International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Agrawal A et al. Int J Reprod Contracept Obstet Gynecol. 2025 Feb;14(2):586-592
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20250198

Original Research Article

Study the effect of lifestyle modifications on fetomaternal outcomes in gestational diabetes mellitus

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Received: 25 November 2024
Revised: 18 December 2024
Accepted: 02 January 2025

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ABSTRACT

Background: GDM leads to varied outcomes on both mother and foetus. However, most of the adverse effects are preventable. Timely diagnosis, proper counselling, adequate follow up plays a vital role. Lifestyle modifications include dietary interventions, weight management, adequate physical activity and stress management and prevention of any ill habits affecting health of the patient.
Methods: A study included pregnant women in their first trimester at their first antenatal visit. patients with DIPSI report >140 were taken into study. all of them were counselled regarding lifestyle interventions. Patients were followed and healthy lifestyle score was calculated. The patients who followed the advices were taken in group 1 and those that didn't followed were taken in group 2. 100 participants of each group were followed. Follow ups were done to see the outcomes till postpartum period.
Results: The study found that Group 1 had better glycaemic control, more vaginal deliveries, and a shorter labor duration. The average baby weight was 97% in Group 1, slightly lower than in Group 2. NICU admissions were also lower in Group 1, and significant differences were observed in antepartum, intrapartum, and postpartum complications.
Conclusions: The study shows that lifestyle modifications are an important part of management of GDM. Adherence to these changes leads to better glycaemic control and thus better maternal and foetal outcomes.

Keywords: DIPSI criteria, Foetomaternal outcome, Glycaemic control, Gestational diabetes mellitus, Lifestyle modification

INTRODUCTION

GDM is most prevalent in the Asia-Pacific area. The occurrence of GDM is also influenced by the characteristics of the group being studied and the standards used for diagnosis. Glucose metabolism abnormalities occur in up to 10% of pregnancies.[1] According to recent research that used updated recommendations, the occurrence rate of gestational diabetes is around 18%.

he American College of Obstetrics and Gynaecology (ACOG) defines GDM as any level of glucose intolerance that begins or is first diagnosed during pregnancy.[2] It is a significant health concern that may have negative consequences for both the mother and the baby. Inadequate treatment may lead to problems such as preeclampsia, elevated risk of caesarean birth, and an increased likelihood of developing type 2 diabetes mellitus and cardiovascular disease. Macrosomia, birth trauma like shoulder dystocia, hypoglycaemia, increased perinatal morbidity and mortality and increased obesity and metabolic problems later in life are potential consequences for the baby.

Effective treatment of GDM necessitates implementing lifestyle alterations, such as making dietary adjustments,

engaging in physical exercise, and actively managing weight.[3] These non-pharmacological therapies seek to regulate blood glucose levels within the desired range, so decreasing the occurrence and severity of problems and minimizing the need for medication. Research indicates that lifestyle adjustment alone is deemed enough for managing blood glucose levels in 70–85% of women diagnosed with GDM.[4] The objective is to enhance insulin sensitivity, manage glucose levels, and foster general well-being.

Public health initiatives that focus on numerous maternal behaviours have the potential to be more successful. Prior research has mostly concentrated on analysing individual behaviours, without considering the collective impact of healthy behaviours. The objective of this research is to examine the collective impact of lifestyle characteristics, including as a nutritious diet, abstaining from smoking, preventing obesity, engaging in regular exercise, and managing stress, as a unified variable referred to as a healthy lifestyle.

