Palestinian Medical and Pharmaceutical Journal (PMPJ). 2023; 8(1): 17-40

Assessment of dietary consumption in a group of pregnant women at their second and third trimesters in Amman

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Received: (19/9/2021), Accepted: (22/5/2022)

ABSTRACT

Background*:** For a child's healthy growth and development, nutrition is indispensable before and during pregnancy. Meeting nutritional needs during pregnancy has always been a significant public health issue. ***Objective*:** The study aimed to assess and evaluate energy, macronutrients, and micronutrient consumption from food among pregnant women in Amman Governorate during the second or third trimesters, then compare the consumption to the Recommended Dietary Allowance (RDA). In addition, it aimed to assess micronutrient consumption from foods and supplements; finally, it investigated macronutrient consumption among under-weight, normal-weight, over-weight, and obese pregnant women. ***Methods: A cross-sectional study was carried out in 2018 at the Ministry of Health's (MoH) Maternal and Children Health Centers (MCHC) in Amman to assess the dietary intake in a convenient sample of 300 seemingly healthy pregnant women between 17 and 40 years old and at ≥ 13 weeks of gestation. Maternal demographic characteristics, medical history, anthropometric measurements, and dietary data (three-day recall) were collected. ***Results*:** The daily mean intake of carbohydrates exceeded the recommended intake in 45.3% of pregnant women. Fiber intake was less than 28g/day in 90% of them. Total fats intake (45.6g/day) was lower than the RDA in 42.3% of pregnant women. Two-thirds of the pregnant women consumed a moderate amount of saturated fats (14.6g/day). The mean daily intake of proteins was 50.5±20.2g—more than two-thirds consumed protein less than the RDA. Subsequently, intakes of all essential amino acids were below RDAs.The intake of fat-soluble vitamins was lower than RDA for vitamins D, E, and K.While, whereas vitamin A was higher than RDA. Copper and salt intakes were more significant than the RDA for minerals (calcium, fluoride, iodine, iron, zinc, and selenium). ***Conclusion***: The results showed inadequate and imbalanced dietary intake compared to RDA. Maternal nutrition and diets of pregnant women in this study show alarming indicators that may negatively affect the well-being of both pregnant women and fetal growth.

Keywords: Pregnancy, RDA, Nutrients Intake, Malnutrition, The Second Half Of Pregnancy, Macronutrients, Micronutrients, Public Health Issues, Maternal Nutrition.

INTRODUCTION

Nutrition directly impacts health throughout a human's life cycle [10]. However, it is well known that pregnant women are the most vulnerable group throughout the human life cycle regarding nutritional health [11]. Attention to the maternal diet during all trimesters of pregnancy is critical to safeguard the health of mothers and ensure a healthy outcome [7]. Vitamins and minerals support every stage of maternal, placental, and fetal interactions to promote and maintain healthy gestation [12]. Blood levels of fat-soluble vitamins tend to increase in pregnancy, whereas water-soluble vitamin levels tend to decrease. Occasionally, prescribing multivitamin supplements during pregnancy overcomes adequacy in water-soluble vitamin levels [6]. Supplements provided to pregnant women should contain the essential nutrients most likely lacking in their diets [3]. These nutrients include pyridoxine, B12, folic acid, D, and C, and the mineral elements, such as iron, iodine, zinc, copper, and selenium. Nutrient amounts should not exceed tolerable upper intake levels for pregnant women [12].

Pregnancy is associated with intense anatomical, physiological, biochemical, and endocrine changes that affect many organs and systems of pregnant women in order to nurture and accommodate the developing fetus [29, 33]. It has been found that maternal dietary intakes of protein, fat, and carbohydrates in pregnancy were positively associated with child dietary intakes of these same nutrients later on [5].

At the end of the first trimester, the fetus weighs 30g; in the following six months of pregnancy, the maximum growth rate for the maternal plasma volume, uterine blood flow, and fetal weight [17]. Gestational weight gain higher than the recommended range may have various adverse effects on the mother, such as the increased risk for pregnancy-induced hypertension and gestational diabetes (GDM). Lower gestational weight gain is associated with an increased risk for unsuccessful breastfeeding [32].

Macronutrients, or "energy-providing nutrients," are carbohydrates (CHO), proteins, and fats. These nutrients usually need larger quantities than micronutrients like vitamins and minerals [32]. Energy requirement increases through pregnancy. In the first trimester, energy requirements are the same as of the non-pregnant women; however, the requirement increases in the second and third trimesters by 340 kcal/ day and 450 kcal/ day, respectively. Higher intakes of the CHO subgroup glucose and lactose were associated with birth weight [28]. Low glycemic index foods prolong carbohydrate absorption, ease the insulin response, and suppress hormone-sensitive lipase, thus decreasing non-esterified fatty acids and increasing the expression of the insulin-responsive glucose transporter GLUT4 [25].

On the other hand, protein requirement during the first trimester is the same as that of non-pregnant. However, the requirement increase during the second and third trimesters to reach 1.1g/kg of pre-pregnancy body weight [16]. The studies on amino acids have revealed increased requirements during later stages of pregnancy for all amino acids to accommodate the increased needs for fetal tissue synthesis, although the increases varied among the amino acids [9]. The dietary fat intake of pregnant women affects pregnancy outcomes, and total fat intake during pregnancy and lactation modulates their children's growth, development, and health [18].

Micronutrients enable the body to secrete enzymes, hormones, and other substances essential for proper growth and development even though they are only needed in small amounts [32]. During pregnancy, physiological micronutrient requirements increase to meet the augmented maternal metabolic demands, erythropoiesis accretion of maternal tissue reserves, and fetal requirements for growth and development [14].

Therefore, this study aimed to assess and evaluate macronutrient and micronutrients consumption from foods among a group of pregnant women in Amman Governorate during the second or third trimesters and compare the consumption of macronutrients and micronutrients in a group of Jordanian pregnant women with to RDA, and finally to assess and compare macronutrient and micronutrients consumption among the underweight, normal, overweight and obese pregnant women of the study.

METHODS

Study design: A descriptive cross-sectional study design was applied to a convenient sample of pregnant women attending Ministry of Health (MoH) facilities for antenatal care from August to October 2018.

Settings: The study was conducted in Amman's Ministry of Health's Maternal and Child Health Center (MCHC). 20 MCHCs were selected according to the highest caseload and reached the area from different districts in Amman. Each MCHC was visited more than once on different weekdays from August 2018 to October 2018.

Study participants: Study participants are selected according to the inclusion and exclusion criteria below. Inclusion criteria are: all women visiting MCHC living in Amman Governorate. Pregnant women should be in their second or third trimester with a Singleton pregnancy, Jordanian nationality, and age ranges from 17- to 40 years. Exclusion criteria are women living outside Amman Governorate, pregnant women in the first trimester, women considered at a high risk of preterm delivery or fetuses with congenital anomalies, twin/multifetal pregnancy, and pregnant women with chronic diseases (e.g., D.M., HTN, T.B., Hepatitis) and Smokers.

Variables: RDA and intakes of all energy, macro, and micronutrients, current and pre-pregnancy weight, height, weight gain, BMI.

Study Size: The sample size was calculated using the Raosoft® online sample size calculator [23]; which is designed specifically for population surveys to calculate the sample size and define how many responses are required to meet the desired confidence level (usually 95%) and with an acceptable margin of error (usually 5%) while taking in consideration the population size. The population size was 1,413 and was estimated by multiplying the number of marriage contracts in 2017 in Amman (28,263) with the percentage of pregnant women by 5% [8]. Up to 300 pregnant women were recruited.

Quantitative Variables / Data Sources/measurements / Bias:

Maternal Anthropometric Measurements: The researcher measured pregnant women's height and current body weight. SECA electronic land scale (Model 876) was used to measure current weight and recorded to the nearest 0.1 kg, whereas height was taken using the measuring tape and recorded to 0.1 cm. The women's medical files obtained the pre-pregnancy weight and gestational age. Finally, pre-pregnancy BMI and total GWG were calculated.

Demographic and Health Data: Any underlying health conditions, i.e., gestational diabetes and smoking, were asked out before filling out the form. If the pregnant women were free of such conditions, with singleton pregnancy and at 13th week or more, consent was taken for participation and a demographic characteristics checklist.

Dietary Data Collection: Maternal dietary intake was collected using a 3-day food recall (see appendix 4). Measuring cups and food models were used to help pregnant women accurately estimate their intake of food items. The days of Eid Al Adha and Arafat Day that came across during the data collection periods were excluded as they may affect the habitual daily intake. Dietary intake from food intake was calculated using the food composition tables in the Middle East [22] and ESHA software (Ver 10.9/2011).

Statistical methods*:* Data were collected and entered into the Statistical Program for Social Studies software (SPSS17.0.1.2008, Chicago: SPSS Inc.). Correlations and simple and multiple regression analyses were used to establish which variables significantly affect maternal nutritional and socioeconomic status. A two-tailed t-test and ANOVA were used to evaluate grouped data. The outcomes data was presented in numbers, proportions, means, and standard deviation. An alpha level of 0.05 was set to assure statistical significance.

Ethical approval: This study was approved by the Graduated Studies faculty and Deanship of Academic Research committee at Jordan University, Amman. Written consent was obtained from all pregnant women that participated in the study. Names of the participants were not included on the consent form, the results, or mentioned in the discussion parts of the study to maintain complete privacy and confidentiality. The study's objectives were explained to each pregnant woman who participated before asking for consent.

RESULTS

Characteristics of the Study Sample

The study consisted of 300 pregnant women. The characteristics of pregnant women are presented in (Table 1**)**. Pregnant women aged 17-30 constituted the highest category (219) with a percentage of (73%) in terms of the age variable.

Table (1): Characteristics of the Study pregnant women.

%[2]	N[1]	Categories	Variable
73	219	17-30 years	Age
27	81	31-40 years	
5	15	Underweight	Pre-pregnancy BMI[3]
50	150	Normal weight	
31.3	94	Overweight	
13.7	41	Obese	

Pre-Pregnancy Weight and Gestational Weight Gain

The mean pre-pregnancy weight and the mean total GWG were (64.8kg) and (4.09kg) respectively, in the second trimester, while in the third trimester, the mean pre-pregnancy weight was (63.57kg) and the mean total GWG was (8.38kg) (Table 2**)**. Among the pregnant women (150) were within normal BMI (50%); on the other hand, pre-pregnancy underweight was the lowest (5%), suggesting a relatively high expectation of overweight-related pregnancy complications.

Table (**2):** Mean Pre-Pregnancy Weight and Total Gestational Weight Gain in Second and Third Trimesters.

Means (kg)	Variable	N[1]	Trimester
64.8 ±13.3 kg	Mean pre-pregnancy weight	173	2nd
4.09 ±5.3 kg	Mean total GWG[2]		
63.5 ±12.8 kg	Mean pre-pregnancy weight	127	3rd
8.38 ±5.8 kg	Mean total GWG[2]		

1: N represented the number of participants.
2: GWG gestational weight gain calculated as current weight – pre-pregnancy weight.

Macronutrient intake:

Carbohydrates and Fiber Intakes: The intakes in terms of means are compared; an adequate amount (179.3g/day±69.05) is consumed according to our study pregnant (Figure 1**)**. There was no significant difference (*P*=0.5) between the mean intake of CHO in the second trimester (177.3g/day) and the third trimester (182.4g/day). The mean fiber intake was 14.6g±10.6, and among the pregnant women, only 4.7% (14) met the recommended intake (28g/day). Almost half of the 300 participants (136) consumed CHO that exceeded the RDA (Figure 2**)**, while 30.3% (91) met the RDA, and 24.3% (73) consumed less.

