# NUTRIENT INTAKE DISPARITIES AMONG URBAN PREGNANT WOMEN: A COMPREHENSIVE ANALYSIS OF DIETARY PATTERNS AND HEALTH IMPLICATIONS

**A PROJECT REPORT**
**BY**

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

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# APPROVAL

This Project titled "Nutrient intake disparities among urban pregnant woman: A comprehensive analysis of dietary patterns and health implications", submitted by Afrin Sultana Toma to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

## EXAMINING COMMITTEE

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# DECLARATION

We hereby declare that this project has been done by us under the supervision of Dr. Nizam Uddin, Associate Professor and Head, and co-supervisor Mr. Abu Saeid, lecturer**,** Department of Nutrition and Food Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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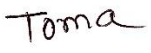

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# ABSTRACT

Pregnancy necessitates significant physiological changes, heightening the nutritional requirements for both the mother and fetus. Inadequate nutrition during this critical period can lead to adverse outcomes for maternal and fetal health. Despite global recognition of the importance of proper nutrition during pregnancy. The objective of the study is to understand dietary habits and nutrient intake among pregnant women which is essential for addressing deficiencies and optimizing health outcomes. This observational study aimed to investigate the dietary habits and nutrient intake of Bangladeshi women attending an urban maternity center in Dhaka. More specifically to examine the food intake patterns of pregnant women, assess the nutrient intake of the pregnant participants, evaluate the intake of carbohydrates, fats, proteins, minerals, and vitamins among the study subjects, investigate variations in mineral, vitamin, fat, and carbohydrate intakes based on trimester differences and to compare the nutrient intakes with established requirements to identify potential deficiencies. The study engaged pregnant women from Dhaka's slum areas in their second and third trimesters, assessing demographic variables, health complications, food intake patterns, and macro and micronutrient intake levels. Findings revealed a diverse population with variations in socioeconomic backgrounds and dietary habits. Health complications such as low back pain, iron deficiency, and diabetes were prevalent among participants, underscoring the need for targeted interventions. Rice emerged as a staple food, with disparities in dietary diversity observed based on education levels. While carbohydrate intake generally met recommendations, deficiencies in protein and micronutrient intake were evident. The study revealed significant variations in macronutrient and micronutrient intake among pregnant women in Dhaka. On average, carbohydrate intake was 112.58g ± 43.48g per day, protein intake was 55.22g ± 12.39g per day, fat intake was 19.98g ± 8.40g per day, and calcium intake was 260.17mg ± 180.54mg per day. Most women faced iodine deficiency, and a majority experienced difficulty while eating, with 73% reporting tastelessness. Fish and egg consumption were common, with maximum levels at 150g/day. However, calcium intake fell short of recommended levels, with only 9% meeting the daily requirement of 1200mg/day. Protein intake exceeded recommended levels, with some women consuming up to 81.26g/day. Similarly, vitamin A and C intake surpassed safe limits, indicating potential risks of excessive supplementation. These findings underscore the need for tailored nutritional interventions to address deficiencies and ensure optimal maternal and fetal health outcomes. These findings emphasize the importance of culturally sensitive interventions to address nutritional deficiencies and promote optimal maternal and fetal health outcomes. Comprehensive antenatal care incorporating nutritional assessment, education, and intervention is crucial for addressing socioeconomic disparities and improving health outcomes in urban settings like Dhaka. This study provides valuable insights for future research and interventions aimed at enhancing the nutritional status of pregnant women in similar contexts

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## INTRODUCTION

### 1.1 Background of the Study:

Pregnancy is a dynamic period marked by rapid and profound physiological changes from conception to delivery. During this crucial time, the nutritional needs of both the mother and the developing fetus significantly escalate to support optimal growth and development. Adequate nutrition is essential not only for fetal well-being but also for the maintenance of maternal metabolism and tissue accretion (Helen. et al., 2002).

The importance of providing pregnant women with nourishing food and comprehensive care cannot be overstated, particularly during the vulnerable periods before, during, and after childbirth (Slade et al., 2009). Specific nutritional requirements evolve throughout a woman's life, emphasizing the need for a healthy diet even before conception to build sufficient reserves (Farooqi, 2005). Insufficient nutritional support during pregnancy and lactation can lead to adverse outcomes for both the mother and the child.

Despite the critical nature of proper nutrition during pregnancy, there is a global disparity in the nutritional status of women, particularly in many underprivileged regions. Inadequate intake of essential nutrients such as iodine, iron, folate, calcium, and zinc during pregnancy can result in severe complications for both the mother and the child, including anemia, pre-eclampsia, hemorrhage, low birth weight, stillbirth, and developmental issues. Alarming statistics, such as over 20 million newborns suffering from low birth weight annually according to UNICEF, underscore the urgent need for comprehensive nutritional interventions.

Furthermore, poor nutritional practices during pregnancy have been associated with adverse outcomes such as excessive gestational weight gain, macrosomia, and gestational diabetes (M.C. & F., 2010). These issues contribute to a cycle of intergenerational health challenges, highlighting the importance of policies and initiatives that promote healthy eating practices during pregnancy (Cheng et al., 2016).

Understanding the dietary habits and nutrient intake of pregnant women is crucial for addressing nutritional deficiencies and optimizing maternal and fetal health (Morrison & Regnault, 2016). The first 1000 days of life, spanning from conception to the second year of a child's life, are particularly crucial for healthy growth and development (Schwarzenberg MD, FAAP & Georgieff MD, FAAP, 2018). Therefore, a comprehensive understanding of the nutritional intake during pregnancy is essential for developing targeted interventions and promoting long-term health outcomes (Brands et al., 2019).

Despite the importance of this information, there is a noticeable gap in comprehensive studies covering the entire trimester and providing a nationwide perspective. Existing research often focuses on specific trimesters, limited geographical areas, or fails to capture the full spectrum of dietary practices and their impact on pregnancy outcomes (Doyle et al., 2017).

In addition to the direct impact on the health of pregnant women and their children, maternal nutrition during pregnancy is increasingly recognized for its role in influencing long-term health outcomes (Christian et al., 2015). Ongoing studies, such as the Nutritional influence on Immunological maturation during Childhood about the Environment (NICE) birth-cohort study, aim to investigate how various environmental factors, including nutrition, impact the maturation of the fetal immune system and subsequent health outcomes.

Understanding the nutritional profile of pregnant women is vital for assessing the evolution of dietary habits over time and comparing them to historical standards (Mobley & Mobley, 2015). This information is particularly scarce for the entire duration of pregnancy and across diverse geographical locations. Consequently, this observational study aims to address these gaps by measuring the food, macronutrient, and micronutrient intakes of pregnant women seeking antenatal care in Dhaka. The assessment will also evaluate the adherence of these women to current national nutrient intake recommendations, providing valuable insights for targeted interventions and improved maternal and fetal health outcomes.

### 1.2 Objective:

This study aimed to investigate the dietary habits and nutrient intake of Bangladeshi women attending an urban maternity center during pregnancy.

Specific Objectives:

- To examine the food intake patterns of pregnant women.
- To assess the nutrient intake of the pregnant participants.
- To evaluate the intake of carbohydrates, fats, proteins, minerals, and vitamins among the study subjects.
- To investigate variations in mineral, vitamin, fat, and carbohydrate intakes based on trimester differences.
- To compare the nutrient intakes with established requirements to identify potential deficiencies.

### 1.3 Scope of the Study:

The purpose of this study is to conduct a thorough analysis of the dietary habits and nutritional consumption of urban pregnant women who are receiving care at a maternity center in Dhaka, Bangladesh. It will engage Dhaka's slum area pregnant women in their second and third trimesters. Demographic variables such family income, occupation, education level, and food

spending will all be evaluated in the study. Surveys and interviews will be used in a mixed-methods approach to assess eating patterns, including frequency of meals, food preferences, and the impact of culture on eating decisions. The consumption of macro- and micronutrients will be examined in relation to national guidelines for nutritional intake. Anthropometric measures and trimester-specific variations in food consumption will be examined in order to evaluate nutritional status. We will also investigate how sociocultural influences influence eating choices. The project is to shed light on nutritional deficits, evaluate the efficacy of current therapies, and provide evidence-based suggestions for enhancing the health of both the mother and the fetus in Dhaka's urban pregnancies.

