ASSESSMENT OF IRON DEFICIENCY ANAEMIA AMONG POST MENOPAUSAL WOMEN AT MAYO HOSPITAL

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ASSESSMENT OF IRON DEFICIENCY ANAEMIA AMONG POST MENOPAUSAL WOMEN AT MAYO HOSPITAL LAHORE

Rukhsana Bibi & Anam Mohiud Din
DEDICATION

I dedicate this thesis to my parents. I hope that this achievement will complete the dream than you had for me all those many years ago when you chose to give me the best education you could.
ACKNOWLEDGEMENT

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Rukhsana Bibi
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Objective - To assess the frequency of iron deficiency anemia and to examine the relationship of iron deficiency anemia and dietary habits in post-menopausal subjects.

Background – Iron deficiency anemia is the most common nutritional deficiency anemia in developing as well as developed countries. Iron deficiency anemia may be caused by primary or secondary causes, primary anemia may cause by any single cause directly, by secondary causes or other conditions like hookworm infestation, nutritional deficiency, and malabsorption. The period between 40 and 55 years which covers pre-menopause perimenopause, and for some women, post-menopause, has a great impact on women health. The prevalence of anemia has been consistently high since 2001 when it stood at 50.9%, than it was increased in 2011 on 61.9%, and declined to 53.7% in 2018.

Methods – It was hospital based descriptive study, data was collected from 70 female post-menopausal subjects at outdoor patient department Mayo hospital Lahore. Convenient sampling technique was used. Approval was taken from organizational authorities for data collection. Spss V23.0 was used for statistical analysis. Chi square test was applied on categorical data to examine the relationship. P-value <0.005 was taken.

Results: The mean age was 51.55±3.07. The minimum age of subject was 46 years and maximum age was 61 years in this study. 30(42.9%) subjects were illiterate. 41(58.6%) subjects were overweight, 8(11.4%) subjects were extremely obese, 47(67.1%) subjects’ hemoglobin levels were 9-11 mg/dL, 15(21.4%) subject’s hemoglobin levels were 6-8 mg/dL and 2(2.9%) subjects found in very severe lower values <6 mg/dL hemoglobin. Data does not shows the association of hemoglobin with iron rich food due to small sample size.
Conclusion – Post-menopausal women with 45-55 years of age group was more prevalent in iron deficiency anemia, most of the subjects were not consuming the recommended daily allowance of iron, and most of the subjects were not consuming the iron fortified foods in this study. Data does not shows the association of iron deficiency anemia and iron rich foods due to small sample size, need longitudinal studies.
# Table of Contents

ACKNOWLEDGEMENT ........................................................................................................ iv  
ABSTRACT ......................................................................................................................... vi  
List of Figures .................................................................................................................... iii  
List of Tables ...................................................................................................................... iv  
CHAPTER 1 ......................................................................................................................... 1  
INTRODUCTION .................................................................................................................... 1  
  1.1 Introduction ................................................................................................................. 2  
  1.2 Statement of problem ................................................................................................. 6  
  1.3 Significance of study ................................................................................................. 6  
  1.4 Objectives of the study .............................................................................................. 6  
  2.0 LITERATURE REVIEW ................................................................................................. 8  
CHAPTER 3 ........................................................................................................................ 12  
METHODOLOGY ................................................................................................................. 12  
  3.1 Study Design ............................................................................................................ 12  
  3.2 study location ........................................................................................................... 12  
  3.3 study population ....................................................................................................... 13  
  3.4 sample size ............................................................................................................. 13  
  3.5 sampling technique ................................................................................................. 13  
  3.6 inclusion exclusion criteria ....................................................................................... 13  
    3.6.1 Inclusion criteria ................................................................................................. 13  
    3.6.2 Exclusion criteria ............................................................................................... 13  
  3.7 Data collection tool ................................................................................................... 14  
    3.7.1 Anthropometric measures (Height, weight, BMI) ............................................... 15  
    3.7.2 Biochemical ...................................................................................................... 15  
    3.7.3 Dietary assessment ............................................................................................. 15  
  3.8 Duration of data collection ....................................................................................... 15  
  3.9 Data Cleaning and Quality of Data .......................................................................... 15  
  3.10 Data Analysis ......................................................................................................... 16  
  3.11 Ethical Consideration .............................................................................................. 16
CHAPTER 4 ......................................................................................................................... 17
RESULTS AND DISCUSSION ................................................................................................ 17
Results ................................................................................................................................ 17
4.1 analysis and interpretation .............................................................................................. 17
4.2. Discussion ...................................................................................................................... 43
5 SUMMARY, CONCLUSION AND RECOMMENDATIONS ................................................. 48
5. 1 SUMMARY .................................................................................................................... 48
5. 2 CONCLUSION ............................................................................................................... 50
5.3 RECOMMENDATIONS .................................................................................................. 51
  5.3.1 Specific Recommendations ....................................................................................... 51
  5.3.2 General Recommendations ...................................................................................... 52
REFERENCES ....................................................................................................................... 53
APPENDICES .......................................................................................................................... 57
  Annex i ............................................................................................................................... 57
  Annex ii ............................................................................................................................. 61
  Annex iii ............................................................................................................................ 1
  Annex iv ............................................................................................................................. 2
List of Figures

Figure 3.1 Building of Mayo hospital Lahore ................................................................. 13
Figure 4.2 Age group of post-menopausal anemic subjects ........................................... 18
Figure 4.3 Marital status of subjects ............................................................................. 19
Figure 4.4 Number of children each participants have .................................................... 20
Figure 4.5 Occupation of subjects ................................................................................ 21
Figure 4.6 Educational status of subjects ...................................................................... 22
Figure 4.7 Nutritional status of subjects ....................................................................... 23
Figure 4.8 Hemoglobin levels in post-menopausal women ............................................ 24
Figure 4.9 The weekly consumption of Liver, kidney by subjects ................................. 25
Figure 4.10 Weekly consumption of beef by subjects ..................................................... 26
Figure 4.11 Weekly consumption of poultry meat by subjects ...................................... 27
Figure 4.12 Weekly consumption of eggs by subjects .................................................... 28
Figure 4.13 Weekly consumption of fish by subjects ...................................................... 29
Figure 4.14 Consumption of Milk and Milk beverages on weekly basis by subjects ...... 30
Figure 4.15 Weekly consumption of cheese by subjects ............................................... 31
Figure 4.16 Consumption of white bread on weekly basis by subjects ......................... 32
Figure 4.17 Consumption of brown bread, whole meal, grains .................................... 33
Figure 4.18 weekly consumption of Iron fortified corn flakes, cereals on weekly basis ... 34
Figure 4.19 Consumption of Rice by subjects on weekly basis .................................... 35
Figure 4.20 Consumption of seasonal fresh fruits by subjects on weekly basis .......... 36
Figure 4.21 Weekly consumption of dried fruits by subjects ......................................... 37
Figure 4.22 Weekly consumption of lentils by subjects ................................................ 38
Figure 4.23 The consumption of vegetables by subjects on weekly basis ..................... 39
Figure 4.24 Weekly consumption of potatoes by subjects ............................................. 40
Figure 4.25 The consumption of fat by subjects ............................................................ 41
Figure 4.26 The consumption of chocolate by subjects ................................................ 42
List of Tables

Table 1.1 Haemoglobin levels for diagnosing mild, moderate, severe condition .................. 3
Table 4.2 Serum ferritin levels ........................................................................................................ 24
CHAPTER 1

INTRODUCTION
1.1 Introduction

Women are heart of a family as they hold a key position in the shaping of the next generation. Women are facing lot of problems through their life. A large number of various important biological changes occur during a woman’s life cycle. Older age is one of the phases of life that brings concerning necessary changes in ladies. Facing older-agedness is a crisis in human's life which is accompanied with more changes and complications in women as compared to men. One of the most common change of middle adulthood is menopause.

Menopause is a universal reproductive phenomenon that cannot be avoided (Amin & Kumari, 2016).

