

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1166_22

# Barriers and facilitating factors of postnatal blood glucose monitoring after structured intervention among mothers with gestational diabetes mellitus receiving care from a tertiary health centre, Puducherry - A qualitative study

Nandhini Manoharan<sup>1</sup>, Venkatachalam Jayaseelan<sup>1</sup>, Sitanshu Sekhar Kar<sup>1</sup>, Nivedita Jha<sup>2</sup>

## Abstract:

**BACKGROUND:** In India, women with GDM are at an increased risk of developing type 2 diabetes mellitus (T2DM). Despite this, the rate of postnatal blood glucose monitoring is low, and the reasons are not well known. Hence, our study explored the barriers and facilitating factors associated with T2DM postnatal screening six weeks after delivery.

**MATERIALS AND METHODS:** We conducted a qualitative study among 21 mothers with GDM in obstetrics and gynecology department, women and child hospital (WCH), JIPMER, from December 2021 to January 2022. Mothers with GDM were selected purposively between 8 and 12 weeks after delivery to explore the barriers and facilitating factors associated with postnatal screening six weeks after getting mobile call reminders and health information booklet interventions. In-depth interviews were transcribed; manual content analysis with deductive and inductive coding was done.

**RESULTS:** We identified two themes; three categories and subcategories that illustrated barriers and five categories that illustrated facilitators to postnatal blood glucose monitoring. Lack of awareness and misconceptions about GDM, knowledge practice gap, lack of family support, and perception of health system failure by mothers with GDM were barriers to postnatal blood glucose monitoring. Concerns about health, standard advice on postnatal screening, information in health education booklet, mobile reminders, and family support were found to be facilitators.

**CONCLUSION:** We found several barriers and facilitating factors that showed mobile call reminders and booklet interventions had improved postnatal blood glucose monitoring. Our qualitative study has strengthened the findings of the previous RCT, and it would provide more insights to develop further interventions which we must focus on improving postnatal blood glucose monitoring.

## Keywords:

Barriers, diabetes mellitus type 2, facilitating factors, gestational diabetes mellitus, postnatal care

<sup>1</sup>Department of Preventive and Social Medicine, JIPMER, Puducherry, India, <sup>2</sup>Department of Obstetrics and Gynecology, JIPMER, Puducherry, India

## Address for correspondence:

Dr. Venkatachalam Jayaseelan,  
Additional Professor,  
Department of Preventive and Social Medicine,  
III Floor, JISPH, JIPMER,  
Puducherry- 605006,  
India.  
E-mail: drvenkatpgi@gmail.com

Received: 11-08-2022  
Accepted: 07-10-2022  
Published: 28-04-2023

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow\_reprints@wolterskluwer.com

## Introduction

Gestational diabetes mellitus (GDM) is defined as “impaired glucose tolerance

with onset or first recognition during pregnancy”.<sup>[1]</sup> Globally, there was an estimation of about 223 million women (20–

**How to cite this article:** Manoharan N, Jayaseelan V, Kar SS, Jha N. Barriers and facilitating factors of postnatal blood glucose monitoring after structured intervention among mothers with gestational diabetes mellitus receiving care from a tertiary health centre, Puducherry - A qualitative study. *J Edu Health Promot* 2023;12:131.

70 years) living with type 2 diabetes mellitus (T2DM).<sup>[2]</sup> One in 10 pregnancies is associated with T2DM, of which 90% are due to GDM.<sup>[3]</sup> Studies showed that the prevalence of GDM in pregnancy is around 28%.<sup>[4,5]</sup> India ranks the second-highest country with an increased prevalence of T2DM, with a higher prevalence reported in Kerala and Tamil Nadu. A similar increasing trend has been noted for GDM. In India, the prevalence of GDM is estimated to be 10% to 14.3%.<sup>[1,6]</sup> In Puducherry, the prevalence of GDM is around 18.5%.<sup>[7]</sup> Women with GDM are at an increased risk of developing glucose intolerance or T2DM later in life and recurrent GDM in the following pregnancies.<sup>[8]</sup> Around 90% of the women who develop T2DM are due to GDM.<sup>[6]</sup> Among them, 90% of women become normal after delivery.<sup>[9]</sup> The remaining 10% of women with GDM may develop T2DM immediately after delivery, which indicates that they had undiagnosed T2DM before pregnancy.<sup>[10]</sup> Nearly half of those diagnosed with GDM are estimated to develop T2DM within five years after delivery.<sup>[11]</sup> In cohort studies, up to 70% of women with GDM developed T2DM after ten years of postnatal follow-up.<sup>[10]</sup>