**1.4 Limitations of the Study:**

This study may have various limitations that could affect the interpretation and generalizability of the results, even with its thorough approach. First of all, there is a chance for recollection bias and social desirability bias because the study relies on self-reported data from questionnaires and interviews. Results could be distorted if participants overestimate their compliance to nutritional guidelines or describe their eating habits incorrectly.

Second, it's possible that the study's narrow focus on expectant mothers visiting a single maternity center in a slum neighborhood of Dhaka limits the applicability of its conclusions to larger urban or rural populations. This population's unique characteristics, such as socioeconomic position, healthcare accessibility, and cultural norms, may have a different impact on dietary patterns than they would in other situations.

Thirdly, the sample size of 68 participants, 90% confidence level and 10% margin of error used to establish the sample size of 68 participants may not fully capture the diversity within the target group. Greater insights into the food habits and nutritional intake of Dhaka's urban pregnant women may be obtained with a bigger sample size.

Furthermore, the cross-sectional design of the study makes it difficult to determine a causal association between dietary components and outcomes related to maternal or fetal health. More detailed information about the effects of nutrition on the health of mothers and fetuses could be obtained via longitudinal studies that monitor eating patterns throughout and after pregnancy.

Furthermore, due to limitations in dietary assessment methods and the complexity of quantifying nutrient absorption and bioavailability, the study may encounter difficulties in reliably assessing nutritional consumption, particularly micronutrients.

Lastly, it may be challenging to account for confounding variables in the research due to the sociocultural background of Dhaka's slum area. It can be difficult to measure or comprehend

the interactions between dietary practices and cultural norms, food availability, and food poverty.

In order to put the study's findings into perspective and guide future research initiatives targeted at addressing the nutritional needs of pregnant women in metropolitan settings like Dhaka, it is imperative to acknowledge these limitations.

### 1.5 Expected Outcome:

This observational study anticipates yielding valuable insights into the dietary habits, macronutrient, and micronutrient intakes of pregnant women seeking antenatal care in Dhaka. The research endeavors to contribute to the existing body of knowledge by addressing several key aspects, with the following expected outcomes:

1. Insights into the dietary patterns and nutritional status of pregnant women.
2. Identification of prevalent micronutrient deficiencies and their impact.
3. Understanding of the socio-cultural context influencing dietary choices.
4. Evaluation of the effectiveness of existing nutritional interventions.
5. Evidence-based recommendations for improving the nutritional well-being of pregnant women.

# CHAPTER 2

## LITERATURE REVIEW

### 2.1 Ideal dietary plan of pregnant women:

A study conducted in rural area of the country named Niger, pregnant and nursing mothers are particularly vulnerable to consuming insufficient amounts of several micronutrients. In order to determine food intakes in this sample (n = 202), 24-hour dietary recalls were carried out and evaluated. Micronutrient gaps in women's diets were found, several supplementation techniques were modeled, and food-based recommendations (FBR) to increase dietary micronutrient adequacy were created using linear programming analyses(Wessells et al., 2019). Energy intakes fell short of anticipated needs, and more than half of women were at danger of consuming insufficient amounts of the majority of micronutrients(Beal et al., 2017). Of the 11 modeled micronutrients, linear programming analyses showed that it would be challenging to choose a diet that met recommended dietary allowances for all but three (zinc, iron, and vitamin B6). One more meal a day along with following the chosen FBR (daily consumption of fermented milk, millet, pulses, vitamin A fortified oil) would reduce the proportion of women at risk of not getting enough of eight modeled micronutrients (calcium, iron, zinc, riboflavin, thiamin, B6, folate, and green leafy vegetables). The supply of nutrient-dense meals or multiple micronutrient supplements should take precedence over the promotion of realistic FBRs, as the latter is unlikely to guarantee that a low proportion of women are at danger of insufficient intakes for all modeled micronutrients.

### 2.2 Dietary complexities in pregnant woman in Bangladesh:

The majority of the 211 million pregnant women worldwide reside in underdeveloped nations(Singh & Maddow-Zimet, 2016). 529,000 women and almost 10 million children die from preventable causes each year, despite tremendous efforts. Undernutrition among mothers and children is indirectly responsible for 3.5 million deaths, 35 percent of diseases that affect children under five, and 11 percent of the world's disability-adjusted life years (DALYs). The majority of cases of chronic energy and micronutrient deficits associated with maternal undernutrition occur in south-central Asia. Inadequate nutrition during preconception and pregnancy has been linked to unfavorable results such low birth weight (LBW), premature delivery, and intrauterine growth restriction (IUGR)(Müller & Jahn, 2009). The expenses of health care, quality of life, development, and survival are all impacted by these unfavorable consequences. Inadequate food intake is typically associated with undernutrition, but it can also be related to higher nutritional needs, nutritional losses, and decreased capacity to absorb or use nutrients. Food insecurity, or the lack of access to and availability of food, as well as inappropriate use of food's quality and quantity and unequal intra-household distribution can

all lead to inadequate intake .The choice, distribution, and consumption of food are strictly regulated by social, cultural, environmental, and economic considerations (Shenk et al., 2021).

**2.3 Importance of nutrition assessment in pregnant women:**

The development of a fetus inside its mother is one of nature's greatest marvels. It is astounding how the fetus not only avoids being recognized by the immune system as a foreign antigen, but also redirects the mother's metabolic processes to support the fetal needs for fast intrauterine growth. Therefore, the metabolic demands of pregnancy might result in severe nutritional shortages even in a healthy woman. Pregnancy's hormonal environment can also reveal or worsen a mother's hypertension, hyperlipidemia, diabetes mellitus, and cardiorespiratory insufficiency. While widely acknowledged, the importance of a healthy diet in preventing these issues is not as widely utilized. The nutritional needs during pregnancy are determined by the fetus's and mother's growth requirements(Harding & Johnston, 1995). A normal-weight woman should typically gain 25 to 35 pounds during her pregnancy, of which the fetus, placenta, and amniotic fluid make up around 40%. The remaining portion is caused by an increase in maternal tissues, such as the breasts, uterus, blood, interstitial fluid, and body fat.81 There exists a substantial correlation between fetal survival and birth weight, with a weight of 3000 to 4000 g considered optimum.109 nutritional therapy, especially when utilizing invasive techniques like as intravenous nutrition and tube feeding, carries a considerable risk of problems, even though malnutrition can have a devastating impact on pregnancy outcomes.67, 143 When to employ nutritional therapy to optimize benefits and minimize complications is determined by the results of the assessment of nutritional status (Hamaoui & Hamaoui, 2003).

# CHAPTER 3

## MATERIALS AND METHODS

The following chart (Figure: 1) has been followed for this study. Furthermore, the steps have been explained below:

### 3.1 Literature Review:

Conduct a thorough review of existing literature related to maternal nutrition during pregnancy, focusing on studies examining dietary habits, nutrient intake, and their impact on maternal and fetal health outcomes. Identify gaps in the literature, including limited research on urban pregnant women in Dhaka and comprehensive studies covering all trimesters.

### 3.2 Selection of the Study:

Choose Dhaka's slum area as the study setting due to its representation of urban populations facing socio-economic challenges. Select a maternity center within the slum area where pregnant women regularly seek antenatal care.

### 3.3 Formulation of Objectives:

Define clear objectives for the study, including examining dietary habits, assessing nutrient intake, and identifying socio-cultural factors influencing food choices among urban pregnant women in Dhaka.

### 3.4 Key Variable Identification:

Identify key variables to be addressed in the study, such as demographic characteristics (age, education, income), dietary habits (meal frequency, food preferences), nutrient intake (macronutrients, micronutrients), and socio-cultural factors (cultural influences, food taboos).

### 3.5 Questionnaire Survey:

Develop a structured questionnaire to collect data from pregnant women attending the selected maternity center. Include questions covering demographic information, dietary habits, nutrient intake, and socio-cultural factors related to food choices test the questionnaire to ensure clarity and reliability, and make necessary revisions based on feedback.