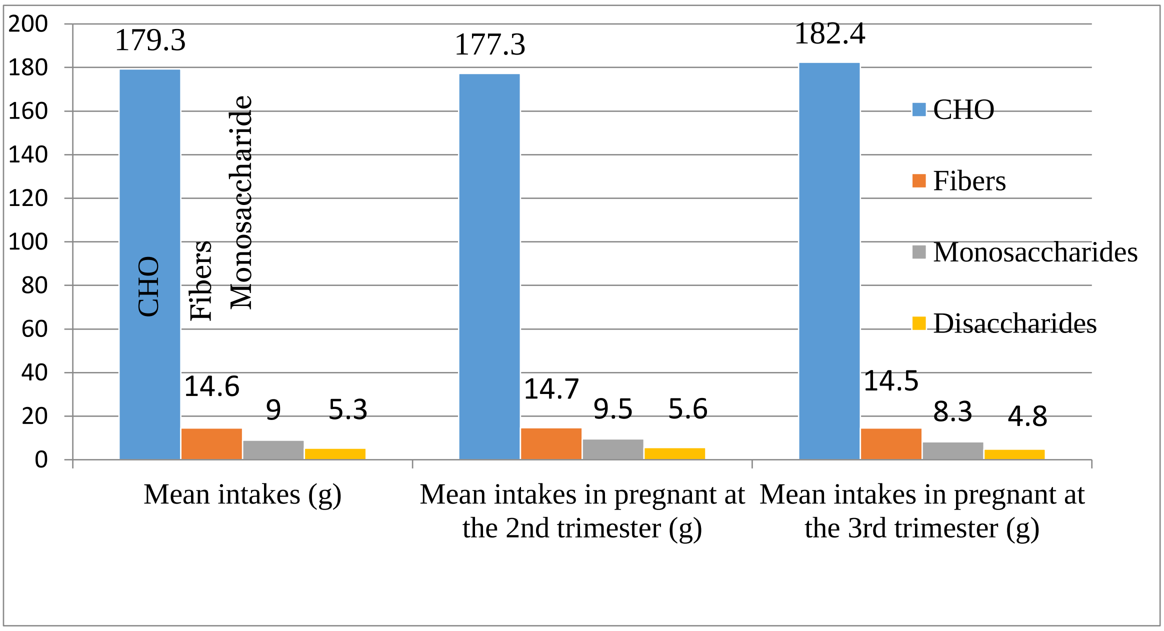

Figure (1): Mean Carbohydrate and Fiber Intakes.

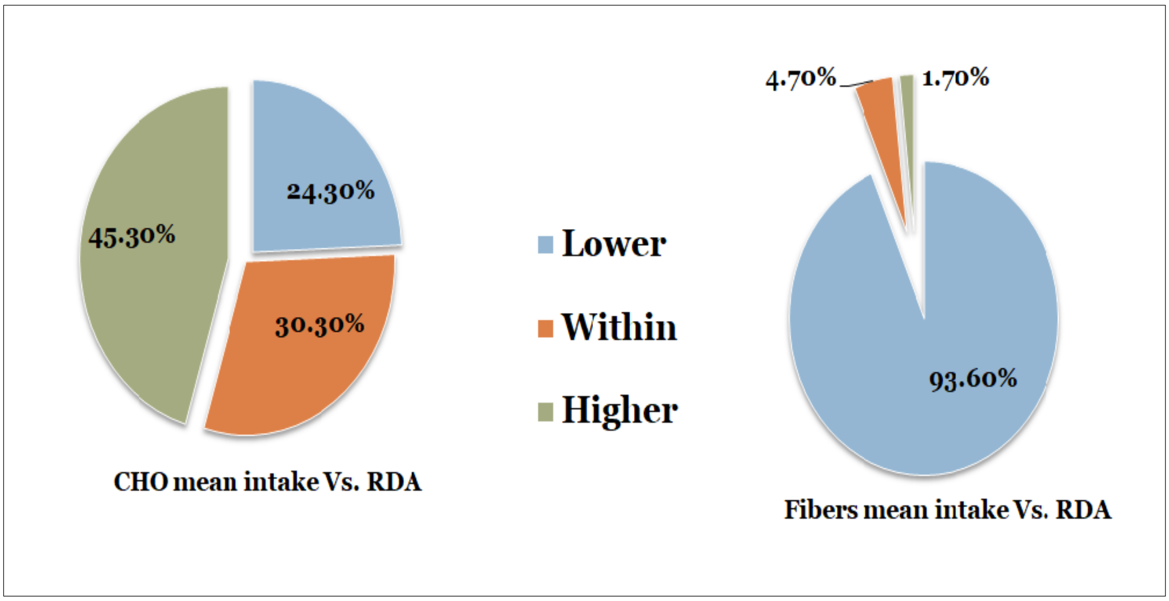

Figure (2): Mean Carbohydrates and Fiber Intakes Compared to Recommended Daily Allowances.

Protein Intakes: Protein intakes (50.5g/day) did not meet the RDA (Figure 3) in more than two-thirds of the pregnant women (82.7%) shown in (Figure 4**)**. There was no significant difference (*P*=0.8) between the mean intakes of protein in the second trimester (50.1g/day) and the third trimester (51.1g/day). The mean intakes of all EAA were below the RDA. In addition, most pregnant women consumed less than the RDAs of all the EAA (Figure 5**)**.

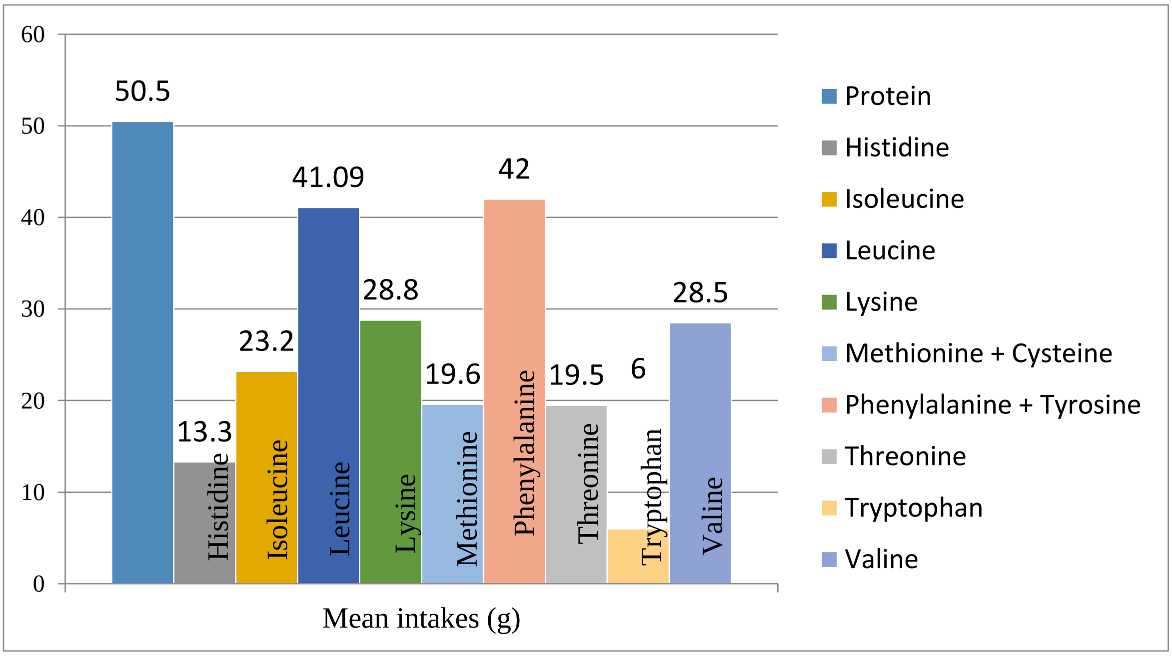

Figure (3): Mean Protein and Amino Acids Intakes.

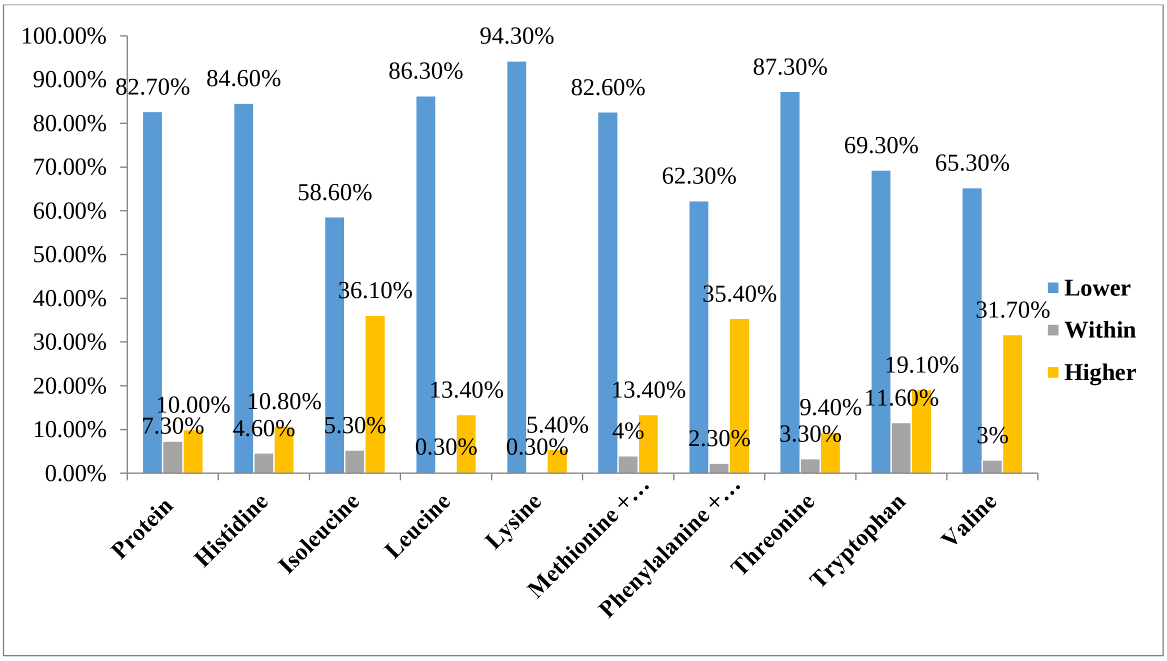

Figure (4): Mean Protein and Amino Acids Intakes VS Recommended Daily Allowances.

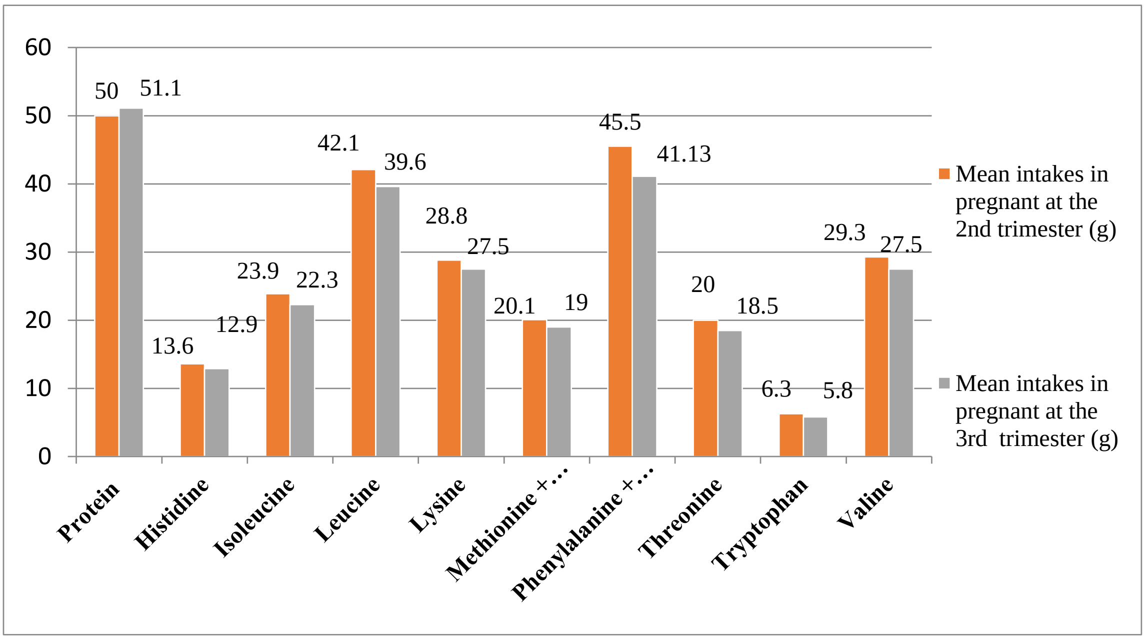

Figure (5): Mean Protein and Amino Acids Intakes VS. Gestational Trimester.

