
| | c)     Synthesis of thyroid hormone | 4 | 13.3 | 0 | 0 |
| | d)     Regulation nerve impulses and muscle contraction | 5 | 16.6 | 0 | 0 |
| 2.3:6 | **Normal haemoglobin level for female** | | | | |
| | a)     12.0- 16.0 gms/dl | 3 | 10 | 18 | 60 |
| | b)     14.0- 17.4 gms/dl | 2 | 6.6 | 2 | 6.6 |
| | c)     15.0- 18.9 gms/dl | 5 | 16.6 | 5 | 16.6 |
| | d)     10.0-12.5 gms/dl | 20 | 66.6 | 5 | 16.6 |

structure in the pre test, whereas 100% of the samples stated that the formation of haemoglobin is the function of iron in the post test.

**Table 2.3:6** showed that majority (66.6%) of the samples stated that the 10.0- 12.5 gms/dl is the normal haemoglobin level in pre test, whereas 60% of the samples stated that the 12.0-16.0 gms/dl in the post test.

**TABLE 2.4: Frequency and percentage distribution of the samples knowledge on iron deficiency and causes of iron deficiency.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.4:7 | **Iron deficiency** | | | | |
| | a) Iodine deficiency | 10 | 33.3 | 1 | 3.3 |
| | b) Skeletal fluorosis | 10 | 33.3 | 2 | 6.6 |
| | c) Vitamin A deficiency | 3 | 10 | 3 | 10 |
| | d) Nutritional anemia | 7 | 23.3 | 24 | 80 |
| 2.4:8 | **Causes of iron deficiency** | | | | |
| | a) Blood loss | 8 | 26.6 | 0 | 0 |
| | b) Low iron intake | 9 | 30 | 3 | 10 |
| | c) Impaired absorption of iron | 3 | 10 | 4 | 13.3 |
| | d) All the above | 10 | 33.3 | 23 | 76.6 |

**Table 2.4:7** showed that the equal number of (33.3%) of the samples stated iodine deficiency and skeletal flurosis is the iron deficiency in the pre test, whereas 80% of the samples stated that nutritional anemia in the post test.

**Table 2.4:8** showed that majority (33.3%) of the samples stated blood loss, low iron intake and impaired absorption of iron were the causes of iron deficiency in the pre test, whereas 76.6 % of the samples stated all the above in the post test.

**TABLE 2.5: Frequency and percentage distribution of the samples knowledge on symptoms of iron deficiency and diagnosis of iron deficiency.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.5:9 | **Symptoms of iron deficiency** | | | | |
| | a) Pallor, fatigue, dizziness, hair loss | 3 | 10 | 28 | 93.3 |
| | b) Hair growth | 1 | 3.3 | 0 | 0 |
| | c) Both a & b | 14 | 46.6 | 0 | 0 |
| | d) None of the above | 12 | 40 | 2 | 6.6 |
| 2.5:10 | **Diagnosis of iron deficiency** | | | | |
| | a) High serum iron | 1 | 3.3 | 0 | 0 |
| | b) Moderate serum iron | 23 | 76.6 | 5 | 16.6 |
| | c) Low serum iron | 1 | 3.3 | 20 | 66.6 |
| | d) None of the above | 5 | 16.6 | 5 | 16.6 |

**Table 2.5:9** showed that majority (46.6%) of the samples stated that both a & b are the symptoms of iron deficiency in the pre test, whereas 93.3% of the samples stated that pallor, fatigue, dizziness and hair loss were the symptoms of iron deficiency in the post test.

**Table 2.5:10** showed that majority (76.6%) of the samples stated that the moderate serum iron is to diagnose iron deficiency in the pre test, whereas 66.6% of the samples stated that the low serum iron in the post test.

