DOI: 10.7860/JCDR/2024/65502.19067

Original Article

Community Section

Self-care Behaviour of Pregnant Women with Gestational Diabetes Mellitus at a Tertiary Care Hospital in Lucknow, India: A Quasi-experimental Study

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ABSTRACT

Introduction: India is now the diabetes capital of the world. The rising burden of Gestational Diabetes Mellitus (GDM) adds to the existing diabetes burden. Euglycemia is achieved once the baby is delivered. The first line of management of GDM is mainly through lifestyle modification with diet and physical activity. There is a dearth of information from Lucknow city about how well pregnant women with GDM adhere to dietary changes and exercise recommendations, or how counselling helps them deal with their GDM.

Aim: To assess the self-care behaviour related to diet, physical activity, and Self-Monitoring of Blood Glucose (SMBG) of pregnant women diagnosed with GDM.

Materials and Methods: A total of 188 pregnant women diagnosed with GDM were selected for present quasi-experimental study. The study participants were recruited from the antenatal Outpatient Department (OPD) at the Department of Obstetrics and Gynaecology of Queen's Mary Hospital, King George Medical University (KGMU), Lucknow, India. The total study duration was from November 2019 to November 2022. Pregnant women diagnosed with GDM according to Diabetes in Pregnancy Study Group in India (DIPSI) criteria, up to 28 weeks of gestation, who gave their written consent to participate in the study and were living within a 15-kilometer radius of the study Institute, were included in the study. One group of the study participants received one-to-one counselling, an individualised diet plan, along with usual GDM care, and the other group received usual GDM care during their antenatal visits. The summary of diabetes self-care was adapted to assess adherence to the recommended dietary and physical activity modifications, as well as self-monitoring of blood glucose. Data were analysed using R software version 4.1.1 (R Core Team, 2021). All categorical data were presented using frequency and percentages. The comparison of baseline demographic and clinical parameters of pregnant women between the two groups was done using the Chi-square test or Fisher's-exact test for categorical observations based on the expected frequency. The independent sample t-test or Mann-whitney U test for continuous measurements was used after checking the normality assumption using the Shapiro-wilk test. The change in scores of general diet, specific diet, physical activity, and SMBG throughout all follow-ups was assessed by repeated measures Analysis of Variance (ANOVA). The change from the first follow-up visit to subsequent follow-up visit was compared using a mixed linear model with follow-up visits. The p-value was considered significant at a 5% level of significance for all comparisons.

Results: The mean age of the pregnant women with GDM was 27.6±3.7 years in the intervention group and 27.9±3.9 years in the control group (p=0.451). The pregnant women with GDM in the two groups did not show significant differences in terms of socio-demographic variables such as age, religion, education, socio-economic status, occupation, type of family, and family history of diabetes mellitus. A significant difference was observed in the dietary and physical activity scores between the two groups of pregnant women with GDM. However, no difference was observed in the case of self-monitoring of blood glucose scores of the two groups.

Conclusion: The study concluded that counseling plays an important role in helping pregnant women with GDM adhere to the recommended dietary modifications and physical activity.

Keywords: Diet, Exercise, Hyperglycaemia, Pregnancy

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as "Any degree of glucose intolerance with onset or first detection during pregnancy" [1]. It is caused by the development of insulin resistance during the latter stages of pregnancy. The blood glucose level of pregnant females returns to the normal range once the baby is delivered. The risk of developing Type 2 Diabetes Mellitus (T2DM) increases among women with a history of GDM. As a result, the prevalence of GDM in Asia is higher than in Europe, owing to the much higher prevalence of T2DM among Asians [2].

In 2019, 15.8% of 129.5 million pregnant females worldwide had some form of hyperglycaemia, among them, 83.6% suffered due to GDM [3]. Hyperglycaemia in pregnancy affected 27% of live births in the South East Asia Region [3]. There is wide variability in reported prevalence for gestational diabetes in India. In India, the prevalence of GDM ranges from 3.8% in Kashmir to 35% in Punjab [4,5]. The prevalence of GDM in Lucknow, Uttar Pradesh was 41% in 2015, and in another study, it was shown to be 13.9% in 2018 [6,7]. These figures depict a difference in the prevalence of GDM across the country, but it may also be partially due to discrepancies in protocols for screening and diagnosis, and access to care in different geographic regions [2,8].