Total Fats and Fat Components Intakes: The fat intake of RDA was met by 24.7% of the pregnant women (74), but 42.3% failed to meet the RDA, and 33% exceeded the RDA. Mean intake (45.6g/day±20.6) was rational in the study (Figure 6**)**. Fat components mean intakes were (14.6g/day±10.4) of saturated fats, (11.7g/day±8.6) of mono-unsaturated fats, and (9.7/day±6.4) of poly-unsaturated fats. The mean intake of trans-fats was (0.13g/day±0.21), which can be accepted as normal. A high percentage of the pregnant women met the recommended upper limit of saturated fats 70% (210), whereas the mean intakes of omega-3 and omega-6 in the study were below RDA (1.4g and 13g, respectively). A high percentage of pregnant women did not consume adequate quantities of omega-3 98% (294) and omega-6 98.7% (296). The mean intakes of cholesterol were 206.3mg, and a minority of the pregnant women exceeded the recommended intake of

20% (60). Inconsistency between means of intake and percentages suggests high variation and heterogeneity in the study of pregnant women (Figure 7**)**. There was no significant difference (*P*=0.2) between the mean intakes of fats in the second trimester (44.5g/day) and the third trimester (47.1g/day) (Figure 8**)**.

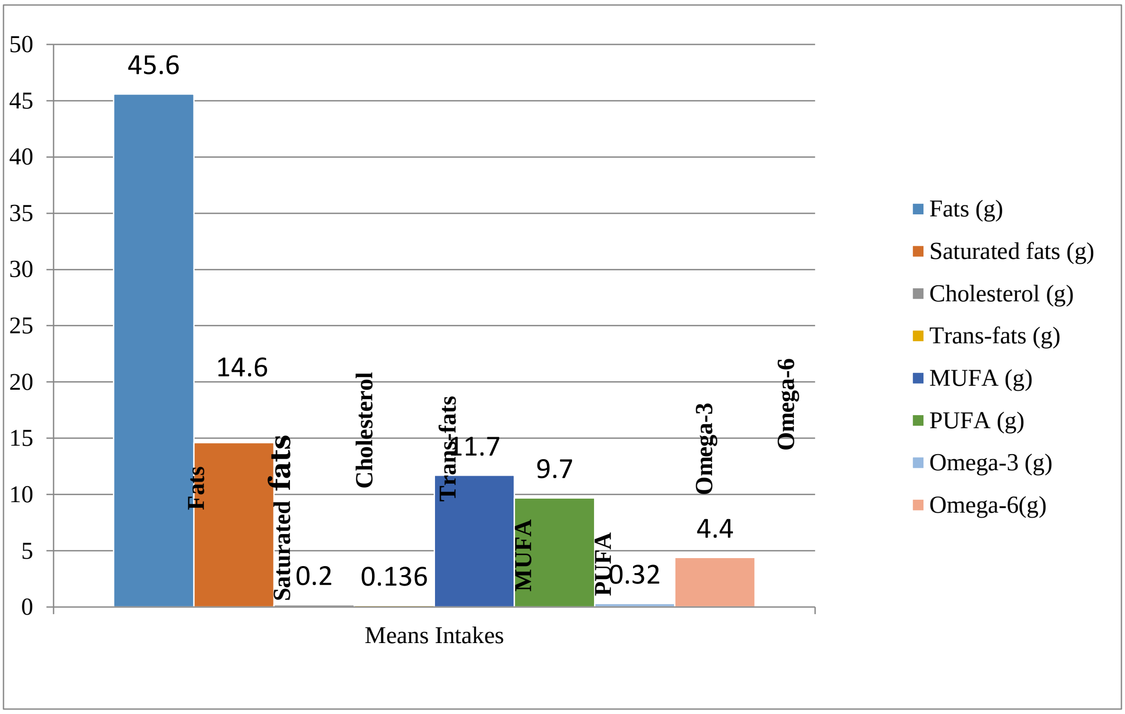

Figure (6): Mean Fats and Fats Component Intakes.

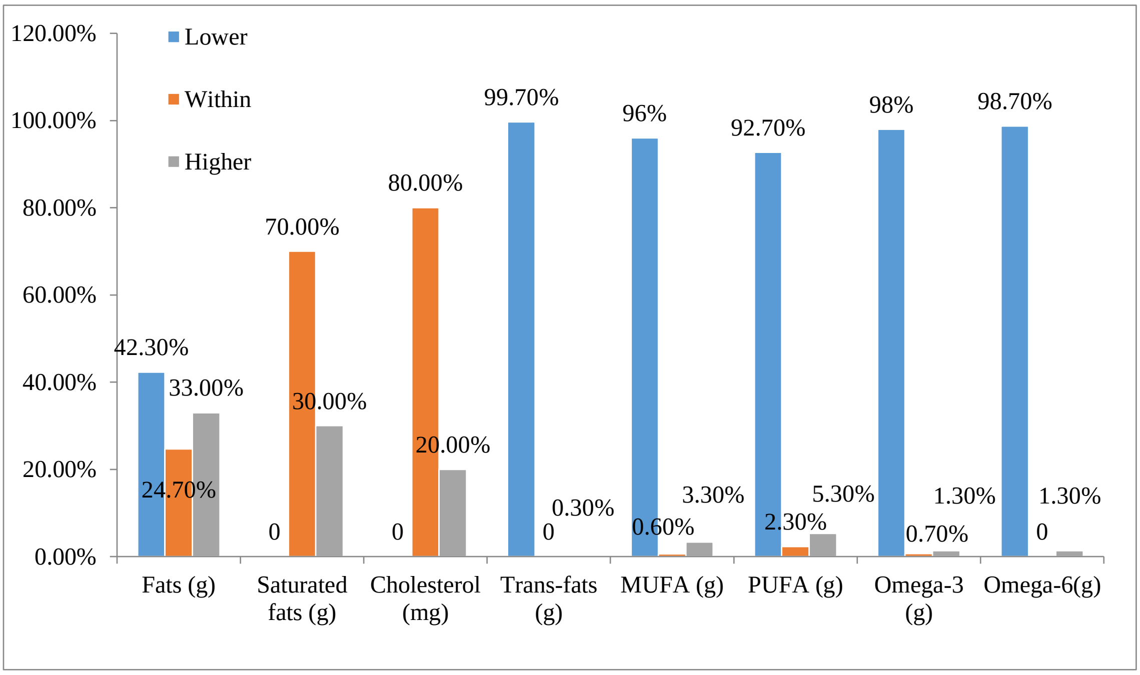

Figure (7): Mean Fats and Fats Component Intakes VS Recommended Daily Allowances.

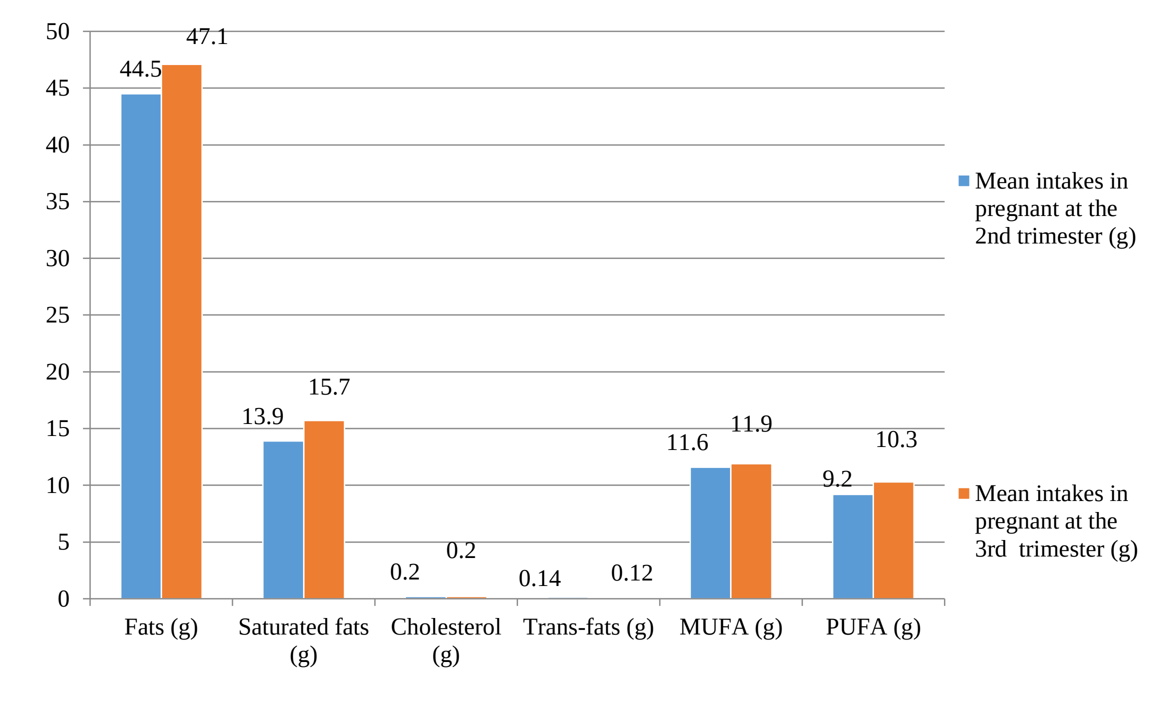

Figure (8): Mean Protein and Amino Acids Intakes VS Gestational Trimester.

Energy and Macronutrients Correlation to Gestational Weight Gain: Energy, CHO, and total fat consumption were directly related to total GWG at $P \leq 0.05$. In contrast, protein intakes were not associated with GWG. The correlation was negative between protein intakes and total GWG (Table 3**)**. Saturated fat intakes showed an insignificant correlation with GWG (r=0.078). Fiber intakes showed a significant positive correlation (r=0.048) with GWG.

Table (3): Energy and Macronutrients Correlation to Gestational Weight Gain.

Macronutrients	**Pearson Correlation (*r*)**
Energy (kcal)	0.144*
CHO (g)	0.135*
Fibers (g)	0.048*
Protein (g)	-0.028
Fats (g)	0.140*
Saturated fats (g)	0.078

* Significant correlation.

Micronutrients Intakes

Vitamins: The mean intake of most vitamins was below the DRI. However, the mean intake of B12 was within the range of the RDA Figure 9&10. The intake of fat-soluble vitamins was lower than RDA for vitamin D and K (100 %, 97.7%), respectively, while the intake of vitamin A was higher than the RDA (93.7%), as shown in (Figures 11, 12 & 13**)**. Intakes of water and fat-soluble vitamins showed no significant difference between the second and third trimesters (p values > 0.05).

