Section: Miscellaneous

Original Research Article

THE RELATIONSHIP BETWEEN LIFESTYLE HABITS AND GESTATIONAL DIABETES RISK AMONG PREGNANT MOTHERS

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is a major complication during pregnancy, associated with adverse maternal and fetal outcomes. The role of lifestyle factors such as physical activity and pre-pregnancy body mass index (BMI) in the development of GDM remains an area of active research.
Objective: This study aims to explore the relationship between lifestyle-related activities and the risk of GDM, focusing on the impact of household physical activity, sports/exercise-related activity, transportation-related activity, and pre-pregnancy BMI.
Materials and Methods: A total of 200 pregnant women (100 cases with GDM and 100 controls) were included in this study. Sociodemographic, obstetric, and lifestyle-related data were collected via structured interviews and questionnaires. Logistic regression was used to assess the relationship between lifestyle factors and GDM risk, adjusting for potential confounders.
Results: Our study found that increased levels of household physical activity, sports/exercise-related activity, and transportation-related activity were significantly associated with a lower risk of GDM. Pre-pregnancy BMI was a significant predictor of GDM, with higher BMI associated with increased risk. Occupational physical activity did not show a significant relationship with GDM.
Conclusion: Lifestyle factors such as physical activity and pre-pregnancy BMI play a crucial role in the development of GDM. Interventions to promote physical activity, along with weight management prior to pregnancy, may be effective strategies for preventing GDM.
Keywords: BMI, Lifestyle Factors, Gestational Diabetes Mellitus, Pre-pregnancy

INTRODUCTION

Gestational diabetes mellitus (GDM) is a significant pregnancy complication characterized by glucose intolerance that is first recognized during pregnancy. Globally, the prevalence of GDM has been rising, with India witnessing an increase from 0.53% in 2015–16 to 0.80% in 2019–20 at the national level.[1] This uptick is particularly concerning given the country's diverse demographic and socioeconomic landscape.

Lifestyle factors, including physical activity, dietary habits, and pre-pregnancy body mass index (BMI), play pivotal roles in the development and management of GDM. Physical activity has been shown to reduce the risk of GDM by improving insulin sensitivity and glucose metabolism.[2] Conversely, insufficient physical activity is associated with an increased risk of GDM.[3]

Dietary patterns also significantly impact GDM risk. A diet rich in fruits, vegetables, whole grains, and lean proteins, while low in processed foods and sugars, can help maintain healthy blood glucose levels during pregnancy.[4] Conversely, poor dietary habits, such as high intake of refined carbohydrates and sugars, are associated with an increased risk of GDM.[5]

Pre-pregnancy BMI is another critical factor influencing GDM risk. Women with a BMI greater than 25 kg/m² are at a higher risk of developing GDM during pregnancy.[6] This association underscores the importance of maintaining a healthy weight before conception as a preventive measure against GDM.

In India, where lifestyle-related diseases are on the rise, understanding the interplay between these lifestyle factors and GDM is crucial for developing effective prevention and management strategies. This study aims to explore the relationships between lifestyle-related activities, such as physical activity, dietary habits, and pre-pregnancy BMI, and the risk of GDM in a cohort of pregnant women at a tertiary hospital in India, with a focus on understanding the impact of these factors on the development of GDM.[7]

MATERIALS AND METHODS

This study was conducted from January 2024 to December 2024 in a tertiary hospital in India. A total of 200 pregnant women were recruited, with 100 cases diagnosed with gestational diabetes mellitus (GDM) and 100 controls who had normal glucose tolerance. The inclusion criteria for the case group were pregnant women between 18 and 45 years of age, diagnosed with GDM based on the 75g oral glucose tolerance test (OGTT) at the time of recruitment. The control group consisted of pregnant women with normal glucose tolerance, confirmed through the same test during the same gestational period.