Diabetes care is a multi-pronged approach. A complete team with a doctor, nurse, diabetes educator, or other healthcare professional helps in improving clinical outcomes. Complex interconnections between environmental, behavioural, clinical, and genetic variables are involved in its management. Access to treatment and education about the disease condition has a significant impact on the clinical course [9].

Due to inadequate glycaemic control and a lack of understanding about appropriate nutritional intake, both the mother and the foetus suffer from malnutrition [10]. The implementation of GDM care is sometimes hampered by cultural perceptions and a lack of knowledge in local communities [10]. Few myths like doing exercise may lead to miscarriage and pregnant women should increase food intake, induce anxious thoughts in pregnant women, making it difficult for them to follow the advice of their healthcare providers to exercise and follow a certain diet.

The 2018 "Diagnosis and Management of GDM: Technical and Operational Guidelines" by the Ministry of Health and Family Welfare, India, stresses the importance of counseling about lifestyle modifications, weight control, exercise, and family planning [11]. Various studies from different parts of the world have shown the positive effect of counseling among women with GDM in improving their dietary practices, leisure time physical activity, and monitoring of blood glucose [12-14]. The novelty of the study lies in the fact that the authors have tried to assess the adherence of pregnant women with GDM to recommended dietary, physical activity, and self-monitoring of blood glucose to manage their blood sugar using a tool on an OPD basis. This would help to track the self-care pattern of the pregnant women with GDM in achieving euglycaemia with lifestyle modifications.

With the above background, this quasi-experimental study was planned with the objective to impart counseling on dietary and physical activity recommendations and self-monitoring of blood glucose and to determine its effect on the self-care behaviour of pregnant women with GDM with respect to recommended diet, physical activity, and self-monitoring of blood glucose.

MATERIALS AND METHODS

It was a quasi-experimental study design. In which study participants were recruited from the antenatal Outpatient Department (OPD) at the Department of Obstetrics and Gynaecology, King George's Medical University, Lucknow, India, between November 2021 and June 2022. Ethical approval was obtained from the Institutional Ethical Committee at KGMU, Lucknow, UP (110th ECM II B-PhD/P2) before data collection.

The pregnant women were diagnosed with GDM according to the Diabetes in Pregnancy Study Group in India (DIPSI) criteria, i.e., blood glucose greater than or equal to 140 mg/dL two hours after 75-grams oral glucose administration, regardless of the previous meal timing [15,16]. The study participants were divided into two groups, i.e., Group-1 (Intervention Group) and Group-2 (Control Group).

Sample size calculation: The sample size was determined by taking the reference from a previous study [17], which reported a mean difference in fasting blood glucose level of 9.11 mg/dL with a Standard Deviation (SD) of 19.43 between 28 and 36 weeks of pregnancy. Assuming the same mean fasting blood sugar in present study, the sample size was calculated using the formula:

$$n = \frac{2\,\sigma^2 (Z_\beta + Z_{\alpha/2})^2}{(d)^2}$$

Where,

$Z\alpha_{/2}$=standard normal deviate for a two-tailed test based on the alpha level (relates to the confidence interval level)=1.96

$Z\beta$=standard normal deviate for a two-tailed test based on the beta level (relates to the power level) at 80%=0.84

σ=standard deviation of the mean difference=19.43

d=mean difference in blood glucose=9.11

A total of 71 subjects in each group with a 95% confidence interval and a power of 80% were required. Further, taking a 20% dropout rate, 85 subjects in each group were required. However, the total number of pregnant women with GDM enrolled was 188, i.e., 94 in each group. Consecutive method sampling was used to select the study participants.

Inclusion criteria: Pregnant women diagnosed with GDM according to DIPSI criteria, up to 28 weeks of gestation, who gave their written consent to participate in the study, and were living within a 15 kilometer radius of Queen Mary Hospital, Lucknow, Uttar Pradesh were included in the study. Pregnant women diagnosed with Type-1 and Type-2 diabetes before their current pregnancy, those with a history of spontaneous or recurrent abortions, and those who were on corticosteroids, as well as pregnant women whom the treating obstetrician did not find fit for the study due to any obstetric complication, were excluded.

Exclusion criteria: Pregnant women on oral hypoglycaemic agents or insulin were also excluded from the study.

Study Procedure

A detailed pretested, semi-structured questionnaire was used to collect data in two parts. Part I consisted of socio-demographic details of the study participants, such as age, sex, education, occupation, socio-economic status, and past and present obstetric history. The Modified Kuppuswamy socio-economic classification was used for comparing socio-economic status [18]. Height and weight measurements were taken according to standard protocol [19].