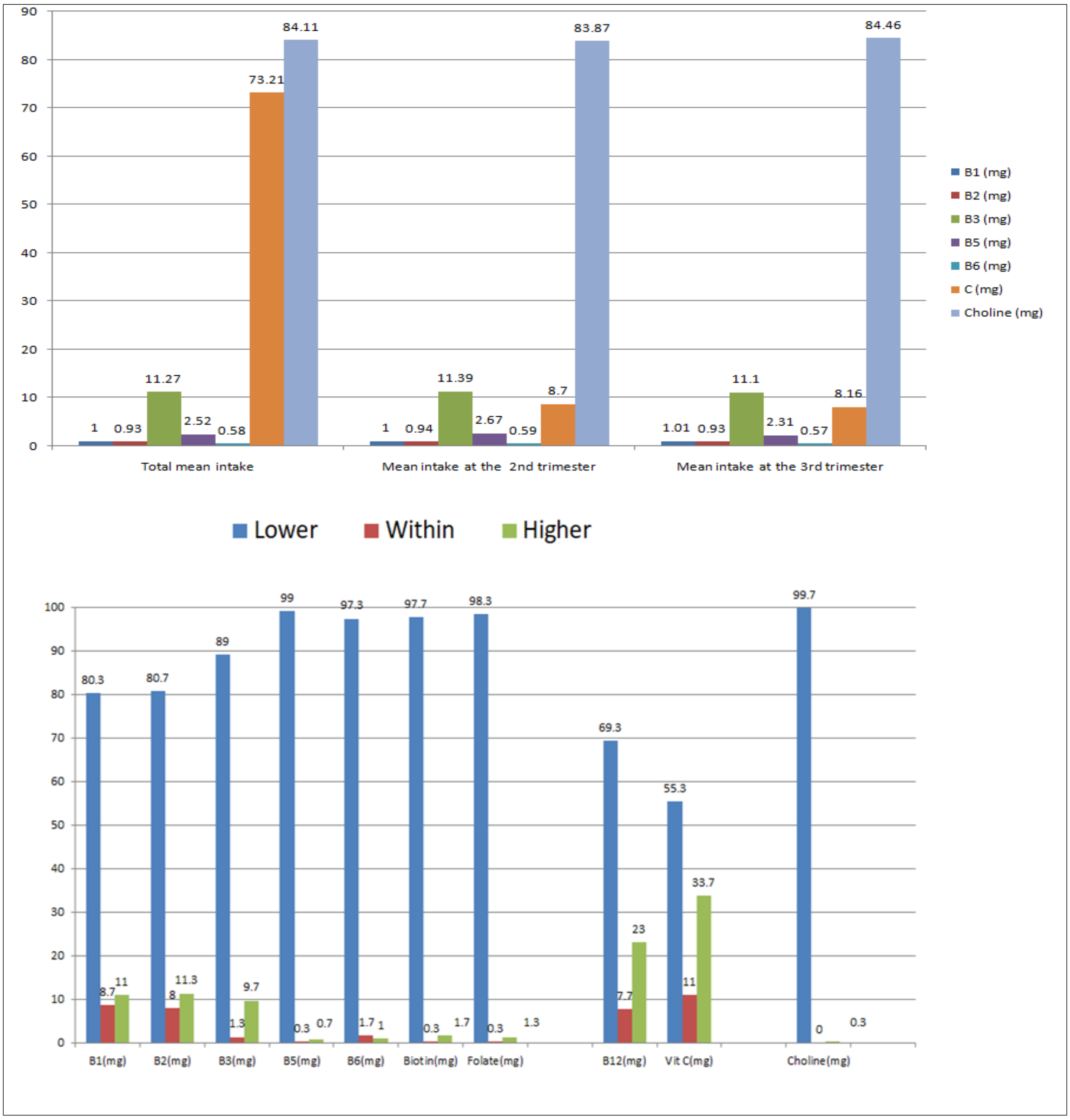

Figure (9): Mean Intakes of Water Soluble Vitamins and Recommended Daily Allowances.

Figure (10): Mean Intakes Water Soluble Vitamins and Recommended Daily Allowances.

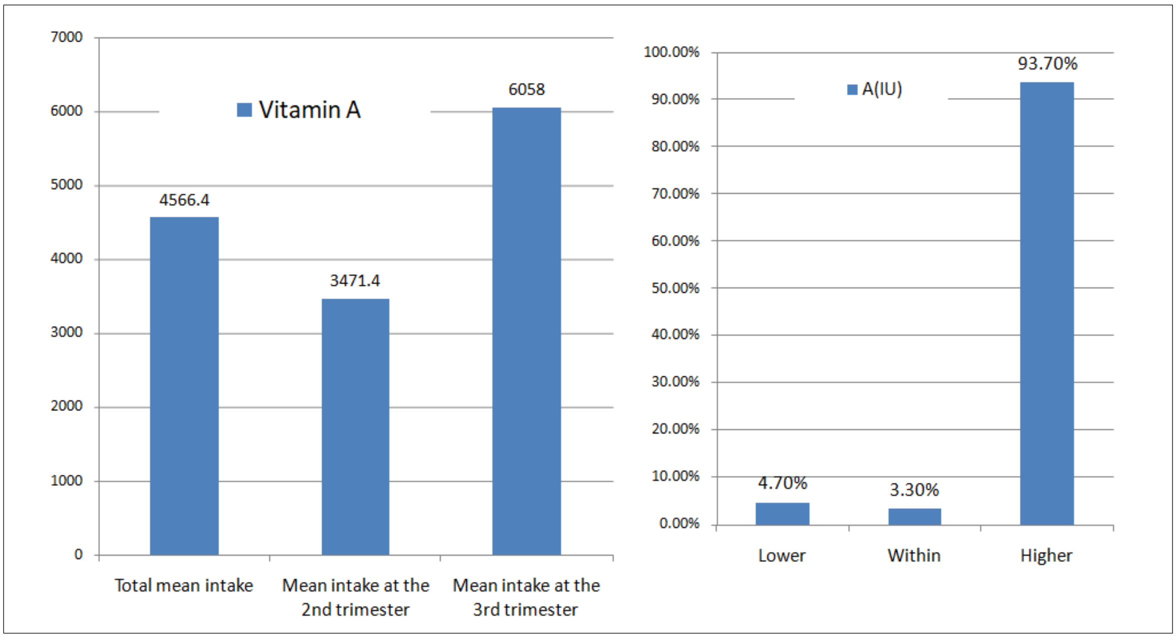

Figure (11): Mean Intakes of Vitamin A and Recommended Daily Allowance.

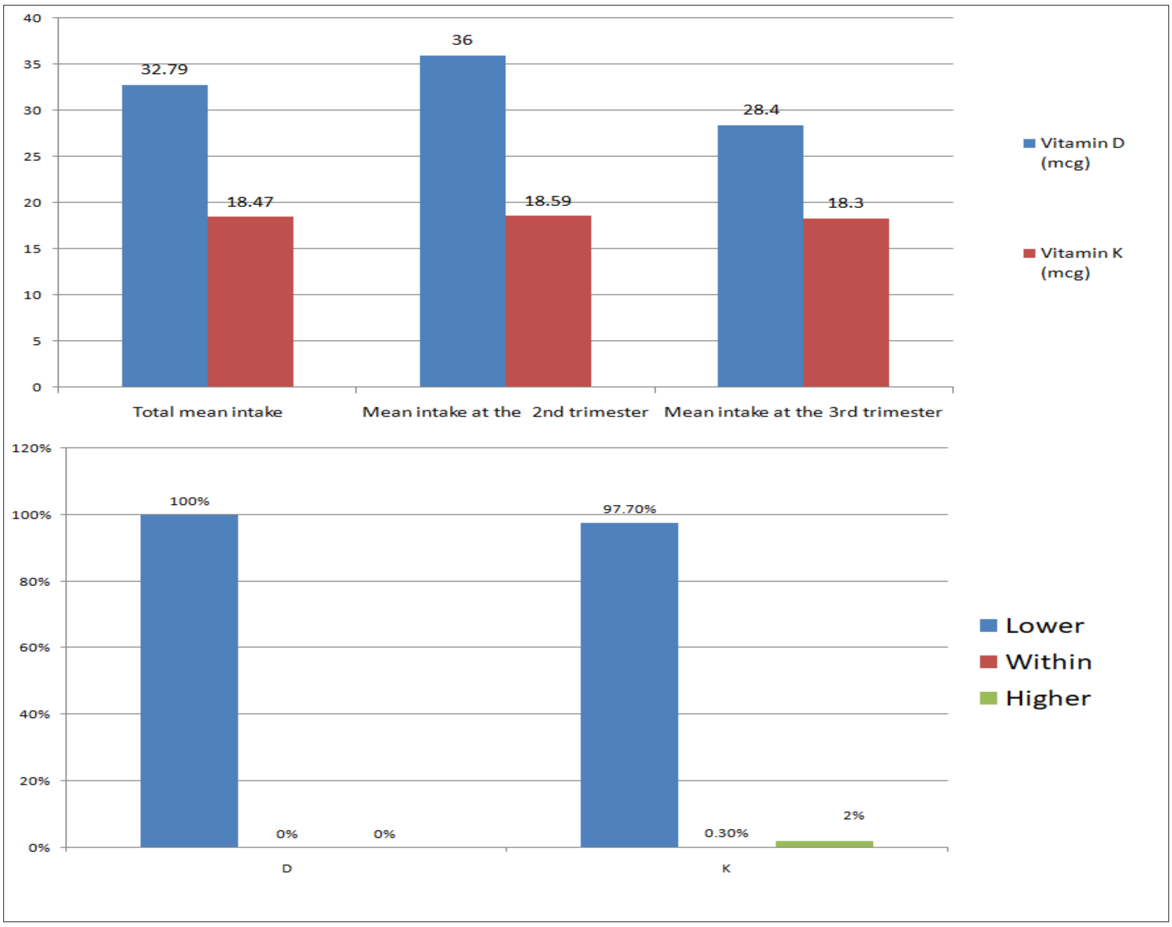

Figure (12): Mean Intakes Vitamins D & K and Recommended Daily Allowances.

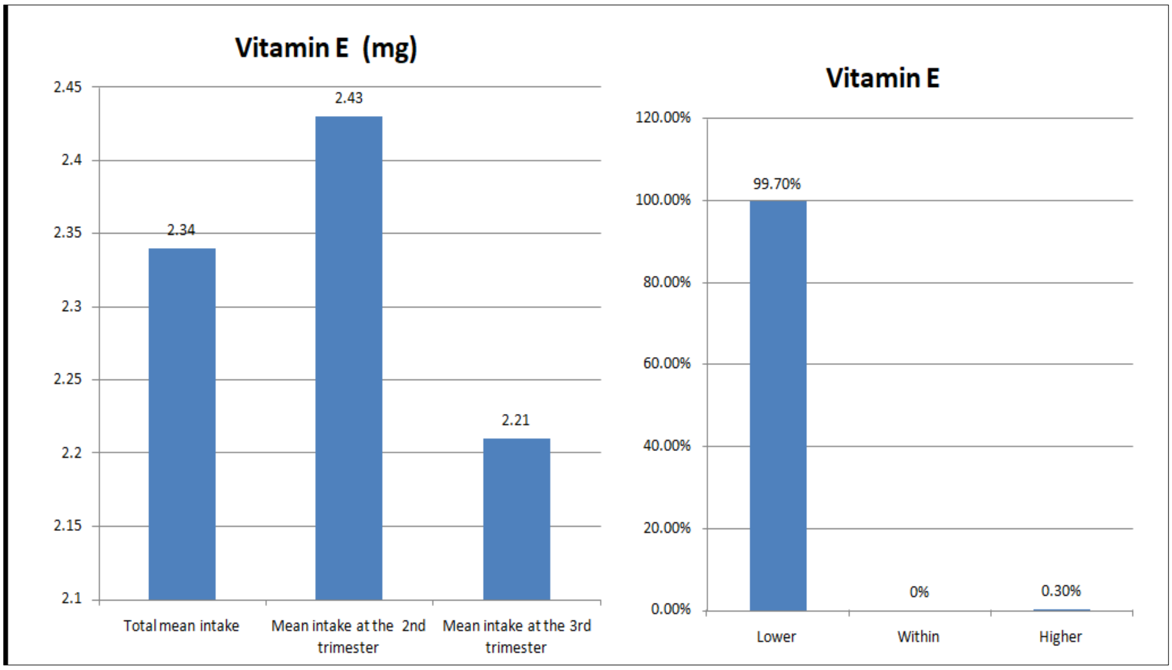

Figure (13): Mean Intakes of Vitamin E and Recommended Daily Allowance.