### 3.6 Data Analysis:

Collect data from the questionnaire surveys conducted with pregnant women. Utilize appropriate statistical methods for data analysis, including descriptive statistics to summarize demographic characteristics, dietary habits, and nutrient intake. Conduct inferential statistics, if applicable, to examine associations between variables. Analyze qualitative data from interviews thematically to identify recurring patterns and themes related to dietary practices and cultural influences.

**Dietary Assessment:**

Food frequency questionnaires (FFQs), a well-managed collection of validated semi-quantitative assessments, were used to assess the dietary intakes of the pregnant women. Participants were asked to indicate the frequency and quantity of each food item specified in the FFQs that they had consumed the day before data collection. In order to quantify and summarize the intake patterns of the food groups, the Dietary Guidelines for Bangladesh transformed each food item's original portion size into the recommended serving sizes.

### 3.7 Results and Discussion:

Present the findings of the study, including descriptive statistics, inferential analyses, and thematic analysis of qualitative data. Interpret the results in light of the study objectives, discussing implications for maternal and fetal health outcomes, as well as any socio-cultural factors influencing dietary practices. Compare the findings with existing literature and discuss implications for future research and interventions aimed at improving maternal nutrition during pregnancy.

### 3.8 Report Writing:

Compile the results, discussion, and conclusions into a comprehensive research report. Ensure that the report adheres to academic standards and includes appropriate citations to support the findings. Emphasize practical implications and recommendations for policymakers, healthcare providers, and other stakeholders involved in maternal and child health initiatives.

**Methodology Flow Diagram:**

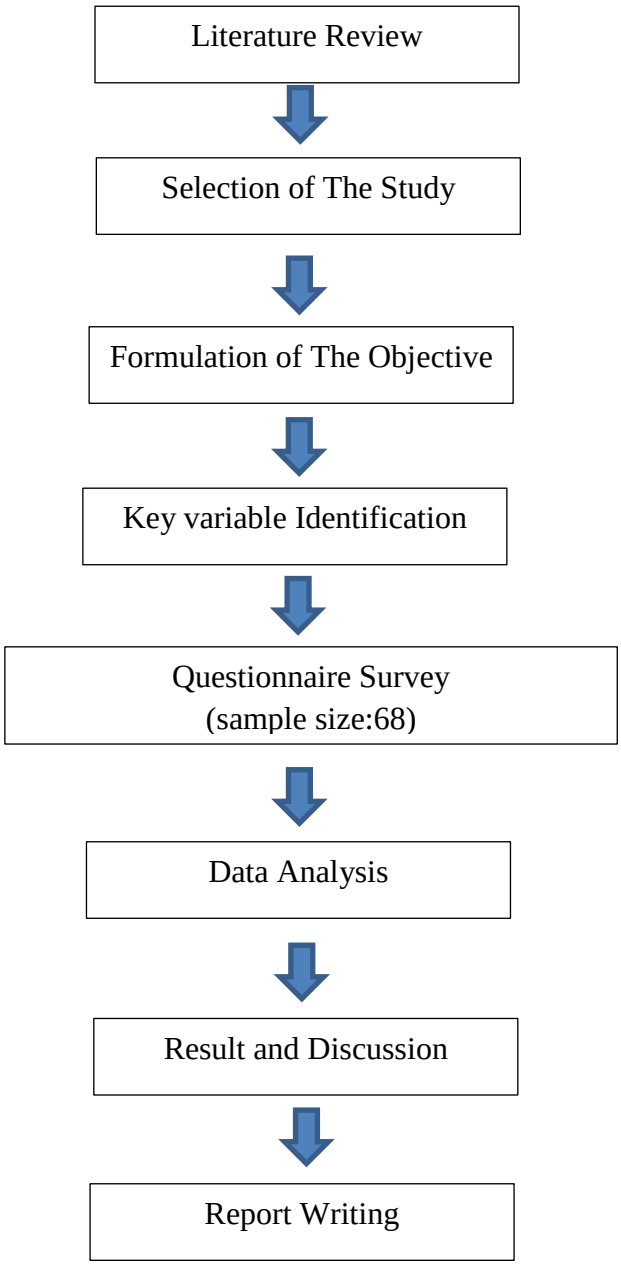


**Figure 1: Flow Diagram of Methodology**

This research focuses on assessing the dietary habits and nutritional status of pregnant women in Dhaka's slum area, utilizing a mixed-methods approach. With a target sample size of 68, determined to achieve a 90% confidence level with a 10% margin of error, random sampling will be employed. Data collection methods will include questionnaires and interviews, facilitated with participants consent. The questionnaire will cover various aspects, including

demographic information, dietary practices, anthropometric measurements, and socio-cultural factors influencing food choices. Topics such as trimester of pregnancy, education, occupation, family income and expenditure, family size, sources of income, meal and snack frequency, food preferences, factors affecting preferences, household responsibilities, food taboos, and knowledge about nutrition education will be addressed. This comprehensive approach aims to provide insights into the nutritional needs and challenges faced by pregnant women in urban slum areas, facilitating the development of targeted interventions to improve maternal and fetal health outcomes.

# CHAPTER 4

## RESULTS AND DISCUSSION

### 4.1 Demographic Analysis:

In this study, 68 pregnant women from urban maternity centers have been surveyed and the local community and slum area to measure their food and nutrient intakes which are presented in the following tables.

**Table-1: Age and socio-economic status among the study subjects**

| | Age | BMI | Income | Family members | Education | Husband's education |
|---|---|---|---|---|---|---|
| **Mean ±SD** | 25.3 ±4.4 | 26.14±3.41 | 28913±11659.1 | 3.67±1.9 | 10.9 ±3.6 | 12.52 ±3.6 |
| **Minimum** | 18 | 19.39 | 10000 | 2 | 3 | 5 |
| **Maximum** | 35 | 38.52 | 60000 | 15 | 17 | 17 |

Table 1 shows that the mean ±SD age of the studied pregnant women was 25.3±4.4 years and the minimum to maximum age was 18 to 35. Mean ±SD of BMI (kg/m²) was 26.14±3.41, mean ±SD of income (Tk) was 28913±11659.1, mean ±SD of a family member was 3.67±1.9 and also education and husband's education of the study subjects was 10.9±3.6 and 12.52±3.6. The number of minimum - maximum BMI were 19.39-38.52(kg/m²) and rages of monthly income was 10000-60000 (Tk).

### 4.2 Health Complications:

After analyzing the information collected from a group of pregnant women in an urban area we found that they are having various complications due to nutritional deficiency. This graph shows the percentage of various complications among a group of the target population from the graph we can see that highest percentage of women are having LBP which is 21%. Next in line comes iron deficiency which is a major concern for the pregnant mothers. The number of Diabetic patients among pregnant women is also high. About 18% of them are suffering from diabetes which is a high-risk factor for the pregnant women and their unborn child. On the contrary a few women have given history of having HBP and PCOS. The percentage is same in both case which is only 2%. Among our target population no one have given history of having thyroid problem, Iodine deficiency or edema.