Part II included details of the diabetes self-care activities pertaining to diet, exercise, and blood glucose monitoring in the previous week prior to the interview. The Summary of Diabetes Self-Care Activities (SDSCA) measure, developed by Toobert DJ et al., in 2000, was adapted to assess adherence to the recommended dietary and physical activity modifications [20]. Permission to use the tool was sought from the author, who permitted adding, omitting, or using the full scale or part of it and modifying the scale to suit the research population. For present study, four domains were studied: general diet, specific diet, exercise, and blood sugar monitoring. Considering the research goals, the nature of gestational diabetes, and Indian culture, the smoking and foot care subscales were removed from the assessment. The tool was validated and is published elsewhere [21]. The scoring was done with regard to the number of days per week the participants practiced the self-care activities on a scale of 0-7 days. The mean of the items in each domain was calculated to score the general diet, specific diet, exercise, and self-monitoring of glucose [20].

To calculate the general diet score, the mean number of days for items 1 and 2 was used {reversing item 2 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0)}, for the specific diet score, the mean of items 3, 4, 5, and 6 was used {reversing item 5 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0)}, for calculating exercise activity score, the mean of items 7 and 8 was used, and for calculating the SMBG score, the mean of items 9 and 10 was used.

The data collection was conducted from November 2021 to June 2022. Pregnant women with an expected date of delivery on or before June 2022 were enrolled in the study. Data was collected during the OPD timings. After reviewing the antenatal OPD register for the previous six months prior to the commencement of data collection, an average of 68 GDM cases were diagnosed every month, or around two cases per day. To reach the requisite sample size, the research participants needed to be enrolled for at least four months. As a result, it was planned that not more than five subjects would be recruited every day. The enrollment of study participants was completed between November 2021 and March 2022. If the last digit of the identification number of the study participant was an odd number, they were assigned to Group-1, and if the final digit was an even number, the patient was assigned to Group-2. If the penultimate digit was zero, the second last number was used to determine whether the research participant would be in the intervention or control group. The choice of odd and even numbers did not provide each of the participants the same chance to be included in each of the study groups. The allocation of the study participants was totally under the control of the principal investigator. No concealment was done. Hence, the study design is quasi-experimental. A complete obstetric examination, general physical examination, and measurement of height (cm) and weight (kg) using calibrated equipment and standardised techniques were conducted for all the study participants.

The pregnant women in the intervention group with GDM were given an individualised diet plan based on food preferences, cultural acceptance, and socio-economic status. All dietary modifications were made according to the guidelines laid down by the government of India [11]. When explaining the diet chart to pregnant women, measuring cups and spoons were used to help them comprehend portion sizes. Dietary adjustments for all study participants were made based on their energy needs as their pregnancy progressed. The calculation of the calorie requirements for pregnant women was done according to their pre-pregnant Body Mass Index [11].

The study participants in the intervention group were counselled about the importance and benefits of physical activity in pregnancy. They were recommended to perform a minimum of 30 minutes of moderate-level walking a day. For their ease, they were advised to walk for 10 minutes after each meal. They were also encouraged to participate in doing housework instead of being sedentary.

In addition to standard antenatal care, study participants in the intervention group received additional counselling when the women came for their diet plan. Due to the Coronavirus Disease-2019 (COVID-19) pandemic, only pregnant women were permitted inside the OPD, making counselling of accompanying family members impossible. In between the follow-up visits, pregnant women in the intervention group were also reminded over the telephone (bi-weekly) to follow the dietary and physical activity recommendations.

The study participants in the control group were provided with their diet plan. The pregnant women in this group received usual GDM care by the treating physician during their antenatal visit. They received no extra counselling, and no reminder phone calls were made to follow the dietary and activity recommendations.

Follow-up of the study participants: All the study participants were encouraged to maintain a food diary to document their daily dietary intake in terms of food type, amount, and frequency. Additionally, they were also instructed to keep a record of their blood sugar if they were able to check their own blood sugar, i.e., self-monitoring of blood glucose (fasting as well as postprandial) as per the recommendation. At every follow-up visit, they were requested to bring the food diary as well as blood sugar and physical activity records. All the study participants were called to test their fasting and postprandial venous blood glucose levels after two weeks of diet modifications and physical activity suggestions. The subsequent follow-up appointment was set according to the obstetrician's advice. The pregnant women with GDM were considered lost to follow-up if she did not answer three consecutive phone calls made on alternate days following the appointment. Any pregnant women started on insulin or oral hypoglycaemic agents were not followed-up further.