Due to the current increasing trend of T2DM worldwide, postpartum T2DM screening after delivery is critical.<sup>[12]</sup> Globally, the screening rates for T2DM are <50%.<sup>[13]</sup> A recent study in southern India reported that only 29% of mothers with GDM have undergone blood glucose testing in the postnatal period.<sup>[14]</sup> Technical and Operational Guidelines of GDM guidelines 2018 recommend postnatal blood glucose screening of all mothers with GDM at six weeks after delivery by 75-g OGTT.<sup>[15,16]</sup> Despite this guideline, the rate of postnatal blood glucose monitoring is low, and the reasons for low screening uptake are unclear. Many qualitative studies showed that healthcare practitioners did not adequately advise the mothers about the postnatal screening and the risk of T2DM and women may fail to perceive themselves are at an increased risk of T2DM.<sup>[17,18]</sup> A systematic review by Dennison *et al.*<sup>[19]</sup> explored that difficulties associated with attending appointments and a focus on the family would affect women's ability to attend postpartum T2DM screening. Understanding the reasons for poor postnatal screening will help develop interventions and check whether the interventions have improved the rate of postnatal screening.<sup>[17]</sup> Therefore, understanding attitudes towards screening and the barriers from the perspectives of mothers is essential. In India, there are few studies done to study the factors associated with postpartum T2DM screening in women diagnosed with GDM. So, in our study, we explored the barriers and facilitating factors associated with postnatal blood glucose monitoring after the structured intervention among the mothers with GDM who received antenatal care in a tertiary health center during their postnatal period.

## Materials and Methods

### Study design and setting

Qualitative study using in-depth interviews.

The present study uses baseline sociodemographic details and postnatal history from the Randomised Controlled Trial on the effectiveness of mobile call reminders and health information booklet to improve postnatal blood glucose monitoring among mothers with GDM receiving care in a tertiary health center in Puducherry. (See Annexure 1). The study was conducted in obstetrics and gynecology department, Women and Child Hospital (WCH), JIPMER, a 300 bedded hospital that provides high-quality obstetric care. On average, 200–300 GDM mothers visit the clinic monthly. GDM accounts for 13% of total deliveries conducted at JIPMER. Universal screening of GDM is offered to all pregnant women at the first visit and 24 to 28 weeks of gestation. Screening is done by OGTT using 75 g of glucose by following the international association of diabetes in pregnancy (IADPSG) criteria. She is advised of medical nutrition therapy or medical management based on abnormal blood glucose values. mothers with GDM are screened postnatally at six weeks by OGTT in the Postnatal clinic every week. Those who cannot attend the postnatal clinic are advised to visit a nearby health center for postnatal blood glucose monitoring.

### Study participants and sampling

Women diagnosed with GDM received antenatal care from a tertiary health centre during the last year and were included between 8 and 12 weeks in this study after delivery. Mothers with overt diabetes, nil access to mobile phones, and illiterate mothers were excluded.

### Study Period: December 2021 to January 2022

In depth, interviews were conducted with a minimum of 21 postnatal mothers (seven mothers with GDM in each booklet arm, mobile reminder arm, and control arm from the previous RCT) until data saturation. These 21 mothers with GDM who received antenatal care from a tertiary health center were selected purposively between 8 and 12 weeks in this study after delivery to explore the facilitating factors and barriers associated with postnatal screening.

### Study procedure

After informed consent, in-depth interviews were conducted among 21 postnatal mothers with GDM identified from the quantitative data collection during the antenatal period who received antenatal care in a tertiary health center to determine the barriers and facilitating factors for postnatal blood glucose monitoring. Interviews were conducted in person at the postnatal clinic or at a convenient place for the participant.

Interviews were conducted in the patient's mother tongue and lasted 40 min. Baseline sociodemographic details and postnatal history were collected from the previous RCT. A semi-structured interview guide included open-ended questions about their knowledge, concerns, barriers, and facilitating factors regarding postnatal blood glucose monitoring (see annexure 2). If she attended the postnatal visit, questions were asked about factors that facilitated them in attending the postnatal visit or any difficulties they faced in attending the visit. If a woman did not attend the postnatal visit, she was asked why she could not attend it. Necessary probes were used to get more information wherever necessary. The interview guide was modified using an iterative approach during the study based on the previous interviews. For example, questions were included on measuring blood glucose by the glucometer after some mothers discussed this topic. Notes were taken during the interview, and the entire interview was audio recorded with the consent of the participants. A phenomenological approach was used for the conduct and analysis of the IDI. Themes were categorized into individual, family, and health system levels.

### Statistical analysis

The transcripts were prepared from audio recordings of the in-depth interview within three days. Manual descriptive content analysis was used to analyze the transcripts. The expert in qualitative research has also reviewed the transcripts prepared to reduce the bias and increase the interpretive credibility. Any discrepancies between the two persons were resolved by discussion. Various codes thus obtained were combined into themes.

## Results

A qualitative study including 21 in-depth interviews was conducted from December 2021 to January 2022. Results were discussed under two themes: barriers and facilitating factors.

Table 1 and table 2 shows the barriers and facilitating factors regarding postnatal blood glucose monitoring respectively.

Table 1 shows the barriers regarding postnatal blood glucose monitoring which includes three categories and five subcategories.