Adopting lifestyle modifications is crucial for effectively managing gestational diabetes. The first approach for treating GDM involves medical nutrition therapy, along with efforts to regulate weight and engage in physical exercise.[5] Research indicates that lifestyle adjustment alone is deemed enough for managing blood glucose levels in 70–85% of women diagnosed with GDM.[6]

The diet advised for women with GDM should include an adequate amount of macronutrients and micronutrients to promote fetal development, while also controlling postprandial glucose levels and promoting optimal maternal weight gain throughout pregnancy. Carbohydrates should primarily be derived from starchy foods that have a low glycaemic index and are naturally rich in dietary fiber, such as vegetables, legumes, fruits, and whole grains. It is advisable to limit the consumption of added sugars.[5,6] High glycemic index (GI) foods are those that include fast-absorbing carbs with a GI value more than 70. Conversely, low GI meals are comprised of slowly absorbed carbohydrates with a GI value of 55 or less.[7,8]

Pregnancy is crucial for managing gestational diabetes mellitus (GDM), as excessive weight gain can worsen insulin resistance and lead to complications. Regular exercise, such as yoga and aerobic exercise, can improve insulin sensitivity and glucose metabolism. Maternal psychological stress can also be a modifiable behaviour in GDM prevention and management.

Many women experience increased stress and anxiety due to the diagnosis and management of GDM, which can lead to concerns about potential complications, adherence to dietary and lifestyle recommendations, and the need for frequent monitoring. Providing support, education, and counselling can help alleviate these concerns and improve overall well-being.

The study aims to determine the frequency of Gestational Diabetes Mellitus in antenatal OPD patients at UISEMH, investigate the impact of lifestyle modifications on maternal and fetal outcomes among these patients.

METHODS

The interventional study was conducted at on Department of Obstetrics and Gynecology, G.S.V.M. Medical College, Kanpur, involving 120 patients from November 2022 to November 2023. All diagnosed using DIPSI criteria keeping in mind the inclusion and exclusion criteria. All the patients were counselled regarding importance of healthy lifestyle and appropriate interventions were advised. the patients were followed till postpartum period to categorise them into appropriate group and to record the outcomes.

The patients who followed the advised interventions were taken in group 1 and the patients who did not were kept in group 2. Compliance of patients is assessed on basis of components of healthy lifestyle score. 100 patients of each group were followed.

DIPSI (GUIDELINE 2005)

It's a single step diagnostic procedure for universal screening.

In this a pregnant female is given 75 g glucose load orally irrespective of her fasting status and timing of her previous meal. GDM is diagnosed if post 2 hours blood glucose value is>= 140 mg/dl. Principle of test is that a normal pregnant female should maintain normoglycemia despite the glucose load.[37,38]

Data collection

Data collection was done by careful history taking regarding implementing of interventions and examination. Also, some routine and basic blood investigations were done atleast once in every trimester. Then the patients were followed till postpartum period to record the outcomes.

Healthy lifestyle score range 0-5, dietary intakes

upper two fifths of AHEI 2010 q4 q5- score =1, lower three fifths of AHEI 2010 q1-q3 – score =0, obesity -body mass index (BMI) <25, score=1, body mass index (BMI) =or>25kg/m^2, score =0, physical activity – active/moderately active score =1, moderately inactive/inactive score =0, distress-perceived stress score - 0-15 score 1, 16-40, score 0, smoking – nonsmokers/ ex-smoker, score =1, smokers, score =0.

Dietary habits were assessed on basis of AHEI scores. Physical activity of the patients was assessed on basis of PAL scores. Stress scores were calculated using a set of standard questionnaires.

RESULTS

Both the groups were comparable on the basis of sociodemographic characteristics.

Both the groups had significant difference in compliance in terms of all the components of healthy lifestyle score. Healthy lifestyle score was significantly more in group 2.

On follow up it was seen that glycaemic controls were achieved in 75 patients without medications in group 1. while in group 2 only 25% patients could achieve glycaemic controls without medications.

Group 1 had a much higher proportion of Vaginal Delivery at 83% compared to Group 2, which had a lower proportion of 44%. In contrast, 56% of individuals in Group 2 had a LSCS, whereas just 13% of those in Group 1 did so.