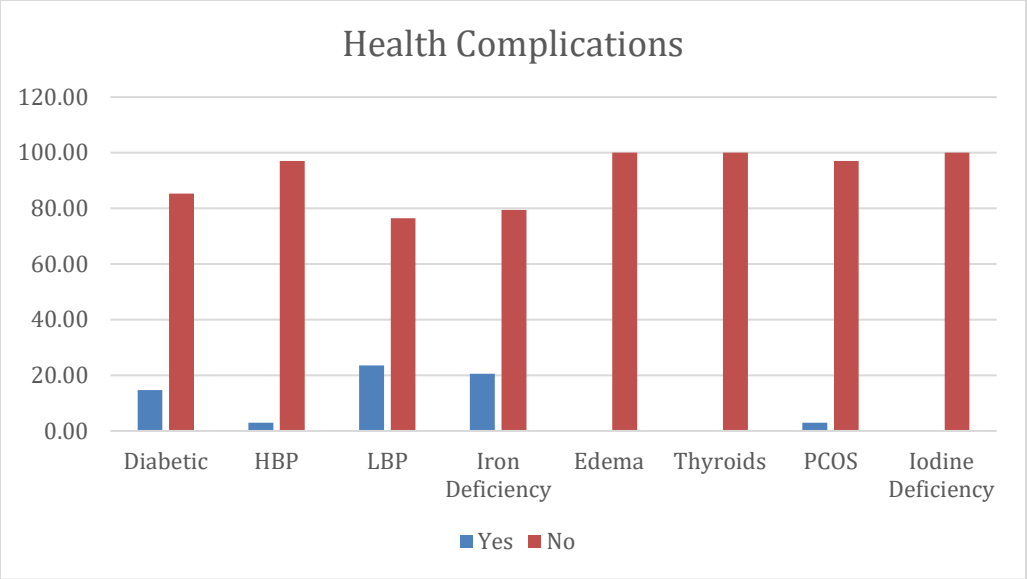


**Figure 2: Figure of Health Complications**

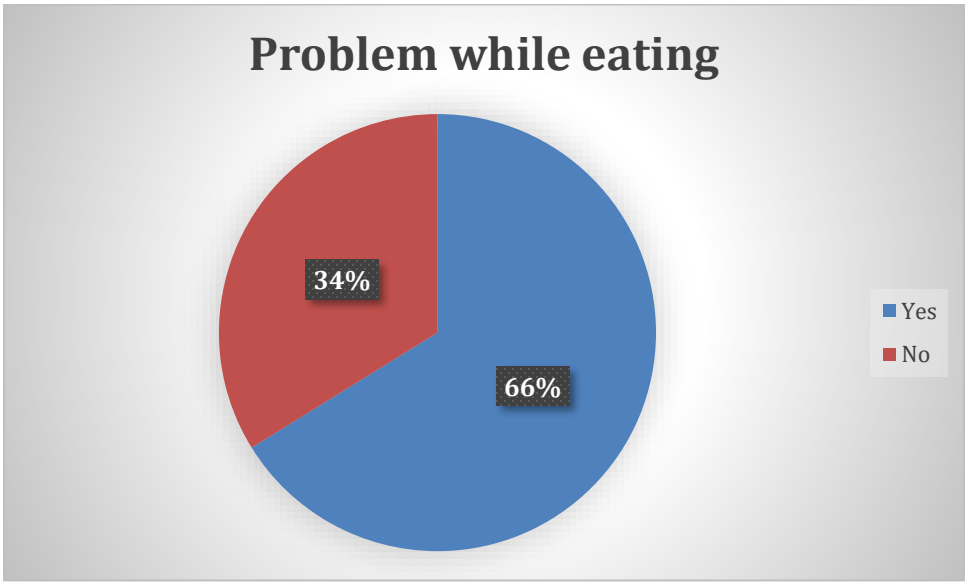


**Figure 3: Percentage of people having problem while eating**

According to this graph, 66% of pregnant women encounter difficulties while eating, while 34% experience no issues during their meals.

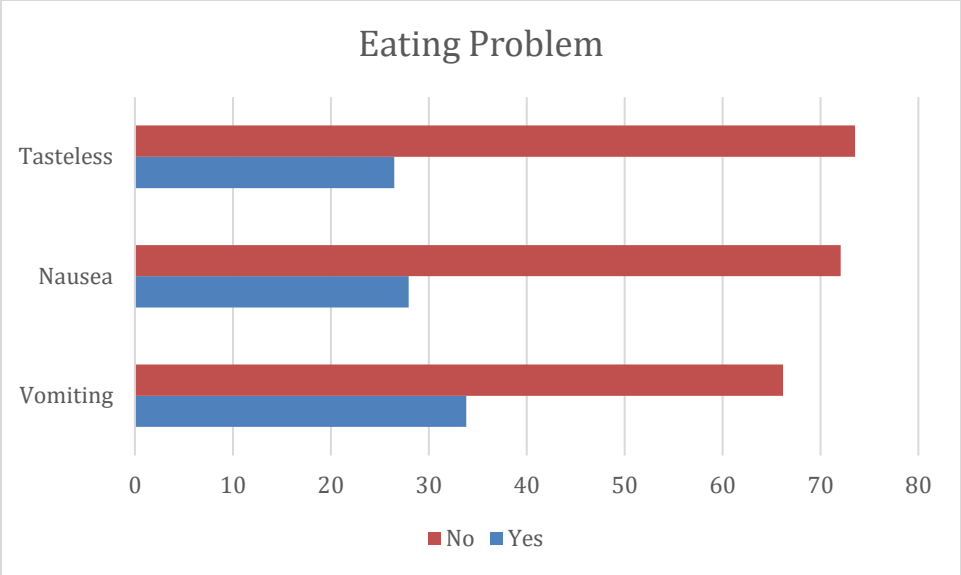


**Figure 4: Eating Problem while having food**

The graph illustrates that the most significant eating issue among pregnant women is vomiting, with a prevalence of 34%. Following closely behind is nausea, affecting 28% of expectant mothers, while tastelessness ranks third at 27%.

**Table 2: Food intake patterns (g/day) among the studied pregnant women**

| Food Items | Mean ±SD | Minimum | Maximum |
|---|---|---|---|
| **Rice** | 502.06±126.62 | 250 | 800 |
| **Wheat** | 84.78 ±44.54 | 5 | 220 |
| **Chicken** | 70.23±32.7 | 25 | 140 |
| **Fish** | 87.66±46.26 | 15 | 240 |
| **Egg** | 68.75±28.91 | 50 | 150 |
| **Vegetables** | 96.15±63.28 | 10 | 300 |
| **Leafy vegetables** | 101.9±50.28 | 50 | 200 |
| **Dal** | 25.11±21.88 | 10 | 105 |
| **Apple** | 77±28.65 | 30 | 120 |
| **Banana** | 145.5±82.45 | 50 | 400 |

Table 2 reveals that rice was the most consumed food by the women, with a Mean ±SD value of 502.06±126.62. The mean intakes of wheat, vegetables, fish, and chicken were 84.78 ±44.55, 96.15±63.2, 87.67.2±46.26, and 70.23±32.7, respectively. The intake of Dal among the studied pregnant women was the lowest at 25.11 (g/day), while rice intake was the highest at 800 (g/day). The average food consumed by the studied pregnant women included banana, wheat, fish, and vegetables, with maximum intakes of 400 (g/day), 220 (g/day), 240 (g/day), and 300 (g/day), respectively.

**Table 3: Food intake patterns (g/day) among the studied subjects according to pregnancy stage**

| Trimester | 2nd Trimester (N=28) | | | 3rd Trimester (N= 42) | | |
|---|---|---|---|---|---|---|
| | Mean± SD | Minimum | Maximum | Mean± SD | Minimum | Maximum |
| **Rice** | 499±133.21 | 250 | 800 | 502.06 ±129.62 | 250 | 800 |
| **Wheat** | 84.84 ±44.22 | 5 | 220 | 84.78 ±44.54 | 5 | 220 |
| **Chicken** | 68.69 ±30.42 | 25 | 130 | 70.23±32.7 | 25 | 140 |
| **Fish** | 86.63±47.3 | 15 | 240 | 87.67±46.26 | 15 | 240 |
| **Egg** | 69.45 ±29.53 | 50 | 150 | 68.75±28.91 | 50 | 150 |
| **Vegetables** | 97.55±62.70 | 10 | 300 | 96.15±63.28 | 10 | 300 |
| **Leafy vegetables** | 105.71±51.79 | 50 | 200 | 101.87±50.28 | 50 | 200 |

Table 3 shows the Food intake patterns(g/day) among the studied subjects according to pregnancy stage. In this table, it can be seen that the number of 2nd trimesters pregnant women was Mean ±SD Rice intake among the study subjects was 499±133.21, Wheat intake was 84.84±44.22, chicken, fish, and egg intake were 68.69±30.42, 86.63±47.3 and 69.45±29.53. they intake veg and leafy veg were 97.55±62.70 and 105.71±51.78. Their maximum number of rices, wheat, chicken, fish egg, vegetables, and leafy veg intake was 800,220,130,240,150,300 and 200 and minimum rice, wheat, chicken, fish, egg, vegetables and leafy vegetables intake was 250, 5, 25, 15 g/day. Again, the number of 3rd trimesters pregnant women was 42. Among them, the carbohydrate food rice intake was 502.06g/day ±129.62, minimum to maximum intake was 250-800 Wheat Intake was 84.78±44.54 (mean ±SD) and the maximum amount of wheat was 220g/day. Chicken, fish, and egg intake were 70.23±32.69,87.67 ±46.26 and 68.75±28.91 Their intake

of veg and leafy veg were 96.15±63.28 and 101.87±50.2. Their maximum number of chickens, fish, egg, veg, and leafy veg intake were 140,240,150,300, and 200, the minimum number was 25, 15, 50, 10,50 g/day.