STATISTICAL ANALYSIS

The data was analysed using R software version 4.1.1 (R Core Team, 2021). All categorical data were presented using frequency and percentages. The comparison of baseline demographic and clinical parameters of pregnant women between the two groups was done using the Chi-square test or Fisher's exact test for categorical observations based on the expected frequency. Independent sample t-tests or Mann-whitney U tests were used for continuous measurements after checking the normality assumption using the Shapiro-wilk test.

The change in scores of general diet, specific diet, physical activity, and Self Monitoring of Blood Glucose (SMBG) throughout all follow-ups was assessed by repeated measures Analysis of Variance (ANOVA). The change from the first follow-up visit to subsequent follow-up visits was compared using a mixed linear model with follow-up visits. The p-value was considered significant at a 5% level of significance for all comparisons.

RESULTS

[Table/Fig-1] shows the socio-demographic details of the pregnant women with GDM. The pregnant women with GDM in both groups were not significantly different with respect to socio-demographic variables such as age, religion, educational level, occupation, socio-economic status, type of family, and family history of diabetes. The mean age of the pregnant women with GDM was 27.6±3.7 years in the intervention group and 27.9±3.9 years in the control group (p=0.451). There was no significant difference in the age distribution of the pregnant women with GDM in both groups. The maximum percentage of the pregnant women with GDM in both groups were Hindu by religion (p=0.09), and 48.9% and 55.3% were graduates (p=0.148). Similarly, the majority of pregnant women with GDM in both groups were homemakers (p=0.80), belonged to the lower-middle socio-economic status (p=0.08), and lived in nuclear families (p=0.44). More than 50% of study participants had a positive family history of diabetes (p=0.99).

Parameters	Intervention group (n=94)		Control group (n=94)		p-value
	n	%	n	%	
Age (years)					
≤25 years	32	34.0	28	29.8	0.059
26-30 years	40	42.6	38	40.4	
>30 years	22	23.4	28	29.8	
Age, mean±SD	27.6±3.7		27.9±3.9		0.451
Religion					
Hindu	81	86.2	72	76.6	0.092
Muslim	13	13.8	22	23.4	
Educational level					
Upto middle school	11	11.7	18	19.2	0.148
High school	19	20.2	10	10.6	
Intermediate	18	19.2	14	14.9	
Graduate and above	46	48.9	52	55.3	
Occupation					
Homemaker	85	90.4	84	89.4	0.809
Working	9	9.6	10	10.6	
Socio-economic status					
Upper and upper middle	37	39.4	27	28.7	0.081
Lower middle	45	47.9	44	46.8	
Upper lower and lower	12	12.7	23	24.5	
Type of family					
Nuclear	58	61.7	63	67.0	0.446
Joint	36	38.3	31	33.0	
Family history of diabetes					
Yes	46	48.9	46	48.9	0.999
No	48	51.1	48	51.1	
Total	94	100	94	100	

[Table/Fig-1]: Socio-demographic details of the pregnant women with GDM (N=188).
Chi-square test or Fisher's-exact test

The mean±SD of the general diet score of the study participants in the intervention group increased from 3.52±1.72 to 4.97±1.52 across the follow-up. The mean±SD of the general diet score of the study participants in the control group increased from 2.77±1.86 to 3.3±2.19. This difference between the two groups was found to be statistically significant (p=0.028) [Table/Fig-2]. The mean±SD of the specific diet score of pregnant women with GDM in the intervention group increased from 3.09±1.16 to 4.75±1.06 across the follow-up. The mean±SD of the specific diet score of pregnant women with GDM in the control group increased from 2.56±1.0 to 2.78±1.25. This difference was found to be statistically significant (p<0.001) [Table/Fig-3].

[Table/Fig-4] shows the mean±SD of the exercise score of pregnant women with GDM in the intervention group increased from 3.72±2.18 to 4.88±1.01 across the follow-up. No significant difference was observed in the SMBG score between the two groups, as shown in [Table/Fig-5].