The mean duration for Group 1 is 7.81 hours with a standard deviation of 2.85 hours, while Group 2 has a mean duration of 10.50 hours with a standard deviation of 3.42 hours. The table 4 presents a comparison of the average weight of babies within the normal range in two groups: women in Group 1 and women in Group 2. Each group consists of 100 participants. Within Group 1, a majority of 97% of infants had a weight within the normal range, whereas in Group 2, this percentage was somewhat lower at 89%. In contrast, 3% of infants in Group 1 fell beyond the normal weight range, while 11% of infants in Group 2 did not meet the normal weight criteria.

Among the Group 1 group, 7 babies (7%) required ICU admission, compared to 18 babies (18%) in the Group 2 group.

Table 6, The comparison of antepartum, intrapartum and postpartum factors between group 1 and group 2 shows significant differences in several areas. Among the antepartum factors, pregnancy-induced hypertension/pre-eclampsia (PIH/PET) was observed in 12% of group 1 and 29% of group 2. Premature rupture of membranes (PROM) was observed in 19% of group 1 and 36% of group 2

During intrapartum labor, prolonged labor was noted in 9% of group 1 and 25% of group 2. Non-progression of labor (NPOL) was observed in 4% of group 1 and 15% of group 2. Fetal distress occurred in 15% of group 1 and 45% of group 2.

In the postpartum period, postpartum hemorrhage (PPH) was observed in 7% of group 1 and 35% of group 2 . Wound infection was observed in 8% of group 1 and 20% of group 2. Lactation failure showed no significant difference between the groups (4% in group 1 vs. 10% in group 2. There is no significant difference in perinatal mortality between Group 1 (0%) and Group 2 (3%).

Table 1: Comparison of mean glycaemic control achieved between group 1 and group 2.

		Group 1 (n=100)		Group 2 (n=100)		T	P value
		N	%	N	%		
Glycaemic control achieved	Yes	95	95.00	75	75.00	14.16	<0.001
	No	5	5.00	25	25.00		

Table 2: Comparison of frequency of different mode of delivery between group 1 and group 2.

		Group 1 (n=100)		Group 2 (n=100)		Chi Sq	P value
		N	%	N	%		
Mode of delivery	TVD	83	83.00	44	44.00	36.87	<0.001
	LSCS	13	13.00	56	56.00		

Table 3: Comparison of mean labour duration Score between group 1 and group 2.

	Group 1 (n=100)		Group 2 (n=100)		T	P value
	Mean	±SD	Mean	±SD		
Labour duration (in hours)	7.81	2.85	10.50	3.42	6.04	<0.001

Table 4: Comparison of mean baby weight in normal range between group 1 and group 2.

		Group 1 (n=100)		Group 2 (n=100)		T	P value
		N	%	N	%		
Baby weight in normal range	Yes	97	97.00	89	89.00	3.76	0.05
	No	3	3.00	11	11.00		

Table 5: Comparison of ICU admission between group 1 and group 2.

		Group 1 (n=100)		Group 2 (n=100)		Chi Sq.	T value
		N	%	N	%		
ICU admission	Yes	7	7.00	18	18.00	5.53	0.0186
	No	93	93.00	82	82.00		

Table 6: Comparison of frequencies of antepartum, intrapartum, and postpartum between group 1 and group 2.

		Group 1 (%)		Group 2 (%)		Chi Sq	P value
		N	%	N	%		
Antepartum	PIH/PET	12	12.00	29	29.00	7.85	0.005
	PROM	19	19.00	36	36.00	6.42	0.011
Intrapartum	Prolonged labor	9	9.00	25	25.00	7.97	0.005
	NPOL	4	4.00	15	15.00	5.82	0.016
	Fetal distress	15	15.00	45	45.00	20.02	<0.001
Postpartum	PPH	7	7.00	35	35.00	21.97	<0.001
	Wound Infection	8	8.00	20	20.00	5.02	0.025
	Lactation failure	4	4.00	10	10.00	1.92	0.166

Table 7: Comparison of frequencies of perinatal mortality between group 1 and group 2.