***Minerals*:** Major and trace minerals intakes were lower than RDA for calcium, fluoride, iodine, iron, zinc, and selenium. While the intakes of Cupper and sodium were higher than RDAs, as shown in (Figures 14, 15 &16**).**

Figure (14): Mean Intakes of Minerals and Recommended Daily Allowances.

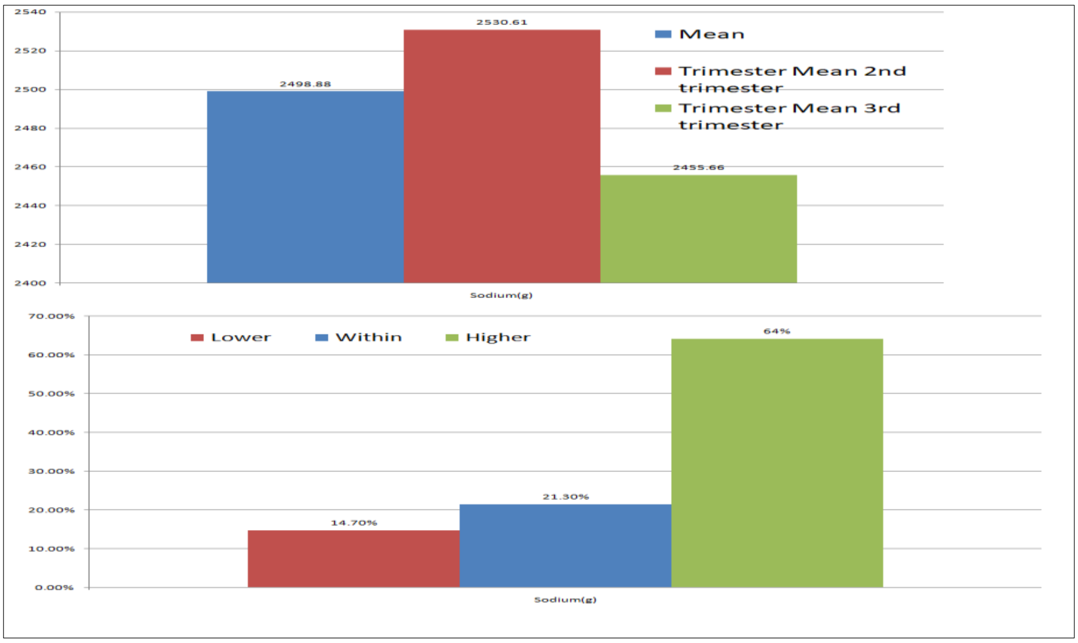

Figure (15): Mean Intakes of Sodium and Recommended Daily Allowances

Macronutrients Intakes Break Down According to Body Mass Index

The study assessed the relationship between energy and macronutrient intakes with BMI (Figure 17**)**. A significant inverse relation (P=0.01) was noticed between the reported energy intake and BMI. Higher intakes of energy were reported in lower BMI categories. The same case also goes with the CHO and proteins intakes (P=0.02) and (P=0.01). However, no association between fiber intake and BMI was detected. Intakes of total fats, saturated fats, MUFA, and PUFA were reported at a higher level within the lower categories of BMI. However, this incident was significant in total fat intake only.

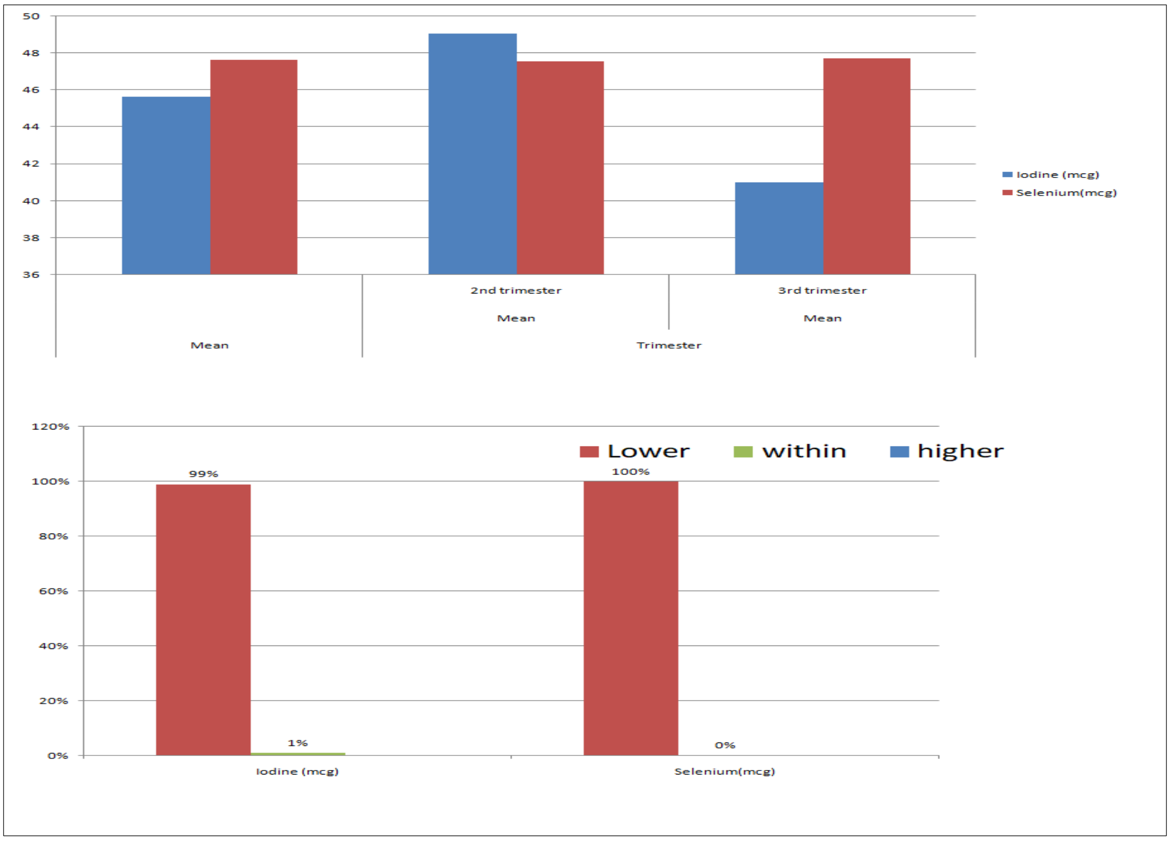

Figure (16): Mean Intakes of Iodine and Selenium and Recommended Daily Allowances.

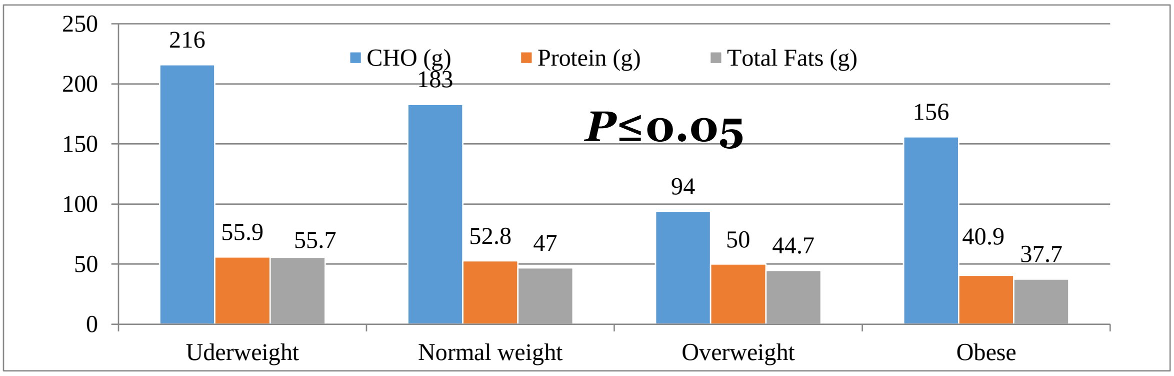

Figure (17): Macronutrients Intakes Break Down According to Body Mass Index.

DISCUSSION

This study assessed dietary intakes intake among a group of pregnant women from food and supplements during the second and third trimesters and examined the efficacy of micronutrient supplementation in improving micronutrient intake. To the researcher's knowledge, minimal studies have recently assessed the nutritional status among pregnant women in Amman.

CHO's mean intakes agreed with the recommended intakes, whereas fiber intakes were lower in more than 90% of pregnant women. Proteins mean intakes were low (50.5 g) in most pregnant women, which can be multi-factorial. High intakes of simple sugar may lead to loss of appetite [2] and to consuming the more available and ready-to-consume CHO sources rather than preparing a better choice of foods. This study found that aversion away from meat sources was common in pregnant women, as many stated that they do not consume meat. Since the requirements of EAA were set according to the grams of proteins needed, this study indicated low EAA intakes among pregnant women in Amman. Knowing the risk, low animal protein food items in the pregnant women's diet might lower the intake of total fats and saturated fat; mean intakes of the total and saturated fats were within recommended intakes. In addition, about 80% of pregnant women consumed moderate amounts of cholesterol (200 mg), consequently lowering the risk of adiposity in infants, formation of atherosclerosis [21], and metabolic disease in later life [27]—However, low intake of omega-3 and omega-6were major characteristics of pregnant women in our study. The researcher suggests that the reasons are due to poor choices of fats sources (low food availability and the high prices of food rich in omega-3 and omega-6 or ignorance of the role of omega-3 and omega-6 in fetal development. The intakes of the pregnant women were lower than RDA in all vitamins and minerals, with some exceptions. Noticeably, vitamin A consumption was significantly higher than RDA while fortunately, vitamin B12 intakes were adequate due to consumption of organ meat sources such as liver, brain, heart, and kidney; beef liver contains 24612 IU of vitamin A and 90.05µ g of B12 per 100 g [30]. It was noticed that pregnant women in our study had many brand forms for multivitamins as a supplement; however, some of these brands were not considered suitable for pregnant use, noting that it is not advised to have supplements of vitamins (A, E, and K) during pregnancy [31, 24]. In addition, sodium and copper intakes were significantly higher than the RDA due to excessive intake of processed food, junk food, and bread [1].

Demographic characteristics of the pregnant women affected energy and macronutrient intakes (refer to appendix 11.1 for more information). CHO, proteins, and total fats especially saturated fats, were affected by educational level and place of living in Amman. Generally, higher intakes were among pregnant women with higher education and women living west of Amman. It may be explained by the fact that these categories are affected highly by what is known as a civilized culture and fast foods with high energy density food rich in saturated fats and simple sugars. On the other hand, monthly household income played a role in affecting maternal diet. Though it was insignificant, higher intakes of total fats, saturated fats, and protein intakes were seen among higher monthly income households. Economic constraints may have led to an inability to afford diverse food choices, consequently lowering the dietary intake of foods such as meat, poultry, and fish. Demographic characteristics of the sample also affected the intake of micronutrients (refer to appendix 11.2 for more information). Intakes of B2, B6, B12, Biotin, and iron were affected by educational level. Generally, it was apparent that higher intakes were consumed among more educated pregnant women, which can be explained by the fact that these categories are highly affected by a more civilized culture [4].In addition, the intake of vitamin B6 and iron, among other nutrients, were significantly affected by monthly income. Pregnant women with a low monthly income had lower B6 and iron intakes when compared with pregnant women with higher monthly incomes.

