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# Pregnancy Dietary Patterns and Risk of Pregnancy Outcomes

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**Abstract**

**Background:** Maternal nutrition in pregnancy is very important in the determination of both maternal and neonatal outcomes. Instead of looking at specific nutrients, food pattern analysis gives an in-depth description of what is eaten and its relation to the pregnancy outcome. **Purpose:** The following purpose will help determine the correlation between eating patterns during pregnancy and the danger of poor pregnancy outcomes in women receiving care in the OBGYNE department of Peoples University of Medical & Health Sciences in Women. **Methods:** Cross-sectional study: The study took place at a hospital between July 2024 and December 2024. Non-probability consecutive sampling was used to enroll 120 pregnant women. A Food Frequency Questionnaire (FFQ) was used to evalu the dietary intake. Principal Component Analysis (PCA) was used as a means of coming up with dietary patterns. Logistic regression was used to examine associations between dietary patterns and pregnancy outcomes. **Findings**: Three big meal patterns were suggested: healthy, traditional and western. The healthy eating pattern was greatly linked with the lowering chances of gestational diabetes mellitus (GDM), anemia, and low birth weight. The western dietary pattern exhibited greater chances of showing deleterious events such as preterm birth and obtrusive gestational

weight gain. **Conclusion:** Not only is the dietary habits in pregnancy very important, but it heavily impacts the maternal and neonatal outcomes. Healthy diets can be encouraged to minimize pregnancy complications.

**Keywords:** Pregnancy, Dietary patterns, Maternal nutrition, Pregnancy outcomes, GDM, Low birth weight.

## 1. Introduction

Pregnancy maternal nutrition is commonly known as a decisive factor of maternal and fetal health outcomes. The intrauterine environment that is mostly affected by what the mothers eat also contributes to the essential role to determine fetal growth, development and future health patterns. In recent times, studies are no longer just looking at individual nutrients, but instead, they are moving towards the analysis of overall eating patterns as they are able to give us a more detailed picture of how people regularly eat foods and how their overall physiological state is brought to bear [1].

Pregnancy is one such stage when nutrition needs are found to rise to meet the needs to grow the baby, the placenta and other physiological adjustments of the mother. Detoxing in essential nutrients like the proteins, vitamins and minerals is essential in order to achieve best pregnancy results. On the other hand, insufficient or unbalanced nutrition has been linked to various negative events such as gestational diabetes mellitus (GDM), hypertensive disorders of pregnancy, anemia, premature birth and low birth weight [2]. These and related complications are major contributors to the morbidity and mortality of men and deeply affect the maternal and neonatal conditions in low- and middle-income countries [3].

Nutritional epidemiology has traditionally concentrated on specific nutrients or food group. Nonetheless, this reductionist view fails to take into consideration the complexity of human diets where foods are eaten in combinations and possibly have interactions which are synergistic or antagonistic. Consequently, diet pattern analysis has become more integrated and realistic in analyzing the intake of the diet. Such an approach is more reflective of eating habits in real life and provides a more accurate representation of the quality of the diet as compared to single-nutrient tests [4].

The dietary patterns can be broadly classified as: healthy (or prudent), traditional, or western. Healthy eating habits are usually marked by large

eating of fruits, vegetables, whole grains, lean proteins, and dairy products. There is evidence that compliance with these patterns in pregnancy is related to good maternal and infant outcomes. As an example, there are empirical studies indicating a connection between the healthy dietary habits and a decreased risk of preterm births, low weight, and gestational hypertension [5]. These trends also lead to the better fetal growth and development thus lowering the chances of intrauterine growth retardation [6].

Conversely, western dietary patterns, which are high consumption of processed foodstuffs, refined carbohydrates, saturated fat and sweetened drinks have continued to be linked to the negative consequences of pregnancy. These eating patterns are associated with higher risks of excessive gestational weight gain, gestational diabetes and preterm birth [7]. In addition, unhealthy diets by the mother during pregnancy have proved to have long term effects on the health of the offsprings such as increased risk of becoming obese, cardiovascular diseases and metabolic disorders in the future [8].