Menopause is defined as a time when the body of a woman does not receive menstruation period for a duration of 12 consecutive months. It is also considered a new phase in life after the child bearing stage. There are over 1.1 million women who are said to be above 51 years old. It is also considered the mean age when the menopause is set to commence (Holloway, 2011). Menopause is a major natural transition and cessation of menstruation resulting from reduced ovarian hormone secretion that occurs naturally for twelve consecutive months or induced surgically (Rahman, Zainudin, & Mun, 2010).

The age of natural menopause is between 46-51 years however it may differ from person to person (Golshiri, Akbari, & Abdollahzadeh, 2016). The middle age at menopause in Europe ranges from 50 to 52 years, in North America from 50 to 51 years, in Latin America from 43 to 53 years, and in Asia from 42 to 49 years (Chieffo et al., 2010).

From clinical perspective, anemia is an insufficient quantity or quality of red blood cells (RBCs) and from public health viewpoint it is the deficient hemoglobin (Hb) concentration in the blood. Hb is a red pigmented protein found in RBCs that is responsible to carry oxygen from lungs to other body parts. The formation of Hb requires folate, folic acid, iron, minerals, vitamin A and vitamin B-12. Anemia leads to hypoxia, a condition in which oxygen becomes deficient which is vital to perform various body functions. Depending on the severity of anemia, it leads to wide range of health consequences. Anemia severity can be determined by its symptoms and Hb concentration and is categorized into mild, moderate, or severe anemia (Beutler & Waalen, 2016).
Anaemia is one of the public health troubles. In underdeveloped countries, iron deficiency is caused by poor iron dietary intake or by parasitic infection, whereas vegetarian dietary choices. Poor iron absorption, is the cause of iron deficiency anemia in income countries. Some other causes of anaemia are iron and other micronutrient deficiencies, acute and chronic infections, inherited or acquired disorders etc. Anaemia has been appeared as an important public health related problem in the whole world, especially in underdeveloped countries (Bishnoi, 2018).

Table 1.1 Haemoglobin levels for diagnosing mild, moderate, severe condition

<table>
<thead>
<tr>
<th>Population</th>
<th>Age</th>
<th>Normal Range</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>6-59 months</td>
<td>&gt;=11.0</td>
<td>10-10.9</td>
<td>7.0-9.9</td>
<td>&lt; 7.0</td>
</tr>
<tr>
<td>Children</td>
<td>5-11 years</td>
<td>&gt;=11.5</td>
<td>11-11.4</td>
<td>8.0-10.9</td>
<td>&lt; 7.0</td>
</tr>
<tr>
<td>Children</td>
<td>12-14 years</td>
<td>&gt;=12.0</td>
<td>11-11.9</td>
<td>8.0-10.9</td>
<td>&lt; 8.0</td>
</tr>
<tr>
<td>Pregnant Women</td>
<td>&gt;= 15 years</td>
<td>&gt;=11.0</td>
<td>10-10.9</td>
<td>7.0-9.9</td>
<td>&lt; 7.0</td>
</tr>
<tr>
<td>Non-pregnant Women</td>
<td>&gt;= 15 years</td>
<td>&gt;=12.0</td>
<td>11.0-11.9</td>
<td>8.0-10.9</td>
<td>&lt; 8.0</td>
</tr>
<tr>
<td>Men</td>
<td>&gt;= 15 years</td>
<td>&gt;=13.0</td>
<td>11-11.9</td>
<td>8.0-10.9</td>
<td>&lt; 8.0</td>
</tr>
</tbody>
</table>

These levels were first published in 1968 by the WHO study group on nutritional anemias (WHO, 1968), which were slightly revised in 1989 (WHO, 1989) and then modified by splitting 5 to 14 years children in 5-11 years and 12-14 years (WHO, 2000).

Iron deficiency is directly related to low levels of hemoglobin in blood. The haemoglobin concentration was expressed in g/dl (WHO, 1989). The normal haemoglobin level of >12 g/dl was considered as normal, but levels <12mg/dl will be considered to iron deficiency anemia. Absorption of iron is maximum regulated by iron deficiency and increased erythropoiesis, and minimum regulated in inflammation and by depletion of iron. Regulated by the recently described regulator of iron homeostasis, hepcidin, which
blocks iron release from enterocytes and macrophages. Body iron stores are regulated through iron absorption (Dugdale, 2011).

Nutritional scarcities, infections, genetic disorders, reproductive health problems and poverty affect the anemia status among women. The deficiency of specific nutrients in the body essential for Hb production results in nutritional anemia. In human body iron plays vitally important role in the synthesis of Hb and its depleted stores in the body is the common cause of anemia. Deficient iron in the body is responsible of causing iron deficiency anemia (IDA) in 20% of the global population (Huang et al., 2010). Common reasons of anemia include heavy blood loss, small intake of dietary iron, production of deficient RBCs (due to chronic illness like cancer, kidney disease diabetes, HIV/AIDS) and destruction of RBCs due to genetic disorders i.e sickle cell and hemolytic anemia (Huang et al., 2010).

Anaemia is well known problem for all ages. More than two to three billion individuals are suffering from anaemia in whole world, especially in under advanced countries. This is true among the older population as the extensiveness of anaemia is raising day by day with age. Previous studies showed that the extensiveness of anaemia among adults increases sharply after the age of 50 years (Badawy, Shaeen, Hegazy, & Mohammed, 2017).

Among women reproductive age, adolescent girls and pregnant women are at the higher risk of developing IDA. Adolescent girls are vulnerable to anemia due to onset of menstruation and iron required for growth spurt, whilst pregnant women the vulnerability to develop anemia is because of additional iron requirement of the body during pregnancy. The lactating mothers are vulnerable to Iron deficiency anemia because blood loss during childbirth and depletion of iron in the body (Ross & Thomas, 2016). Anemia during pregnancy and/or inadequate nutritional intake increases the risk of postpartum anemia among lactating mothers (Lakew, Biadgilign, & Haile, 2015). The people who do not eat iron rich food, those suffering from diseases such as kidney failure or who have internal bleeding are also at the risk of developing iron deficiency anemia (Yunus, 2018). The treatment of iron deficiency anemia includes utilization of iron rich diet and vitamin C for absorption of iron from food and iron supplements (Mahmood & Sultan, 2006). Vitamin C (ascorbic acid) deficiency anemia is caused by the insufficient amount of vitamin C in the
body. Bone marrow manufactures abnormally small red blood cells due to vitamin C deficiency (Batool, 2010). Vitamin C is not made by the body and is mostly obtained from diet and supplements. Vitamin C and iron rich diets create ascorbic acid in the stomach due to which iron is absorbed in the body (Batool, 2010).

As we know that there are different types of anemia, but according to nutritious point of view Iron deficiency is one of the most important problems of the humans. It is related to serious health problems, which includes abnormal mental and motor development in infancy, disordered work capacity, increased risk of premature delivery. In women, Estrogen deficit has been considered as the main causative factor in menopausal symptoms and diseases. Studies show that estrogen decreases by 90%, a synchronous but inverted change occurs in iron levels during menopausal transition (Jian, Pelle, & Huang, 2009).

Among older ladies anemia is most often due to nutritional imbalances, absolule confidence however a decline in hormones aditionally impact and might result in iron deficiency anemia, which similarly can purpose many troubles bodily and internally too. Hemoglobin stage underneath ordinary can be used to hit upon anemia. Clinicians regularly verify the lower hemoglobin level by using repeating the Complete blood count take a look at if clinicians detects anemia, they normally will review the suggest corpuscular volume dimension (covered inside the CBC) to see if the crimson cells are smaller or bigger than regular. We do this because the dimensions of the pink blood cells can assist point docs in the direction of the underlying motive of anemia. As compared to most cells within the body, regular crimson blood cells have a brief lifespan: approximately a hundred-120 days. So a healthful body ought to continually be generating crimson blood cells. This is finished within the bone marrow and takes about seven days, then the new pink blood cells work inside the blood for 3-4 months. Once the crimson blood cell dies, the body recover the iron and utilize it to create new purple blood. Anemia happened while something goes incorrect with these normal procedures (Niv et al., 2005).

