

**ASSOCIATION OF DIETARY OIL WITH WEIGHT GAIN AND BLOOD PRESSURE
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ABSTRACT

In Bangladesh, most of the population use soybean as the dietary oil and a few may still consume mustard oil. The association of these two varieties and their marketing practices as well as their consumption related factors with pregnancy outcome have not much studied. Hypertensive disorders in pregnancy (HDPs) and gestational diabetes mellitus (GDM) usually develop by this time. Semiurban population specific data at this critical stage are not yet available among Bangladeshi ethnic groups. This quantitative cross-sectional study was conducted among 193 pregnant women and the study area was the indoor of the Hamdard General Hospital, Munshiganj, Bangladesh. Demographic characteristics, anthropometric values, and dietary intake data were collected from clinical records by researcher. Standard food intake was gathered through a validated Food Frequency Questionnaire (FFQ), and dietary patterns were obtained by principal component analysis. Nutritional competency was defined according to European dietary intake recommendations for pregnant women. In this research researchers found that there is positive association of dietary oil with weight gain and blood pressure among semiurban Bangladeshi pregnant women. Among the 193 participants, 96 respondents consume less than 29.1 ml of dietary oil per day and remain 97 respondents consume more than 29.1 ml of dietary oil per day. The individual, who consume less than 29.1 ml oil per day the average blood pressure was 118 /87 mmHg and weight difference from first trimester to second trimester was 1.26 kg on the other hand who consume more than 29.1 ml oil per day, the average blood pressure was 119/89 mmHg and weight difference from first trimester to second trimester is 1.42 kg. So, there is association of dietary oil with blood pressure and weight gain. Women who followed dietary patterns rich in ω -6 fatty acids and saturated fatty acids were more likely to experience weight gain during pregnancy than those who adhered to these patterns to a lesser extent.

KEYWORD: Association, Dietary oil, Weight gain, Blood pressure, Pregnant women.**1. INTRODUCTION**

Pregnancy presents significant physical and emotional challenges for women, which can be further complicated by various conditions, including those associated with hypertension. Hypertensive disorders of pregnancy (HDP) encompass a range of conditions marked by elevated blood pressure, specifically a systolic blood pressure of 140 mmHg or greater and/or a diastolic blood pressure of 90 mmHg or greater, diagnosed before 20 weeks of gestation, as well as gestational hypertension and chronic hypertension with eclampsia syndrome (Lowe et al., 2015). The global prevalence of these disorders during pregnancy is estimated to be between

5.82% to 8.2%, making them the second leading direct cause of maternal mortality worldwide (Say et al., 2014). The repercussions of hypertensive disorders during pregnancy can include placental abruption, pulmonary edema, thrombocytopenia, hemolytic anemia, stroke, recurrent seizures, kidney damage, and liver injury (Ukah et al., 2018). Additionally, the risk of perinatal death is significantly elevated in women experiencing pre-eclampsia or eclampsia syndrome, with an increase of three to five times (Abalos et al., 2014). The quantitative and qualitative aspects of diet are crucial for maintaining health at all life stages, and they become even more critical during pregnancy due to their

significant impact on both maternal and fetal outcomes. The 'fetal origin' hypothesis suggests that maternal nutrition during pregnancy can have lasting effects on the health of the fetus later in life (Grieger *et al.*, 2014). Key factors contributing to a healthy pregnancy include overall health, appropriate weight gain, physical activity, and the consumption of a variety of foods, along with mineral supplements and vitamins (Procter and Campbell, 2014). Maternal nutrition plays a crucial role in determining fetal development, birth weight, and the health of the infant, as well as influencing women's health and reproductive capabilities. Anthropometric measurements provide a straightforward, dependable, and cost-effective means of evaluating the nutritional status of mothers (Kelly *et al.*, 1996). Among the macronutrients, fats possess the highest energy density. Given the established links between high fat consumption and obesity, there has been a growing focus on exploring the relationship between the intake of different types of fatty acids and obesity or fat accumulation (Torres-Castillo *et al.*, 2018), which in turn is associated with cardiovascular diseases (CVDs), particularly hypertensive disorders of pregnancy (HDPs). Dietary oils serve as the primary source of fatty acids, and their quantity and quality significantly influence anthropometric measurements, particularly weight gain, and blood pressure, which is a critical factor for HDPs in pregnant women. In Caucasian populations, commonly utilized oils, such as olive oil, have been shown to aid in maintaining body weight (Zamora *et al.*, 2018; Saedi *et al.*, 2017). Furthermore, canola and sunflower oils have demonstrated effectiveness in reducing total cholesterol, LDL, and triglyceride levels while increasing HDL, without impacting body weight (Saedi *et al.*, 2017). In contrast, hydrogenated vegetable oils have been associated with an increased risk of metabolic syndrome (Hosseinpour-Niazi *et al.*, 2016). For many centuries, mustard oil served as the primary edible oil for the Bangladeshi population; however, in recent decades, soybean oil has emerged as the predominant dietary oil, largely due to its cost-effectiveness. The market offers these oils in various forms, including loose packaged, fortified, non-fortified, branded, and non-branded options, with consumption levels differing among families. During pregnancy, oil consumption is influenced by several factors, such as ethnicity, age, geographic location, socioeconomic status, pre-pregnancy body weight, dietary intake of other nutrients, physical activity, and lifestyle habits, all of which may impact cardiovascular disease outcomes. Changes in the consumer economy and market dynamics also lead to periodic variations in both the quantity and quality of dietary oil consumption. Therefore, it is essential to examine the relationship between the quantity and quality of dietary oil intake and various anthropometric and clinical factors within specific populations across different community settings (rural, urban, semi-urban). Recent studies focusing on pregnancy in semi-urban Bangladeshi populations have been lacking, highlighting a gap in research that needs to be addressed.