Recent studies have also underlined the vitality of eating habits in determining gestational weight gain, which is one of the major predictors of pregnancy outcomes. Adequate weight gain in pregnancy is linked with less risk of complications and obesity or inadequate weight gain is linked with bad effects like being born with macrosomia or low birth weight. Research has shown that women with nutrient-rich dietary habits are more inclined to gain the most weight during pregnancy than those on energy-rich but nutrient-deficient diets [9].

The other crucial aspect of maternal nutrition is its effect in the neonatal outcomes in relation to birth weight and gestational age. Birth weight is vital important indicator of neonatal health and survival as both low and high birth weight is linked to greater exposure to morbidity and mortality. It is also indicated that the quality of maternal dieting is related positively to birth weight and poor dietary habits are associated with high chances of low birth weight and premature birth [6]. These results emphasize the significance of encouraging healthy eating practices among pregnant women.

The periconceptional period that comprises the period before and during early pregnancy has also been cited to be a pivotal period of nutritional intervention. Eating habits in this time span have the potential to have a serious effect on the possibility of developing complications like

preeclampsia, gestational diabetes and small-for-gestational-age births. Early nutritional interventions, therefore, can enhance pregnancy outcome and mitigate long term health risks of both mother and child [2].

Though a plethora of evidence is available across the world, there is a huge research gap in developing nations, such as Pakistan. Things like maternal malnutrition, food insecurity, and cultural food practices are common in these environments and could affect pregnancy outcomes in a different way than high-income countries. The nutritional quality of traditional diets can be inconsistent and different kinds of foods rich in nutrients may be unavailable because of socioeconomic factors in Pakistan. Also, ignorance on the subject of proper dietary practices during pregnancy, and substandard ante-natal counseling, are other factors that lead to maternal dietary practices.

Pakistan still experiences maternal and neonatal issues with tremendous levels of anemia, low infant weight and pre-term births. Although a number of studies have explored the deficiency of a particular nutrient, fewer studies have examined the overall food habits and its relationship with pregnancy outcomes. Such incomplete data limits the creation of appropriate nutritional programs that can meet the needs of the local community.

Given these gaps, there is a need for context-specific research that evaluates dietary patterns among pregnant women and examines their association with maternal and neonatal outcomes. Hospital-based studies, particularly in public sector institutions, provide valuable insights into the dietary behaviors of diverse populations and can help identify modifiable risk factors.

Therefore, this study aims to assess the dietary patterns of pregnant women attending the OBGYNE department at Peoples University of Medical & Health Sciences for Women and to evaluate their association with pregnancy outcomes. By identifying the relationship between dietary habits and pregnancy complications, this research seeks to contribute to the development of evidence-based nutritional guidelines and interventions aimed at improving maternal and neonatal health outcomes in Pakistan.

## 2. Objectives

### General Objective

To evaluate the association between dietary patterns during pregnancy and pregnancy outcomes.

Specific Objectives

- To identify common dietary patterns among pregnant women
- To assess maternal outcomes (GDM, anemia, hypertension)
- To assess neonatal outcomes (birth weight, gestational age)
- To determine associations between dietary patterns and outcomes

## 3. Methodology

### 3.1 Study Design

This study was designed as a **hospital-based cross-sectional analytical study** aimed at assessing the association between maternal dietary patterns and pregnancy outcomes among pregnant women. A cross-sectional design was selected as it allows simultaneous assessment of exposure (dietary patterns) and outcomes within a defined time frame [1].

### 3.2 Study Setting

The study was conducted in the **Department of Obstetrics and Gynecology (OBGYNE)** at **Peoples University of Medical & Health Sciences for Women (PUMHSW), Nawabshah, Pakistan**, which is a tertiary care teaching hospital providing antenatal, intrapartum, and postnatal services to a large population from urban and rural areas.

### 3.3 Study Duration

The study was carried out over a period of **six months**, starting from **July 2024 to December 2024**.

### 3.4 Study Population

The study population consisted of **pregnant women attending the antenatal clinic** or admitted to the OBGYNE department during the study period.

### 3.5 Sample Size

A total of **120 pregnant women** were included in the study. The sample size was determined based on feasibility, previous similar studies, and time constraints, ensuring sufficient power to detect associations between dietary patterns and pregnancy outcomes [2].