		Group 1 (%)		Group 2 (%)		Chi Sq.	P value
		N	%	N	%		
Perinatal mortality	Yes	0	0.00	3	3.00	1.35	0.245
	No	100	100.0	97	97.00		

DISCUSSION

The study compares demographic and socio-economic variables between women with gestational diabetes mellitus (GDM) (Group 1) and those without GDM (Group 2), with each group consisting of 100 participants. Maternal age analysis shows no statistically significant difference between the two groups, with 48% of mothers in Group 1 and 43% in group 2 aged between 19 and 24 years old, 33% in group 1 and 45% in Group 2 aged between 25 and 29 years old, and 9% in group 1 and 6% in group 2 aged between 30 and 34 years old. The average age of mothers in both groups is 25.10±3.36 years, with a p value of 0.77 indicating no significant difference. The study suggests that maternal age plays an important role in the development of GDM, as evidenced by the average age of mothers with GDM being 27.9 years.[9]

The survey reveals that 61% of women in group 1 were primiparous, 34% were multiparous, and 5% were grand multiparous. In group 2, 68% were experiencing their first pregnancy, 35% had given birth twice, and 7% had given birth more than three times. The chi-square test showed no significant difference in parity distribution between the two groups, indicating that parity is a common characteristic among pregnant women.[10]

Education level is comparable in both groups, with 12% in group 1 and 14% in group 2. The proportion of people with primary education is slightly higher in group 2 than in group 1, while the proportion of people with a 10th grade education is similar. However, the proportion of women with a post-12th grade education is higher in group 1 (15%) than in group 2, and a larger number of women in group 1 have a college degree or higher (5%) than in group 2. The level of education attained may impact health outcomes, particularly the development of gestational diabetes mellitus (GDM), as higher education is often associated with better health literacy and greater availability of health services.[11]

The study reveals that 42% of people in group 1 live in rural areas, while 39% of people in group 2 live in rural areas. In contrast, 58% of people in group 1 and 61% of people in group 2 live in metropolitan areas. The distribution of places of residence between the two groups is not statistically significant, suggesting that place of residence could influence access to health services and lifestyle choices, which in turn affects gestational diabetes mellitus (GDM) outcomes.[12]

Socioeconomic status (SES) is also observed to be slightly higher in group 2 than in group 1, with a slightly higher proportion of upper-middle class members. This discrepancy is statistically significant, as it is higher in group 2 than in group 1. Higher SES is often associated with better access to healthcare and a healthier lifestyle, leading to a lower likelihood of developing GDM.[13]

The study shows no significant differences between the two groups in terms of maternal age, parity, level of education, and distribution of residence. However, there is a subtle disparity in socioeconomic status, with a larger percentage of upper and upper-middle class members in Group 2. These data indicate that demographic and socioeconomic characteristics are evenly distributed among women with and without GDM, with very little difference in socioeconomic position.

The study compared the DIPSI values of women with gestational diabetes mellitus (GDM) and those without GDM. Group 1 had a mean DIPSI score of 159.68±13.99, while Group 2 had a slightly lower score of 156.71±13.95. The results showed no statistically significant difference in DIPSI scores, indicating that glycemic control and dietary treatments in Group 1 brought blood glucose levels into a comparable range to Group 2, which did not have GDM. This supports the importance of lifestyle and dietary changes for improved glycemic management. The study also supports the need for monitoring and controlling blood glucose levels in pregnant women to reduce maternal and fetal outcomes, even if the changes are not statistically significant. A nutrient-rich diet before and during pregnancy can reduce the risk of GDM and control its consequences.[11,12]

