

Efficacy of interactive communication system in the management of gestational diabetes

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ABSTRACT

Background: Gestational Diabetes Mellitus (GDM) is one of the forerunners of diabetes and by its merit demands close surveillance so that early lifestyle changes and preventive programs are instituted. Hence targeted management using effective interactive communication system becomes imperative to combat the phenomenal increase of glucose intolerance in gestation.

Methods: The study was conducted at Dr. Seshiah Diabetes Specialties Centre, Chennai and gestational follow-up until delivery was carried out for 900 pregnant women. A diabetes protocol was developed to maintain a complete record of their clinical assessment every month. The clinical management of GDM was done in 3 stages namely during gestation, immediate postpartum and after delivery through effective communication techniques like lecture method, computer-aided counselling, power point presentations, brochures, individual and family counselling, postpartum follow-up through postpartum follow-up module and counselling prospective mothers through audio-visual aids. The impact of dietary intervention given to the pregnant women under follow-up was studied in two folds: Knowledge, Attitude and Practice (KAP) study and estimation of their glycemic level before and after intervention. The glycemic levels before and after intervention was tested for significance level using t test and effect of risk factors on gestational glycemia was tested using multiple regression analysis.

Results: The targeted management through interactive counselling and education communication proved effective as maternal glucose was well controlled during gestation and encouraged postpartum screening. Nutrition intervention proved effective in bringing down their energy intake and improved their glycemic level. The post counselling scores in KAP showed significant improvement. **Conclusion:** GDM may well be incurred in future as an open window of opportunity for prevention, rather than a closed door of bleak outcomes. Increasing awareness of GDM, appropriate timing and methodology of screening, ante partum and postpartum precautionary measures employed through efficient communication strategies in a meaningful way would be a “wake-up” call for the increasing burden of the disease.

Key words: GDM- Gestational Diabetes Mellitus, PGDM-Pre-Gestational Diabetes Mellitus, DP-Diabetes Protocol, KAP- Knowledge, Attitude and Practice.

The influence of globalization, pronounced changes in the human environment, human behavior and lifestyle with socio-economic development and rapid epidemiological transition over the last 20 years in India has resulted in gaining dubious distinction of being called, “the diabetic capital of the world”. India was estimated to have had 31.7 million people having diabetes

in year 2000 which is projected to be 79.4 million by year 2030 [1]. The two major challenges during the next decade would be diabetes in youth and women, particularly pregnant women. Gestational diabetes mellitus (GDM) is one of the forerunners of Diabetes [2]. The importance of GDM is that two generations are at risk of developing diabetes in the future. Women with a history of GDM are

at increased risk of future diabetes; predominantly Type 2 Diabetes as are their children. With changes in lifestyle and the increasing prevalence of obesity, diabetes is affecting young women of reproductive age and increases the risk of pregnancy complications [3].

In India about 17-18% of pregnant women develop GDM and the mother has increased weight gain. Gestational Diabetes mellitus is defined as carbohydrate intolerance with onset or recognition during pregnancy and develops in one in 25 pregnancies worldwide [4]. GDM recurrence rates are influenced by maternal health characteristics and past pregnancy history [5]. Though the prevalence of diabetes is alarmingly high among Indians, there have been very few studies assessing the effect of diabetes on pregnancy outcome. In this context, data on the outcomes of pregnancies in Indian diabetic women is very important and the rates are always changing due to increase in the rates of diabetes mothers itself and availability of better treatment modalities [6].

One of the important causes of diabetes developing after GDM is discontinuity of care as neglected by young women after delivery. It is important for these women to get their blood glucose estimation after childbirth, after 6-8 weeks and every year thereafter. Hence patient education in lifestyle modification and encouragement to return for glucose testing at regular intervals using effective communication techniques is important in the subsequent follow-up of women with GDM. Diabetes in pregnancy is a neglected issue that needs urgent global attention, not only for its negative maternal and perinatal consequences, but for the potential lifelong disabilities it causes for the women and child [7].

Gestational Diabetes Mellitus (GDM) by its merit demands close surveillance so that early lifestyle changes and preventive programs are instituted. The importance of educating women with GDM and its management cannot be overemphasized and compliance with the treatment plan through proper counseling and education sessions becomes a compulsion. Hence targeted management using effective interactive communication system becomes imperative to combat the phenomenal increase of glucose intolerance in gestation.