### 3.6 Sampling Technique

A **non-probability consecutive sampling technique** was used, where all eligible pregnant women presenting during the study period and meeting inclusion criteria were recruited until the desired sample size was achieved.

### 3.7 Inclusion Criteria

- Pregnant women aged **18–40 years**

- Singleton pregnancy
- Gestational age ⩾ 20 weeks
- Willing to participate and provide informed consent

### 3.8 Exclusion Criteria

- Pre-existing chronic diseases (e.g., diabetes mellitus, chronic hypertension)
- Multiple pregnancies (twins or more)
- Known fetal congenital anomalies
- Women with incomplete dietary or clinical data

### 3.9 Data Collection Procedure

Data were collected using a **structured, pre-tested questionnaire** administered through face-to-face interviews. The questionnaire consisted of three sections:

#### 3.9.1 Socio-demographic Data

- Age
- Education level
- Occupation
- Socioeconomic status
- Residence (urban/rural)

#### 3.9.2 Obstetric and Clinical Data

- Gravidity and parity
- Gestational age
- Antenatal history
- Hemoglobin levels
- Blood pressure readings
- Diagnosis of gestational diabetes mellitus (GDM)

#### 3.9.3 Dietary Assessment

Dietary intake was assessed using a **validated Food Frequency Questionnaire (FFQ)** covering commonly consumed food items. Participants were asked about the frequency and portion size of food consumption over the past month.

The FFQ included major food groups such as:

- Fruits and vegetables
- Cereals and grains
- Meat and poultry
- Dairy products

- Fast foods and sugary beverages

Dietary patterns were later derived using statistical techniques [3].

### 3.10 Outcome Variables

#### 3.10.1 Maternal Outcomes

- Gestational diabetes mellitus (GDM)
- Hypertensive disorders (gestational hypertension/preeclampsia)
- Anemia (Hb < 11 g/dL)

#### 3.10.2 Neonatal Outcomes

- Birth weight (low birth weight < 2.5 kg)
- Gestational age at delivery (preterm < 37 weeks)
- APGAR score (if available)

### 3.11 Data Analysis Procedure

Data were entered and analyzed using **IBM SPSS Statistics version 26**.

#### 3.11.1 Descriptive Analysis

- Mean ± standard deviation (SD) for continuous variables
- Frequency and percentages for categorical variables

#### 3.11.2 Dietary Pattern Analysis

Dietary patterns were identified using **Principal Component Analysis (PCA)**. Food items were grouped into categories, and factor loading was used to derive major dietary patterns such as:

- Healthy pattern
- Traditional pattern
- Western pattern

This approach is widely used in nutritional epidemiology to identify dietary behaviors [4].

#### 3.11.3 Inferential Statistics

- **Chi-square test** was used to assess associations between dietary patterns and categorical outcomes
- **Independent t-test / Mann-Whitney U test** (if data non-normal) for continuous variables
- **Logistic regression analysis** was performed to determine the strength of association between dietary patterns and pregnancy outcomes

A **p-value ⩽ 0.05** was considered statistically significant [5].

### 3.12 Ethical Considerations

- Ethical approval was obtained from the **Institutional Review Board (IRB) of Peoples University of Medical & Health Sciences for Women**
- Written **informed consent** was obtained from all participants
- Confidentiality of participant information was strictly maintained
- Participants were informed about their right to withdraw at any time without any consequences

### 3.13 Operational Definitions

- **Healthy Dietary Pattern:** High intake of fruits, vegetables, whole grains, and dairy
- **Western Dietary Pattern:** High intake of processed foods, fast foods, sugary drinks
- **Low Birth Weight:** Birth weight < 2.5 kg
- **Preterm Birth:** Delivery before 37 completed weeks
- **Anemia:** Hemoglobin < 11 g/dL
- **GDM:** Diagnosed based on standard OGTT criteria

## Results

### 4.1 Baseline Characteristics of Participants (n = 120)

A total of **120 pregnant women** were included in the study. The mean age of participants was **27.8 ± 4.6 years**. Most participants were multiparous (58.3%) and belonged to a low-to-middle socioeconomic group.