### Code 1a. Complications of GDM and future risk of DM:

During the in-depth interview, most mothers said they were unaware of GDM and associated future maternal and neonatal complications of T<sub>2</sub>DM.

## Operational definitions:

### Gestational Diabetes Mellitus:

Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance with onset or first recognition during pregnancy. An oral glucose tolerance test (OGTT) was done using a 75-gm glucose load using the IADPSG criteria (endorsed by WHO 2013 & FIGO 2016).

The IADPSG glucose cut-offs for GDM: Fasting Plasma Glucose (mg/dl)  $\geq 92$  1 h (mg/dL)  $\geq 180$  2 h (mg/dL)  $\geq 153$ . If any of the values are above these cut-offs, the woman is diagnosed with GDM.

### Overt Diabetes:

Diabetes that antedates pregnancy is called pregestational or overt diabetes.

Women with a random plasma glucose level  $>200$  mg/dl plus classical signs and symptoms such as polydipsia, polyuria, and unexplained weight loss or FBS  $>125$ mg/dL or PPBS  $>200$  mg/dL.

### Test for postpartum screening as per guidelines:

2 h 75-g oral glucose tolerance test (OGTT) either in the fasting or non-fasting state.

### Timely postpartum screening:

Screening at  $\geq 6$  weeks postpartum and  $<8$  weeks using any test for a blood glucose level.

*"I was unaware that high sugar levels would affect some mothers even after delivery. I didn't get any symptoms." - 22-year-old Homemaker from Cuddalore*

### Code 1b. Not aware of postnatal screening for DM

Mothers with GDM were aware of the antenatal diagnosis of GDM, but most women were not aware of postnatal T<sub>2</sub>DM screening at six weeks. Also, they were not advised on the importance of blood glucose monitoring.

*"I was unaware I should do a blood sugar checkup immediately after delivery." - 23-year-old Homemaker from Puducherry*

### Code 1c. Timing of postnatal screening:

Some women were aware of postnatal screening for T<sub>2</sub>DM but when and where they should get checked for postnatal blood glucose was unknown to them.

**Table 1: Thematic analysis of barriers affecting postnatal blood glucose monitoring at eight weeks among mothers with GDM attending a tertiary health centre, Puducherry: Theme 1 - Barriers affecting postnatal blood glucose monitoring at eight weeks**

Categories	Subcategories	Codes	
Individual level	Knowledge about GDM	Lack of awareness about GDM	
		Complications of GDM and future risk of T2DM	
		Not aware of postnatal screening for T2DM	
		Timing of postnatal screening	
		Misconceptions about GDM	
		Blood sugar levels will be normal after delivery	
		Young people won't get diabetes mellitus	
		No need to test if asymptomatic	
		Knowledge practice gap	Self
			Procrastination
	Lack of time due to other works		
	Fear of being diagnosed as T2DM		
	Self-monitoring by glucometer		
	COVID related issues		
	Travel		
	Difficulty in taking the child to hospital		
	Distance from health facility		
	Family level	Knowledge about GDM	Lack of knowledge about the importance of postnatal screening among the family members
			Family support
		No one to take care of the child and household work in her absence	
Health system level	Perception of health system failure by postnatal mothers	Lack of advice regarding postnatal screening	
		Reassurance that blood sugar levels will be normal after delivery	
		Lack of testing facilities in primary health centres	

**Table 2: Theme 2 - Facilitating factors affecting postnatal blood glucose monitoring among those who undergo testing**

Categories	Codes	Statements
Concerns about health	Fear of future complications	<p>"Some pregnant mothers admitted to the hospital had difficulties during their delivery. I have heard that some of them were getting treatment for diabetes after delivery. I was worried whether my blood sugar levels would decrease after delivery." - 25-year-old Homemaker from Puducherry</p> <p>"I have giddiness on and off one month after delivery. So, I went to a nearby hospital for a checkup." - 28-year-old Homemaker from Puducherry</p> <p>"My father is a diabetic, so I know something about the symptoms of blood sugar and related issue." - 36-year-old graduate from Puducherry</p>
	Being symptomatic	
	Family history of Diabetes	
Standard care	Advice regarding postnatal screening	"Sister from the hospital informed me that I must undergo blood sugar testing six weeks after delivery. Doctors have written in my discharge sheet." - 26-year-old Homemaker from Puducherry
Information on health education booklet	Increase awareness about GDM	<p>"When I received the book, I understood that blood sugar testing is important even after delivery. After reading the book, I know that blood sugar testing must be done after delivery." - 25-year-old graduate from Puducherry</p> <p>"The book was handy for me. It clarified some of my doubts about high blood sugars during pregnancy. I followed the diet given in that book." - 35-year-old Homemaker from Puducherry</p>
	Clear and brief information	
Mobile reminders	Positive reinforcement	"When I was pregnant, I didn't know I had to do sugar testing after delivery. I got calls from the hospital after delivery. I was a little worried. I went to a private clinic and checked. They said that it was normal." - 26-year-old Homemaker from Puducherry
Family support	Husband's support in travel to hospital	"My home is far away from the hospital. My husband took me to the hospital in a two-wheeler for a checkup." - 27-year-old Homemaker from Puducherry

*“During my discharge, I was informed that I should get blood sugar testing six months after delivery. So, I thought a blood sugar checkup had to be done at six months, and I am waiting for six months to get it done.” - 32-year-old multipara, MA graduate, a school teacher from Puducherry*

#### **Code 2a. Blood sugar levels will be normal after delivery**

Most women perceived that their blood glucose levels were slightly raised during pregnancy. They assumed that their blood sugar levels would be normal after delivery.