MATERIAL AND METHODS

The study was conducted at Dr. Seshiah Diabetes Specialties Centre, Chennai and the pregnant women were

selected by purposive sampling. It included all the pregnant women between the age group of 18 to 40 years, in any trimester, who were undergoing screening for gestational diabetes. All the patients who were willing for follow up for the entire gestational period were included in the study. Pregnant women above the age of 40 years, pregnant women with diabetic complications like retinopathy, neuropathy, nephropathy and cardio-vascular diseases and women who conceived through infertility treatment were excluded from the study. An informed consent was obtained from all 900 pregnant women included in the study. Baseline information such as socio-economic status, educational status, type of family, occupation and activity pattern was elicited from the selected pregnant women using a questionnaire.

Screening of diabetes was done through oral glucose tolerance test (OGTT). The estimation of plasma glucose was done as three fold with 75 g of oral glucose given to the pregnant women and fasting blood glucose levels followed by post prandial estimation at one hour and two hour post meal was carried out in the hospital laboratory. Blood glucose was estimated by Glucose Oxidase Peroxidase method (GOD-POD method). GDM diagnosis was based on World Health Organization (WHO) criteria (Table 1). Gestational follow-up was carried out for 900 pregnant women who visited the hospital for all the follow-up sessions every trimester until delivery. A diabetes protocol was developed for the pregnant women to maintain a complete record of their clinical assessment throughout the gestational period till delivery. A follow-up data with the name of the pregnant women, their ID, age, date of visit, gestational age, body weight, clinical profile namely blood pressure, fasting and post prandial blood glucose and haemoglobin levels was elucidated using the diabetes protocol proforma every month for each pregnant women.

Table 1: Glycemic criteria for diagnosis of glucose intolerance by 75g, 2-hour OGTT (WHO)

Criteria	2-hour Post Glucose (mg/dl)
Gestational Diabetes Mellitus (GDM)	>140
Normal Glucose Tolerance (NGT)	<140

As diet plays an important part in the management of diabetes, counseling was given to all the GDM women. Nutrition education and awareness was given through individual counseling to the 900 pregnant women as well

as their family members accompanying them. Counseling sessions was conducted once in every trimester for three trimesters for a period of 20 minutes through educational communication tools namely brochures, audio-visual aids, computer assisted one on one and group counseling and power point presentations. Brochures included information on food diary, food exchange list, calorie reckoner, pre-conceptual advice, breast feeding practices and long-term considerations in GDM.

The power point presentations focused on the importance of screening for GDM, risk factors, diagnostic criteria, maternal and foetal complications in GDM and management of GDM highlighting the role of diet and adequate nutrition. Efficacy of clinical management is heavily dependent on food habits, stress free home environment and other supportive care at home. Therefore management of GDM is not directed at the pregnant women alone, but her family as a whole [8]. Hence group counselling was conducted every trimester involving a group of 60-70 patients with their family members to raise awareness on diabetes and its complications in gestation.

As adherence to nutrition and meal planning principles is one of the most challenging aspects of diabetes care, the detailed information obtained on dietary pattern of the mothers was translated into behavior changes through Medical Nutrition Therapy (MNT). The nutrition intervention for GDM emphasized overall healthy food choices, portion control and cooking practices that can be continued postpartum and may help prevent diabetes in later life. The impact of dietary intervention given to the pregnant women under follow-up was studied in two folds: through Knowledge, Attitude and Practice (KAP) study and estimation of their glycemic level before and after intervention.

Knowledge, attitude and practice (KAP) study to assess their awareness, understanding and management of GDM and importance of meal plan was carried out. Questions on the disease condition, its risk factors, awareness on adverse outcomes in pregnancy, proper adoption of nutritional plan and maintenance of blood glucose and food intake were included in the knowledge portions. The knowledge quotient based on these factors was checked by scoring them on their responses with one score each for 20 questions. Attitude based questions involving the management measures and the precautionary strategies to be followed were raised with one score each for 10 questions. The dietary management measures was

emphasized through practice based questions with high scores for practice (score of 2 for each 20 practice based questions). A checklist to assess the awareness, management of GDM and importance of meal plan was formulated and administered to the pregnant women before and after counseling.

The glycemic levels fasting and post glucose along with HbA1C was recorded before the onset of the intervention for the women involved in the nutrition intervention programme in the hospital laboratory. The post intervention blood glucose levels of both fasting and post prandial levels were studied after a period of six months at the end of the follow-up sessions to assess the impact of nutritional intervention on the glycemic status on the GDM and NGT mothers.