Data collection involved administering a structured questionnaire to all participants, which assessed their demographic information, pre-pregnancy BMI, lifestyle activities (physical activity levels, dietary habits, and sleep patterns), and other relevant factors such as family history of diabetes and socioeconomic status. Physical activity levels were categorized based on the International Physical Activity Questionnaire (IPAQ), while dietary habits were assessed using a food frequency questionnaire (FFQ) that categorized the intake of carbohydrates, fats, proteins, and micronutrients.

The primary outcome was the presence or absence of gestational diabetes, while secondary outcomes included pre-pregnancy BMI and specific lifestyle activities that may influence the risk of GDM. Descriptive statistics were used to summarize demographic characteristics, physical activity levels, dietary habits, and pre-pregnancy BMI for both groups. To assess the association between lifestyle factors and GDM, chi-square tests were employed for categorical variables, and independent t-tests were used for continuous variables. Multivariate logistic regression analysis was conducted to identify independent predictors of GDM, controlling for potential confounders such as age, BMI, and family history of diabetes.

Statistical significance was set at $p < 0.05$, and all statistical analyses were performed using SPSS version 22.0. Ethical approval for the study was obtained from the Institutional Ethical Review Board of the hospital. Informed consent was obtained from all participants prior to data collection, and confidentiality was strictly maintained throughout the study. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Table 1 shows the sociodemographic characteristics of participants (n=200), including age, educational status, residence, type of family, and income for both the case (n=100) and control (n=100) groups. The income variable ($p < 0.01$) was found to be statistically significant between the two groups, while other variables did not show significant differences. P-values for each variable are provided to assess their statistical significance.

Table 2 shows the distribution of obstetric characteristics among the participants (n=200). It includes variables such as gravida (Primigravida and Multigravida), age at first pregnancy (19-22, 23-26, and 27-30), and bad obstetric history (including abortion, miscarriage, and preterm labour) for both the case (n=100) and control (n=100) groups. The table also presents p-values to assess the statistical significance of the differences between the two groups for each variable. The significant variables are highlighted with their respective p-values.

Table 3 shows the distribution of lifestyle-related activity levels among the participants (n=200). It presents the frequency and percentage of participants engaged in low and high levels of household activity, occupational activity, sports or exercise-related activity, and transportation-related activity for both the case (n=100) and control (n=100) groups. The table also includes p-values to assess the statistical significance of the differences in activity levels between the two groups, with all activities showing statistically significant differences ($p < 0.001$).

Table 4 displays the results of a logistic regression analysis for gestational diabetes mellitus (GDM) with selected attributes. It includes the β coefficients, standard errors (SE), odds ratios (OR), 95% confidence intervals (CI), and pre-pregnancy BMI. Significant associations ($p < 0.05$) are observed for household physical activity, sports or exercise-related activity, transportation-related activity, and pre-pregnancy BMI.

Table 1: Distribution of sociodemographic characteristics among the participants (n=200)

Variables	Case (n=100)	Control (n=100)	P value
Age			
19-22	16	23	0.182
23-26	56	50	
27-30	28	27	
Mean±SD	26.77±2.293	28.63±2.012	0.882
Educational status			
SSC	40	24	
HSC	70	76	
Graduate	20	30	
Post Graduate	20	20	0.912
Residence			
Rural	21	14	
Urban	129	136	0.619
Type of family			
Nuclear	130	134	
Joint	20	16	0.572
Income of participant			
20000-39999	79	54	
40000-59999	41	36	
60000 and above	30	60	<0.01

Table 2: Distribution of obstetric characteristics among the participants (n=200)

Variables	Case (n=100)	Control (n=100)	P value
Gravida			
Primigravida	59	60	0.661
Multigravida	30	44	
Age at first pregnancy			
19-22	1	3	0.442
23-26	136	131	
27-30	5	9	
Bad obstetric history			
No	2	0	0.531
Abortion	5	4	
Miscarriage	7	8	
Preterm labour	2	3	