*“After my delivery, I didn’t have any symptoms. I thought my blood sugar values would have returned to normal after delivery. My neighbours also said that blood sugar values become normal after delivery.” - 23 years old Homemaker who studied up to 10<sup>th</sup> standard in Puducherry*

#### **Code 2b. Young people won’t get diabetes mellitus**

Women have the misconception that only older women get diabetes. Due to this lack of awareness, women get undiagnosed earlier and develop complications.

*“I think it’s due to a lack of awareness and fear. Young people tend to think they won’t get diabetes at a young age. I also didn’t get checked after delivery for the previous two pregnancies. I was informed to check blood sugar levels after delivery, but I didn’t check and didn’t take medicine. If I had done that, I wouldn’t have landed up in high blood sugar levels.” -39 years old MSC graduate, a school teacher from Puducherry*

*“My family said I am young and young people won’t get diabetes, and only people get diabetes after 40 years of age.” - 25-year-old BE graduate from Puducherry*

#### **Code 2c. No need to test if asymptomatic**

Usually, those women who develop symptoms after delivery approach health facilities for a postnatal checkup.

*“I didn’t get any symptoms after delivery. So, I didn’t go to the hospital to test my blood sugar levels. For the past month, I had giddiness on and off. I am planning to go for a checkup.*

*- 32-year-old multipara, MA graduate, a school teacher from Puducherry*

#### **Code 3a. Procrastination**

Some women said that they were aware of postnatal screening for diabetes. But there is a delay in action. They were also aware of the complications of T<sub>2</sub>DM. Still, they overlook it.

*“I was informed to check blood sugar testing after two months of delivery. Uh. I have to check it. I forgot to check it after delivery despite the reminder from the hospital on this. I don’t feel it is important either.” - 22-year-old Homemaker from Cuddalore*

#### **Code 3b Lack of time due to other works**

Some women find difficulty going to the hospital due to their busy household activities.

*“I couldn’t go to the hospital after delivery because I didn’t get time. I have to do household work. Also, my child was not well during that time.” - 21-year-old Homemaker studied 12<sup>th</sup> standard from Puducherry*

#### **Code 3c Fear of being diagnosed as DM and undergoing lifelong treatment**

Few women were afraid of getting diagnosed with T<sub>2</sub>DM. This leads to an unwillingness to undergo blood glucose testing despite knowing the complications associated with T<sub>2</sub>DM.

*“I was a little hesitant to check my blood sugar levels after delivery, and I am afraid that my blood sugar levels may continue to be at higher levels and facing such a situation again.” - 22-year-old Homemaker, 12<sup>th</sup> standard from Puducherry*

*“I think many women are not doing blood sugar checkups because they are afraid, they may be diagnosed with diabetes after the checkup. So, they avoid doing the checkup.” - 32-year-old multipara, MA graduate, a school teacher from Puducherry*

#### **Code 3d. Self-monitoring by glucometer**

During our in-depth interview, some women used glucometers in their homes. They perceived that blood glucose values would be the same using a glucometer or checking at the hospital. They also said that either doctors nor healthcare workers did not inform them that glucometer is not a valid tool for diagnosing T<sub>2</sub>DM.

*“I used to check it with a glucometer available at my home. I don’t think there won’t be any difference between checking blood sugar levels at home with a glucometer and at a hospital. So, I didn’t go to the hospital.” - 25-year-old graduate female from Cuddalore*

#### **Code 3e. COVID-related issues:**

Most women with GDM were informed that COVID-related restrictions had been an obstacle to their hospital visits. One woman said she turned COVID positive and couldn’t visit the hospital eight weeks after delivery.

*"I was infected with Covid-19 at that time and got isolated myself. My husband was also infected by Covid-19. I could not go to the nearby government hospital when they called me for a blood sugar levels checkup."* - 22-year-old Homemaker, 12<sup>th</sup> standard from Puducherry

#### **Code 4a. Difficulty in taking the child to the hospital**

After delivery, taking care of the child became an essential task for women, and they mentioned that taking the child to the hospital is difficult.

*"Taking the child to the hospital during a checkup is difficult. Nobody takes care of my child in my absence."* - 24-year-old graduate female from Puducherry

#### **Code 4b. Distance from health facility**

Some women claimed that the health facility was far away from their residence. Lack of transportation facilities to go to the hospital and waiting time at the hospital was considered difficult by the postnatal mothers.