TZ et al., where about 48 (69.6%) and 46 (66.7%) of the pregnant women with GDM were within the age range of 26-35 years in the Intervention Group (IG) and Control Group (CG), respectively (p=0.11) [22].

The result of the present study reported that the majority of the pregnant women with GDM in both groups (48.9% in the intervention group and 55.3% in the control group) were educated up to graduate level and above. There was no significant difference in the educational level of the pregnant women with GDM in both groups (p=0.15) [23]. A randomised control trial conducted by Zandinava H et al., in Iran

Follow-up	Mean general dietary score		p-value¥	Change from first follow-up		Change mean difference	p-value*
	Intervention group (n=94)	Control group (n=94)		Intervention (n=94)	Control (n=94)	Mean (95% CI)	
I	3.52±1.72	2.77±1.86	0.028	-	-	-	-
II	4.01±2	2.96±1.88		-0.48 (-1.10,0.13)	-0.19 (-0.81,0.42)	-0.29 (0.35, -0.94)	0.372
III	4.64±1.82	3.17±1.93		-1.12 (-1.74, -0.51)	-0.40 (-1.01,0.22)	-0.72 (-0.08, -1.37)	0.027
IV	4.97±1.52	3.3±2.19		-1.45 (-2.06, -0.83)	-0.54 (-1.15,0.08)	-0.91 (-0.27, -1.55)	0.006

[Table/Fig-2]: General dietary score of the study participants in both the groups and change with every follow-up (N=188).
Repeated measures ANOVA ¥linear mixed model *Post-Hoc, Bonferroni adjusted

Follow-up	Specific diet score		p-value¥	Change from first follow-up		Change mean difference	p-value*
	Intervention group (n=94)	Control group (n=94)		Intervention (n=94)	Control (n=94)	Mean (95% CI)	
I	3.09±1.16	2.56±1	<0.001	-	-	-	-
II	3.72±1.14	2.64±1.05		-0.63 (-1.05, -0.21)	-0.08 (-0.50,0.33)	-0.55 (-0.11, -0.98)	0.014
III	4.16±1.18	2.63±1.1		-1.07 (-1.49, -0.66)	-0.07 (-0.49,0.34)	-1.00 (-0.56, -1.43)	<0.001
IV	4.75±1.06	2.78±1.25		-1.66 (-2.08, -1.24)	-0.22 (-0.63,0.20)	-1.44 (-1.01, -1.88)	<0.001

[Table/Fig-3]: Specific Dietary Score of the study participants in both the groups and change with every follow-up (N=188).
Repeated measures ANOVA ¥linear mixed model; *Post-hoc; Bonferroni adjusted

Follow-up	Mean exercise score		p-value¥	Change from first follow-up		Change mean difference	p-value*
	Intervention group (n=94)	Control group (n=94)		Intervention (n=94)	Control (n=94)	Mean (95% CI)	
I	3.72±2.18	2.3±1.08	<0.001	-	-	-	-
II	4.35±1.62	2.22±1.13		-0.63 (-1.13, -0.14)	0.09 (-0.41,0.58)	-0.72 (-0.20, -1.23)	0.006
III	4.44±1.08	2.75±1.3		-0.72 (-1.21, -0.22)	-0.44 (-0.94,0.05)	-0.28 (0.24, -0.79)	0.294
IV	4.88±1.01	2.42±1.3		-1.16 (-1.65, -0.67)	-0.11 (-0.61,0.38)	-1.05 (-0.53, -1.56)	<0.001

[Table/Fig-4]: Exercise score of the study participants in both the groups and change with every follow-up (N=188).
Repeated measures ANOVA ¥linear mixed model *Post-hoc, Bonferroni adjusted

Follow-up	Mean SMBG score		p-value¥	Change first follow-up		Change mean difference	p-value*
	Intervention group (n=94)	Control group (n=94)		Intervention (n=94)	Control (n=94)	Mean (95% CI)	
I	0.51±0.72	0.42±0.69	0.945	-	-	-	-
II	0.52±0.72	0.38±0.65		-0.01 (-0.23,0.21)	0.03 (-0.19,0.25)	-0.04 (0.19, -0.27)	0.716
III	0.54±0.65	0.33±0.52		-0.03 (-0.25,0.19)	0.09 (-0.13,0.30)	-0.12 (0.11, -0.35)	0.318
IV	0.61±0.63	0.31±0.5		-0.1 (-0.32,0.12)	0.11 (-0.11,0.33)	-0.21 (0.02, -0.44)	0.076