**TABLE 2.6: Frequency and percentage distribution of the samples knowledge on the treatment of iron deficiency and the factors enhancing iron absorption.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.6:11 | **Treatment of iron deficiency** | | | | |
| | a) Dietary iron intake | 2 | 6.6 | 1 | 3.3 |
| | b) Iron supplementation | 2 | 6.6 | 1 | 3.3 |
| | c) Both a & b | 2 | 6.6 | 28 | 93.3 |
| | d) None of the above | 24 | 80 | 0 | 0 |
| 2.6:12 | **Factors enhancing iron absorption** | | | | |
| | a) Citrate | 2 | 6.6 | 1 | 3.3 |
| | b) Vitamins | 20 | 66.6 | 3 | 10 |
| | c) Minerals | 5 | 16.6 | 2 | 6.6 |
| | d) All the above | 3 | 10 | 25 | 83.3 |

**Table 2.6:11** showed that majority (80%) of the samples stated none of the above in the pre test; whereas 93.3% of the samples stated both dietary iron intake and iron supplementation were the treatment of iron deficiency in the post test.

**Table 2.6:12** showed that majority (66.6%) of the samples stated that the factors enhancing iron absorption is vitamins in the pre test, whereas 83.3% of the samples stated all the above in the post test.

**TABLE 2.7: Frequency and percentage distribution of the samples knowledge on foods rich in haem iron and non- haem iron.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.7:13 | **Food rich in haem iron** | | | | |
| | a)  Green leafy vegetables | 0 | 0 | 0 | 0 |
| | b)  Cereals | 0 | 0 | 0 | 0 |
| | c)  Liver, fish and poultry | 15 | 50 | 30 | 100 |
| | d)  Milk | 15 | 50 | 0 | 0 |
| 2.7:14 | **Foods rich in non- haem  iron** | | | | |
| | a)  Liver and meat | 0 | 0 | 1 | 3.3 |
| | b)  Poultry | 30 | 100 | 1 | 3.3 |
| | c)  Meat | 0 | 0 | 0 | 0 |
| | d)  Green leafy vegetables | 0 | 0 | 28 | 93.3 |

**Table 2.7:13** showed that the equal number of (50%) of the samples stated that liver, fish and poultry are the foods rich in haem iron in the pre test, whereas 100% of the samples stated liver, fish and poultry in the post test.

**Table 2.7:14** showed that majority (100%) of the samples stated that poultry is rich in non haem iron in the pre test, whereas 93.3% of the samples stated that green leafy vegetables in the post test.

**TABLE 2.8: Frequency and percentage distribution of the samples knowledge on iron source rich in sea foods and in vegetables.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.8:15 | **Iron source rich in sea foods** | | | | |
| | a)  Pomfret fish | 5 | 16.6 | 0 | 0 |
| | b)  Rohu fish | 0 | 0 | 0 | 0 |
| | c)  Salmon fish | 10 | 33.3 | 29 | 96.6 |
| | d)  Red salmon fish | 15 | 50 | 1 | 3.3 |
| 2.8:16 | **Iron source rich in vegetables** | | | | |
| | a)  Green leafy vegetables | 8 | 26.6 | 27 | 90 |
| | b)  Soya beans | 19 | 63.3 | 1 | 3.3 |
| | c)  Lentils | 0 | 0 | 0 | 0 |
| | d)  Red gram dhal | 3 | 10 | 2 | 6.6 |

**Table-2.8:15:** showed that majority (50%) of the samples stated that the iron source rich in sea food is red snapper fish in the pre test, whereas 96.6% of the samples stated salmon fish in the post test.

**Table-2.8:16:** showed that majority (63.3%) of the samples stated that the iron source rich in vegetable is soya beans in the pre test, whereas 90% of the samples stated green leafy vegetables in the post test.

**TABLE 2.9: Frequency and percentage distribution of the samples knowledge on iron source rich in fruits, nuts and dry fruits.**

n=30

| S S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.9:17 | **Iron source rich in fruits** | | | | |
| | a)  Chico | 0 | 0 | 0 | 0 |
| | b)  Pomegranates | 10 | 33.3 | 30 | 100 |
| | c)  Apple | 17 | 56.6 | 0 | 0 |
| | d)  Pineapple | 3 | 10 | 0 | 0 |
| 2.9:18 | **Iron source rich in nuts and dry fruits** | | | | |
| | a)  Pista nut and dates | 1 | 3.3 | 28 | 93.3 |
| | b)  Cashew nut | 8 | 26.6 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| c) | Almond | 20 | 66.6 | 0 | 0 |
| d) | Ground nut | 1 | 3.3 | 2 | 6.6 |

**Table 2.9:17** showed that majority (56.6%) of the samples stated that rich iron source fruit is apple in the pre test, whereas 100% of the samples stated pomegranates in the post test.