Anemia badly affects the physical, mental and reproductive capabilities of the individuals among women reproductive age, the consequences of anemia are enormous in adolescent girls and
pregnant women. In developing countries, anemia is highly associated with poor pregnancy and birth outcomes predisposing premature delivery, increases fetal mortality risk, elevate prenatal and postnatal complications and increase maternal mortality during childbirth and postpartum period (Axemo, Liljestrand, Bergström, & Gebre-Medhin, 2015).

1.2 Statement of problem

Women spend almost more than one third of their lives in menopausal years, which cause numerous physical and psychological changes in women (Ibrahim, Sayed Ahmed, & El-Hamid, 2015). Iron deficiency anemia is one of the major problem after menopause. (Kafeel & Ishaq, 2016). Iron deficiency anemia and its consequences especially related to female life cycle and women of the studied age groups are ignored so, it should be focused and should be controlled.

1.3 Significance of study

This study would be significant and important because anemia is a major health problem itself and also it occurs because of other problems either these are physiologic or pathologic. It should be ruled out, so the need of hour is to know and study the frequency of iron deficiency anemia and its causes so that problem can be highlighted and ruled out. By doing this, further study would be done and it will be useful for us and for our coming generations. It should be controlled and an awareness about it should be provided to community at all age’s especially elder ages.

1.4 Objectives of the study

The objectives of the study were:

i. To assess the frequency of iron deficiency anemia among post-menopausal subjects

ii. To examine the relationship of iron foods and iron deficiency anemia
CHAPTER 2
LITERATURE REVIEW
LITERATURE REVIEW

Menopause is a normal physiological process that signals the end of reproductive life of a woman as a result of reduced secretions of ovarian hormone. It is commonly known as the “change of life” during which a number of biological and physiological changes appear in the body of a woman (Shijina, 2017).

The age of menopause varies from person to person related to a number of factors such as genetic, reproductive history, lifestyle and socioeconomic status. Studies showed that the mean age of menopause varies between 46-50 years. This range of age of menopause is also according to studies from other countries in Asia, such as Indian and Pakistani women experience menopause between 46-49 years (Nisar, Sohoo, & Sikandar, 2015).

A study was conducted to assess the knowledge, attitude and practices of women regarding menopausal health problems. 40% of women were illiterate and they have very poor knowledge about menopausal symptoms. Most common vasomotor symptoms were hot flashes, night sweats, joint pain and abnormal bleeding. This study suggests that majority of our women perceived menopause as a normal physiological event in their life that does not require medical treatment. It is due to Asian culture that women do not seek any help or treatment unless they suffer with severe symptoms. Women should visit the health centres to increase awareness about menopause and its related problems like iron deficiency anemia is a major health related and nutrition related problem (Rajbhandari et al., 2017).

Iron deficiency Anemia is one of the major health problems with fatal results among women after menopause. Many studies showed that anemia is an independent health related risk factor for increased disease and death rates among the elderly (Badawy et al., 2017).

Education of women and their husbands is significantly associated with the anemia prevalence during pregnancy (Lokare, Karanjekar, Gattani, & Kulkarni, 2012). According the study, anemia among women decreases with the education of husbands. Anemia is 3 and 16 times more prevalent among pregnant women whose husbands are illiterate than those
whose husbands had education up to high school and intermediate respectively (Melku, Addis, Alem, & Enawgaw, 2014).

Income plays an imperative role to acquire abundant and quality food, utilize adequate medical care and get access to lucrative resources which can affect the wellbeing of mother and her child. Women from eminent economic status get adequate nutrition and health facilities as compared to women who are poor. The prevalence of anemia in low income countries is 56% as compared to 18% economically rich countries (Hyder, Persson, Chowdhury, Lönnerdal, & Ekström, 2004).

Socio-economic status is strongly linked to better and diverse food choices, and accessibility to quality medical care, which can reduce anemia. Family income is significantly correlated with prevalence of anemia in females and about 47% of females suffering from mild to moderated anemia belonged to the earning groups having low socio-economic status. High economic status groups had less frequency of anaemia (Sharma, Umanaktala, & Malhotra, 2011).

Occupation is strongly related to income and is directly associated with the material living standards and utilization of health facilities. Profession is an occupational position which is considered as an indicator of socio-economic status of an individual that is associated with health enhancing resources (Fujishiro, Xu, & Gong, 2010).

A community-based study was conducted by Galobardes et all in 2011 to investigate the association of diet and socioeconomic position (determined based on education and occupation). The authors reported that lower education and/or lower occupation are independent contributors in determining differences in the dietary habits. The women of low socio-economic class consume less food and nutrient intake is low among them. They elaborated in their study that professional women consult with healthcare service providers more often and give proper attention to diet (e. a. Galobardes, 2011). Prevalence of severe anemia and its associated risk factors among non-pregnant women residing in rural areas of China. The findings revealed significantly higher severe anemia in farmers compared to workers in other occupations. Researchers pointed out the high anemia prevalence in farmers might be associated to their low socioeconomic status (Ma et al., 2017).
A study showed that frequency of anaemia in the age above 50 vary among different countries. Prevalence of Iron deficiency anaemia is 11 and 10.2% in women age above 50 years and above in the USA has been reported. Another study carried out in Italy showed that 11.8% of the elderly were iron deficient. In south Brazil, a prevalence of 12.8% in a population of older women was documented. In Egypt, a study showed that the prevalence of anaemia among the elderly was about 15% (Badawy et al., 2017)

Literature related to iron deficiency anemia in postmenopausal women is very scanty and needs attention to workup on this issue. A study conducted in 2015 have reported 5-10% prevalence of malabsorption in iron deficiency anemia in elderly age (Qamar, Saboor, Qudsia, & Khosa, 2015)

In a study by International Journal of Innovative and Applied Research (2015), 58.0% of women have had mild anemia and 29.0% postmenopausal women had moderate anemia. Most of the postmenopausal women (32.5%) were aged between 50-55 years, (24.0%) were aged between 45-50 years. The age group of 55-60 years (16.0%) postmenopausal women respectively. A study suggested that inadequate intake of ironic nutrients is the significant risk factor for anemia in older women and use of multivitamin/mineral supplements is not associated with lower rates of anemia. Author also found that deficiency in more than a single food or food group were associated with greater than 21% risk of persistent anemia while deficiency in three resulted in 44% increase in risk for persistent anemia. Age and body mass index were also associated with anemia in that age (Thomson et al., 2011).

Iron deficiency is also caused by lack of iron intake or poor intake or it can’t be available to certain population, either it is not available or not reachable. Food which is in low bioavailability may be those which are high in cereals and legumes and may be low in meat and fruits etc. foods which have low iron bioavailability can reduce iron absorption. Iron (about 5 % of daily requirement or 1 – 2 mg per day) is absorbed mailly by duodenal enterocytes. About 5 – 15 % of dietary iron is absorbed. Iron in food is absorbed by gut wall as either heme or non heme iron. Heme is much bioavailable as compared to non-heme iron and its absorption is more efficient whereas the bioavailability of non-heme iron is affected significantly by other dietary components. Non-heme iron is found in environment and the
diet as the insoluble ferric (Fe 3) form of iron but is transported across the gut wall in the ferrous (Fe2) form. Iron (Ferric) is reduced to ferrous iron by duodenal enzymes (ferrireductases) such as the membrane-bound duodenal cytochrome B (DcytB). In addition, reducing agents in the diet such as ascorbic acid, lactic acid, citric acid and other organic acids, or foods which stimulate endogenous gastric acid production, also reduce Fe 3 to Fe 2 and promote its absorption. Ascorbic acid is the main and best source for absorption of iron. It is noted that ascorbic acid is a particularly labile vitamin which is degraded by light, high temperature and oxygen (Coad & Pedley, 2014)

Meat, fish, and poultry have been shown many times to enhance absorption of non heme iron, especially from cereals and legume-based meals. meat stimulates such as gastric acid secretions and that the inability to produce gastric acid is detrimental to iron absorption (Hurrell, Reddy, Juillerat, & Cook, 2006)
CHAPTER 3

METHODOLOGY

3.1 Study Design

The study design was descriptive cross-sectional. It was accomplished to find the frequency of iron deficiency in post menopausal women and to examine the relationship of iron deficiency and iron foods in post menopausal women. A self-structured questionnaire was structured to collect the data from patients.