**Table 4: Monthly family income according to the education of the pregnant women**

| Education level | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Up to Class V | 7 | 28044.44 | 11996.02 | 10000 | 60000 |
| Class V - X | 28 | 29115.94 | 11728.25 | 10000 | 60000 |
| >X | 33 | 29238.81 | 11848.66 | 10000 | 60000 |

Table 4 is showing the data analysis of the monthly family income of studied pregnant women according to their education. Most of the studied women found that their education level is Class >X as the number is 35 and the monthly income mean ±SD 29238.81±11848.66, max 60000 and min 10000. Around 28 were found in study level upper X and their Max & Min monthly income is 10000 & 60000 respectively. There were 25 of them who were educated up to class V and the monthly income mean ±SD 28044.44±11996.02, Max10000, Min 60000.

**Table 5: Food intake patterns according to the education of the studied pregnant women**

| Education Level | | Rice | Wheat | Chicken | Fish | Egg | Vegetables | Leafy vegetables |
|---|---|---|---|---|---|---|---|---|
| **Up to Class 5** | | 499.83 | 82.19 | 66.58 | 88.19 | 66.67 | 96.63 | |
| | **Mean ±SD** | ± 135.20 | ± 41.15 | ± 29.56 | ± 48.36 | ± 26.59 | ± 64.20 | 95±46.40 |
| | **Minimum** | 250 | 5 | 25 | 15 | 50 | 10 | 50 |
| | **Maximum** | 800 | 205 | 130 | 240 | 150 | 300 | 200 |
| **6 - 10** | | | 84.78 | 70.23 | 87.67 | 68.75 | 96.15 | 101.86 |
| | **Mean ±SD** | 502 ±129.62 | ± 44.54 | ± 32.69 | ± 46.26 | ± 28.91 | ± 63.28 | ± 50.28 |
| | **Minimum** | 250 | 5 | 25 | 15 | 50 | 10 | 50 |
| | **Maximum** | 800 | 220 | 140 | 240 | 150 | 300 | 200 |
| **> 10** | | 502.12 | 83.79 | 66.90 | 86.90 | 69.23 | 97.37 | 102 |
| | **Mean ±SD** | ± 130.41 | ± 43.80 | ± 29.61 | ± 46.53 | ± 29.12 | ± 63.56 | ± 51.92 |
| | **Minimum** | 250 | 5 | 25 | 15 | 50 | 10 | 50 |
| | **Maximum** | 250 | 5 | 25 | 15 | 50 | 10 | 50 |

Table 5 shows the food intake patterns according to the education level of the studied pregnant women. Most of the women who were found to have an education level greater than class 10 mostly consumed rice, vegetables, wheat, chicken, etc. as the max is 250, 10, 5, 25 respectively. They were having fish, egg & leafy vegetables in lower numbers as the standard deviation for these are 46.53 29.12 and 51.92 respectively. On the other hand, women who have the education level of class 6- 10 were found intaking more wheat, fish, vegetables, and leafy vegetables as the Standard Deviation found 44.54, 46.26, and 63.28, 50.28 respectively. Women having education levels up to class 5 are more prone to rice, fish & vegetables as the max number is 800, 240, and 300 respectively. They had less intake of chicken and egg, with 29.56 and 26.6. It is understood that the family with higher monthly income having greater education are more likely to afford chicken, fish, eggs, etc. rather than those with lower monthly income families.

**Table 6: Macro and Micro-nutrient intake patterns among the study subjects**

| Nutrients | Minimum | Maximum | Mean ±SD |
|---|---|---|---|
| **Carbohydrate, g/d** | 37.76 | 222.45 | 112.58±43.48 |
| **Protein, g/d** | 29.7 | 81.26 | 55.22±12.39 |
| **Fat, g/d** | 5.4 | 56.99 | 19.98±8.40 |
| **Zinc, mg/d** | 4.5 | 24.11 | 10.37±3.85 |
| **Calcium, mg/d** | 54.1 | 905.6 | 260.17±180.54 |
| **Folic acid, µg/d** | 8.65 | 52.67 | 26.80±10.32 |
| **Iron, mg/d** | 3.14 | 56.33 | 25.75±11.66 |
| **Vitamin A, µg/d** | 13.533 | 2686.92 | 161.38±316.24 |
| **Vitamin D, mg/d** | 4.465 | 16.88 | 9.7 ±2.68 |
| **Vitamin E, mg/d** | 4.623 | 12.58 | 8.6 ±1.8 |
| **Vitamin C, mg/d** | 3.92 | 403.63 | 46.54±80.29 |
| **Retinol, µg/d** | 0.576 | 341.1 | 108.2 ±75.94 |
| **Riboflavin, mg/d** | 1.594 | 18.24 | 6.61±3.82 |
| **Thiamin, mg/d** | 0.621 | 3.27 | 1.68±0.54 |
| **Niacin, mg/d** | 128.5426 | 384.36 | 248.22 ±58.51 |

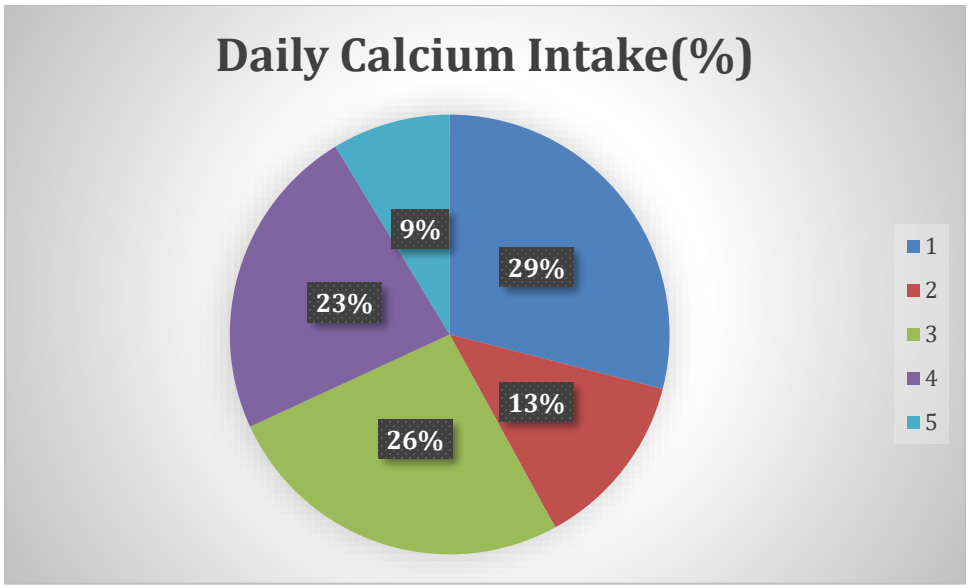


**Figure 5: Distribution of subjects according to calcium intake pattern (1=up to 100mg/d, 2=100.1-200mg/d, 3=200.1-300mg/d, 4=300.1-500mg/d, 5=>500mg/d**

Figure 5 shows that 29% of the studied pregnant women were consuming up to 100 mg of Calcium per day. Among the observed pregnant women 13%, 26%, and 23% were intaking around 100-200 mg, 200-300 mg, 300-500mg and >500mg of Calcium per day respectively. The least percentage (9%) of studied subjects were intaking more than 500mg of Calcium per day.