**Table 2.9:18** showed that majority (66.6%) of the samples stated that rich iron source nuts is almond in the pre test; whereas 93.3% of the samples stated that Pista nut and dates in the post test.

**TABLE 2.10: Frequency and percentage distribution of the samples knowledge on iron source rich in pulses and in grains.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.10:19 | **Iron source rich in pulses** | | | | |
| a) | Lentils | 3 | 10 | 8 | 26.6 |
| b) | Bengal gram | 12 | 40 | 1 | 3.3 |
| c) | Khesari dhal | 2 | 6.6 | 0 | 0 |
| d) | Soya beans | 13 | 43.3 | 21 | 70 |
| 2.10.20 | **Iron source rich in grains** | | | | |
| a) | Oat meal | 16 | 53.3 | 5 | 16.6 |
| b) | Ragi | 5 | 16.6 | 25 | 83.3 |
| c) | Wheat | 9 | 30 | 0 | 0 |
| d) | Barley | 0 | 0 | 0 | 0 |

**Table 2.10:19** showed that majority (43.3%) of the samples stated that rich iron source pulses is soya beans in the pre test, whereas 70% of the samples stated that soya beans in the post test.

**Table 2.10:20** showed that the majority (53.3%) of the samples stated that rich iron source grain is oat meal in the pre test, whereas 83.3% of the samples stated Ragi in the post test.

**TABLE 2.11: Frequency and percentage distribution of the samples knowledge on iron source rich in milk products and the requirement of iron supplementation.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POSTTEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.11:21 | **Iron source rich in milk products** | | | | |
| a) | Processed milk | 3 | 10 | 26 | 86.6 |
| b) | Butter milk | 6 | 20 | 0 | 0 |
| c) | Curds | 11 | 36.6 | 4 | 13.3 |
| d) | Skimmed milk | 10 | 33.3 | 0 | 0 |
| 2.11:22 | **Requirement of iron supplementation** | | | | |
| a) | Adult | 5 | 16.6 | 0 | 0 |
| b) | Heavy worker | 16 | 53.3 | 0 | 0 |
| c) | Adolescent girls | 3 | 10 | 30 | 100 |
| d) | Infant | 6 | 20 | 0 | 0 |

**Table 2.11:21** showed that majority (36.6%) of the samples stated that the rich iron source in milk is curd in the pre test, whereas 86.6% of the samples stated processed milk in the post test.

**Table-2.11:22:** showed that majority (53.3%) of the samples stated that heavy worker requires iron supplementation in the pre test, whereas 100% of the samples stated adolescent in the post test.

**TABLE 2.12: Frequency and percentage distribution of the samples knowledge on the types of food and beverages that interacts absorption of iron.**

n=30

| S.NO | KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.12:23 | **Foods interacts absorption of iron** | | | | |
| a) | Curd | 17 | 56.6 | 23 | 76.6 |
| b) | Oat meal | 3 | 10 | 0 | 0 |
| c) | Lentils | 5 | 16.6 | 4 | 13.3 |
| d) | Almond | 5 | 16.6 | 3 | 10 |
| 2.12:24 | **Types of beverage interacts absorption of iron** | | | | |
| a) | Milk | 25 | 83.3 | 3 | 10 |
| b) | Orange juice | 3 | 10 | 2 | 6.6 |
| c) | Tea or coffee | 2 | 6.6 | 25 | 83.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | d) | Mint leaves | 0 | 0 | 0 | 0 |

**Table 2.12:23** showed that majority (56.6%) of the samples stated that curd absorbs iron in the pre test, whereas 76.6% of the samples stated curd in the post test.

**Table 2.12:24** Showed that majority (83.3%) of the samples stated that milk interact iron absorption in the pre test, whereas 86.6% of the samples stated that tea or coffee in the post test.