3.2 Study Location

The data was collected from tertiary care hospital outdoor patients at Mayo hospital Lahore. Mayo hospital is 3000 beds hospital which is located near new Anarkali, Neela Gumband Lahore Punjab 54000. It is operational since 1871. Mayo hospital provides free treatment to public outdoor and indoor patients as part of government policy.
3.3 study population
In this study 70 adults patients >45 years of age.

3.4 sample size
The sample size was 70 adult post-menopausal subjects.

3.5 sampling technique
The convenient sampling technique was used to select the samples based on inclusion and exculsion criteria.

3.6 inclusion exclusion criteria
3.6.1 Inclusion criteria
All menopausal women with age >45 years
Satisfied patients who agreed by consent form

3.6.2 Exclusion criteria
Women age less than <45 years were excluded from the study
Non cooperative who refused to collect data from them
Impaired cognitive

3.7 Data collection tool
Data was collected through structured questionnaire which was comprised of following sections.

i) Sociodemographic profile, age, height, weight, BMI, occupation, Type of job.

It includes age categorized into 45-50, 51-55 and 56-60 years. Height was categorized into 151-153 centimeters, 154-156 centimeters and 157-159. Marital status was categorized into married, single, divorced and widow. Educational profile was stratified into illiterate, literate, Under Matric, Matriculation and above matriculation. Asian Body mass index were taken to classify the data into four categories Underweight, Normal, Overweight, Obesity.

Occupation was grouped as

Type of job was asked and it was categorized into four categories, Unemployed, Government employees, Private employees and house workers.

Section

ii) Section related to personal history, clinical history and Drug history.

iii) Section related to investigations and bio-chemical measurements such as complete blood picture (blood CP) and Serum Ferritin levels.

iv) Section concerned with dietary pattern/ intake with the help of food frequency questionnaire (FFQ). FFQ which are most commonly used method of measuring diet in dietary habits. The food items were taken which were rich in iron sources.

In addition to above noted tools, following research tools were also included.

Anthropometric measurements

  a) Sphygmomanometer (Blood Pressure measuring Apparatus)
  b) Weighing machine with stadiometer (scale)
  c) Stethoscope
3.7.1 Anthropometric measures (Height, weight, BMI)
Height, body weight, was measured in light clothing and without shoes. Body weight was measured using a digital weighing scale and recorded to the nearest 0.1 kg. Standing body height was recorded to the nearest 0.2 cm with a portable wall stadiometer. BMI was calculated as weight in kg divided by height in meters squared (kg/m²). Study participants were classified as normal weight (BMI 18.5-22.9 kg/m²), overweight (BMI ≥ 23-24.9 kg/m²), or obese (BMI ≥ 25 kg/m²). Global obesity was defined as BMI ≥ 30 kg/m².

3.7.2 Biochemical
Biochemical values i.e. blood complete picture, serum ferritin levels were were taken,

3.7.3 Dietary assessment
Dietary intake was assessed using a structured food frequency questionnaire (FFQ), images of portion size shown to the subjects for actual intake, which assessed the frequency of consumption over the previous three months. Patients were asked how frequently they consumed per week.

3.8 Duration of data collection
The data were collected from 1st August 2019 to 1st November 2019. The subjects were taken according to inclusion and exclusion criteria. Informed consent was taken from all subjects. Data were recorded through face to face interview.

3.9 Data Cleaning and Quality of Data
Prior to beginning our analysis, the data that gathered was cleaned. This first involved transforming the text data format to a data format readable by SPSS (data analysis and statistical software). To ensure the quality of the data, a preliminary descriptive analysis was performed. The missing data, variables deemed to be out of the expected range, and duplicate cases were removed. The database was then evaluated for the study inclusion and exclusion criteria.
3.10 Data Analysis
Data was analyzed by statistical software V.23® SPSS (statistical package for social sciences) Chi square test was applied on categorical data to examine the relation between variables. P value <0.05 was taken as significant.

The frequency of each variable was measured. Tabulation of data was done and a percentage of each response to each item was calculated. Diet related data was analyzed to know the significance of various food items. Cross tabs was used. Correlation test applied on numerical data like age, BMI,

3.11 Ethical Consideration
This study was conducted after taking written approval from the concerned head of the department of Out Door Patients and from the Institutional Review Board (IRB) of Mayo hospital Lahore. Subjects were briefed about the study objectives and their satisfaction was obtained. Approval was taken verbally from every participant through consent form.
CHAPTER 4
RESULTS AND DISCUSSION

Results

4.1 analysis and interpretation
This Chapter includes the portion of analysis. The focus of this chapter is to analyze the data, which was gathered through self administered Questionnaire. Questionnaire contain three portions. First portion is Demographic, then second is Hemoglobin level, and third portion is assessment of weekly ironic diet. Descriptive analysis was used to analyze the data of questionnaire.
Figure 4.2 Age group of post-menopausal anemic subjects

Figure 4.2 shows the age group of post-menopausal subjects which were suffering from anemia. The mean age was 51.55±3.07. The minimum age of subject was 46 years and maximum age was 61 years in this study. In 45-50 years of age group 31(44.3%) subjects, in 51-55 years of age group the subjects were 30(42.9%) and in 56-60 years of age group the subjects were 9(12.9%). Most of the subjects were from 45-55 years age group. Maximum subjects were recorded in 45-50 years of age group.
Figure 4.3 Marital status of subjects

Figure 4.3 shows the marital status of subjects. 53(75.7%) subjects were married, 4(5.7%) subjects were recorded single, single subjects were belonging from rural areas of Lahore city. 6(8.6%) subjects were divorced and 7(10%) subjects were recorded in widow category. Most of the subjects were married. Very less recorded in single category.
Figure 4.4 shows the number of children each participants have. Data shows that 40 (57.1%) participants had one to three children. 24 (34.3%) participants had four to seven children and 5 (7.1%) subjects had more than children in a single family. 1 (1.4%) subject recorded who had no any child. Most of the children were recorded in one to three children category.
Figure 4.5 shows the profession of participants. In this study 52(74.3%) subjects were house workers, 11(15.7%) subjects had own business and 7(10%) subjects were government employees. Maximum subjects were house wives with low to middle income socio-economic status.
Figure 4.6 Educational status of subjects

Figure 4.6 shows that 30(42.9%) subjects were illiterate, 14(20%) subjects were primary education passed, 4(5.7%) pass the tenth grade, 15(21.4%) subjects studied the higher secondary education level and 7(10%) subjects were bachelor and master degree holder. Most of the subjects were illiterate and the subject were equal in primary and higher secondary education level.
Figure 4.7 shows that 21 (30%) subjects were recorded Normal body mass index (18.5-22.9 kg/m²). 41 (58.6%) subjects were overweight (23-24.9 kg/m²) and 8 (11.4%) subjects found obese (BMI >25). Maximum subjects were overweight. In overweight category 20 (28.6%) subjects were from 45-50 years of age group and 17 (24.3%) subjects were from 51-55 years of age group. 33 (47.1%) housewives were overweight. In overweight category 17 (24.3%) subjects were illiterate, 8 (11.4%) subjects were primary pass and other were above education level. In obese category 7 (10%) subjects were obese. No any subject found underweight in this study.
Figure 4.8 Hemoglobin levels in post-menopausal women

Figure 4.8 shows the hemoglobin levels in participants. Data shows that 47(67.1%) subjects were mild (9-11 mg/dl) anemic, in (9-11 mg/dL) category 23(32.9%) subjects were from 45-50 years of age group 15(21.4%) subjects were moderate-severe anemic and 19(27.1%) subjects were from 51-55 years of age group. 2(2.9%) subjects very very severe anemic, severe anemia was recorded in house wives in 45-55 years of age group. Only 6(8.6%) subjects had normal hemoglobin levels. In normal values of hemoglobin levels house workers were recorded with highest educatational status.