[Table/Fig-5]: SMBG score of the study participants in both the groups and change with every follow-up (N=188).
Repeated measures ANOVA ¥linear mixed model; *Post-hoc; Bonferroni adjusted

DISCUSSION

In the present study, the pregnant women with GDM in both groups were not significantly different with respect to socio-demographic variables such as age, religion, educational level, occupation, socio-economic status, type of family, and family history of diabetes. In the present study, the majority (42.6%) of pregnant women with GDM in the intervention group were between 26-30 years of age, and similarly in the control group, also the maximum (40.6%) of the pregnant women with GDM were between 26-30 years. The mean age of the pregnant women with GDM in the present study was almost similar in the intervention (27.6±3.7) as well as in the control group (27.9±3.9). There was no significant difference in the age distribution of the pregnant women with GDM in both groups. As far as the age is concerned, result is consistent with the result of Khorshidi Roozbahani R et al., who reported a mean±SD age of 30.7±5.1 years in the intervention group and 30.9±5 years in the control group (p>0.5) [17]. Similar results were reported by Diddana

reported that more than 50% of the pregnant women with GDM were educated up to high school, and no significant difference was found between the intervention and control groups (p=1.00) [23]. Similar results were obtained by Khorshidi Roozbahani R et al., in Iran and Koivusalo SB et al., in Finland. They also reported that both control and intervention groups were not significantly different in the level of education (p>0.05) [17,24].

In the present study, 90.4% and 89.4% of the pregnant women with GDM in the intervention and control groups, respectively, were homemakers with no differences between the groups (p=0.8). A similar result was obtained by Zandinava H et al., with the majority (89%) of pregnant women with GDM in the intervention and control groups being homemakers, and no significant difference was observed between the groups (p=0.63) [23]. Nobles C et al., also reported no significant difference between the intervention and control groups regarding the occupation of pregnant women with GDM. The result of the present study shows that more than 40% of the pregnant women with GDM in both the intervention and control groups were from a lower-middle socio-economic status with no significant difference between the groups [25]. Said AR and Aly FK from Egypt reported in their study that 51.4% of pregnant women with GDM in the control group and 60% of pregnant women in the intervention group did not have enough income, and the two groups were not statistically different (p>0.05) [26]. Similar results were reported by Symons Downs D et al., and Chan RSM et al., who observed no significant group differences for family income per year among pregnant women with GDM [27,28]. In the present study, more than 50% of pregnant women with GDM in both the intervention and control groups had a positive family history of diabetes in their first-degree relatives. The participants in both groups were found to be similar (p=0.99). The results are consistent with the results of other studies conducted by Al-Hashmi I et al., who also reported no significant difference between the two groups regarding family history of diabetes [29].

In the present study, adherence to the recommended dietary modification, exercise, and SMBG practice was assessed by the mean number of days of following the recommendations after intervention at each follow-up. Different studies have used different methods to assess adherence to diet, exercise, and SMBG among pregnant women with GDM after lifestyle intervention. Adherence in many studies has been presented in the form of percentages or using different scoring patterns because of different scales used to assess adherence.

The results of the present study show a significant difference (p=0.028) in the mean general diet scores and mean specific diet score (p<0.001) of the study participants in the intervention group and control group across the follow-ups. Study participants in the intervention group, who received an individualised dietary plan, had better adherence to dietary recommendations. Additionally, better adherence to exercise was observed among pregnant women with GDM in the intervention group compared to those in the control group. This difference was found to be statistically significant (p<0.001). The SMBG score of the study participants in the intervention group is higher than the SMBG scores of the pregnant women with GDM in the control group. However, this difference between the SMBG scores of the two groups was not found to be statistically significant (p<0.945). The reason for this very low SMBG score was non availability of a glucometer, the cost of lancets, and forgetfulness.