**TABLE 2.13: Frequency and percentage distribution of the samples knowledge on the types of nuts that decrease the iron absorption.**

n=30

| S.NO | KNOWLEDGE | PRETEST | | POSTTEST | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 2.13:25 | **Types of nuts decrease the iron absorption**<br>a)       Apple<br>b)       Almond<br>c)       Khesari dhal<br>d)       Wheat | 0<br>10<br>1<br>19 | 0<br>30<br>3.3<br>63.3 | 0<br>18<br>0<br>12 | 0<br>60<br>0<br>40 |

**Table 2.13:25** showed that majority (63.3 %) of the samples stated that wheat decrease the iron absorption in the pre test, whereas 60% of the samples stated almond in the post test.
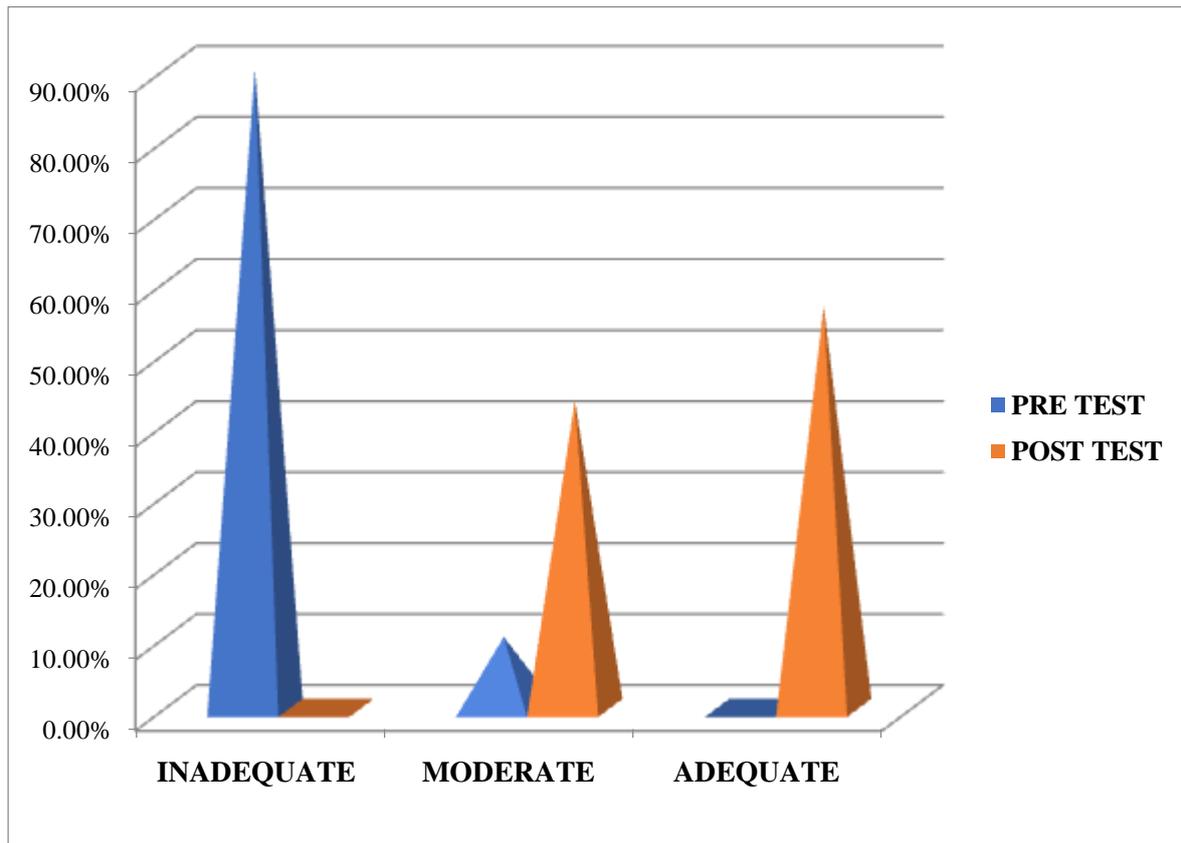
**SECTION –III**