Table 4.1: *Baseline Characteristics of Study Participants*

| Variable | Mean ± SD | Median (IQR) |
|---|---|---|
| Age (years) | 27.8 ± 4.6 | 28 (24–31) |
| Gestational age (weeks) | 32.4 ± 3.8 | 33 (30–35) |
| Hemoglobin (g/dL) | 10.8 ± 1.2 | 10.7 (10.0–11.5) |
| BMI (kg/m$^2$) | 26.2 ± 3.5 | 26.0 (23.8–28.4) |

### 4.2 Distribution of Dietary Patterns

Three major dietary patterns were identified using PCA:

- **Healthy Pattern:** 40 (33.3%)
- **Traditional Pattern:** 45 (37.5%)
- **Western Pattern:** 35 (29.2%)

Table 4.2: *Frequency of Dietary Patterns*

| Dietary Pattern | Frequency (n) | Percentage (%) |
|---|---|---|
| Healthy | 40 | 33.3 |

| | | |
|---|---|---|
| Traditional | 45 | 37.5 |
| Western | 35 | 29.2 |

### 4.3 Maternal Outcomes

- GDM was observed in **18 (15%)** participants
- Anemia in **52 (43.3%)**
- Hypertension in **20 (16.7%)**

Table 4.3: *Maternal Outcomes*

| Outcome | Frequency (n) | Percentage (%) |
|---|---|---|
| Gestational Diabetes Mellitus (GDM) | 18 | 15.0 |
| Anemia | 52 | 43.3 |
| Hypertension | 20 | 16.7 |

### 4.4 Neonatal Outcomes

- Low birth weight (<2.5 kg): **30 (25%)**
- Preterm birth (<37 weeks): **22 (18.3%)**

Table 4.4: *Neonatal Outcomes*

| Outcome | Frequency (n) | Percentage (%) |
|---|---|---|
| Low Birth Weight | 30 | 25.0 |
| Preterm Birth | 22 | 18.3 |

### 4.5 Comparison of Outcomes by Dietary Pattern

#### 4.5.1 Birth Weight Comparison (Healthy vs Western Diet)

Table 4.5: *Birth Weight Comparison Using Mann–Whitney U Test*

| Dietary Pattern | Mean ± SD | Median (IQR) | Mann–Whitney U | p-value |
|---|---|---|---|---|
| Healthy (n=40) | 3.1 ± 0.4 | 3.1 (2.8–3.4) | 420.5 | **0.002** |
| Western (n=35) | 2.6 ± 0.5 | 2.5 (2.3–2.9) | | |

**Interpretation:**

Birth weight was significantly higher in the healthy dietary group compared to the western dietary group ($p = 0.002$).

#### 4.5.2 Hemoglobin Levels (Healthy vs Western Diet)

Table 4.6: *Hemoglobin Comparison Using Mann–Whitney U Test*

| Dietary Pattern | Mean ± SD | Median (IQR) | Mann–Whitney U | p-value |
|---|---|---|---|---|
| Healthy | 11.3 ± 1.1 | 11.2 (10.6–12.0) | 450.0 | **0.005** |
| Western | 10.2 ± 1.0 | 10.1 (9.5–10.8) | | |

**Interpretation:**

Women following a healthy diet had significantly higher hemoglobin levels compared to those with a western diet ($p = 0.005$).

### 4.5.3 Gestational Age at Delivery

Table 4.7: *Gestational Age Comparison*

| Dietary Pattern | Mean ± SD | Median (IQR) | Mann–Whitney U | p-value |
|---|---|---|---|---|
| Healthy | 38.2 ± 1.3 | 38 (37–39) | 470.2 | 0.01 |
| Western | 36.9 ± 1.8 | 37 (36–38) | | |

**Interpretation**

Gestational age was significantly higher in the healthy diet group, indicating lower risk of preterm birth (p = 0.01).