Table 4.2 Serum ferritin levels

<table>
<thead>
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<th>S.NO</th>
<th>n=</th>
<th>MEAN</th>
<th>MEDIAN</th>
<th>ST.DEVIATION</th>
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<td>01</td>
<td>09</td>
<td>193.28</td>
<td>85</td>
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<td>4</td>
<td>511</td>
</tr>
</tbody>
</table>

Table 4.2 shows the ferritin levels of nine subjects. The mean average of serum ferritin level was 193.28±218.704, the median was 85, the minimum serum ferritin value was 4 ng/ml and maximum value of serum ferritin was 511 ng/ml. most of the critically low values were found in <6 hemoglobin levels subjects.
Figure 4.9 The weekly consumption of Liver, kidney by subjects

Figure 4.9 showing the consumption of meat organ liver, kidney. Data shows that 18(25.7%) subjects did not consumed the liver, kidney, 9(12.9%) subjects consumed up to 50 grams per week, (19(27.1%) consumed the 51-100 grams in a week, 6(8.6%) consumed upto 150 grams and 18(25.7%) consumed upto 200 grams in a week. The subjects who did not consumed the liver, kidney belong from low income socio-economic status house wives. On the other hand consumption was higher in house wives in middle to high income socio-economic status. The consumption of liver, kidney was lower in government servants.
Figure 4.10 Weekly consumption of beef by subjects

Figure 4.10 shows that 23(32.9%) subjects were not consuming the beef, 8(11.4%) were consuming 50-100 grams and 39(55.7%) subjects were consuming more than 100 grams in a week. Illetrate house workers were not consuming the beef on weekly basis, on the other hand consumption of more than 100 grams of beef was higher in literate subjects.
Figure 4.11 Weekly consumption of poultry meat by subjects

Figure 4.11 shows that 28(40%) subjects were not consuming the poultry meat on week basis, 4(5.7%) were consuming upto 100 grams in a week, while 38(54.3%) subjects were consuming more than 100 grams in a week. House wives were more consuming the poultry meat as compared to other professions.
Figure 4.12 Weekly consumption of eggs by subjects

Figure 4.12 shows that 3 (4.3%) subjects were not consuming the eggs in their diet, 7 (10%) were taking up to 100 grams in a week, 29 (41.4%) subjects were consuming the 101-200 grams and 31 (44.3%) were consuming 201-300 grams per week.
Figure 4.13 shows that 23(32.9%) subjects were not consuming the fish, 15(21.4%) were consuming 1-50 grams in a week, 22(31.4%) were consuming 51-100 grams per week and 10(14.3%) subjects were consuming more than100 grams in a week. The consumption of fish was never consumed by low socio-economic status subjects, while consumption was higher in self employed or in those subjects who had own buisiness.
Figure 4.14 Consumption of Milk and Milk beverages on weekly basis by subjects

Figure 4.14 shows that 4(5.7%) subjects were not consuming the milk and milk beverages, 6(8.6%) subjects were consuming less than 500 grams in a week, 19(27.1%) subjects were taking 500-1000 grams in a week, 8(11.4%) subjects were taking 1501-2000 grams in a week and 12(17.1%) subjects were taking more than 2000 grams weekly.
Figure 4.15 Weekly consumption of cheese by subjects

Figure 4.15 shows that 60(85.7%) subjects were not taking the cheese in their diet, 3(4.3%) subjects were taking 1-25 grams in a week, 5(7.1%) were taking 26-50 grams in a week and only 2(2.8%) were taking up to 100 grams in a week.
Figure 4.16 shows that 28(40%) were not consuming the white bread, 8(11.4%) were consuming 36-70 grams which is two slice, 3(4.3%) subjects were consuming 71-105 grams in a week, 10(14.3%) were taking 106-140 grams in a week, 9(12.9%) subjects were taking 141-175 grams per week and 11(15.7%) were consuming 176-205 grams in a week. The consumption of 1-35 grams were consumed by only one subject. Most of the subjects were consuming white bread in their morning breakfast.
Figure 4.17 Consumption of brown bread, whole meal, grains

Figure 4.17 shows that 65(92.9%) subjects were taking more than 206 grams of brown bread, whole meal bread, whole grains bread. 3(4.3%) were taking 36-70 grams of whole meal bread, brown bread and whole grains. Most of the subjects were depend on whole grains products due to easy availability. Only 1(1.4%) subject who was a government servant was recorded in study not taking the whole grain products in their diet.
Figure 4.18 weekly consumption of Iron fortified corn flakes, cereals on weekly basis

Figure 4.18 shows that 30(42.9%) were not consuming iron fortified corn flakes, cereals. 19(27.1%) were taking 1-35 grams in a week, 10(14.3%) were taking 36-70 grams weekly, 11(15.7%) subjects were taking the iron fortified corn flakes, cereals on weekly basis.
Figure 4.19 Consumption of Rice by subjects on weekly basis

Figure 4.19 shows the consumption of rice by subjects. 29(41.4%) were not taking rice in their diet, 7(10%) were taking up to 100 grams in a week, 22(31.4%) were taking 101-200 grams, 10(14.3%) were taking 201-300 grams weekly and 2(2.9%) were taking 301-400 grams weekly.
Figure 4.20 Consumption of seasonal fresh fruits by subjects on weekly basis

Figure 4.20 shows that 13(18.6%) subjects were consuming upto 400 grams of fresh seasonal fruits, 10(14.3%) were consuming 401-800 grams, 13(18.6%) were consuming 801-1200 grams weekly, 29(41.4%) subjects were taking 1201-1600 grams and 5(7.1%) were taking more than 1600 grams of seasonal fresh fruits in their daily diet.
Figure 4.21 Weekly consumption of dried fruits by subjects

Figure 4.21 shows that 36(51.4%) subjects were not consuming any dried fruit in their daily life. 17(24.3%) were taking up to 50 grams, 10(14.3%) were taking 51-100 grams, 3(4.3%) were taking 101-150 grams and 4(5.7%) were taking 151-200 grams of dried fruits on weekly basis. The consumption of dried fruits was higher in literate and private business employees.
Figure 4.22 Weekly consumption of lentils by subjects

Figure 4.22 shows that 46 (65.7%) subjects were not taking the lentils, 21 (30%) subjects were taking 1-200 grams in a week and 3 (4.3%) subjects were taking 201-400 grams weekly. The consumption of lentils were higher in low and middle socio-economic status subjects.
11(15.7%) subjects were taking 1-200 grams of vegetable on weekly basis, 4(5.7%) subjects were taking 201-400 grams, 6(8.6%) subjects were taking 401-600 grams, 10(14.3%) subjects were taking 601-800 grams, 14(20%) subjects were taking 801-1000 grams and 24(34.3%) subjects were taking more than 1000 grams of fresh vegetables weekly. The consumption of fresh vegetables were higher in low socio-economic status and highly educated subjects.
Figure 4.24 Weekly consumption of potatoes by subjects

Figure 4.24 show that 39(55.7%) subjects were consuming the potatoes 1-200 grams, 22(31.4%) were consuming 201-400 grams and 9(12.9%) subjects were consuming 401-600 grams of potatoes on weekly basis. The consumption of potatoes were higher in low socio-economic status subjects.
Figure 4.25 The consumption of fat by subjects

Figure 4.25 shows the consumption of fat by subjects, data shows that 50(71.4%) subjects were consuming upto 200 grams of fat in a week, 14(20%) subjects were consuming 201-400 grams of fat weekly, 2(2.8%) subjects were consuming 401-600 grams of fat and 4(5.7%) subjects were consuming 601-800 grams of fat weekly. In 600-800 fat intake category obese married women were recorded who were taking the above the recommended intake of fat.
Figure 4.26 The consumption of chocolate by subjects

Figure 4.26 shows that 56(80%) subjects were not taking the chocolate, while 14(20%) subjects were taking up to 40 grams of chocolate in the week.
4.2. Discussion
Iron deficiency anemia (IDA) is the most common nutritional deficiency anemia in developing as well as developed countries (Milman, 2011). It results decreased iron stores due to inadequate iron intak, poor absorption and increased demand and blood loss (Gnana-Prakasam, Martin, Smith, & Ganapathy, 2010). Iron is essential for the production of erythrocytes, if its supply is inadequate, red blood cells production declines. This leads to the development of microcytic and hypochromic anemia (Miller, 2013). Iron deficiency anemia may be caused by primary or secondary causes, primary anemia may cause by any single cause directly, by secondary causes or other conditions like hookworm infestation, nutritional deficiency, malabsorption (Shrivastava, Shrivastava, & Ramasamy, 2013).