**TABLE 3: OVERALL FREQUENCY AND PERCENTAGE DISTRIBUTION OF THE SAMPLES BASED ON THEIR LEVEL OF KNOWLEDGE ON IMPORTANCE OF IRON IN DIET AMONG ADOLESCENT GIRLS.**

n=30

| LEVEL OF KNOWLEDGE | PRE TEST | | POST TEST | |
|---|---|---|---|---|
| | FREQUENCY | PERCENTAGE (%) | FREQUENCY | PERCENTAGE (%) |
| Inadequate knowledge | 27 | 90 | 0 | 0 |
| Moderate knowledge | 3 | 10 | 13 | 43.3 |
| Adequate knowledge | 0 | 0 | 17 | 56.6 |

**Table 3:** showed that (90%) of the samples had inadequate knowledge, 10% of the samples had moderate knowledge and none of them had adequate knowledge in the pre test, whereas (56.6%) of the samples had adequate knowledge, 43.3% of the samples had moderate knowledge and none of them had inadequate knowledge in the post test.

**FIG 3: DIAGRAMMATIC REPRESENTATION OF THE OVERALL PRE TEST AND POST TEST KNOWLEDGE SCORE REGARDING IMPORTANCE OF IRON IN DIET AMONG ADOLESCENT GIRLS**



**SECTION –IV**

**TABLE 4: COMPARISON OF MEAN AND STANDARD DEVIATION AND T-TEST OF PRE TEST AND POST TEST KNOWLEDGE SCORE REGARDING IMPORTANCE OF IRON IN DIET AMONG ADOLESCENT GIRLS.**

n=30

| LEVEL OF KNOWLEDGE | MEAN | STANDARD DEVIATION | PAIRED t-TEST |
|---|---|---|---|
| PRE TEST | 10 | 4.7 | 10.6 |
| POST TEST | 19.4 | 6.8 | |

*P<0.05, ** p<0.01, ***p<0.001, S – significant, NS – Non significant

**Table 4:** showed that pre test mean score of importance of iron in diet was 10 with SD of 4.7 and the post test mean score was 19.4 with SD of 6.8. There was a statistically significant increase in the overall knowledge regarding importance of iron in diet after structured teaching programme at p<0.05 level.

**SECTION-V**

**TABLE 5: ASSOCIATION OF THE POST TEST KNOWLEDGE ON IMPORTANCE OF IRON IN DIET WITH DEMOGRAPHIC VARIABLES.**

**TABLE 5.1:** Association of post test level of knowledge with demographic variables such as age, standard of studying, religion, dietary habits.

n=30

| S.NO | DEMOGRAPHIC VARIBLES | LEVEL OF KNOWLEDGE | | TOTAL | CHI-SQUARE VALUE |
|---|---|---|---|---|---|
| | | MODERATE | ADEQUATE | | |
| 1) | **Age in years**<br>a) 13-14 years<br>b) 15-16 years<br>c) 17-18 years | 5<br>12<br>0 | 6<br>7<br>0 | 11<br>19<br>0 | X2=0.83<br>P=0.6757<br>(<0.05) |

| | | | | | |
|---|---|---|---|---|---|
| | d) 19-20 years | 0 | 0 | 0 | (S)* |
| 2) | **Standard of studying**<br>a) 7<sup>th</sup>std<br>b) 8<sup>th</sup>std<br>c) 9<sup>th</sup>std<br>d) 10<sup>th</sup>std | 0<br>7<br>4<br>0 | 0<br>8<br>11<br>0 | 0<br>15<br>15<br>0 | X2=1.2<br>P=0.8721<br>(<0.05)<br>(S)* |
| 3) | **Religion**<br>a) Hindu<br>b) Muslim<br>c) Christian<br>d) Others | 11<br>1<br>4<br>0 | 10<br>0<br>4<br>0 | 21<br>1<br>8<br>0 | X2=0.944<br>P=0.8721<br>(<0.05)<br>(S)* |
| 4) | **Dietary habits**<br>a) Vegetarian<br>b) Non vegetarian | 6<br>10 | 4<br>10 | 10<br>20 | X2=0.23<br>P=0.1026<br>(<0.05)<br>(S)* |

*P<0.05, ** p<0.01, ***p<0.001, S – significant, NS – Non significant

**Table 5.1:** showed that there was a statistically significant association between the level of knowledge with age, standard of studying, religion, and dietary habits at p<0.05 level.