A randomised controlled trial conducted by Diddana TZ et al., reported a significant (p<0.001) improvement in good dietary practice among pregnant women with GDM in the intervention group compared to the control group after the intervention [22]. Another study from Italy conducted by Bruno R et al., reported a higher adherence to diet modification among pregnant women with GDM in the intervention group compared to those in the control group [30]. Similarly, Al-Hashmi I et al., in Oman conducted a quasi-experimental study on pregnant women with GDM [29]. They reported a significant difference between the intervention group and control groups regarding the pre-post change in actual adherence scores for diets, physical activity, and SMBG (p<0.01). Sabry F et al., reported a statistically significant difference between the two groups (intervention and control group) after the intervention in terms of dietary and exercise practices among the pregnant women [31]. Said AR et al., studied the effect of the educational package regarding lifestyle among women with GDM in Egypt. They reported a highly statistically significant difference in women's lifestyle-related modifications such as nutrition, physical activity, stress management, and health responsibility before and after GDM educational package implementation in the intervention group [26]. Mukona DM et al., conducted a cohort study in Zimbabwe among pregnant women with GDM and reported that only 36.9% of pregnant women with GDM scored above the recommended 80% or higher level of adherence for antidiabetic therapy [32]. In the present study, a significant difference in the mean exercise score of study participants in the intervention group compared to the control group reflects a better adherence to exercise among pregnant women with GDM in the intervention group. The results of the present study are consistent with the results of Bo S et al., who reported a better adherence to exercise recommendations among women in the intervention group through simple lifestyle recommendations [33]. Sklempe Kokic I et al., conducted an RCT among pregnant women with GDM and reported that adherence to daily brisk walking was well above the 70% threshold in the exercise group [34]. The reason for the similarity of findings with the other studies in terms of dietary and physical activity adherence could be attributed to one-on-one counselling of the pregnant women with GDM and regular reminders over the phone to help them adhere to the recommendations. Moreover, pregnant females are more receptive during this phase of life, and in developing countries like present study, where the majority of the population is from middle-class families, they do not want to incur extra expenses on medicines or insulin.

Few studies have been conducted in the past to assess the adherence of SMBG practice among pregnant women with GDM. In contrast to the results of the present study, Al-Hashmi I et al., reported a significant difference (p<0.05) between adherence to SMBG practice in the intervention group (1.2±0.3) and the control group (0.0±0.3) [35]. Guo J et al., reported that 35.6% of the Chinese pregnant women with GDM were actively engaged in SMBG, and 42.9% of the diet-controlled GDM patients performed SMBG at least four times a week [36]. Freitas SS et al., conducted a longitudinal study in Brazil and reported in their study that 97.5% of the pregnant women with GDM were compliant with the SMBG recommendations [37]. Mackillop L et al., reported that almost 85% of the pregnant women with GDM conducted SMBG as per the recommendation [38]. The high compliance could possibly be attributed to the fact that all pregnant women received a smartphone and a blood glucose meter paired with a Bluetooth device. Blood glucose readings were transmitted to the phone via a preloaded software application, allowing for easy record-keeping of blood sugar levels. In a randomised control trial by Hong JGS et al., which compared three days of SMBG (SMBG3) to one day (SMBG 1) per week in women with GDM between 20 and 30 weeks, who were managed by lifestyle changes [39], it was found that the less-intensive SMBG1 arm had a greater compliance rate for self-monitoring blood glucose (86.5% vs. 81.3%). Each participant was provided with a personal glucometer, glucose strips, lancet needles, and alcohol swabs. The distribution of glucometers could be one of the reasons for the adherence rate of over 80%.

Limitation(s)

Data was collected at a single centre; thus, the results might not be generalisable. Self-reporting on dietary intake and physical activity could have led to an overestimation of adherence.

CONCLUSION(S)

The findings of the present study lay the groundwork for future research aimed at determining strategies to improve self-care behaviour among women during pregnancy with GDM. There is a need to increase awareness among this vulnerable group regarding the importance of diet, exercise, and self-monitoring of blood glucose, while also educating them about myths and health facts. It is vital to educate patients about the disease, its complications, management strategies, and the importance of adherence to the management plan. One-on-one counselling of pregnant women with GDM can improve adherence to dietary modifications and physical activity recommendations. Future multicentre studies need to be planned with a larger sample size to assess other factors affecting dietary practices, physical activity, self-monitoring of blood glucose, and glycaemic control.

Acknowledgement

Authors would like to thank Indian Council of Medical Research (ICMR), New Delhi, India for sponsoring the Post MD- PhD course (2019-2022) at KGMU Lucknow, Uttar Pradesh, India.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jun 14, 2023
- Manual Googling: Nov 23, 2023
- iThenticate Software: Nov 25, 2023 (13%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jun 12, 2023**
Date of Peer Review: **Aug 10, 2023**
Date of Acceptance: **Nov 28, 2023**
Date of Publishing: **Feb 01, 2024**