Intake of the vitamins (B1, B2, B3, B6, D, and folate) and the minerals (calcium, iodine, selenium, iron, sodium, and zinc) were different according to pregnant women living in different districts in Amman. Those intakes were higher among west Amman because they have higher income, can afford to buy different types of high-quality food, have a high consumption of meat products, and have better knowledge of nutritional requirements and self-care. In addition, according to food groups, there were lower intakes of grains, vegetables, fruits, milk, meats, and beans compared to recommended values.

Women's employment may play a significant factor in determining the quantity and quality of food intake; there was a significant relationship between choline, selenium, and fluoride with employment. Our study showed that the non-employed pregnant women may have had more time to prepare meals and consume higher quantities of choline and selenium, while employed women who might have less time to take care of their quality of food could depend on fast food consumption due to lack of time to prepare homemade meals, which could result with lower amounts of choline and selenium. In addition, fluoride was higher in employed pregnant women due to consuming higher quantities of coffee and tea during working hours.

When discussing the pre-pregnancy BMI in pregnancy, reporting intakes showed a trend among the pregnant women whose pre-pregnancy BMI was low or high. The underweight participants reported higher intakes of macronutrients before pregnancy, whereas obese pregnant women reported lower intakes. Hence, this raises the question of overestimation and underestimation of intakes caused by fear of being judged for low or high intakes, additionally the panic of gaining extra weight during pregnancy in overweight and obese pregnant women. A significant relation was found between the prevalence of underreporting intakes in overweight/obese pregnant women; it was noticed that overweight and obese pregnant women tend to under-report food intake more than normal-weight pregnant women [19].

Energy and macronutrient intakes between the second and third trimesters showed no significant differences. Lack of knowledge of the nutritional needs and requirements through pregnancy, unawareness of the risks associated with suboptimal nutrition, and poor economic status may have contributed to the negligence of maternal diets, leading to a possible threat of not accommodating the nutrients needs for fetal development and irreversible complications on pregnant women and outcome. Gestational weight gain among pregnant women was affected significantly by energy, CHO, and total fats intakes. A result that agrees with the majority of research [15] states that controlling intakes of energy and macronutrients (recognized as the "energy-yielding nutrients") sustain an optimal GWG. Olafsdottir *et al.*, Investigated dietary factors related to the risk of suboptimal or excessive GWG; excessive GWG was among pregnant women who consumed higher energy, CHO, fats, and proteins, whereas pregnant women who gained suboptimal weight had their energy intakes decrease as the pregnancy progressed [20].

A study was conducted on 195 pregnant women in the Northeastern United States of America to examine the consistency and adequacy of nutritional intake in a population of Black women in the second and third trimesters of pregnancy. The main finding indicated that the overall micronutrient intake was insufficient, despite prenatal vitamin use, similar to this study's results. It was found that women consumed inadequate micronutrients, including iron, vitamin D, and calcium, during the third trimester. It is worth mentioning that this study was carried out on iron, vitamin D, calcium, and folate only [13].

The study considered the subgroups of macronutrients while collecting food recalls and entering and analyzing dietary data, such as inquiring about the type of oils used during cooking. It has also drawn a relatively newer picture describing the dietary consumption of pregnant women living in Amman. However, this study applies a dietary assessment limit generated from food recalls. Another point is that the study did not include private health sectors such as private hospitals and clinics to investigate the differences between dietary habits in pregnant women attending MoH and private facilities in Amman.

CONCLUSION

From the collected data and information, we can conclude that the maternal diet in Amman can be considered inadequate and imbalanced, a matter that may impose a danger on pregnant women. There is more risk of protein-energy malnutrition and fetal growth retardation, increasing maternal and fetal mortality and morbidity risks. Mean intake CHO intake was relatively high among the majority of the pregnant women, whereas fiber intakes were low in more than 90% showing hints of the probability of chronic and metabolic diseases development in pregnant women and their outcomes. Fortunately, moderate intakes of total fats and saturated fat ease concerns regarding high-fat intake complications such as G.M. and long-term metabolic disease for mother and child, including hypertension, obesity, and diabetes. However, inadequate intakes of omega-3 and omega-6 in the study may affect the neurological and retinal development of the fetus. Micronutrient intake was relatively low among pregnant women during the second and third trimesters, except for vitamin A and sodium, which were relatively high, while vitamin B12 intakes were adequate. Hence, prenatal care that helps women identify high micronutrient foods is essential for the health of the women and the newborns. The study found that nutritional intake is consistently inadequate, and therefore, activating the role of a nutritionist in the MCHC is essential to counsel pregnant women to improve nutritional intake. An observation highlights the importance of nutritional awareness and conducting active nutrition and health education offices, especially in locations characterized by meager income, education, and knowledge levels.

Ethics Approval and Consent to Participate

The committee approved this study by the Graduated Studies faculty and Deanship of Academic Research at Jordan University.

Human and Animal Rights

No Animals were used. The reported experiments on women are by the Helsinki Declaration of 1975, revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

Consent for Publication

All authors agree to the publication.

Availability of Data and Materials

The data supporting this study's findings are available from the corresponding author, [H.G], upon reasonable request.

Author's contribution

Duha Abulawi: writing-original draft, data collection, formal analysis, investigation, methodology, resources, software, visualization, validation, writing review & editing. **Rand Blasi:** data collection, formal analysis, investigation, methodology, resources, software**. Mufeed AlNimer:** conceptualization, validation, writing review & editing. **Hadeel Ghazzawi**: conceptualization, funding acquisition, investigation, methodology, project administration, supervision, validation, writing review & editing.

Competing interest

The authors declare no intentions of competing interests or conflict.

FUNDING

Jordan University provided funding support

ACKNOWLEDGMENTS

Appreciation is a must for Jordan University and the Scientific Research department to make this research possible. Moreover, deep gratitude is forwarded to all the study participants who were very cooperative and generous in sharing their information for the investigation.