*"It is difficult to go to a lab for blood sugar testing because it is far away from my home. The nearby government hospital is 4 to 5 km away from my home. It nearly takes half an hour to go to the hospital."* - 32-year-old multipara, MA graduate, a school teacher from Puducherry

#### **Code 4c. Lack of transportation facilities**

*"I don't have bus facilities to visit a nearby hospital in my village."* - 21-year-old Homemaker studied 12<sup>th</sup> standard from Puducherry

#### **Code 4d. Waiting time at the hospital**

*"I didn't go to the government hospital. I wanted to test in a private hospital because I thought it would be difficult to go and wait for testing in a government hospital."* - 30-year-old Homemaker studied up to 12<sup>th</sup> standard from Vilianur, Puducherry

#### **Code 5a. Lack of knowledge about postnatal screening among the family members**

At the family level, a Lack of knowledge regarding postnatal screening and a lack of family support in accompanying postnatal women to the hospital or doing household work was perceived as a more significant challenge for postnatal blood glucose testing compliance.

*"My family didn't allow me to go outside because I had a fever and had to take care of the baby. Only after I got symptoms like giddiness and tiredness, I compelled them to take me to the hospital after four months, when tested I got my blood*

*sugar levels in the 400s."* - 25-year-old BE graduate from Puducherry

#### **Code 6a. Not able to go to a health facility without a male companion**

*"I didn't get any symptoms after delivery. So, I didn't go to the hospital to test my blood sugar levels. For the past month, I have had giddiness on and off. I plan to go for a checkup, but nobody is there to take me to the hospital."* - 32-year-old multipara, MA graduate, a school teacher from Puducherry

#### **Code 6b. No one to take care of the child and household work in her absence**

*"My husband is abroad, and I am in my mother's home. She is also going to work. So, it's difficult to take care of the baby and to go for test."* - 26-year-old Homemaker studied up to 12<sup>th</sup> standard from Puducherry

#### **Code 7a. Lack of advice regarding postnatal screening**

Most women were informed that they were discharged from the hospital without prior advice regarding postnatal blood checkups at six weeks.

*"Doctors informed me to undergo blood sugar testing after delivery. But they didn't inform me when to do blood sugar testing. They have not informed me that GDM affects my health after delivery."* - 22-year-old female BE graduate working in SBI from Puducherry

*"I went to the nearby government hospital for my child's vaccination 45 days after delivery. But nobody informed about postnatal blood sugar testing."* - 32-year-old multipara, MA graduate, a school teacher from Puducherry

#### **Code 7b. Reassurance that blood sugar levels will be normal after delivery**

Most women said their doctors had advised them that their blood glucose levels would be normal after delivery.

*"Doctor advised that blood sugar levels will be normal after delivery. Doctors didn't advise me after delivery to check my sugar levels".* - 22-year-old Homemaker, 12<sup>th</sup> standard from Puducherry

#### **Code 7c. Lack of testing facilities in primary health centers**

Some women claimed that the nearby health centers did not have facilities for blood glucose testing. They were asked to visit a higher center for blood glucose monitoring.

*"When I enquired about blood sugar checkups at my nearby government, they told me there is no facility in that hospital for*

a checkup. I checked my blood sugar at a private hospital after three months." - 34 years old graduate from Puducherry

## Discussion

This study was a part of a randomised controlled trial that explored the factors affecting postnatal screening among mothers with GDM in India. In our in-depth interview, we found that lack of awareness and misconceptions about GDM, knowledge practice gap, lack of family support, and perception of health system failure by mothers with GDM were considered barriers by the postnatal mothers.

Our study results showed that lack of awareness about GDM was the important cause of women not undergoing postnatal blood glucose monitoring. This finding was consistent with previous studies, which also reported inadequate education about GDM as an obstacle to postpartum diabetes screening.<sup>[18]</sup> Older women, those women who have a family history of DM, perceived themselves as having an increased risk for DM.<sup>[20,21]</sup> Our study results were similar to previous studies showing that some women with the previous history of GDM do not consider themselves to be at increased risk for having diabetes. Other factors like lack of time due to other work and poor family support played an important role in poor compliance with postnatal blood glucose monitoring.<sup>[18,21]</sup> Similar to another study, our results showed that lack of patient understanding and awareness of the risks of T2DM and the low motivation for self-care are reasons for low postnatal screening.<sup>[22]</sup> Knowledge practice gap is a significant obstacle to postnatal T2DM screening as described in a qualitative study which shows procrastination, gaps in intention, and action are essential factors associated with failure to postpartum diabetes screening.<sup>[18]</sup> A study by Keely *et al.* (2010)<sup>[13]</sup> demonstrated that there is a neglected barrier that affects postpartum T2DM screening rates, despite the perceived importance of screening by the patients. In our in-depth interview, we also found difficulties in travel with a child after delivery to a health center, distance from the health facility, and lack of women's decision-making authority in their family were perceived as barriers by postnatal mothers. A study by Bennet *et al.*<sup>[23]</sup> showed that fear of receiving a diabetes diagnosis at the visit was identified as a key barrier. Some women have a glucometer at their homes to monitor their blood glucose levels, resulting in reduced postnatal visits to the hospital for blood glucose monitoring. In our study, 8 participants used a glucometer to check blood glucose levels at home. In their perception of health system failure, women were not routinely advised regarding postnatal screening at discharge, reassurance by the health practitioners that blood glucose levels will be normal after delivery, and

lack of testing facilities in primary health centers were considered barriers.<sup>[18]</sup>