As reproductive health is a matter of great concern for prospective mothers, they were targeted to receive awareness and education campaigns through interactive communication system like pamphlets, power point slides and checklist. The message that 'pregnancy is a window of opportunity for improving current and future health was imposed with the golden rule "confirm you are fit to be pregnant".

RESULTS

Of the pregnant women screened under universal screening 14 per cent had GDM 9 per cent had PGDM and 77 per cent had Normal Glucose Tolerance (NGT). Among ethnic groups in South Asian countries, Indian women have the highest frequency of GDM necessitating universal screening [9]. The mean fasting blood glucose level of the GDM mothers based on WHO criteria of 2 hour post glucose (PG) ≥ 140 mg/dl was 96.51mg and the corresponding mean 2 hour post prandial levels was 152.5mg. A long term outcome study conducted by Seshiah et al [10] documented that when maternal 2 hour post prandial glucose was >140 mg/dl, the cumulative risk of offspring developing type 2 DM was 30 per cent at the age of 24 years. The mean blood glucose level of the pregnant women at first visit is depicted in Figure 2.

Fat consumption was excess by seven per cent in the GDM mothers and they consumed more of saturated fat and fat from packaged, processed and ready to eat foods. Fibre was deficit by 40 per cent for GDM women, with low intake of dietary fibre. Iron, an important nutrient during gestational period also showed a deficit of 29 per

cent in GDM (Table 2).

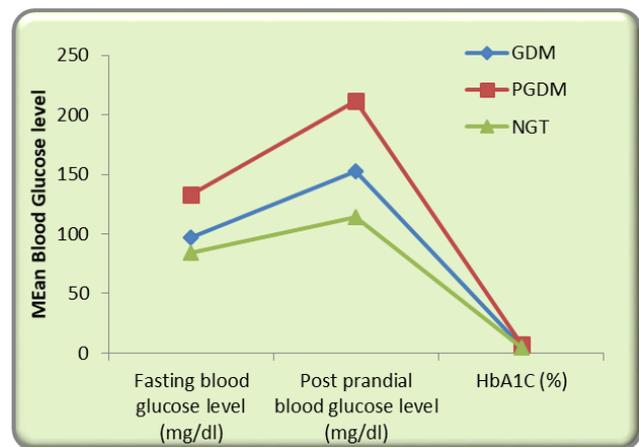


Figure 1: Mean Blood glucose level at first visit

Table 2: Mean nutrient intake in pregnant women

Nutrients	RDA	GDM	
		Intake	% excess/ deficit
Energy (kcal)			
Sedentary	2250*	2430	+8
Moderate	2580*	2709	+5
Heavy	3200*	3360	+5
Protein (g)	78	58	-25
Carbohydrate (g)	nil	340	nil
Fat (g)	30	39	+30
Fibre (g)	40	24	-40
Iron (mg)	35	25	-29

* Significant at 5% (t<0.05); *RDA with added allowance for pregnancy – 550 kcal

The pre and post counseling scores on knowledge of the GDM women showed that 41 per cent scored in the range 10-15 of total score of 20 while improvement on the post counseling scores was seen in 84 per cent of the women. Significant improvement in the scores of NGT women was seen post counseling as 78 per cent scored in the range 16-20. Scores on attitude revealed 76 per cent low scores by the GDM women, while 92 per cent scored good scores (6-10) post-counseling (Table 3). The practice pre-counseling scores revealed 57 per cent scored less than 20 while post counseling scores of 31-40 was seen in 89 per cent of the GDM women. Knowledge and practice measures of the pregnant women needs to be improved and their awareness raised to initiate precautionary strategies at the initial stages itself (Table 4).

Nutrition intervention given to the GDM and NGT women was effective in bringing down their energy intake in all the three activity pattern. The consumption of protein

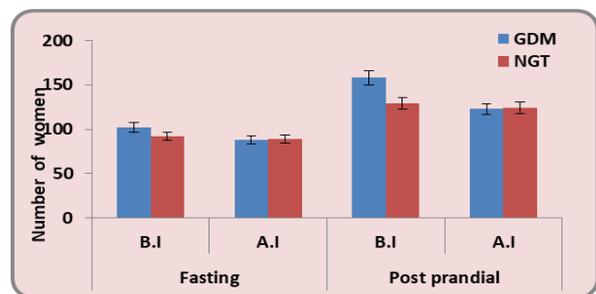
increased considerably as the women incorporated more pulses along with cereals and vegetables as advised through counseling. The women brought down the intake of carbohydrate and fat rich foods and showed keen interest in the consumption of unrefined carbohydrate and boiled form of fleshy foods rather than a fried form. The comparison of mean daily nutrient intake before and after intervention is presented in Table 4.