The study compared women with gestational diabetes mellitus (GDM) and those without GDM using the Alternative Healthy Eating Index (AHEI). The results showed a significant difference between the two groups, with Group 1 being more likely to engage in healthy eating behaviors. This indicates the benefits of dietary control in GDM therapy. Pregnant women with GDM need effective dietary changes to regulate blood glucose and improve health. A nutrient-rich diet can help maintain normal blood sugar levels and avoid pregnancy problems. Dietary treatments help control weight gain and improve pregnancy outcomes. Higher AHEI reduces the risk of GDM, emphasizing the importance of food quality in the control and prevention of GDM. Pregnant women who ate a healthy diet had a lower risk of adverse pregnancy outcomes, highlighting the importance of dietary control. Research shows that dietary treatments improve blood glucose management and reduce pregnancy problems, emphasizing the importance of good nutrition in the treatment of GDM.[11-13]

The study examines the BMI distribution of subjects with gestational diabetes mellitus (GDM) and those without GDM. The mean BMI was 25.74±2.06 for group 1 and 25.93±1.57 for group 2, with no significant difference. This suggests that BMI is comparable in both groups, which is important as BMI is an established risk factor for GDM. Insulin resistance increases with high BMI, which can lead to GDM.[11,12]

Living a healthy lifestyle, including controlling diet and exercise, is essential for pregnant women, particularly those with GDM. Studies have shown that lifestyle changes, including diet and exercise, can improve health outcomes for women with GDM regardless of BMI.

The study also examined the level of physical activity (PAL) between women with GDM and those without GDM. The mean PAL value for group 1 was 1.85, while in group 2, it was 1.52. The t-value of 46.01 showed a statistically very significant difference between the groups, indicating that group 1 had greater PAL values than group 2. The data emphasizes the importance of exercise in the treatment of GDM. Women in Group 1 with GDM who changed their lifestyle and exercised more had higher PAL scores than women without GDM. Exercise is known to improve glycemic control and reduce pregnancy-related problems in GDM. This study supports Anjana et al. (2016) and previous studies on lifestyle therapies for gestational diabetes by emphasizing the role of physical activity in prenatal care.[11-13]

This study compared stress levels in women with gestational diabetes mellitus (GDM) and those without GDM. The results showed that group 1 had significantly less stress than group 2, indicating that lifestyle changes can reduce stress in pregnant women. This supports the idea that comprehensive GDM treatment improves physical health and lowers psychological stress, benefiting both maternal and fetal health, pregnancy outcomes, and reducing problems.[14-17]

Group 1 also showed a significantly higher Healthy Lifestyle Score than group 2, suggesting that women who controlled GDM with lifestyle changes lived healthier lives. The American Diabetes Association recommends lifestyle changes as the first-line therapy for GDM to improve glycemic control and reduce pregnancy problems. The higher healthy lifestyle scores in Group 1 emphasize the importance of lifestyle treatments for managing GDM.[14-16]

The study also compared delivery methods and neonatal outcomes between women with and without GDM. Group 1 had more complete vaginal deliveries (83) than group 2 (44%), and 56% had a lower segment cesarean section (LSCS) compared to 13% in group 2. The significantly reduced risk of LSCS in group 1 suggests that lifestyle changes and glycemic management reduce delivery-related surgery. The study group also had a higher rate of normal vaginal births than the control group, highlighting the benefits of GDM therapy.[10,18,19]

The study compared the frequency of neonatal ICU hospitalizations between children delivered to mothers with gestational diabetes mellitus (GDM) and those without (Group 2). The results showed that Group 1 had 17 newborns (17%) needing ICU care, compared to 8 in Group 2. This suggests that babies delivered to GDM mothers need more extensive care due to GDM concerns such as macrosomia, respiratory distress syndrome, and hypoglycemia. However, well-controlled GDM moms still have a greater risk of NICU admission than non-GDM

mothers.[20] The study also found a significant difference in labor duration between women with gestational diabetes mellitus who changed their lifestyle (Group 1) and those who did not (Group 2). Group 1 needed an average of 7.81 hours with a standard deviation of 2.85 hours, while Group 2 needed an average of 10.50 hours with 3.42 hours. This suggests that proper diet and exercise can speed up work, which could facilitate labor.