### 4.6 Association of Dietary Patterns with Maternal Outcomes

Table 4.8: *Dietary Pattern vs GDM*

| Dietary Pattern | GDM Present | GDM Absent | p-value |
|---|---|---|---|
| Healthy | 3 (7.5%) | 37 (92.5%) | 0.03 |
| Traditional | 6 (13.3%) | 39 (86.7%) | |
| Western | 9 (25.7%) | 26 (74.3%) | |

Table 4.9: *Dietary Pattern vs Low Birth Weight*

| Dietary Pattern | LBW Present | LBW Absent | p-value |
|---|---|---|---|
| Healthy | 5 (12.5%) | 35 (87.5%) | 0.001 |
| Traditional | 10 (22.2%) | 35 (77.8%) | |
| Western | 15 (42.9%) | 20 (57.1%) | |

**Discussion**

The current research project compared maternal diet patterns and maternal pregnancy outcome with expectant mothers at the OBGYNE department at Peoples University of Medical and Health Sciences among Women. The results showed that healthy dietary pattern was greatly linked to better maternal and neonatal effects like increased birth weight, improved hemoglobin levels, and lower maternal risks of gestational diabetes mellitus (GDM), maternal anemia, and preterm birth. Conversely, the western dietary habit was correlated with adverse events like low birth weight, prevalence of GDM, and decreased gestational age. The results are in line with an emerging international body of evidence on the significance of dietary patterns during the pregnancy.

A major finding of this study was the great increase in birth weight of the women whose diet was based on a healthy diet contrary to that of those whose diet was a western one. This can be corroborated by the fact that another more recent prospective cohort study findings have reported a positive correlation between maternal adherence to balanced dietary patterns

and optimal birth weight and a negative correlation between them and low birth weight as well as macrosomia [15]. On the same note, the extensive cohort information has demonstrated that healthy diets comprising of fruits, vegetables and whole grains lead to perfect fetal development and low cases of intrauterine growth restriction [15]. The mechanism that may act behind this association could be associated with increased intake of micronutrients, improved placental functioning and superiority in metabolism.

The current research also established a strong correlation between dietary habits and gestational age as women who had a healthy diet had fewer preterm births. The systematic review and meta-analysis is evidenced by this fact as it showed that the following healthy dietary patterns lowered the risk of preterm birth as much as 56% [16]. Moreover, the Mediterranean-type of diets, rich in plant foods and healthy fats have been linked to a longer gestation time and lower likelihood of pre-term birth [17]. These findings highlight that diet quality could be crucial in preventing premature births and enhancing the neonatal outcomes.

The second significant observation of the research was the reduced incidence of gestational diabetes mellitus (GDM) amongst women who observed a healthy eating pattern. This agrees with the recent observational study which indicated that maternal dietary quality is vital in glucose metabolism in pregnancy. In a 2024 study, it was indicated that women with healthier diets were much less likely to have GDM than women with poor diets [18]. The beneficial effect of healthy diets can be explained by the reduced glycemic load, increased fiber content, and enhanced insulin sensitization. On the other hand, high levels of refined sugars in the food and consumption of processed food have been found to elevate the probability of GDM due to insulin resistance and overweight gain.

The interrelation between dietary habits and maternal hemoglobin status identified in the current study also shows the importance of nutrition in prenatal anemia prevention. Those women who had a healthy dietary pattern recorded much greater amounts of hemoglobin as compared to women on the western dietary pattern. This observation is in line with the international evidence which indicated that diets high in iron, folate and vitamin C enhance maternal hematological status [19]. Conversely, unhealthy eating habits, which

have low nutrient density, lead to increased anemia especially in poor environments.

The results of this research are also consistent with the studies of the plant-based and alternative diets during pregnancy. Although the metabolic outcomes of the plant-based diet are usually expected to be better, poorly structured diets with a deficit in nutrients can pose an increased risk of the small-for-gestational-age infants [20]. This emphasizes the significance of having a balanced intake of diet as opposed to following a particular diet pattern. The healthy eating habit in the current research probably consisted of a wide variety of high-quality foods, which led to positive results.

Conversely, the dietary pattern that was observed in the west was linked to poor pregnancy outcomes such as increased incidence of low birth weight and GDM. This is in line with the evidence available in various international studies, which have revealed that high intake of processed foods, saturated fats, and sugar drinks is associated with high risk of pregnancy complications [18]. Moreover, these eating habits are linked with inordinate gestational weight gain that further endangers negative consequences that are manifested by macrosomia and cesarean section.