It is estimated that approximately 1.6 billion people are suffering from anemia in all over the world, it is estimated that approximately 50% of anemic individuals are afflicted with iron deficiency (Shrivastava et al., 2013). Prevalance of anemia is highest in Africa (47.5%) and south East Asia (40-47%). In America the prevalence is 17.8% and in United Arab Emirates 14%, in Egyptian the prevalence of iron deficiency anemia is 11% (Gómez-Ramírez et al., 2019). According to national nutrional survey of Pakistan 2011, the prevalence of iron deficiency anemia among women of reproductive age was 19.9%, in which 18.5% were from urban areas and 20.5% was from rural areas (ValiRam, Mahesh, Shaikh, & Sultana, 2019). The period between 40 and 55 years which covers pre-menopause peri-menopause, and for some women, post-menopause, has a great impact on women health (Peuranpää, Helövaara-Peippo, Fraser, Paavonen, & Hurskainen, 2014). The prevalent of anemia has been consistently high since 2001 when it stood at 50.9%, than it was increased in 2011 on 61.9%, and declined to 53.7% in 2018 (Axemo et al., 2015).

The present study was carried out to assess the iron deficiency anemia in post-menopausal women and to examine the relationship of anemia and dietary patterns in Mayo hospital Lahore. Socio-economic variables play an important role in determining socio-economic status of an individual that directly influences social pleasure and economic wellbeing of an individual (Saydam, Genc, Sarac, & Turfan, 2017). In this study the mean age of subject was 51.55±3.07. The minimum age of subject was 46 years and maximum was 61 years. Most of subjects were from 45-55 years of age group.
Occupation (own, husband or parental for children) is strongly related to income and is directly associated with the material living standards and utilization of health facilities. Profession is an occupational position which is considered as an indicator of socio-economic status of an individual that is associated with health enhancing resources. The social standing due to occupation is related to the easier access to better healthcare, education, and salubrious residential facilities (Pan, Chen, Tsao, & Chen, 2017). In this study 7(10%) subjects were government employees, 11(15.7%) had own business, and 52(74.3%) subjects were housewives.

Education is a profound factor that has both direct and indirect impact on the female and her family. Direct impact influences the health by acquiring better medical facilities, better family relations, enhanced endurance and cognitive behavior. Indirect effects include encouraging health habits, return over education in terms of better household income and occupation. Higher education has shown positive effect on the Hemoglobin level, better health status, during pregnancy, lactation and increasing age with quality of life (Mirza, Abdul-Kadir, Breymann, Fraser, & Taher, 2018). In this study 30(42.9%) subjects were illiterate, 14(20%) had primary level education, 15(21.4%) subjects were had higher secondary level education and 7(10%) subjects had bachelor and above level education. In this study the illiteracy frequency was higher in subjects. Galobardes et al. (2001) conducted a community-based study to investigate the association of diet and socioeconomic position (determined based on education and occupation). The authors reported that lower education and lower occupation are independent contributors in determining differences in the dietary habits. The women of low socio-economic class consume less food and nutrient intake is low among them (B. Galobardes, Morabia, & Bernstein, 2001).

Nutritional status plays and important role in increasing age, quality of life, and co-morbidity, overweight and obese patients are on more risks of metabolic syndrome and other diseases. Normal body mass index bodies had less chances of risk factors as compared to overweight and obese subjects (Shekarriz & Vaziri, 2017). In this study 21(30%) subjects had normal body mass index, 41(58.6%) subjects were overweight and 8(11.4%) subjects were obese. In this study maximum subjects were overweight. Obesity rate was higher in illiterate subjects.
The major causes of anemia are poor consumption of dietary iron, excessive destruction of red blood cells due to malaria and helminth infection, nutritional deficits other than iron deficiency (folic acid, vitamins A and B-12), genetic disorders (thalassemia and sickle cell), reproduction related factor (obstetric complications, high fertility, contraceptives or practices that increase blood loss and infections. Pallor is the major clinical symptom of anemia and iron deficiency and fatigue or decreased working capacity are its physical symptoms. According to the study results only 6(8.6%) subjects found who had 12-14 milligram/decil litter, according to world health organization 12-14 mg/dL is considered appropriate hemoglobin levels in the body. 47(67.1%) subjects had 9-11 mg/dL. 15(21.4%) subjects had 6-8 mg/dL, which is accounting in severe anemic category and only 2(2.9%) subjects had very severe anemia (hemoglobin level <6). Research studies shows that subjects with lower levels of hemoglobin had more consequences. Those subjects had more clinical complications as compared to mild and moderate anemia.

Diet and food intake have a pivotal role in maintaining human health. Unhealthy diet, obesity, and nutritional deficiencies may lead to various disorders. A better understanding of the factors that contribute to chronic diseases including diabetes is vital. There is a need to focus on the effects of optimal nutrition on the health and wellbeing of women during menopause (Sapkota, Sapkota, Acharya, Raut, & Jha, 2015). It is evident that good nutrition and optimizing the intake of specific nutrients, together with lifestyle changes can improve maintaining a healthy menopause. According to modern lifestyle associated with easy access to food, lack of exercise, sedentary lifestyles, calorie dense foods, and excessive television viewing contribute to the development of noncommunicable diseases (Khokhar, Kaur, & Sidhu, 2010). It observed that health of the postmenopausal women and overall well-being during the climacteric period is highly related to general good health and a healthy lifestyle including a balanced diet, nonsmoking habits, and regular physical exercise, a positive attitude toward aging and menopause. Different lifestyle practices, particularly diet may delay the appearance of risk factors in this population group (Marques et al., 2019). In this study most of the participants were taking iron rich diet to cover the gap of iron deficiency anemia. The consumption of liver, kidney and meat organs was good, 18(25.7%) subjects were consuming 151-200 grams of organ meat in a week. While 19(27.1%) subjects were
taking the organ meat 51-100 grams in a week. The weekly consumption of beef was good, 39(55.7%) subjects were taking more than 100 grams of beef in week. 28(40%) were not consuming the poultry meat, 38(54.3%) subjects were consuming the poultry meat more than 100 grams in a week. 29(41.4%) were consuming the eggs 101-200 grams weekly, 31(44.3%) were consuming the eggs 201-300 grams in a week. Fish consumption was 51-100 grams in 22(31.4%) and 10(14.3%) were consuming more than 100 grams in a week. The consumption of milk was adequate, 19(27.1%) subjects were taking 500-1000 grams of milk in a week, 21(30%) subjects were taking 1001-1500 grams of milk and 20(28.5%) subjects were consuming more than 1500 grams of milk in a week. Cheese provide 0.7 milligram iron in 100 grams of cheese. 60(85.7%) subjects were not consuming the cheese in their diet, while only 2(2.9%) subjects were consuming the cheese 76-100 grams in a week. Rest of 8(11.4%) subjects were taking cheese less than 50 grams in a week.

100 grams of white bread provides 3.6 grams of iron, the consumption of white bread was not recorded in 28(40%) subjects, 8(11.4%) subjects were consuming the white bread 36-70 grams in week, 10(14.3%) were consuming 106-140 grams, 9(12.9%) subjects were consuming 141-175 grams in a week and 11(15.7%) subjects were consuming 176-205 grams of white bread in week.