Table 3: Scores on Pre and Post Counselling for Knowledge, Attitude, & Practice

Scores	GDM (n=115)		NGT (n=120)					
	Pre counseling	Post counseling	Pre counseling	Post counseling				
Knowledge								
<10	46	40	nil	nil	53	44	nil	Nil
10-15	47	41	18	16	59	49	26	22
16-20	22	19	97	84	8	7	94	78
Attitude								
0-5	87	76	9	8	98	82	13	11
6-10	28	24	106	72	22	18	107	89
Practice								
<20	65	57	6	5	74	62	10	8
20-30	43	37	13	11	43	36	17	14
31-40	7	6	101	89	3	2	93	78

The intake of vegetables and green leafy vegetables also increased among the women in both the groups as they incorporated vegetables during dinner and breakfast meals. Incorporation of vitamin C rich foods in addition to iron rich foods helped the women in increasing their consumption of iron and aiding easy absorption.

The mean maternal blood glucose after intervention showed significant difference when compared to the initial reading in 72 per cent of the GDM women after a period of six months. Twenty eight per cent of the GDM mothers had poor diet compliance and did not meet the follow-up guidelines and hence they exhibited poor control in their glycemic status. The mean blood glucose level before and after intervention in the pregnant women is depicted in Figure 2. Among the 749 pregnant women who were followed after delivery, 386 women were GDM. Of the 386 GDM women only 344 (89%) women came back for post-partum follow-up 6-8 weeks after delivery. Eleven per cent did not turn for post-partum screening despite counseling and raising awareness about GDM. The scenario of diabetes at post-partum is given in Figure -3.



*B.I. - Before Intervention, A.I. - After Intervention

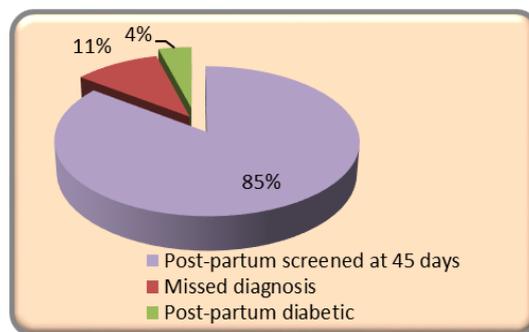


Figure -3: Scenario of Diabetes at Post-partum

Figure 2: Mean Blood Glucose Level Before and After Intervention

Table 4: Comparison of Mean Nutrient Intake before and after Intervention

Nutrients	GDM		NGT	
	Pre intervention	Post intervention	Pre intervention	Post intervention
Energy (kcal)				
Sedentary	2430 ± 33.85	2255 ± 21.32	2385±21.50	2300 ± 19.49
Moderate	2709 ± 17.50	2601 ± 15.29	2709 ± 14.56	2620 ± 12.73
Heavy	3360 ± 16.01	3242 ± 24.16	3328 ± 23.50	3210 ± 25.62
Protein (g)	58 ± 3.0	69 ± 2.79	68 ± 2.75	71 ± 3.05
Carbohydrate (g)	340 ± 14.25	270 ± 8.56	287 ± 8.45	279 ± 11.24
Fat (g)	39 ± 2.02	28 ± 1.75	32 ± 1.36	30 ± 1.65
Fibre (g)	24 ± 2.0	35 ± 3.46	30 ± 2.65	33 ± 1.90
Iron (mg)	25 ± 1.5	31± 2.52	24 ± 2.37	28 ± 1.55

The barriers for screening when studied revealed that 63 per cent of the mothers did not report for post-partum diagnosis due to time constraint owing to the baby’s schedule (Table 5). Fourteen percent of the mothers were unaware of the risks involved and the other factors reported included fatigue (11%), perception of good health in seven per cent and cost or inconvenience in five per cent of them.