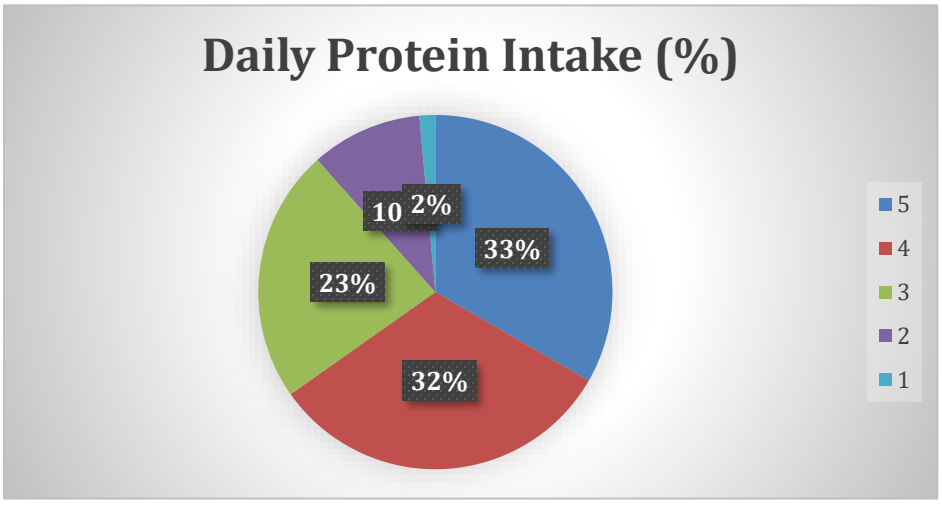


**Figure 6: Distribution of study subjects according to protein intake pattern (1= up to 30g/d, 2=30.1-40g/d, 3=40.1-50g/d, 4=50.1-60g/d, 5=>60g/d)**

The percentage of studied pregnant women according to their protein intake. Among all the respondents about 32% pregnant women intakes more than 50g of protein per day whereas about 23% of the pregnant women intakes only up to 40 g protein per day. And more than 60g of protein 33% of the pregnant woman intake per day.

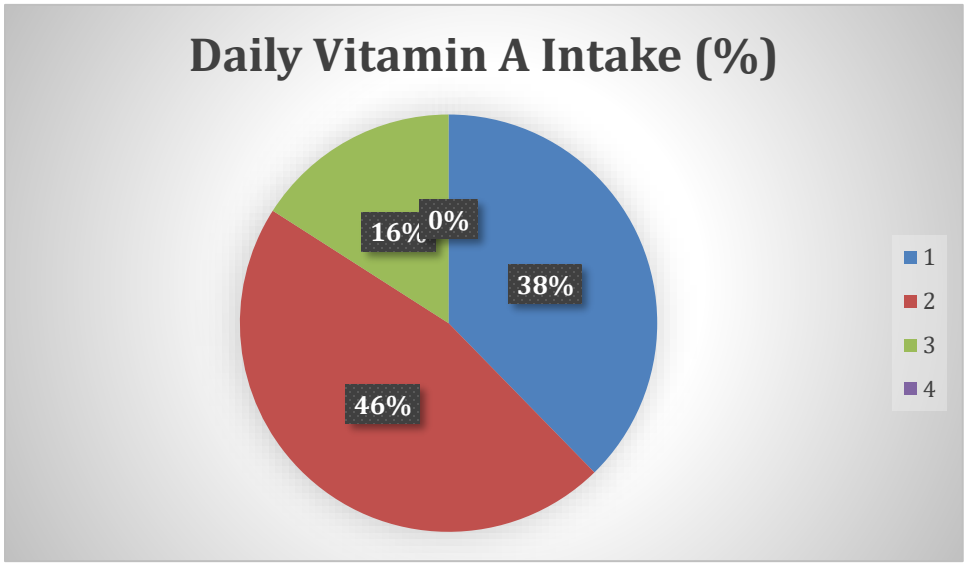


**Figure 7: Distribution of subjects according to vitamin A intake pattern (1= up to 100µg/d, 2= 100.1-200 µg/d, 3= 200.1-400 µg/d, 4= >400 µg/d,**

The information of Vitamin- A intake pattern among the studied pregnant women. Almost half of the studied subjects as mentioned 38 % of them were having up to 100 µg of Vit A per day. Very few of them around 0 % of them have more than 400 µg of Vit A per day. 46% of the respondents Vit A intake was found to be 100.1- 200 µg per day. Finally, 16% of the respondents were consuming 200.1- 400 µg of Vit A per day.

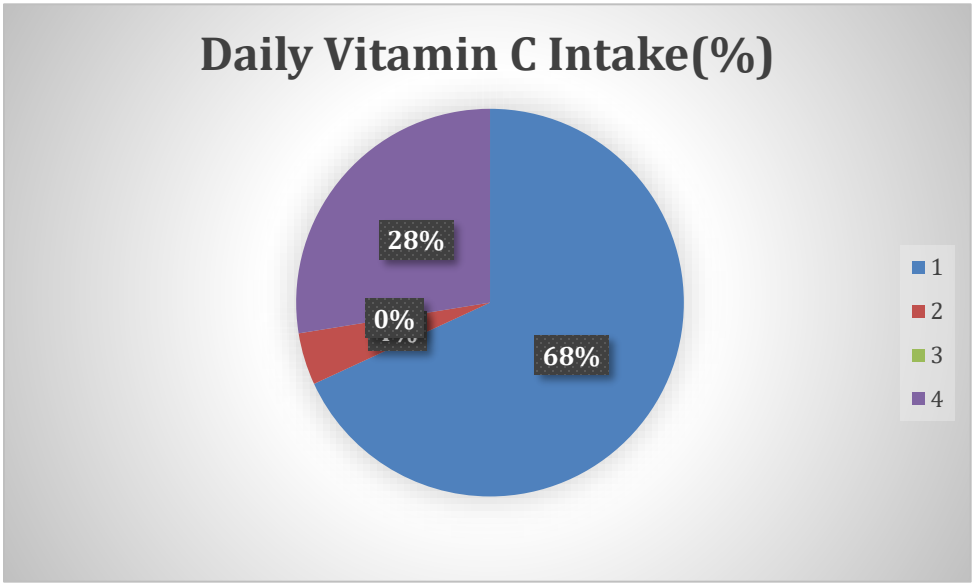


**Figure 8: Distribution of subjects according to vitamin C intake pattern (1= up to 20mg/d, 2= 20.1-30mg/d, 3 = 30-50mg/d, 4= >50mg/d)**

The information on the pregnant women who were the respondents of the study's vitamin-C intake pattern is shown. As indicated, 68% of the study participants consumed up to 20 mg of vitamin C daily. 28% of them consume more than 50 mg of vitamin C per day. A daily consumption of 30-50 mg of vitamin C was found in 0 % of the participants. Finally, 20.1–30 mg of vitamin C was consumed daily by 0% of the patients.

### 4.3 Discussion

The results of the study provide valuable insights into the demographic characteristics, health complications, food intake patterns, and nutrient intake levels among pregnant women attending urban maternity centers.

In terms of demographic analysis (Table 1), the studied pregnant women had a mean age of 25.3 years, with a range from 18 to 35 years. The mean BMI was 26.14, indicating a generally overweight population. The average monthly family income was 28,913 Tk, with variations observed across different education levels. Most women had completed at least a primary education, with a mean education level of 10.9 years, while their husbands had slightly higher educational attainment, with a mean education level of 12.52 years.

The assessment of health complications revealed a range of issues among the pregnant women surveyed. The highest prevalence was observed for low back pain (LBP), affecting 21% of the population, followed by iron deficiency (Table not specified), which is concerning given its implications for maternal and fetal health. Additionally, a notable proportion of pregnant women were diagnosed with diabetes (18%), highlighting the importance of managing blood sugar levels during pregnancy to mitigate adverse outcomes.

Regarding food intake patterns (Table 2), rice emerged as the most consumed food item among the studied pregnant women, followed by wheat, vegetables, fish, and chicken. However, intake levels varied, with rice consumption notably higher compared to other food items. The variation in food intake patterns according to pregnancy stage (Table 3) revealed consistent trends across trimesters, with rice being the predominant carbohydrate source and vegetables being commonly consumed throughout pregnancy. Interestingly, there were minimal differences in food intake patterns between the second and third trimesters.