100 grams of cereals provides 4.3 grams of iron, 100 grams of brown bread provides 4.1 milligram iron (Rybicka & Gliszczyńska-Świgło, 2017). Cereals and brown bread consumption more than 206 grams were recorded in 65(92.9%) subjects in week, 5(7.1%) subjects were taking less than 140 grams per week. Most of the subjects were dependent on whole grains due to easy accessibility and availability at homes.

Fortification of cereals with iron is a good option to reduce the numbers of iron deficiency anemia in a community or nation, in this study 30(42.9%) were not consuming any iron fortified food in their diet, 19(27.1%) were consuming iron fortified corn flakes, 10(14.3%) subjects were taking 36-70 grams of iron fortified cereals and 11(15.7%) subjects were taking 71-105 grams of fortified cereals in a week.

Fruits and vegetables are high in iron including dried fruits, dark green leafy vegetable. Spinach, Swiss chard, beet green, are good source of iron rich food. 100 grams of spinach
provides 6 mg iron. In dried fruits one cup of dried apricots provides 8 milligram of iron. Fruits i.e apple, banana, pomegranates are also rich in iron (Ghose & Yaya, 2018). High intake of fruits and vegetables prolongs the reproductive lifespan because of the presence of antioxidants in fruits and vegetables that counteract the adverse effects of reactive oxygen species on the number and quality of ovarian follicles (Dunneram, Greenwood, Burley, & Cade, 2018). According to this study results 13(18.6%) were consuming 1-400 grams of fresh fruits, 10(14.3%) were consuming 401-800 grams of fresh fruits in a week, 13(18.6%) subjects were consuming 801-1200 grams of fresh fruits, 29(41.4%) subjects were consuming 1201-1600 grams and rest of 05(7.1%) subjects were consuming more than 1600 grams in a week. The consumption of fresh fruits were higher in middle and high socio-economic status and well educated subjects. The dried fruit was not much consumed by the participants, half of the subjects never consumed the dried fruits, only 7(10%) subjects were consuming upto 200 grams of dried fruits in a week. All age group of subjects were consuming fresh green leafy vegetables, 11(15.7%) subjects were consuming upto 200 grams of vegetables, 6(8.6%) subjects were consuming 401-600 grams vegetables, 10(14.3%) were consuming 601-800 grams, 14(20%) subjects were consuming 801-1000 grams vegetables and 24(34.3%) subjects were consuming more than 1000 grams of vegetables per week.

Lentils are the good source of iron, one cup of lentils provides 229 calories and 6.5 mg iron, soya bean provides 297 calories and almost 9 mg iron (Yunus et al., 2019). The consumption of lentils not much consumed by the subjects, 46(65.7%) subjects not consumed the lentils, 21(30%) subjects were consumed upto 200 grams, and 3(4.3%) subjects were consuming 201-400 grams of lentils in a week.

A similar study was conducted on 13017 subjects to assess the relationship of dietary fruits vegetables and other foods and hemoglobin levels. Their study design was double blinded placebo control study, according to their results in pre-menopausal women serum ferritin was positively associated with intake of fruits and vegetables (Péneau et al., 2008). In this study the dietary data does not shows significant due to small sample size and cross sectional study design.
Limitations
The limitations of the study were collected from only menopausal patients of out door patients, sample size and study duration was limited, and data collection point was only one institute. Serum ferritin levels could not be collected due to non affordability of subjects and covid-19 outbreak.

5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5. 1 SUMMARY
A hospital based descriptive study was conducted at out door patient’s department of Mayo hospital Lahore to assess the frequency of iron deficiency anemia among post-menopausal women and to examine the relationship of iron deficiency anemia and nutritional status.

The study sample comprise of 70 subjects age>45 years with menopausal status with characteristics including age in years, marital status, education level, occupation and clinical characteristics, hemoglobin levels, serum ferritin levels were included in the study. The mean age of subject was 51.55±3.07. The minimum age of subject was 46 years and maximum age was 61 years in this study. Most of the subjects were from 45-55 years of age group. In this study 53(75.7%) subjects were married, 4(5.7%) subjects were single, 6(8.6%) subjects were in divorced category and 7(10%) subjects were recorded widow. In this study maximum participants had one to three children. The occupation of the subjects were recorded, maximum subjects were house wives. Maximum subjects were illiterate.

In this study 21(30%) subject’s nutritional status was normal, 41(58.6%) subjects were overweight and 8(11.4%) subjects were recorded obese. Most of the subjects found overweight 45-55 years of age group. The prevalence of obesity was higher in house wives,
obesity related subjects were recorded with low educational status. No any subject was recorded underweight in this study.

Biochemical levels were also taken from participants, 6(8.6) were recorded with normal (12-14 mg/dL) hemoglobin levels 47(67.1%) subjects were recorded with low (9-11) mg/dL hemoglobin, 15(21.4%) were recorded with sever (6-8 mg/dL) hemoglobin levels, 2(2.9%) subjects were recorded with very severe lower lower <6 mg/dL. The prevalence of iron deficiency anemia was recorded in house wives as compared to other professions. Normal hemoglobin was recorded in house wives with above higher secondary educational status.

Dietary patterns were recorded in participants, 19(27.1%) were consuming 51-100 grams of meat organs (liver, kidney), 6(8.6%) subjects were consuming 101-150 grams, while 18(25.7%) were consuming more than 150 milligram and other 18(25.7%) subjects were not consuming the meat organs in their diet. 39(55.7%) subjects were consuming the beef more than 100 grams of beef in a week, while 23(32.9%) subjects were not consumed beef. The beef was consumed more frequent in with good socio-economic status. The consumption of poultry meat was more than 100 grams by 38(54.3%), 28(40%) were not consuming the poultry meat. The consumption of egg was 201-300 grams by 31(44.3%) participants, 101-200 grams weekly consumed by 29(41.4%). The consumption of fish was more than 100 grams by 10(14.3%) participants, 22(31.4%) subjects were consuming 51-100 grams weekly, 15(21.4%) were consuming upto 50 grams and 23(32.9%) were not consuming the fish.

The consumption of dairy products were recorded in subjects, most of the subjects were recorded with recommended dairy allowances, only 10(14.3%) subjects were consuming below the recommended intake. Most of the participants were not taking cheese in their diet.

The white bread consumed by 11(15.7%) subjects more than 175 grams weekly, and 10(14.3%) subjects more than 100 grams upto 140 grams. Most of the subjects were consuming white bread in morning time. Brown bread, whole meal and whole grains were consumed more than 206 grams in a week by 65(92.9%) subjects. iron fortified food consumed by 40(57.1%) subjects, 30(42.9%) subjects were not consumed the iron fortified foods.
The fresh fruits consumed by 29(41.4%) participants 1201 grams upto 1600 grams, the consumption of fresh fruits was less recorded in 23(32.9%) subjects <800 grams. The consumption of dried fruits were not recorded in 36(51.4%) subjects, while 27(38.6%) were taking the dry fruits upto 100 grams weekly and 7(10%) were consuming 100-200 grams in a week. The consumption of lentils not recorded in 46(65.7%) subjects, 21(30%) were taking upto 200 grams weekly and 3(4.3%) were taking upto 400 grams lentils in a week. The consumption of vegetables were more than 1000 grams in 24(34.3%) subjects, 801-1000 grams in 14(20%) subjects and in 31(44.3%) the consumption of vegetables were recorded <800 grams in week which is below the recommended intake according to various dietary guidelines.

5. 2 CONCLUSION
Post-menopausal women with 45-55 years of age group was more prevalent in iron deficiency anemia, most of the subjects were not consuming the recommended daily allowance of iron, and most of the subjects were not consuming the iron fortified foods in this study. Data does not shows the association of iron deficiency anemia and iron rich foods due to small sample size, need longitudinal studies.
5.3 RECOMMENDATIONS

5.3.1 Specific Recommendations

Recent and older studies show the impact of educational status and quality of life. As in this study 30(42.9%) were illiterate, the literacy rate should be increased in rural areas to cover the gap of non-communicable diseases and improve the quality of life.