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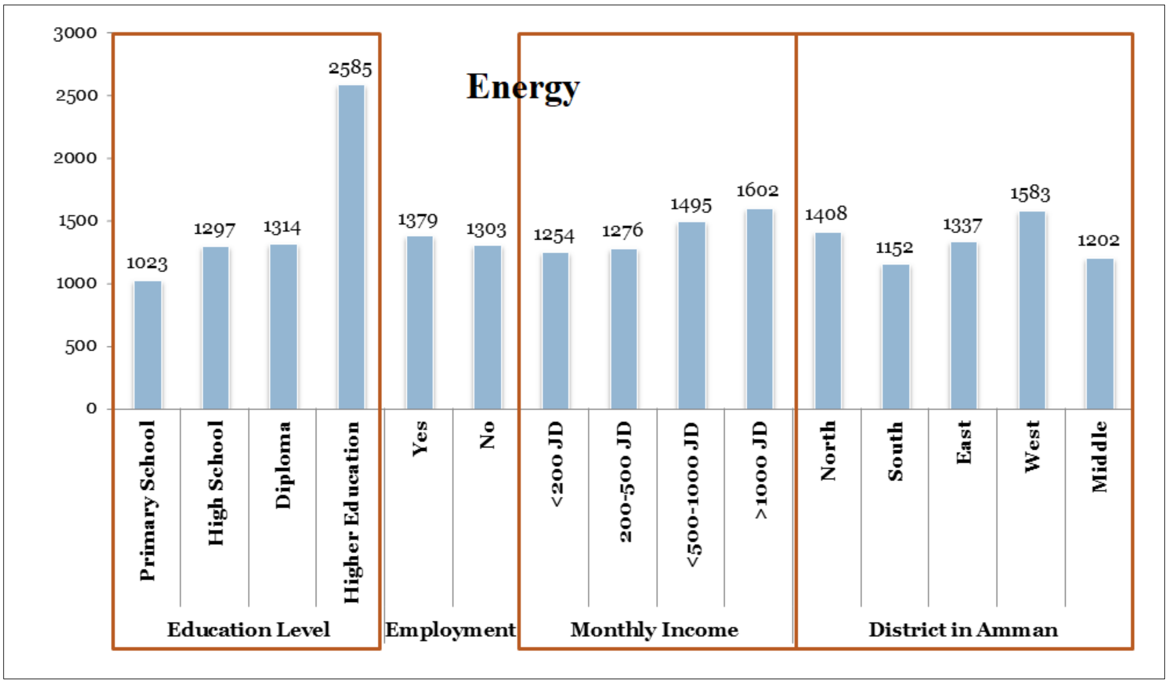
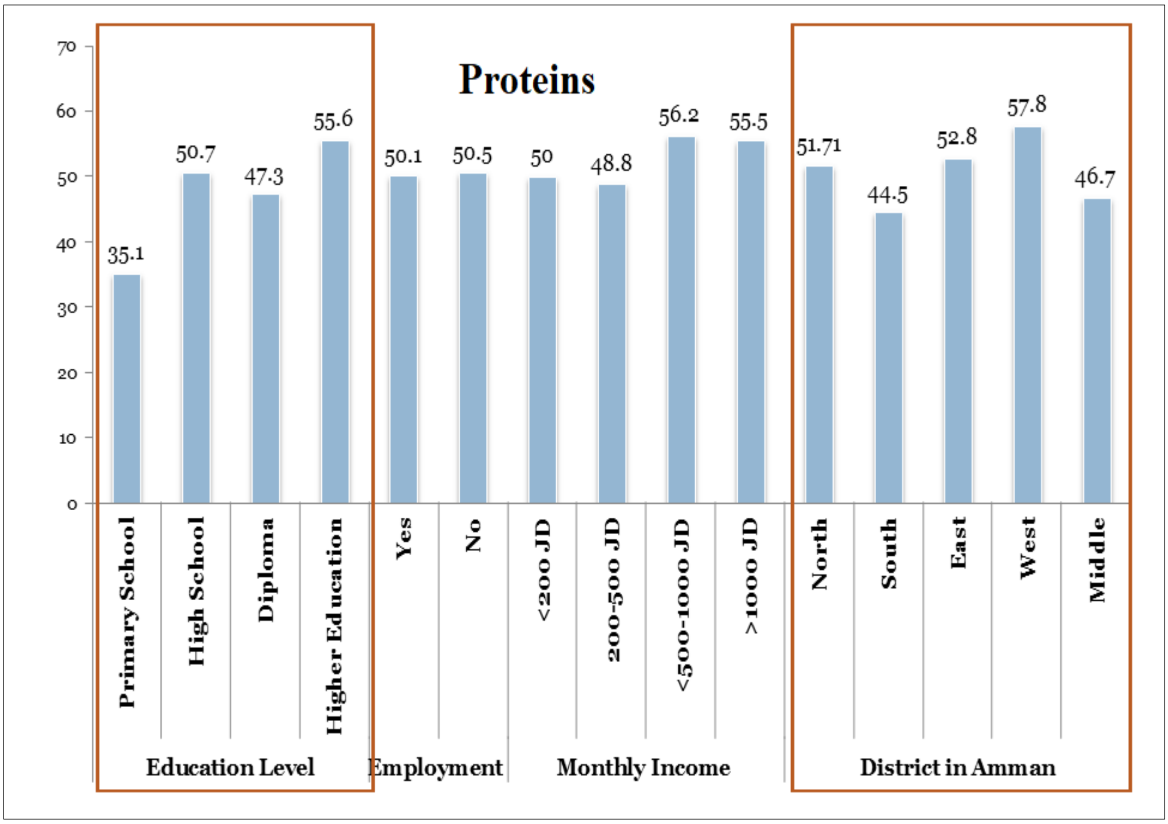
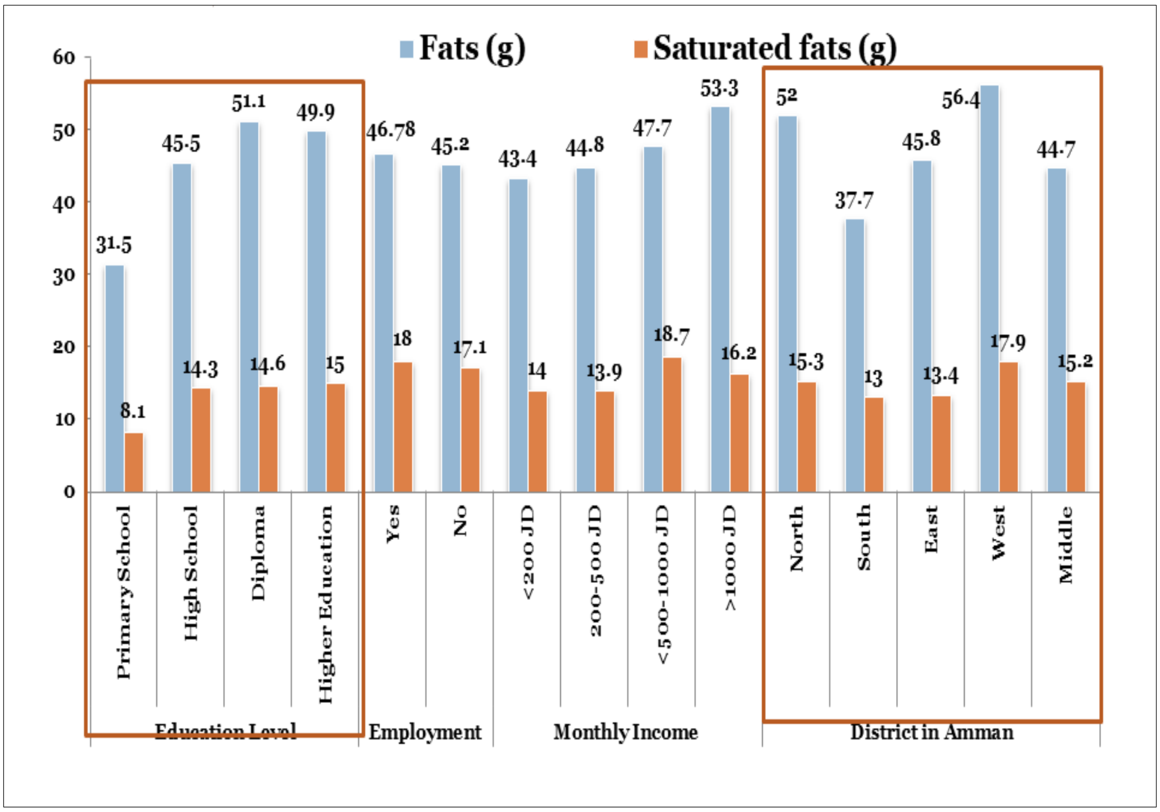
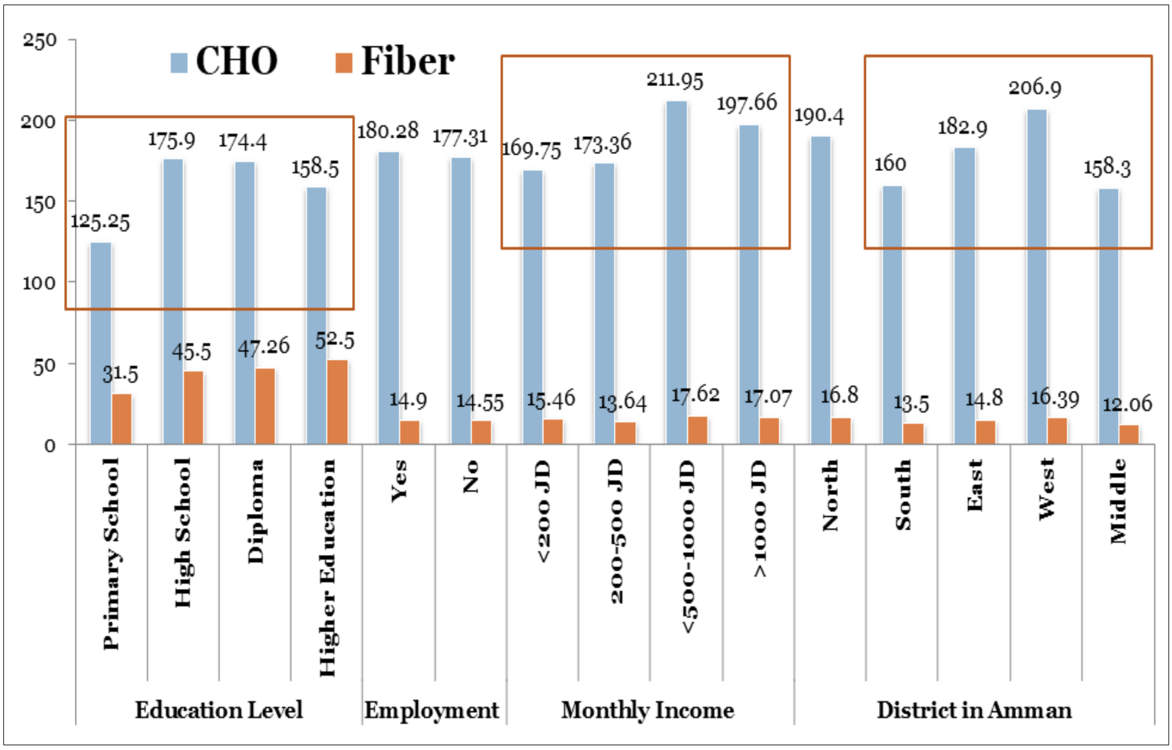
APPENDICES

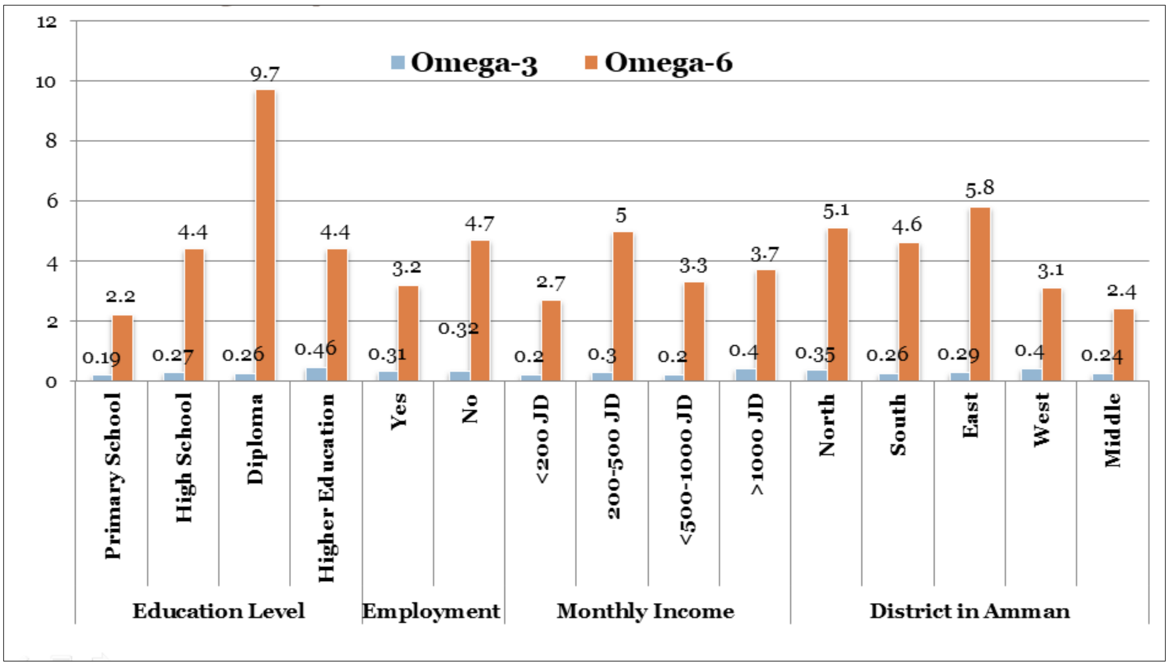
Appendix: Macronutrients vs. Demographic factors:



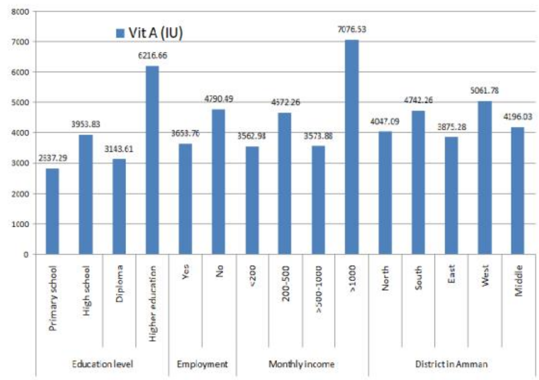


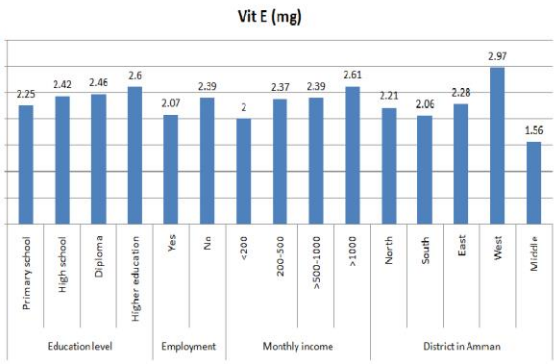

Fats (g)
Saturated fats (g)
60
50
40
30
20
10
0
31.5
8.1
45.5
14.3
51.1
14.6
49.9
15
46.78
18
45.2
17.1
43.4
14
44.8
13.9
47.7
18.7
53.3
16.2
52
15.3
37.7
13
45.8
13.4
56.4
17.9
44.7
15.2
Primary School
High School
Diploma
Higher Education
Yes
No
<200 JD
200-500 JD
<500-1000 JD
>1000 JD
North
South
East
West
Middle
Education Level
Employment
Monthly Income
District in Amman

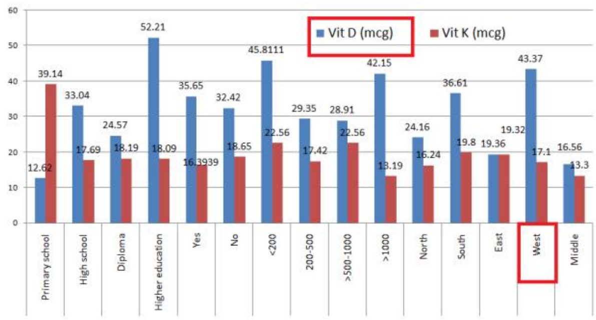

CHO
Fiber
250
200
150
100
50
0
125.25
31.5
175.9
45.5
174.4
47.26
158.5
52.5
180.28
14.9
177.31
14.55
169.75
15.46
173.36
13.64
211.95
17.62
197.66
17.07
190.4
16.8
160
13.5
182.9
14.8
206.9
16.39
158.3
12.06
Primary School
High School
Diploma
Higher Education
Yes
No
<200 JD
200-500 JD
<500-1000 JD
>1000 JD
North
South
East
West
Middle
Education Level
Employment
Monthly Income
District in Amman