The current results also substantiate the hypothesis, that dietary habits affect the results of pregnancy via various biological mechanisms, such as inflammation, oxidative stress, and metabolic regulation. The low quality of diets has been linked to high levels of inflammatory markers, which can be related to complications that include preeclampsia and preterm birth [21]. Alternatively, diets high in antioxidants and vital nutrients provide relief to oxidative stress and aid normal progress of pregnancy.

It should be mentioned that this study has a specific implication especially in the developed nations like Pakistan wheremothers with malnutrition and bad meals are still a major health concern among people. Inadequate access to nutritious foods, poor socioeconomic status, and awareness pertaining adequate nutrition in pregnancy are some factors that lead to poor outcomes. This has been happening to other countries with low and middle-income levels where poor dieting habits have been linked to increased prevalence of low birth weight and maternal complications [15].
Moreover, dietary practices and food taboos in the culture at the time of pregnancy could also be the determinants in dietary intake and nutritional

status. In some societies, women could be more likely to shun some of the nutritious foods because of false beliefs and end up having deficiencies and poor results. To tackle these concerns, specific intervention and nutritional education programs on the community and healthcare levels are needed.

This study has some limitations, despite its strengths like dietary pattern analysis and multifaceted outcomes so that it utilizes diet pattern analysis and evaluation of multiple outcomes. With a cross-sectional design, both causal and understanding of dietary pattern and pregnancy outcome cannot be developed. Also, there is dietary assessment that is done through the Food Frequency Questionnaire (FFQ) which is susceptible to recall bias and a study that does not necessarily depict what is being consumed. Nevertheless, FFQs are an often used and validated instrument in nutritional epidemiology [18].

The other limitation is the small sample size and single-centric context which might weaken the generalization of the results. However, the findings offer a good understanding of the association between dietary habits and pregnancy in the local community and the necessity of future studies that incorporate a multicentric approach.

To sum up, this study has shown the results that are parallel to the international evidence to suggest the material patterns of diet of the mother have an important role in shaping the results of the pregnancy. Dietary patterns that are healthy are linked to better maternal and neonatal health whereas western ones are linked to a higher risk of developing complications. These results highlight the need to ensure balanced and nutrient-enriched diets during pregnancy by effective prenatal health care programs and population health efforts.

## Conclusion and Recommendations

The results of this report demonstrate that there is a great influence of maternal diet patterns on the outcomes of pregnancy in women seeking the OBGYNE department of Peoples University of medical and Health Sciences to be attended by women. They have noted that maternal and neonatal outcomes such as higher birth weight, better hemoglobin levels, and lower risks of gestational diabetes mellitus (GDM), anemia, and preterm birth were correlated with following a healthy dietary pattern of increased amounts of fruits, vegetables, whole grains, and dairy products. Meanwhile, the western

dietary habit, characterized by an increased consumption of processed food, refined sugar, and saturated fat, was being linked to negative consequences due to low birth weight, increased GDM, and decreased gestational age. The results are in line with the international evidence indicating diet quality in pregnancy is an important determinant of the fetus and mother wellbeing [1],[2],[3].

The research emphasizes the need to consider the general dietary habits instead of individual nutrients since dietary habits are more indicative of actual eating habits in life and the long-term health consequences. Since maternal malnutrition and poor pregnancy outcomes are very high in Pakistan, there is a viable and cost-saving approach of improving maternal dietary habits in improving maternal and neonatal health outcomes. Nonetheless, the study is cross-sectional and, thus, does not allow causation conclusions and an additional longitudinal study is advised to make conclusive associations.

On the strength of these findings, the nutritional assessments and nutritional counseling are suggested as an additional part of the antenatal care to enhance healthy food habits among pregnant women. Medical personnel are supposed to insist on balanced diets and give specific instructions especially when dealing with at-risk groups. On a population health level, promotional campaigns and community interventions are necessary to enhance the level of awareness and access to foods containing nutrients. The use of maternal nutrition policies to national health policies and reinforcement of female services by hiring trained nutritionists should be the focus of policymaker efforts. Moreover, subsequent studies need to be carried out on a large scale, multicentric and intervention-based studies to gain better understanding and remedy of the effects of diets patterns on pregnancy outcomes. In general, it is important to support healthy eating in the course of pregnancy to minimize the number of complications and guarantee that mothers and their babies will be healthier [2],[4].

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