The analysis of food intake patterns according to education level (Table 5) highlighted disparities in dietary habits based on educational attainment. Women with higher education levels tended to consume a wider variety of foods, including chicken, fish, and eggs, compared to those with lower education levels, who relied more heavily on rice and vegetables. This suggests that socioeconomic factors may influence access to and affordability of nutritious foods among pregnant women.

The assessment of macro and micronutrient intake patterns (Table 6) revealed both strengths and deficiencies in the diets of pregnant women. While carbohydrate intake met recommended levels, protein intake was slightly below optimal levels, with only 32% of women consuming more than 50g of protein per day. Similarly, while calcium intake was generally adequate, there were notable variations in vitamin A and vitamin C intake levels, with a significant proportion of women consuming less than recommended amounts.

Overall, these findings underscore the importance of targeted interventions to improve the nutritional status of pregnant women in urban areas. Strategies aimed at promoting dietary diversity, addressing micronutrient deficiencies, and providing education on healthy eating habits are crucial for ensuring optimal maternal and fetal health outcomes. Additionally, efforts to address socioeconomic disparities and improve access to nutritious foods are essential for addressing the root causes of malnutrition among pregnant women.

# CHAPTER 5

## CONCLUSION

In conclusion, this study provides a comprehensive understanding of the nutritional status, dietary habits, and health complications among pregnant women attending urban maternity centers in Dhaka. Through demographic analysis, it was observed that the studied population exhibited a diverse range of ages and socioeconomic backgrounds, with variations in education levels and income contributing to differences in dietary patterns and nutrient intake. The assessment of health complications revealed a concerning prevalence of issues such as low back pain, iron deficiency, and diabetes among pregnant women. These findings underscore the importance of targeted interventions to address common health concerns during pregnancy and ensure optimal maternal and fetal health outcomes. The study found significant variations in the daily intake of macronutrients and micronutrients among the subjects. Carbohydrate intake ranged from 37.76g to 222.45g per day (mean ± SD: 112.58g ± 43.48g), while protein intake ranged from 29.7g to 81.26g per day (mean ± SD: 55.22g ± 12.39g). Fat intake ranged from 5.4g to 56.99g per day (mean ± SD: 19.98g ± 8.40g), and calcium intake ranged from 54.1mg to 905.6mg per day (mean ± SD: 260.17mg ± 180.54mg). Other nutrients showed similar variations in intake, emphasizing the need for tailored nutritional interventions.25 ages woman's bmi is 26.1 on average and their income 10000-60000 on average. Mostly 100% woman faces iodine deficiency. And 66% woman faces problem while eating food. 73% pregnant woman feeling tasteless while eating. Most of the pregnant woman eating fish 150 g/day in maximum level and eat egg maximum level 150 g/day. All pregnant woman should have calcium intake.1200 mg/day but the sample woman has highest 905 mg/day only 9% had above 500 mg/day. The recommended dietary allowance (RDA) for protein during the first trimester of pregnancy is estimated at 46 g/day (0.8 g/kg bw/day), and at 71 g/day (1.1 g/kg bw/day) during the second and third trimesters. But the sample woman has highest 81.26 g/day. Pregnant women should receive up to 10,000 IU vitamin A daily or up to 25,000 IU vitamin A weekly as an oral liquid, oil-based preparation of retinyl palmitate or retinyl acetate. Supplementation should be continued for a minimum of 12 week during pregnancy until delivery. But the sample woman has highest 2686.92 IU vitamin A received. As for how much vitamin C you can take without having side effects, the makers of Emergent-C advise that no one consumes more than 2,000 milligrams of vitamin C per day. The ODS confirms that this is also the upper daily limit (UL) for pregnant and breastfeeding women over 19. But the sample woman has highest 403.63 mg vitamin c received. Analysis of food intake patterns highlighted the predominance of rice in the diet, along with variations in intake of other food items such as wheat, vegetables, fish, and chicken. These patterns were influenced by factors such as pregnancy stage and education level, emphasizing the need for culturally sensitive and context-specific nutritional interventions.

Furthermore, the evaluation of macro and micronutrient intake patterns revealed both strengths and deficiencies in the diets of pregnant women. While carbohydrate intake generally met recommended levels, there were gaps in protein intake and variations in intake levels of essential micronutrients such as calcium, vitamin A, and vitamin C. Addressing these deficiencies through targeted nutritional interventions is critical for ensuring the overall health and well-being of both mothers and their unborn children.

Overall, this study underscores the importance of comprehensive antenatal care that includes nutritional assessment, education, and intervention. By addressing socioeconomic disparities, promoting dietary diversity, and providing access to essential nutrients, we can work towards improving maternal and fetal health outcomes in urban areas like Dhaka. This research serves as a valuable foundation for future studies and interventions aimed at enhancing the nutritional status and overall health of pregnant women in similar settings.

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## APPENDICES

### Appendix 1: Questionnaire

| | | |
|---|---|---|
| 1.Demography | Name | |
| | Age | ○ <18<br>○ 18-25<br>○ 25-35 |
| | Occupation | |
| | Income | ○ <12000<br>○ 12000-18000<br>○ 18000-25000<br>○ >25000 |
| | Education | |
| 2.Anthropometric Indices | Height | |
| | Weight | |
| | BMI | |
| 3.Number of Family Member | | |
| 4.Education Qualification | | |
| 5.Husbands Education and Occupation | | |
| 6.Complication | | |
| 7.Number of Children | | |
| 8.Number of pregnancies | | |
| 9.Trimester | | |
| 10.Miscarriage History | | |
| 11.Blood Group | | |
| 12.Do you face any problem while eating? How often you eat green vegetables? How often you drink milk? If yes then mention the amount? | | |
| 13.What kind of problem you face? | | |
| 14.What kind of food you prefer? | | |
| 15.Do you take any vitamin tablets? | | |
| 16.Which medicine the doctor prescribed for you? | | |
| 17.Are you under observation by any nutritionist? | | |
| 18. Do you take any mineral supplements such as Ca or iron tablet? | | |

19. 24-hour dietary recall

| Time | Item | Quantity (gm) |
|---|---|---|
| Morning | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Mid-Morning | | |
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| Lunch | | |
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| Snacks | | |
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| | | |
| | | |
| | | |
| Dinner | | |
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| | | |
| Late night | | |
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## Appendix 2: Synopsis

**Title:**

**Nutrient Intake Disparities Among Urban Pregnant Women: A Comprehensive Analysis of Dietary Patterns and Health Implications**

**Introduction:**

Pregnancy is a dynamic period marked by rapid and profound physiological changes from conception to delivery. During this crucial time, the nutritional needs of both the mother and the developing fetus significantly escalate to support optimal growth and development. Adequate nutrition is essential not only for fetal well-being but also for the maintenance of maternal metabolism and tissue accretion (Helen. et al., 2002).

The importance of providing pregnant women with nourishing food and comprehensive care cannot be overstated, particularly during the vulnerable periods before, during, and after childbirth (Slade et al., 2009) . Specific nutritional requirements evolve throughout a woman's life, emphasizing the need for a healthy diet even before conception to build sufficient reserves (Farooqi, 2005). Insufficient nutritional support during pregnancy and lactation can lead to adverse outcomes for both the mother and the child.

Despite the critical nature of proper nutrition during pregnancy, there is a global disparity in the nutritional status of women, particularly in many underprivileged regions. Inadequate intake of essential nutrients such as iodine, iron, folate, calcium, and zinc during pregnancy can result in severe complications for both the mother and the child, including anemia, pre-eclampsia, hemorrhage, low birth weight, stillbirth, and developmental issues. Alarming statistics, such as over 20 million newborns suffering from low birth weight annually according to UNICEF, underscore the urgent need for comprehensive nutritional interventions.