In light of this context, the current study aims to explore the relationship between the quantitative and qualitative aspects of dietary oil consumption and body weight gain and blood pressure among pregnant women visiting a general hospital in a semi-urban area of Bangladesh.

2. METHODOLOGY

2.1. Study Design and Subjects

A cross-sectional study design was used, and it include pregnant women ($n = 193$) from the Hamdard General Hospital, Gazaria. Sampling was purposive/ convenient sampling.

2.2. Data Collection Tools

All data was collected through interview widely used, reliable and validated questionnaires. The data collection has five sections: (1) Informed consent form, (2) Socio economics profiles, (3) Anthropometric characteristics (4) Blood pressure measurement, (5) Dietary intake.

2.2.1. Informed Consent of the Respondents

Written informed consent was taken before starting the study.

2.2.2. Demographic and Socioeconomic Status

For this purpose, the socioeconomic status and demographic questionnaire was applied, which has questions on education, job, family size, means of support, and method of transportation. Each questionnaire item was coded in order to calculate the socioeconomic status score, and the codes was added.

2.2.3. Anthropometric Indices

Height (cm), weight (kg), and Blood pressure was measured by the participants, and detailed instructions was provided. To measure body weight, the participants were instructed to stand in the center of the scale while wearing minimal clothing and be barefoot. To measure height, the participants was instructed to use a height meter while barefoot, place the soles of their feet on the ground with their heels pressed together,

2.2.4. Clinical measurement

Blood pressure was measured by BP machine with standard method.

2.2.5. Dietary Intake

Intake of oil per month was measured by participants.

2.3. Ethical Consideration

Ethical clearance was taken from the ethical review committee of Hamdard University Bangladesh prior to the commencement of data collection.

2.4. Data Analysis

Data was analyzed by using SPSS.

3. RESULT

The result showed that (Table 1) the mean age of the respondents was 21.38 year with standard deviation of

± 2.71 most of the respondents were with higher secondary educational qualification (42.0%) followed by secondary educational qualification (38.3%). Mean height of the respondents was 5.08 feet with SD ± 0.34 . Mean weight was 55.47 kg and 56.81 kg in first and second trimester, accordingly, Mean SBP and DBP was 118.13 mmHg and 85.53 mmHg accordingly. Among the respondents 99% of them consume soft drinks and fast-food consumption was maximum (91.20%), Majority 91.2% of the respondent's intake salt in their daily diet. Student T test (Table 2) was done to compare variables along with oil consumption group <29.1 ml/day and oil consumption group >29.1 ml/day. Oil use per day was (found statistically highly significant (p value= 0.001). Among SBP and DBP of the respondents. DBP of respondents with oil consumption was found statistically significant (p= 0.05). In table 3, student T test was done to compare different variables namely, age, oil consumption per day, weight in first and second trimester, SBP, DBP and exercise duration, with systolic hypertensive and non-systolic hypertensive participants and SBP was found statistically significant. To compare different variables with diastolic hypertensive and non-diastolic Hypertensive participants and both SBP and DBP was found statistically significant (Table 4). Regression analysis was done to correlative association between oil consumption per day with weight in first and second trimester and SBP and DBP (Table 5). Correlation between oil consumption per day with DBP was found statistically significant (p= 0.002).

Table 1: Characteristics of the respondents (n=193).

Variables	Values
Age year, M \pm SD	21.38 \pm 2.71
Educational status	
Unable to read and write, n (%)	3 (1.6)
Able to read and write, n (%)	33 (17.1)
Secondary, n (%)	74 (38.3)
Higher Secondary, n (%)	81 (42.0)
Bachelor (Hons), n (%)	2 (1.0)
Height (Ft), M \pm SD	5.08 \pm 0.34
Weight_1 st trimester (kg), M \pm SD	55.47 \pm 5.83
Weight_2 nd trimester (kg), M \pm SD	56.81 \pm 5.72
SBP (mm/Hg), M \pm SD	118.13 \pm 5.34
DBP (mm/Hg), M \pm SD	85.53 \pm 11.64
Exercise duration (Minute), M \pm SD	22.56 \pm 5.52
Soft drink	
Yes, n (%)	191(99)
No, n (%)	2(1)
Fast Food	
Yes, n (%)	176 (91.2)
No, n (%)	17 (8.8)
Extra Salt Intake	
Yes, n (%)	176 (91.2)
No, n (%)	17 (8.8)