**TABLE 5.2: Association of post test level of knowledge with demographic variables such as type of family, residence and source of information had obtained.**

n=30

| S.NO | DEMOGRPHIC VARIBLES | LEVEL OF KNOWLEDGE | | TOTAL | CHI-SQUARE |
|---|---|---|---|---|---|
| | | MODERATE | ADEQUATE | | |
| 5) | **Type of family**<br>a) Joint family<br>b) Nuclear family | 2<br>6 | 1<br>21 | 3<br>27 | X2=2.75<br>P=0.9<br>(>0.05)<br>(NS) |
| 6) | **Residence**<br>a) Urban<br>b) Rural | 15<br>0 | 15<br>0 | 30<br>0 | X2=2.2<br>P=0.9<br>(>0.05)<br>(NS) |
| 7) | **Do you have formal information about iron rich diet?**<br>a) Yes<br>b) No | 4<br>7 | 16<br>3 | 20<br>10 | X2=0.44<br>P=0.1<br>(>0.05)<br>(NS) |
| 8) | **If yes, specify the source of information**<br>a) Books<br>b) News paper<br>c) Television<br>d) Internet | 3<br>1<br>0<br>1 | 6<br>3<br>1<br>4 | 9<br>4<br>1<br>5 | X2=5.05<br>P=0.5<br>(>0.05)<br>(NS) |

*P<0.05, ** p<0.01, ***p<0.001, S – significant, NS – Non significant

**Table 5.2** showed that there was no statistically significant association between the level of knowledge with type of family, residence and source of information had obtained at p<0.05 level.

## V. DISCUSSION

The study is aimed at assessing the effectiveness of structured teaching programme on importance of iron in diet among adolescent girls at selected settings, Chennai. A total of 30 samples were selected and their knowledge was assessed using self structured questionnaire in selected settings, Chennai.

**DESCRIPTION OF SAMPLE CHARACTERISTICS**

The findings of the study that revealed maturity 80 % of the samples were in the age group of 13 to 14 years, equal number of 15% of the girls studying in 8<sup>th</sup> & 9<sup>th</sup> standard, 70% of the samples were belonged to Hindu religion, 66.6% of the samples were non-vegetarians, 90 % of the samples were nuclear family and 100%of them were urban residential, whereas 66.6% of the samples got formal information through books.

**THE DISCUSSION BASED ON THE OBJECTIVES SPECIFIED IN THE STUDY**
**OBJECTIVES – 1:** To assess the effectiveness of structured teaching programme on importance of iron in diet. The investigator found that (90%) of the samples had inadequate knowledge, 10% of the samples had moderate knowledge and none of them had adequate knowledge in the pre test, whereas (56.6%) of the samples had adequate knowledge, 43.3% of the samples had moderate knowledge and none of them had inadequate knowledge in the post test.

**OBJECTIVES – 2:** To compare the pre test and post test knowledge on importance of iron in diet among adolescent girls.
It showed that pre test mean score of importance of iron in diet was 10 with SD of 4.7 and the post test mean score was 19.4 with SD of 6.8. There was a statistically significant increase in the overall knowledge regarding importance of iron in diet after structured teaching programme at $p < 0.05$ level.
**OBJECTIVES – 3:** To associate the post test knowledge on importance of iron in diet with demographic variables.
It showed there was a statistically significant association between the levels of knowledge with age, standard of studying, religion, dietary habits, type of family, residence and source of information had obtained at $p < 0.05$ level.
 This result was supported by a study conducted by **RAM GOPAL (2017)** to assess the effectiveness of structure teaching program regarding importance of iron in diet among adolescent girls at selected school and to determine the association of the knowledge with selected sample characteristics. The results showed that majority (90%) were in the age group of 13-14 years, (68.3%) of the samples were belonged to Hindu religion, (66.7%) of the samples were non vegetarians and the chi square values of level of knowledge with sample characteristics was statistically significant at $p < 0.05$ level of significance.