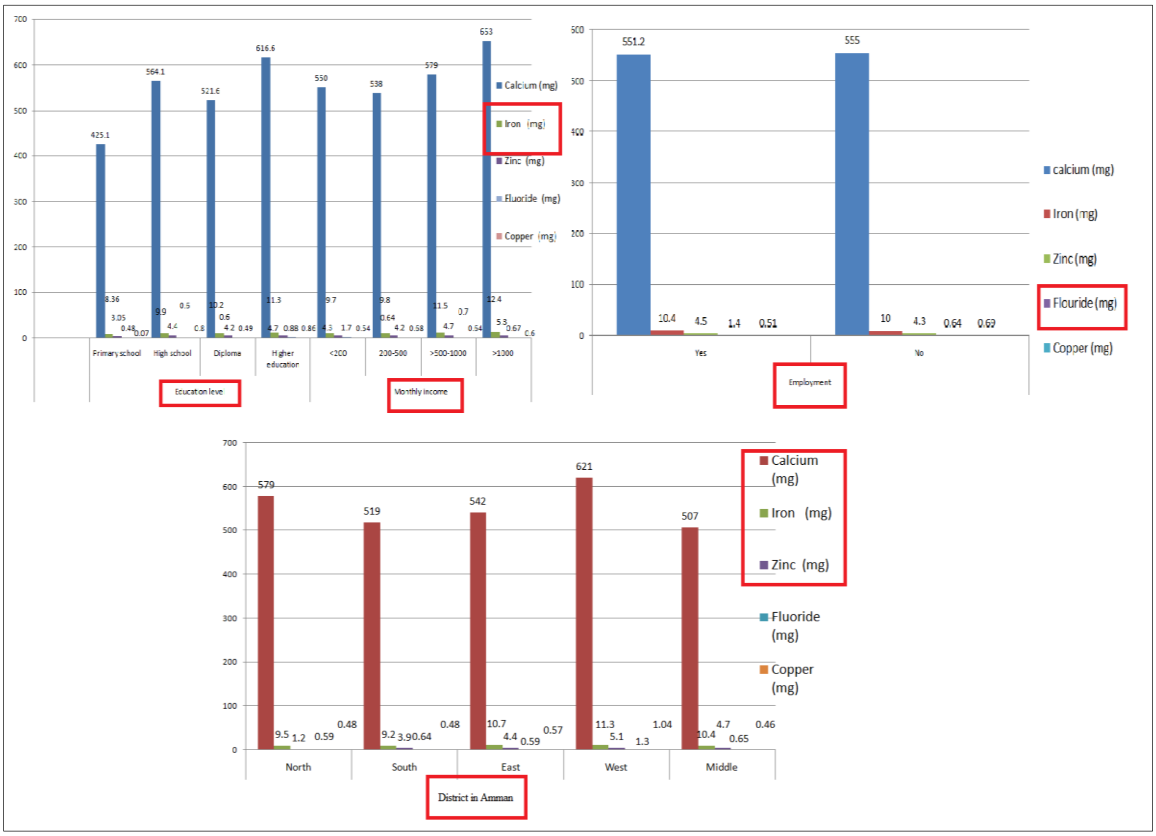
Appendix
Micronutrients vs. Demographic factors

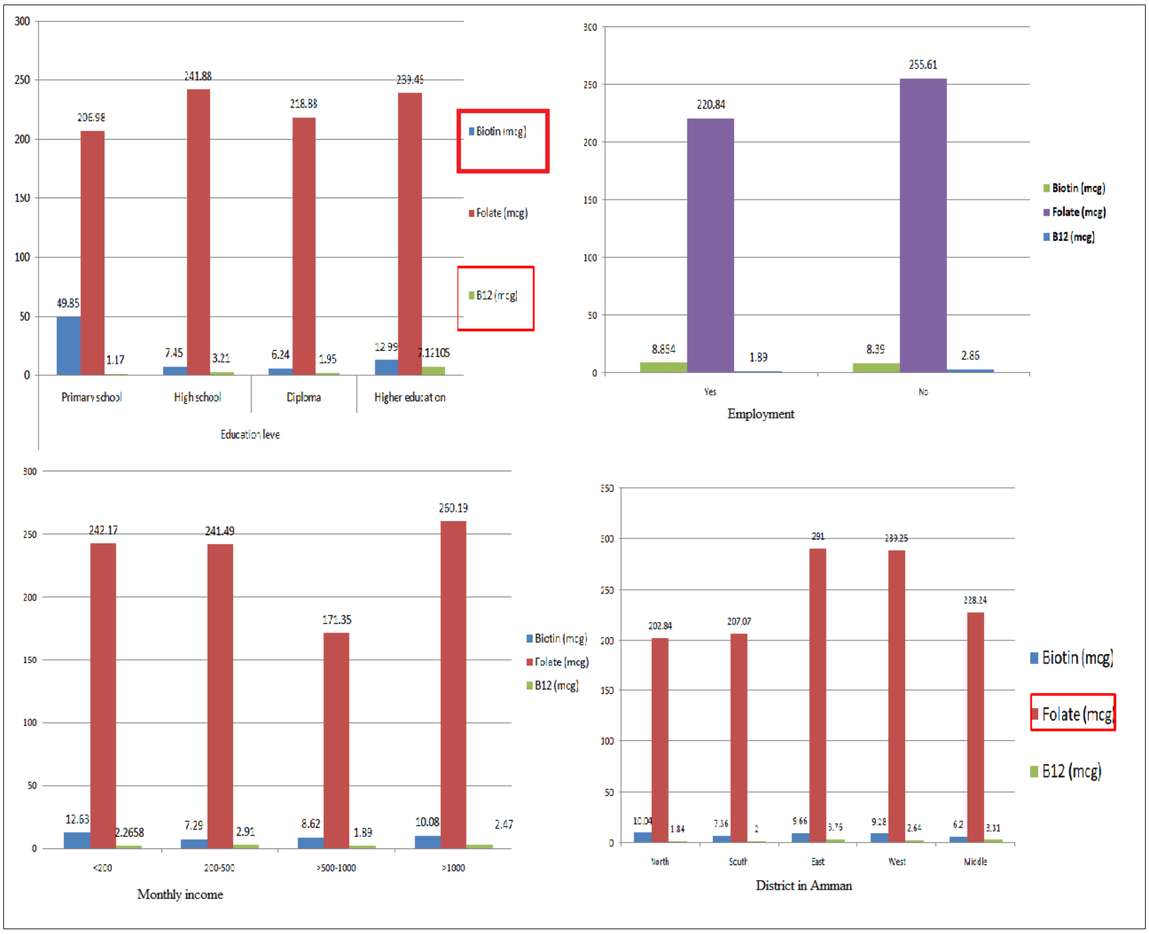


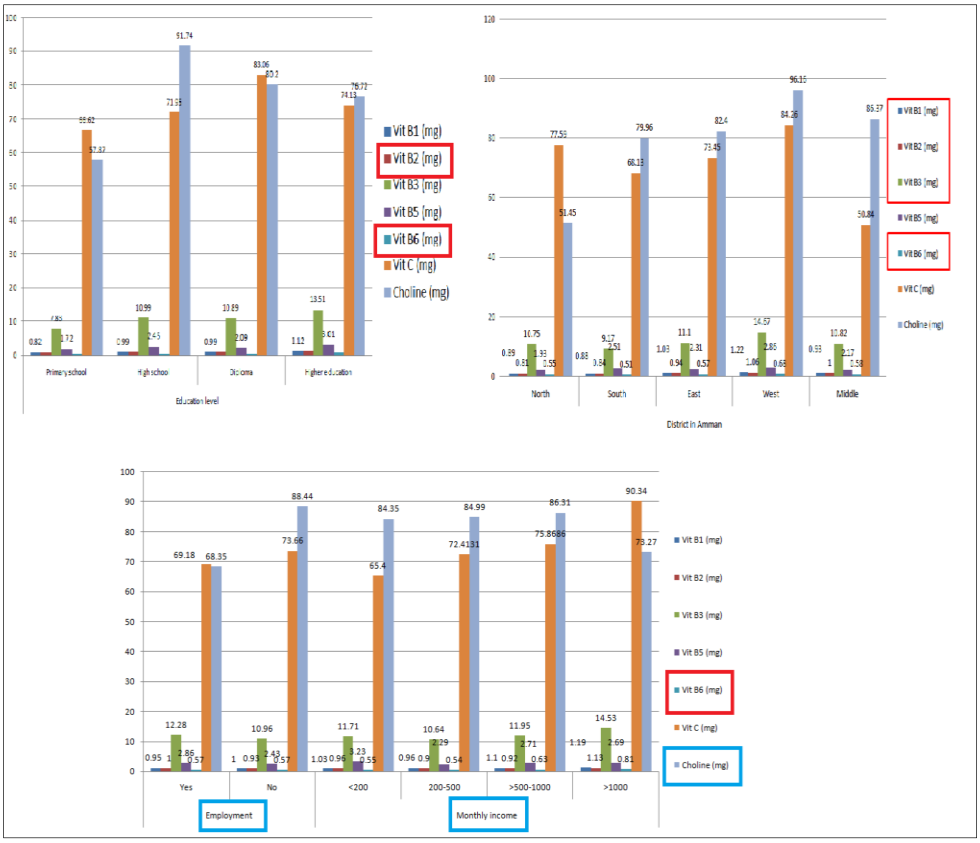





Sodium
3
2.5
2
1.5
1
0.5
0
2
2.5
2.1
2.6
2.4
2.4
2.4
2.4
2.6
2.5
2.4
2.2
2.7
2.7
2
Primary school
High school
Diploma
Higher education
Yes
No
<200
200-500
>500-1000
>1000
North
South
East
West
Middle
Education level
Employment
Monthly income
District in Amman
Iodine (mcg)
Selenium (mcg)
70
60
50
40
30
20
10
0
31.9
44
46.5
46.69
37.3
46.16
50
61.3
40.5
41.68
46.9
48.98
50
45.36
45
45.99
42.1
56.1
47.3
52.47
32
38.98
51.2
41.89
35.3
48.75
50.6
56.64
34.3
46.56
Primary school
High school
Diploma
Higher education
Yes
No
<200
200-500
>500-1000
>1000
North
South
East
West
Middle
Education level
Employment
Monthly income
District in Amman


Calcium (mg)
Iron (mg)
Zinc (mg)
Fluoride (mg)
Copper (mg)
Primary school
High school
Diploma
Higher education
<200
200-500
>500-1000
>1000
Education leve
Monthly income
calcium (mg)
Iron (mg)
Zinc (mg)
Flouride (mg)
Copper (mg)
Yes
No
Employment
Calcium (mg)
Iron (mg)
Zinc (mg)
Fluoride (mg)
Copper (mg)
North
South
East
West
Middle
District in Amman


Biotin (mcg)
Folate (mcg)
B12 (mcg)
Primary school
High school
Diploma
Higher education
Education leve
Biotin (mcg)
Folate (mcg)
B12 (mcg)
Yes
No
Employment
Biotin (mcg)
Folate (mcg)
B12 (mcg)
<200
200-500
>500-1000
>1000
Monthly income
Biotin (mcg)
Folate (mcg)
B12 (mcg)
North
South
East
West
Middle
District in Amman


Vit B1 (mg)
Vit B2 (mg)
Vit B3 (mg)
Vit B5 (mg)
Vit B6 (mg)
Vit C (mg)
Choline (mg)
Primary school
High school
Diploma
Higher education
Education level
North
South
East
West
Middle
District in Amman
Yes
No
<200
200-500
>500-1000
>1000
Employment
Monthly income


Vit B1 (mg)
Vit B2 (mg)
Vit B3 (mg)
Vit B5 (mg)
Vit B6 (mg)
Vit C (mg)
Choline (mg)
Primary school
High school
Diploma
Higher education
Education level
North
South
East
West
Middle
District in Amman
Yes
No
<200
200-500
>500-1000
>1000
Employment
Monthly income