The study also investigated birth weight distributions of children delivered to women with gestational diabetes mellitus (Group 1) and those without (Group 2). Group 1 had 94% of newborns within the typical 2.5-4.0 kg range, whereas Group 2 had 86%. Group 1 had a 5% low birth weight (<2.5 kg) rate, whereas Group 2 had 8%. Group 1 also had 6% high birth weight (>4.0 kg) compared to 1% in Group 1. The t-value is 4.62 and the p-value is 0.099, indicating that infant weights are not significantly different across groups.

The study supports current evidence on the need of rigorous GDM control for optimum birth weight outcomes. Maintaining maternal glucose levels within the optimal range with food, exercise, and medication throughout pregnancy improves newborn outcomes. The study also supports larger literature trends that stress comprehensive treatment strategies that include lifestyle modifications and blood glucose monitoring. Managed GDM also reduces low birth weight and macrosomia, according to Anjana et al, and Catalano et al.[12,17,20]

In some newborn outcomes, Abd El-Hafez et al found substantial differences between the study and control groups, including neonatal weight, pulse, respiration, low glucose after delivery, congenital abnormalities, respiratory issues, jaundice, NICU hospitalizations, and stillbirths. These findings support Barakat et al, who studied the effects of three weekly moderate-intensity exercise sessions on gestational diabetes mellitus in Spain.[11,19]

The study analyzed the impact of lifestyle changes on gestational diabetes mellitus (GDM) in women. The results showed that lifestyle changes significantly reduced the incidence of pregnancy-induced hypertension/pre-eclampsia (PIH/PET) and intrauterine growth restriction (IUGR) during pregnancy. Additionally, lifestyle adjustments led to better fetal development outcomes.[13,15] Intrapartum factors showed that a healthy lifestyle strengthened membranes, and a healthy lifestyle may ease labor. Group 1 had a lower rate of premature rupture of membranes (19%) compared to group 2, and a healthier lifestyle may improve fetal well-being during labor.[13]

Postpartum factors showed that the incidence of postpartum hemorrhage (PPH) was only 7% in group 1, while it was significantly higher in group 2, suggesting that lifestyle changes may be effective in reducing severe postpartum problems. Women who maintained a healthier lifestyle had better recovery and healing.[12]

The study concluded that lifestyle adjustments for women with GDM offer significant benefits in reducing a range of problems before, during, and after childbirth. Effective management of GDM through dietary changes and regular exercise not only improves maternal health but also ensures better fetal and neonatal health. This underscores the need to include such measures in prenatal care protocols.

The study has limitations, such as a small sample size of 200 participants, potential recall bias, inaccuracies due to self-reported data, a short follow-up period, and lack of diverse ethnic and socio-economic groups. Adherence to lifestyle modifications was not continuously monitored, potentially affecting the reliability of the findings. Confounding variables like pre-existing health conditions and genetic predispositions were not controlled for. Future research should include a larger, more diverse population, implement long-term follow-up, and monitor adherence to lifestyle changes. Personalized intervention programs should consider individual differences in socio-economic status, cultural background, and health conditions. Healthcare providers and policymakers should incorporate structured lifestyle modification programs into prenatal care protocols.

CONCLUSION

The study shows that lifestyle modifications, such as healthy eating and physical activity, significantly improve outcomes for pregnant women with gestational diabetes mellitus (GDM). Women in Group 1 showed better glycemic control, lower stress levels, and healthier newborn weights compared to Group 2. The findings emphasize the importance of lifestyle interventions in managing GDM and reducing complications. Demographic and socio-economic factors did not show significant differences between groups.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Agarwal A, Dwivedi S, Tyagi P, Tripathi D. Study the effect of lifestyle modifications on fetomaternal outcomes in gestational diabetes mellitus. Int J Reprod Contracept Obstet Gynecol 2025;14:586-92.