Values are expressed as Number percentage, n (%) or Mean-Standard Deviation, M \pm SD

Table 2: Comparison between oil consumption groups (Less than median, 29.1 Oil (n=96) and median and above (n=97) per person per day (ml)

Variables	Oil <29.1 ml/day (n=96)	Oil ≥ 29.1 ml/day (n=97)	t/p
Age			
Oil used per person/day	25.84 \pm 1.12	33.45 \pm 4.88	-16.86/0.001
BP Systolic	118.44 \pm 5.04	117 \pm 5.63	0.783/0.4
BP Diastolic	87.71 \pm 5.70	85.88 \pm 7.18	1.96/0.05
Exercise duration	23.17 \pm 5.08	21.90 \pm 5.88	1.53/0.13
Weight-1 st trimester	55.04 \pm 5.57	55.88 \pm 6.07	-1/0.316
Weight-2 nd Trimester	56.30 \pm 5.27	57.30 \pm 6.10	-1/0.222

Table 3: Comparison of different variables between systolic hypertensive (≥ 130 mmHg) and non-systolic hypertensive (<130 mmHg) study subject groups.

Variables	Non- Systolic Hypertensive (n=180)	Systolic Hypertensive (n=13)	t/p
Age	21.33 \pm 2.7	22.15 \pm 2.57	-1.05/0.293
Oil consumed/person/day	29.10 \pm 5.62	29.97 \pm 5.19	-0.54/0.58
Weight_1 st trimester	55.34 \pm 5.81	57.15 \pm 6.16	-1.08/0.28
Weight_2 nd trimester	56.69 \pm 5.66	58.38 \pm 6.44	-1.03/0.30
Weight Difference_1 st and 2 nd trimester	1.35 \pm 0.62	1.23 \pm 0.43	0.68/0.49
SBP	117.27 \pm 4.43	130 \pm 0.00	-10.32/0.001
DBP	86.67 \pm 6.69	88.46 \pm 3.75	0.95/0.34
Exercise Duration	22.53 \pm 5.58	23.07 \pm 4.80	0.34/0.73

Table 4: Comparison of different variables between Diastolic hypertensive (≥ 90) and non-diastolic hypertensive (< 90) groups.

Variables	Non-diastolic Hypertensive (n=42)	Diastolic Hypertensive (n=151)	t/p
Age	21.23 \pm 2.79	21.43 \pm 2.69	-0.427/0.67
Oil consumption/day/person	31.71 \pm 6.52	28.45 \pm 5.07	3.49/0.001
Weight 1 st trimester	53.56 \pm 6.75	56.01 \pm 5.44	-2.46/0.015
Weight 2 nd trimester	54.97 \pm 6.58	57.33 \pm 5.35	-2.41/0.017
Weight Difference 1 st and 2 nd trimester	1.42 \pm 0.59	1.32 \pm 0.62	0.934/0.0351
BP-Systolic	113.95 \pm 5.83	119.33 \pm 4.55	6.39/0.001
BP-Diastolic	75.58 \pm 5.47	90 \pm 0.00	-32.45/0.001
Exercise Duration	21.90 \pm 7.64	22.76 \pm 4.76	-9.48/0.344

Table 5: Correlation between “oil used per person per day” and other variables (weight 1st 2nd trimester, SBP and DBP, Exercise duration, Height).

Variables	r/p
Weight 1 st trimester	-0.016/0.831
Weight 2 nd trimester	-0.001/0.992
BP-Systolic	-0.109/0.131
BP-Diastolic	-0.224/0.002

4.2. DISCUSSION

In this study, there is an association of dietary oil with weight gain and blood pressure among semi-urban Bangladeshi pregnant women. Among the total 193 samples, 96 respondents average oil consumption per day was about less than 29.1 ml, and 97 respondents average oil consumption per day was about more than 29.1 ml. The group of respondents who consume less than 29.1 ml of oil have an average BP of 118/87 mmHg, and the weight difference from first trimester to second trimester is 1.26 kg. On the other hand, those who consumes more than 29.1 ml of oil have an average BP of 119/89 mmHg, and the weight difference from first trimester to second trimester is 1.42 kg. Therefore, there appears to be an association between dietary oil consumption, blood pressure and weight gain. One study was conducted by Santana *et al.* (2022), In his research, he discovered that women who followed dietary patterns rich in sources of both unsaturated and saturated fatty acids were more likely to experience weight gain during pregnancy than those who adhered to these patterns to a lesser extent.

5. RECOMMENDATIONS

During the second trimester of pregnancy, it's essential to increase calorie intake and eat a balance of protein, carbohydrates, fat, including plenty of fruits and vegetables. Following a meal plan is a great way to ensure reaching nutrient goals while enjoying pregnancy. Do not use too much oil for preparing daily meal.

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