Our in-depth interview found that health concerns, advice from health facilities regarding postnatal screening, mobile reminders, health information booklet, and family support facilitated postnatal screening. Our study results were consistent with previous studies that showed mothers with concerns about their health and advice regarding postpartum T<sub>2</sub>DM screening were considered facilitating factors for postnatal screening.<sup>[18,21,24]</sup> During our in-depth interview, most women in our study accepted that booklets and mobile reminders had facilitated their postnatal blood glucose testing after delivery. This finding was in line with other studies conducted in different countries which showed significant improvement in postpartum T2DM screening after counseling or other health education tools.<sup>[25-28]</sup> A study by Mohebbi *et al.*,<sup>[29]</sup> showed that self-efficacy was the significant predictor for adopting healthy lifestyle behaviours for pregnant women with GDM which indicated that adopting interventions using educational strategies can lead to better self-management and improvement among pregnant women with low self-efficacy. A study by Capula *et al.*,<sup>[30]</sup> reported that following verbal and written antepartum counseling improved the postpartum screening rate from 24.1% to 62.4% in the Iranian Population.

In the present study, the qualitative part explored the barriers and facilitating factors of postnatal blood glucose monitoring that strengthen the quantitative results, further improving the validity of the study findings. This in-depth interview provided more profound insights into the current problem and helped us find possible solutions. Barriers to postpartum screening as perceived by the mothers and health care practitioners must be considered before implementing reminders and other interventions into the program. The health education booklet improves awareness about GDM among mothers with GDM, reduces the fear of undergoing tests, and improves the screening rate. Healthcare practitioners should be adequately trained to counsel mothers with GDM regarding postnatal blood glucose monitoring at six weeks during discharge, nutrition, and physical activity. Strengthening testing facilities at the primary health center level and all mothers with GDM should be followed by the field workers regarding their postnatal blood glucose testing during the standard postnatal visit. The cost of interventions must be considered at a larger scale before implementing these strategies into the program.

A few limitations of this study must also be considered. First, the study excluded illiterate mothers, so their perceptions regarding barriers and facilitating factors

could not be explored in this study. This is mainly because health education booklets could not be administered to illiterate mothers. Secondly, we have included mothers with GDM from a tertiary hospital where mothers were referred from various primary health centers and private clinics, which includes patients with diverse experiences and perceptions. However, concerns about waiting time, treatment facilities, and satisfaction with services were different in a tertiary hospital. But it can be applied to other tertiary health facilities interested in developing interventions to improve postnatal T2DM screening.

## Conclusion

Our qualitative study has strengthened the findings of the previous RCT, and it would provide insights to develop further interventions to improve postnatal blood glucose monitoring. Addressing the barriers affecting postnatal blood glucose monitoring and generating awareness among mothers with GDM reduces the fear of undergoing the tests and improves postnatal screening uptake for T<sub>2</sub>DM. Strengthening the standard advice on postnatal screening and giving booklets and mobile reminders facilitate the uptake of postnatal screening. Ministry of Health can include health education booklets and mobile call reminders into the current program considering the cost of the intervention in the community setting.

## Acknowledgements

We would like to thank all the study participants for agreeing to take part in the trial. We would also like to thank the JIPMER Research monitoring committee, the Ethics Clearance committee for approval of the study, the intramural fund committee for research funding, and the staff in JIPMER for their support.

**Abbreviations:** Gestational diabetes mellitus (GDM), Type 2 Diabetes Mellitus (T2DM), Women and Child Hospital (WCH), COnsolidated criteria for REporting Qualitative research (COREQ), International Association of Diabetes in pregnancy (IADPSG) criteria, Randomised Controlled trial (RCT), In-depth interview (IDI), Oral Glucose Tolerance Test (OGTT).

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Financial support and sponsorship

Intramural Research Fund Committee, JIPMER.

## Conflicts of interest

There are no conflicts of interest.