## VI.    SUMMARY, CONCLUSION, IMPLICATION AND   RECOMMENDATION
### SUMMARY
        A research project was done to assess the effectiveness of structured teaching programme on knowledge regarding importance of iron in diet among adolescent girls .The objective of the study was to assess the effectiveness of structured teaching programme on knowledge regarding importance of iron in diet and to associate the post test level of knowledge with the demographic variables.
        A quasi experimental research design was chosen in which one group pre test and post test was taken to assess the effectiveness of structured teaching programme on osteoporosis. The study was conducted among adolescent girls studying at Rani Lady Meiyyammai Girls Higher Secondary School, Chennai. The time duration of the study was from 2.12.2019 to 7.12.2019 and the samples were selected by using convenient sampling technique. The demographic data collected and pre test knowledge was assessed through structured teaching programme by interview method. After one week period, post test was conducted by using the same questionnaire and the data was collected, tabulated, analyzed and interpreted. The finding revealed that there was a significant increase in overall knowledge regarding importance of iron in diet among adolescent girls after structured teaching programme.

**CONCLUSION**
        The study was done to assess the structured teaching programme on knowledge regarding importance of iron in diet among adolescent girls at selected setting Chennai.
        The findings of the research project revealed that in pre test 90 % of the samples had inadequate knowledge, 10 % of the samples had moderate knowledge and none of them had adequate knowledge, whereas in post test 56.6 % of the samples had adequate knowledge, 43.3 % of the samples had moderate knowledge and none of them had inadequate knowledge. This proves that the structured teaching programme is effective in increase in the knowledge on importance of iron in diet among adolescent girls. It implies that there was significant association at ($p < 0.05$) increase in level of knowledge on importance of iron in diet among adolescent girls at selected school.

**NURSING IMPLICATION**
**NURSING PRACTICE**
•        Nurses in all settings should be given training classes on importance of iron in diet and its health issues and to impart knowledge among the reflective groups.
•        Nurses should motivate the adolescent girls, maternal mothers, lactating mothers about the importance of taking iron rich diet during the required period.
•        Nurses should motivate the student nurses to give health education programme on iron rich diet and its importance at hospital and community settings.

**NURSING RESEARCH**
* The findings of the study help to extend knowledge upon the future research projects.
* The nurse researcher can develop new strategies to impart knowledge among adolescent girls, young women regarding importance of iron in diet.
* The findings of the study can be disseminated through conference, seminar, and it can be published in journals.

**NURSING EDUCATION**
* Nursing educator can ensure that the staff and students are equipped with updated knowledge regarding iron related health issues.
* Nursing educator should motivate the student nurses to prepare the informative health education models in relation to the iron rich diet and the available sources of iron in diet.
* Contact CNE programme on prevalence of anaemia and dietary habits among public for nursing students and staff nurses.

**NURSING ADMINISTRATION**
* Nurse administrator can frame a policy on dietary resources to combat anaemia at all health care settings level.
* Nurses' administrator can provide information materials at all centre level as a part of teaching programme.

**RECOMMENDATIONS**
Based on the present study in view, the following recommendation were made,
* The research study can be conducted on larger samples to validate and generalize the findings.
* The research study can be conducted to assess the effectiveness of health education regarding importance of iron in diet among adolescent girls at different settings.