Obesity is a risk factor for hypertension, cardiovascular disease, and diabetes mellitus, weight gain is the greater risk of myocardial infarction, stroke, and renal failure. Reduction of weight is the key to reduce the risk factors from above diseases. In this study 41(58.6%) subjects were overweight and 8(11.4%) were extremely obese. It is recommended that BMI of subjects should be within normal range or slightly below normal range.

As in this study 47(67.1%) subjects' hemoglobin levels were below the normal values, the intake of iron-rich food should be taken frequently to overcome the iron deficiency anemia. 15(21.4%) subjects were suffering from severe iron deficiency anemia, they should need the proper follow up from worthy physicians. And if there is need of intravenous infusion advice by physicians then should be infused accordingly to overcome the iron deficiency anemia.

As 18(25.7%) subjects were not consuming the meat organs like liver, kidney, they should consume to fulfil the recommended daily allowances from high biological values, some subjects were consuming the below the recommended intake of Pakistani dietary guidelines, so should be consume according to dietary guidelines. Most of subjects were also not consuming the beef, chicken and high biological related food, they should consume to overcome the deficiency of anemia.
As 30(42.9%) subjects were not taking the iron fortified food, the consumption should be increase to cover up the gap of iron deficiency anemia throughout the life, diet should be based on five food groups and should be taken in balanced and according to dietary guidelines.

5.3.2 General Recommendations

It is also recommended that processed food, samosa, pakora, fried chips, burger, should be consumed in moderation, bakery items, biscuits, soft drinks, cold drinks, chips, should be avoided because these items are high in empty calories and less nutrients, these food progress the iron deficiency anemia due to less nutrition value.

It is recommended that iron rich foods should be more consume, meal patterns should be from all food groups, specially dairy, grains, fruits and vegetables should be taken daily to complete the recommended daily allowance of iron and other hidden hunger nutrients.

The basic health unit, rural health centers and dispensaries should provide the services in community and assessment should be done by lady health workers and lady health visitors by mobile teams, where the prevalence exist in community there iron and folic acid supplements should be provided to pregnant, lactating and menopausal women.

Fortification of wheat and maze flours with iron, folic acid and other micronutrients should be provided in prevalent areas where the iron deficiency anemia still exist to reduce the risk of anemia by improving the iron status in mothers and post-menopausal females.

It is recommended that fresh fruits and green leafy vegetables should be consumed frequently, because fruits and vegetables are the good source of iron, dietary fiber, vitamins, minerals and phytochemicals. Fresh fruits and vegetable are rich source of iron.

In developing countries like Pakistan in all communities after age 35 the all baseline investigation including blood complete picture, liver functions and renal functions tests should be done after every 6 months or annually free of cost to diagnose the iron deficiency
anemia and other related diseases.
Social media, Print media and Electronic media can play a vital role to create awareness regarding improvement of quality of life, balanced nutrition, eating patterns and linked diseases by eating habits.

**REFERENCES**


**APPENDICES**

**Annex i**
Questionnaire

Female medical department

Mayo hospital Lahore.

**Title: Assessment of Iron deficiency anaemia among post-menopausal women**

Date: ________________________________

1. Social and demographic characteristics:
1. Age of woman in years: _____
2. Marital status: (a) Married   (b) Single   (c) Divorced   (d) Widow
3. How many children do you have? (………………)
4. Occupation: (a) House wife   (b) Professional, specify………… (c) Self employed
5. Education: (a) Illiterate   (b) Literate, specify level of education:
6. Height: ______________
7. Weight: ______________
8. BMI: ______________

2. Laboratory Investigations:

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3. Frequency of Ironic food intake per week:

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<td></td>
</tr>
<tr>
<td>Category</td>
<td>Food Item</td>
<td>Serving Size</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------</td>
<td>-------------------------------</td>
<td></td>
</tr>
<tr>
<td>Poultry stomach</td>
<td></td>
<td>100 g (palm of small hand)</td>
<td></td>
</tr>
<tr>
<td>Beef, duck, Meat</td>
<td></td>
<td>100 g (palm of small hand)</td>
<td></td>
</tr>
<tr>
<td>Poultry meat</td>
<td></td>
<td>100 g (palm of small hand)</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td>50 g (1 egg)</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>Fish and fish products</td>
<td>50 g (deck of cards)</td>
<td></td>
</tr>
<tr>
<td>Milk and milk beverages</td>
<td>Milk and milk beverages</td>
<td>250 g (1 glass)</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td>Cheese</td>
<td>50 g (1 thick slice, 2 tablespoons)</td>
<td></td>
</tr>
<tr>
<td>Dairy products</td>
<td>Cheese</td>
<td>25 g (1 slice, 1 triangle serving)</td>
<td></td>
</tr>
<tr>
<td>White wheat and rye</td>
<td>White wheat and rye bread, bakery</td>
<td>35 g (1 slice, small roll)</td>
<td></td>
</tr>
<tr>
<td>Dark bread, wholemeal,</td>
<td>Dark bread, wholemeal, with grains,</td>
<td>35 g (1 slice, small roll)</td>
<td></td>
</tr>
<tr>
<td>Wares</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Example</td>
<td>Serving Size</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>----------------------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>Graham, bagels, pumpernickel bread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crispbread</td>
<td>10 g (1 slice)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat bran, wheat germ</td>
<td>10 g (1 spoon)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron-fortified corn flakes and cereals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 g (1 glass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other cereal products (uncooked)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 g (e.g. 1 glass of pasta or oatmeal, 1/2 glass of rice or groats)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fruits</td>
<td>100 g (1 medium piece, 1 glass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dried fruits</td>
<td>50 g (handful)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry legumes</td>
<td>100 g (1/2 of glass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other vegetables</td>
<td>100 g (1 medium piece, 1 glass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 g (1 large piece)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 g (1 spoon)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts and Seeds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower, pumpkin, &amp;</td>
<td>30 g (handful, 3 spoons of seeds)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other nuts and seeds</td>
<td>30 g (handful, 3 spoons of seeds)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cocoa products

<table>
<thead>
<tr>
<th>Cocoa</th>
<th>Chocolate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 g (1 spoon)</td>
<td>20 g (1/5 of bar)</td>
</tr>
</tbody>
</table>

Annex ii

**Consent form**

The questionnaire, for which you are being asked to fill in, is a part of research on assessment of iron deficiency anemia among post-menopausal subjects. The data will be kept confidential and will be used for research purpose only.

**CONFIDENTIALITY**

I confirmed that I have read and I understand the information which is taken from me.

Participant name:
Annex iii

Organizational Approved permission for data collection

Allama Iqbal Open University
Department of Environmental Design, Health and Nutritional Sciences

Date: July 11, 2019

The Head of Female Medical Department,
Mayo Hospital,
Lahore.

Subject: FACILITATION FOR DATA COLLECTION

Dear Sir,

It is stated that Rukhsana Bibi Roll No. BP54056 is a student of M.Sc Public Nutrition Program of this Department at Allama Iqbal Open University, Islamabad. She has been assigned the research topic, “Assessment of iron deficiency anemia among post menopausal women”. She is at the stage of collection of data related to her study.

The student may kindly be facilitated to collect data for the said research report. It is assured that the collected information will be used for academic purpose only.

With kind Regards.

Yours sincerely

[Signature]

Dr. Hajra Ahmed
Chairperson
Dept. of Environmental Design, Health
and Nutritional Sciences
AUQ Islamabad

[Stamp]

Medical Superintendent
Mayo Hospital, Lahore.
Annex iv

**RESUME**

**Title of project**  
Assessment of iron deficiency anemia among post-menopausal subjects

**Name** Rukhsana Bibi & Anam Mohi ud din

**E-mail** rukhsanashaheen892@gmail.com

**Place and date of birth**  
Lahore City

**College and universities with years attended and degrees obtained**  
B.S Nursing Mayo hospital Lahore, RN Mayo hospital L

**Memberships in learned or honorary societies**  
Nil

**Publications**  
nil

**Date** 12-02-2020