## References

- World Health Organization. Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy. World Heal Organ 2013;1–6. Available from: [https://apps.who.int/iris/bitstream/handle/10665/85975/WHO\\_NMH\\_MND\\_13.2\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/85975/WHO_NMH_MND_13.2_eng.pdf?sequence=1&isAllowed=y). [Last accessed on 2022 Feb 06].
- Gestational diabetes. Available from: <https://www.idf.org/our-activities/care-prevention/gdm>. [Last accessed on 2022 Feb 06].
- GDM booklet.pdf. Available from: <https://www.worlddiabetesfoundation.org/sites/default/files/GDM%20booklet.pdf>. [Last accessed on 2022 Feb 22].
- Jiwani A, Marseille E, Lohse N, Damm P, Hod M, Kahn JG. Gestational diabetes mellitus: Results from a survey of country prevalence and practices. JMaternFetal Neonatal Med 2012;25:600–10.
- Melchior H, Kurch-Bek D, Mund M. The prevalence of gestational diabetes. DtschArzteblInt 2017;114:412–8.
- Morampudi S, Balasubramanian G, Gowda A, Zomorodi B, Patil AS. The challenges and recommendations for gestational diabetes mellitus care in India: A review. Front Endocrinol (Lausanne) 2017;8:56.
- Bhavadharini B, Mahalakshmi MM, Anjana RM, Maheswari K, Uma R, Deepa M, *et al.* Prevalence of gestational diabetes mellitus in urban and rural tamil Nadu using IADPSG and WHO 1999 criteria (WINGS 6). Clin DiabetesEndocrinol 2016;2:8.
- O'Sullivan JB. Diabetes mellitus after GDM. Diabetes 1991;40:131–5.
- Kjos SL, Buchanan TA, Greenspoon JS, Montoro M, Bernstein GS, Mestman JH. Gestational diabetes mellitus: The prevalence of glucose intolerance and diabetes mellitus in the first two months post partum. Am JObstetGynecol 1990;163:93–8.
- Sanderson H, Loveman E, Colquitt J, Royle P, Waugh N, Tan BK. Improving uptake of postnatal checking of blood glucose in women who had gestational diabetes mellitus in universal healthcare settings: A systematic review. J Clin Med 2018;8:4.
- Rajasekar G, Muliylil DE, Cherian AG, Prasad JH, Mohan VR. Prevalence and factors associated with gestational diabetes mellitus among antenatal women at a rural health center in Vellore. J Assoc Physicians India 2019;67:42–7.
- Thanawala U, Divakar H, Jain R, Agarwal MM. Negotiating gestational diabetes mellitus in India: A national approach. Medicina (Kaunas) 2021;57:942.
- Keely E, Clark H, Karovitch A, Graham I. Screening for type 2 diabetes following gestational diabetes. Can Fam Physician 2010;56:558–63.
- KS. Patterns of and Factors Associated with Postpartum Diabetes Screening in Women Diagnosed with Gestational Diabetes Mellitus in Malappuram District. 2016.
- Manoj J, Vandhana G, Manohar A, Dinesh B. Diagnosis & Management of Gestational Diabetes Mellitus 2018;1-78. [https://nhm.gov.in/New\\_Updates\\_2018/NHM\\_Components/RMNCH\\_MH\\_Guidelines/Gestational-Diabetes-Mellitus.pdf](https://nhm.gov.in/New_Updates_2018/NHM_Components/RMNCH_MH_Guidelines/Gestational-Diabetes-Mellitus.pdf)
- Mishra S, Bhadoria AS, Kishore S, Kumar R. Gestational diabetes mellitus 2018 guidelines: An update. J Family Med Prim Care 2018;7:1169–72.
- Lithgow GE, Rossi J, Griffin SJ, Usher-Smith JA, Dennison RA. Barriers to postpartum diabetes screening: A qualitative synthesis of clinicians' views. Br J Gen Pract 2021;71:e473–82.
- Rafii F, Rahimparvar SFV, Mehrdad N, Keramat A. Barriers to postpartum screening for type 2 diabetes: A qualitative study of women with previous gestational diabetes. Pan Afr Med J