Furthermore, poor nutritional practices during pregnancy have been associated with adverse outcomes such as excessive gestational weight gain, macrosomia, and gestational diabetes (M.C. & F., 2010). These issues contribute to a cycle of intergenerational health challenges, highlighting the importance of policies and initiatives that promote healthy eating practices during pregnancy (Cheng et al., 2016).

Understanding the dietary habits and nutrient intake of pregnant women is crucial for addressing nutritional deficiencies and optimizing maternal and fetal health (Morrison & Regnault, 2016). The first 1000 days of life, spanning from conception to the second year of a child's life, are particularly crucial for healthy growth and development (Schwarzenberg MD, FAAP & Georgieff MD, FAAP, 2018). Therefore, a comprehensive understanding of the nutritional intake during pregnancy is essential for developing targeted interventions and promoting long-term health outcomes (Brands et al., 2019).

Despite the importance of this information, there is a noticeable gap in comprehensive studies covering the entire trimester and providing a nationwide perspective. Existing research often focuses on specific trimesters, limited geographical areas, or fails to capture the full spectrum of dietary practices and their impact on pregnancy outcomes (Doyle et al., 2017).

In addition to the direct impact on the health of pregnant women and their children, maternal nutrition during pregnancy is increasingly recognized for its role in influencing long-term health outcomes (Christian et al., 2015). Ongoing studies, such as the Nutritional influence on Immunological maturation during Childhood about the Environment (NICE) birth-cohort study, aim to investigate how various environmental factors, including nutrition, impact the maturation of the fetal immune system and subsequent health outcomes.

Understanding the nutritional profile of pregnant women is vital for assessing the evolution of dietary habits over time and comparing them to historical standards (Mobley & Mobley, 2015). This information is particularly scarce for the entire duration of pregnancy and across diverse geographical locations. Consequently, this observational study aims to address these gaps by measuring the food, macronutrient, and micronutrient intakes of pregnant women seeking antenatal care in Dhaka. The assessment will also evaluate the adherence of these women to current national nutrient intake recommendations, providing valuable insights for targeted interventions and improved maternal and fetal health outcomes.

**Objective:**

1.To identify and analyze the dietary patterns of urban pregnant women, focusing on the types and

quantities of nutrients consumed.

2.To investigate disparities in nutrient intake among different demographic groups of urban pregnant

women, such as variations based on socioeconomic status, education level.

3.To examine the relationship between nutrient intake and health outcomes in urban pregnant women and

their unborn children, including the impact of deficiencies or excesses in certain nutrients.

4.To compare the nutrient intake of urban pregnant women with recommended dietary guidelines, to

highlight any significant differences or concerns.

**Methodology**

•Study Area: Dhaka, slum area, maternity center

•Total Population = 68

considering a 90% Confidence level and 10 % margin of error, the sample size should be 68.

•Sampling method = Random Sampling.

•Survey method = Questionnaire and Interview

This research will employ a mixed-methods approach, including surveys and interviews with pregnant women regarding dietary assessments, and anthropometric measurements. A questionnaire form will be prepared and which will be filled by the researcher with the written consents of the participants.

It will contain questions regarding

I. 2nd and 3rd trimesters pregnant women.

II. Education of the respondents.

III. Occupation of the respondents.

IV. Family income, expenditure, and expenditure on foods.

V. Family size.

VI. Sources of Income

VII. Anthropometric measurements.

VIII. Number of meals taken.

IX. Number of snacks taken.

X. Food preferences.

Xl. Factors affecting preferences.

XIII. Responsible for household work.

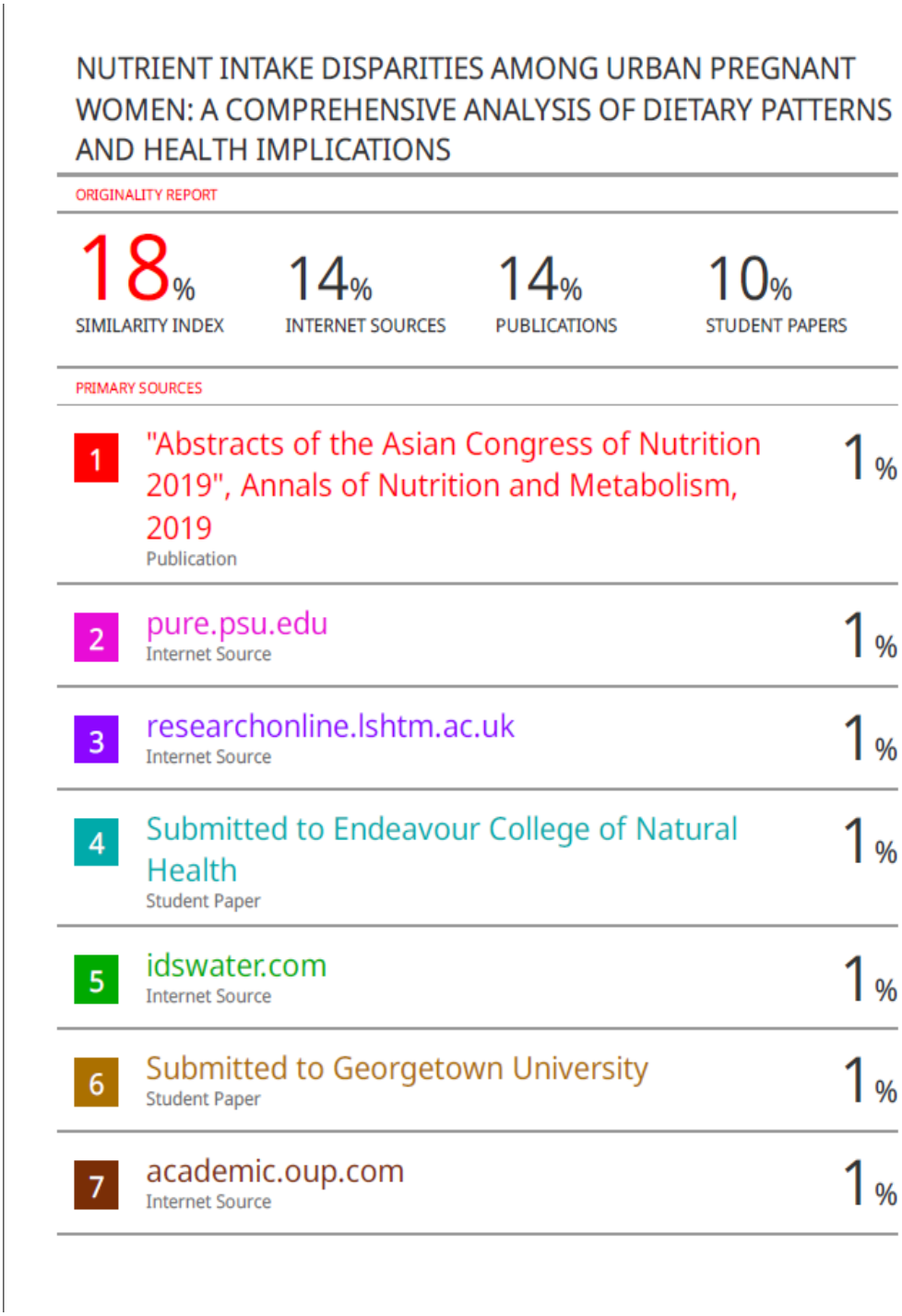
XVII. Food taboos.

**Expected Outcome:**

This observational study anticipates yielding valuable insights into the dietary habits, macronutrient, and micronutrient intakes of pregnant women seeking antenatal care in Dhaka. The research endeavors to contribute to the existing body of knowledge by addressing several key aspects, with the following expected outcomes:

1. Insights into the dietary patterns and nutritional status of pregnant women.
2. Identification of prevalent micronutrient deficiencies and their impact.
3. Understanding of the socio-cultural context influencing dietary choices.
4. Evaluation of the effectiveness of existing nutritional interventions.
5. Evidence-based recommendations for improving the nutritional well-being of pregnant women

## Appendix 3: Plagiarism Report



NUTRIENT INTAKE DISPARITIES AMONG URBAN PREGNANT WOMEN: A COMPREHENSIVE ANALYSIS OF DIETARY PATTERNS AND HEALTH IMPLICATIONS

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