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## APPENDICES
## TOOL
**A TOOL TO ASSESS THE EFFECTIVENESS OF  STRUCTURED TEACHING PROGRAMME ON IMPORTANCE OF IRON IN DIET AMONG ADOLESCENT  GIRLS AT  SELECTED SETTING, CHENNAI.**

### SECTION-A
### DEMOGRAPHIC DATA

1. Age in years
a.       13-14 years

b.        15-16 years
c.        17-18 years
d.        19-20 years
2. Standard of studying
a.        7<sup>th</sup>std
b.        8<sup>th</sup>std
c.        9<sup>th</sup>std
d.        10<sup>th</sup>std
3. Religion
a.        Hindu
b.        Muslim
c.        Christian
d.        Others

4. Dietary habits
a.        Vegetarian
b.        Non vegetarian

5. Type of family
        a. Joint family
        b. Nuclear family
6. Residence
        a. Urban
        b. Rural
7. Do you have formal information about iron rich diet?
        a. Yes
        b. No
8. If yes, specify the source of information?
        a. Books
        b. Newspaper
        c. Television
        d. Internet

**SECTION-B**

1. What is iron?
        a. Minerals
        b. Trace elements
        c. Enzyme
        d. Acid
2. Where is iron produced in the body?
        a. Liver
        b. Thyroid
        c. Pancreas
        d. Red blood cells
3. Where is iron stored in the body?
        a. Endocrine system
        b. Liver, Spleen, Marrow, Skeletal muscle
        c. Brain
        d. Eyes
4. Where is iron absorbed in the body?
        a. Stomach-fundus
        b. Thyroid
        c. Uterus
        d. Duodenum and small intestine

5. What are the functions of iron?
      a. Essential for skeletal structure
      b. Formation of haemoglobin
      c. synthesis of thyroid hormones
      d. Regulates nerve impulses and muscle contraction.
6. What is the normal hemoglobin level for female?
      a.12.0-16.0gms/dl
      b.14.0-17.4gms/dl
      c. 15.0-18.9 gms/dl
      d.10.0-12.5gms/dl
7. What is iron deficiency?
      a. Iodine deficiency
      b. Skeletal flurosis
      c. Vitamin A deficiency
d. Nutritional anemia
8. What are the causes of iron deficiency?
      a. Blood loss
      b. Low iron intake
      c. Impaired absorption of iron
      d. All the above

9. What are the symptoms of iron?
      a. Pallor, fatigue, dizziness, hair loss
      b. Hair growth
      c. Both a & b
      d. None of the above
10. How to diagnose iron deficiency?
      a. High serum iron
      b. Moderate serum iron
      c. Low serum iron
      d. None of the above
11. What is the treatment of iron deficiency?
      a. Dietary iron
      b. Iron supplement
      c. Both a & b
      d. None of the above
12. What is the factor enhancing iron absorption?
      a. Citrate
      b. Vitamins
      c. Minerals
      d. All the above

13. What are the foods rich in Haem iron?
      a. Green leafy vegetables
      b. Cereals
      c. Liver, fish and poultry
      d. Milk
14. What are the foods rich in Non -haem iron?
      a. Liver and meat
      b. Poultry
      c. Milk
      d. Green leafy vegetables
15. What is the iron source rich in sea foods?
      a. Pomfret fish
      b. Rohu fish
      c. Salmon fish
      d. Red snapper fish
16. What is the iron source rich in vegetables?
      a. Green leafy vegetables
      b. Soybeans

c. Lentils
d. Red gram dhal

17. What is the iron source rich in fruits?
    a. Chico
    b. Pomegranates
    c. Apple
    d. Pine apple
18. What is the iron source rich in nuts and dry fruits?
    a. Pista nut and dates
    b. Cashew nut
    c. Almond
    d. Groundnut
19. What is the iron source rich in pulses?
    a. Lentils
    b. Bengal gram
    c. Khesari dhal
    d. Soya beans
20. What is the iron source rich in grains?
    a. Oat meal
    b. Ragi
    c. Wheat
    d. Barley

21. What is the iron source rich in milk products?
    a. Processed cheese
    b. Butter milk
    c. Curds
    d. Skimmed milk
22. Who require iron supplementation?
    a. Adult
    b. Heavy worker
    c. Adolescent girls
    d. Infant
23. Which food interact absorption of iron?
    a. Curd
    b. Oatmeal
    c. Lentils
    d. Almond
24. Which type of beverage interact absorption of iron?
    a. Milk
    b. Orange juice
    c. Tea or coffee
    d. Mint leaves

25. Which nuts decrease the iron absorption?
    a. Apple
    b. Almond
    c. Khesari dhal
    d. Wheat