- 2017;26:54.
19. Dennison RA, Fox RA, Ward RJ, Griffin SJ, Usher-Smith JA. Women's views on screening for Type 2 diabetes after gestational diabetes: A systematic review, qualitative synthesis and recommendations for increasing uptake. *Diabet Med* 2020;37:29–43.
  20. Teh K, Quek IP, Tang WE. Postpartum dietary and physical activity-related beliefs and behaviors among women with recent gestational diabetes mellitus: A qualitative study from Singapore. *BMC Pregnancy Childbirth* 2021;21:612.
  21. Shang J, Henry A, Zhang P, Chen H, Thompson K, Wang X, *et al.* Chinese women's attitudes towards postpartum interventions to prevent type 2 diabetes after gestational diabetes: A semi-structured qualitative study. *Reprod Health* 2021;18:133.
  22. Quaresima P, Visconti F, Chiefari E, Puccio L, Foti DP, Venturella R, *et al.* Barriers to postpartum glucose intolerance screening in an Italian population. *Int J Environ Res Public Health* 2018;15:2853.
  23. Bennett WL, Ennen CS, Carrese JA, Hill-Briggs F, Levine DM, Nicholson WK, *et al.* Barriers to and facilitators of postpartum follow-up care in women with recent gestational diabetes mellitus: A qualitative study. *J Womens Health (Larchmt)* 2011;20:239–45.
  24. Kim C, McEwen LN, Kerr EA, Piette JD, Chames MC, Ferrara A, *et al.* Preventive counseling among women with histories of gestational diabetes mellitus. *Diabetes Care* 2007;30:2489–95.
  25. Kebede AS, Ajayi IO, Arowojolu AO. Effect of enhanced reminders on postnatal clinic attendance in Addis Ababa, Ethiopia: A cluster randomized controlled trial. *Glob Health Action* 2019;12:1609297.
  26. Cormick G, Kim NA, Rodgers A, Gibbons L, Buekens PM, Belizán JM, *et al.* Interest of pregnant women in the use of SMS (short message service) text messages for the improvement of perinatal and postnatal care. *Reprod Health* 2012;9:9.
  27. Jareethum R, Titapant V, Chantra T, Sommai V, Chuenwattana P, Jirawan C. Satisfaction of healthy pregnant women receiving short message service via mobile phone for prenatal support: A randomized controlled trial. *J Med Assoc Thai* 2008;91:458–63.
  28. Pastore I, Chiefari E, Vero R, Brunetti A. Postpartum glucose intolerance: An updated overview. *Endocrine* 2018;59:481–94.
  29. Mohebbi B, Tol A, Sadeghi R, Mohtarami SF, Shamshiri A. Self-management intervention program based on the Health Belief Model (HBM) among women with gestational diabetes mellitus: A quazi-experimental study. *Arch Iran Med* 2019;22:168–73.
  30. Capula C, Chiefari E, Vero A, Iiritano S, Arcidiacono B, Puccio L, *et al.* Predictors of postpartum glucose tolerance testing in Italian women with gestational diabetes mellitus. *ISRN Endocrinol* 2013;2013:182505.

## **Annexure 1:**

**Reference:** Effectiveness Of Mobile Call Reminders and Health Information Booklet to Improve Postnatal Blood Glucose Monitoring Among Mothers with Gestational Diabetes Mellitus Receiving Care from a Tertiary Health Centre, Puducherry - A Randomized Controlled Trial (Accepted online for publication on 21.07.2022 in Indian Journal of Endocrinology and Metabolism)

## **Annexure 2:**

### **INTERVIEW GUIDE FOR IN DEPTH INTERVIEW**

#### **Barriers And Facilitating Factors of Postnatal Blood Glucose Monitoring After Structured Intervention Among Mothers With Gestational Diabetes Mellitus Receiving Care From A Tertiary Health Centre, Puducherry - A Qualitative study**

**Welcome Note:** Thanks for agreeing to be part of the In-depth interview. I appreciate your willingness to participate.

#### **Introduction:**

One trained person will take down the notes, later translate from Tamil to English and will note the non-verbal communication/gestures/attitudes and prepare the sociogram. Audio recording of the interview will be done.

#### **Explain the purpose of In depth interview:**

The interview is to know the perception of the individuals in the study regarding the postnatal blood glucose monitoring and to explore the reasons for not undergoing postnatal blood glucose test.

#### **GROUND RULES FOLLOWED:**

There is no right or wrong answer

- The person can give varying opinions
- Information provided in the interview must be kept confidential
- No one else other than a note taker, interviewer and interviewee should be present at the time of interview
- Interviewer should not interrupt the flow of speech of the participant. Let him/her speak freely

#### **Sociodemographic details**

Warm up:

1. Name:
2. Age:
3. Service area:
4. Address:
5. Education:
6. Occupation:

Explain the purpose of this in-depth interview

#### **Body of IDI**

1. Introduction
2. What do u mean by GDM? What are the complications of GDM?
3. What are the concerns or worries about GDM on your health? (Mothers health (short term, long term), diet, child care, glucose monitoring, future risk, future pregnancy)
4. What is your satisfaction of health services in JIPMER /any other health facilities? (Advice by doctors, Advice of ASHA at PHC, Private practitioner, etc.)
5. What is your opinion on the usefulness of glucose monitoring at health facility?

6. What challenges did you face for undergoing postnatal blood glucose monitoring? (Fear, distance, support, family, health knowledge, discomfort while undergoing the test)
7. In your personal opinion what are the reasons why do some women refuse to undergo postnatal screening? (Probe on what they know about the reasons for refusal)
8. What is your suggestion to improve the postnatal blood glucose monitoring in the hospital? (Feasibility, who, how)

**GENERAL PROBES TO BE USED:**

Silent probe  
Gestures (Hmm, what else)  
Can you tell me more about that?  
What about that? What do you mean by that?  
What makes you feel that way? Can you think of an example of that?  
What are some of your reasons for feeling as you do?  
You started to say something about....  
You mentioned something about....  
Concluding speech -- Summarizing the ideas emerged from in depth interview

**THANKING THE PARTICIPANT**