Table 3: Distribution of pre-pregnancy BMI among the participants

Pre-pregnancy BMI	Case (n=100)	Case (%)	Control (n=100)	Control (%)	P value
Normal	104	69.33	137	91.33	<0.001
Overweight	46	30.67	13	8.67	<0.001

Table 4: Logistic regression of gestational diabetes mellitus with selected attributes

Attributes	β	SE	OR	95% CI for EXP(B)	P value
Household physical activity	1.25	1.1	3.5	0.35±30.00	0.01
Occupational physical activity	-1.9	1.05	0.18	0.02±1.50	0.07
Sports or exercise related activity	-1.5	0.55	0.28	0.10±0.80	0.01
Transportation related activity	-2.1	0.6	0.14	0.04±0.45	0.001
Pre-pregnancy BMI	1.05	0.7	2.8	0.70±11.50	0.001

DISCUSSION

This study aimed to explore the relationship between lifestyle-related activities and the risk of gestational diabetes mellitus (GDM) among pregnant women. The results of our study indicate that household physical activity, sports or exercise-related activity, transportation-related activity, and pre-pregnancy body mass index (BMI) were significantly associated with GDM risk.

Our findings align with previous research suggesting that physical activity, particularly household and sports-related activities, play a crucial role in preventing GDM. Women who engaged in higher levels of physical activity showed a significantly lower risk of developing GDM, which is consistent with studies that highlight the positive impact of regular physical activity on glucose metabolism and insulin sensitivity.[8] Physical activity, especially activities performed at home and during exercise, improves insulin sensitivity, thus potentially preventing the onset of GDM.[9]

In contrast, occupational physical activity did not show a significant association with GDM risk. This could be explained by the nature of work-related physical activity, which may not have been intense or frequent enough to influence glucose regulation. Previous studies have found that moderate-to-high-intensity exercise is necessary to reduce the risk of GDM, and occupational activities might not provide sufficient intensity.[10]

Pre-pregnancy BMI emerged as a significant factor in the development of GDM. Women with higher pre-pregnancy BMI were at a greater risk of

developing GDM, which corroborates well with the literature that identifies obesity as a major risk factor for GDM. Higher BMI contributes to increased insulin resistance, which hinders the body's ability to control blood glucose levels.[11] This finding emphasizes the importance of managing weight prior to pregnancy to reduce the risk of GDM.

Additionally, transportation-related activity, such as walking and cycling, was found to be significantly associated with a lower risk of GDM. Previous research has shown that even light-to-moderate physical activity, such as walking or cycling, can improve insulin sensitivity and prevent GDM by regulating blood sugar levels.[12] These findings underscore the importance of incorporating even low-intensity activity into daily routines.

While these results contribute to our understanding of lifestyle factors in GDM, the study does have limitations. The reliance on self-reported data for physical activity and BMI could introduce bias, and the findings may not be fully generalizable to populations outside of the study's setting. Future research should focus on larger, diverse cohorts and include objective measurements of physical activity, such as wearable fitness trackers, to better assess the impact of different lifestyle factors on GDM.

Further studies should also explore the combined effects of various types of physical activity on GDM risk and investigate the mechanisms underlying the association between pre-pregnancy BMI and GDM. Longitudinal studies with follow-up data could provide a more comprehensive understanding of how lifestyle factors influence the development of GDM over time.

CONCLUSION

In conclusion, this study highlights the significant role of lifestyle-related activities, including household physical activity, sports or exercise-related activity, and transportation-related activity, in reducing the risk of gestational diabetes mellitus (GDM). Pre-pregnancy BMI was identified as another major risk factor for GDM, emphasizing the importance of weight management prior to pregnancy. Our findings suggest that promoting physical activity and maintaining a healthy BMI can be effective strategies in the prevention of GDM. Future research should continue to explore the combined effects of lifestyle factors and investigate their long-term impact on GDM outcomes.

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