Table 5: Barriers to Screening Post-Partum Diabetes

Barriers to screening (n=42)	N	%
Time constraint	24	63
Unaware of risks and proven preventive measures	8	14
Fatigue	5	11
Perception of good health	3	7
Cost or inconvenience	2	5

A post-partum follow-up module designed and followed to encourage post-partum screening among GDM mothers (Figure 5)

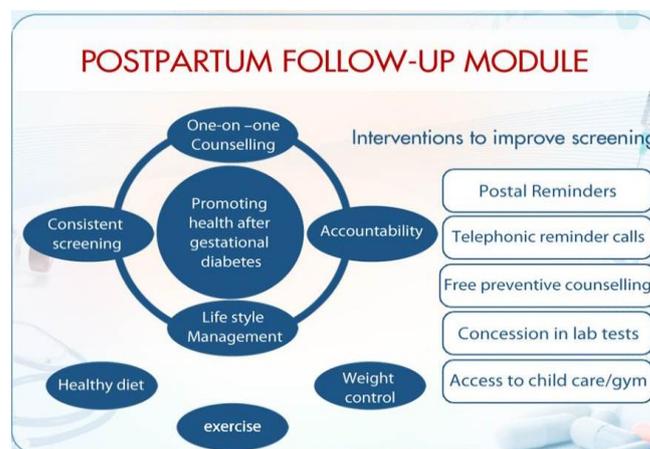


Figure 5: Post partum follow up module

Table 6: Scores on Counseling for Prospective Mothers

Target Group	Pre-Counseling Scores (MS=20)						Post Counseling Score (MS =20)					
	<10		10 – 15		16-20		<10		10 – 15		16-20	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Rural adolescents (n=200)	142	71	54	27	4	2	Nil	Nil	14	7	186	93
Urban adolescents (n=500)	310	62	170	34	20	4	Nil	Nil	10	2	490	98
Engaged Couples (n=200)	132	66	58	29	10	5	Nil	Nil	2	1	198	99

* MS – Maximum score

Scores on counseling given to the prospective mothers revealed that the rural adolescents had less knowledge and awareness on GDM and its preventive measures as 71% scored low scores. But the post counseling scores showed significant improvement and 93% scored between 16–20 on a maximum score of 20. The scores on counseling for prospective mothers is depicted in Table-6.

DISCUSSION

In a community based study in Tamil Nadu under the DIPAP - Diabetes in Pregnancy Awareness and Prevention project the overall prevalence of GDM was 13.9% [11]. According to this study an overall prevalence of GDM is 13.9 per cent in the mean fasting blood glucose level of the GDM mothers based on WHO criteria of 2 hour post glucose (PG) ≥ 140 mg/dl was 96.51mg and the corresponding mean 2 hour post prandial levels was

152.5mg. A long term outcome study conducted by Franks *et al* (2006) documented that when maternal 2 hour post prandial glucose was >140 mg/dl, the cumulative risk of offspring developing type 2 DM was 30 per cent at the age of 24 years [12].

Energy requirement during pregnancy comprises the normal requirement for an adult women and an additional requirement for foetal growth plus the associated increase in body weight during pregnancy and deviation from normal physical activity. Among the GDM women, the energy intake was excess by eight per cent for those involved in sedentary activity. Protein intake was deficit by 25 per cent for GDM women with poor intake of protein of high biological value. It is important that the higher intake of protein recommended during pregnancy

should come from a normal varied diet and not from commercial high protein Supplements [13]. In the gestational follow-up, the impact of dietary counseling and intervention has revealed significant improvement in the scores of NGT women post counseling as 78 per cent scored in the range 16-20.

The scoring pattern of the urban adolescents and that of the engaged couples were more or less similar, as their urban life style and educational background raised their awareness level and precautionary measures to be taken. The post counseling scores showed significant improvement compared with pre-counseling scores.

CONCLUSION

Gestational Diabetes mellitus is one of the most common complications of pregnancy with short and long-term repercussions for both mother and child [14]. The scenario of gestational diabetes depicted is on the rise and points out that GDM is an upcoming maternal health burden and needs urgent attention for its negative and perinatal consequences.

This study strengthens the fact that keeping aside the non-modifiable factors, there are many modifiable factors, which if targeted before, during and after GDM through effective communication techniques will impart favorable outcome. Targeted management during and after pregnancy with one on one counseling and building a rapport with the patient inclusive of early detection, regular monitoring and lifestyle modification must be implemented to reach the affordable goals. Effective follow-up of the GDM women for post-partum screening for diabetes have to be initiated to prevent the increased risk of permanent diabetes.

GDM may well be incurred in future as an open window of opportunity for prevention, rather than a closed door of bleak outcomes [15]. Increasing awareness of GDM, appropriate timing and methodology of screening, ante partum and post-partum precautionary measures employed through efficient communication strategies in a meaningful way would be a “wake-up” call for the increasing burden of the disease.

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