

## Research Article

# Knowledge and Attitudes on Gestational Diabetes Mellitus and its Associated Factors among a Selected Population of Pregnant Mothers Attending Antenatal Clinics in Mathugama, Western Province of Sri Lanka

Wimalajeewa T.M.D.Y.D.<sup>1\*</sup> and Hettiaratchi U.P.K.<sup>2</sup>

<sup>1</sup>Department of Nursing and Midwifery, Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka

<sup>2</sup>Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

### Abstract

**Introduction:** Diabetes Mellitus (GDM) has become an emerging metabolic disorder around the world leading to type 2 diabetes mellitus in two generations, including the mother and the offspring. Complications associated with GDM can be prevented by proper management of the disease. This study aimed to assess knowledge and attitudes on GDM and its associated factors in a selected population of pregnant mothers in Sri Lanka. **Methods:** A descriptive cross-sectional study was carried out among eight antenatal clinics in the Mathugama Medical Officer of Health (MOH) area, Sri Lanka. Pregnant mothers of less than 20 weeks of gestation (n=150) attending the above clinics were selected by convenience sampling. A pre-tested, interviewer-administered questionnaire was used as the data collection instrument. The SPSS version 23 was used for data analysis. Descriptive statistics, visual binning, independent sample t-test and bivariate correlation were used as statistical tools. **Results:** Only 4.7% of participants had developed GDM previously. The mean gestational age of the study participants was 12±5 weeks. The mean percentage knowledge score regarding GDM was 36.1±23.3%. Only 20.0% had good knowledge and 35.3% had poor knowledge about GDM. Age (p=0.017), level of education (p=0.024), history of GDM (p=0.033), and family history of diabetes mellitus (p=0.025) had significant associations with the knowledge on GDM. In addition, positive correlations were found between the mean knowledge score for GDM and gestational age (p=0.001), and the gravidity (p=0.018) of the participants (p<0.05). **Conclusions:** Only a minority of the study group (20.0%) had good knowledge about GDM while, more than 50.0% of the participants showed positive attitude towards the management of GDM. Therefore, taking measures to enhance the pregnant mothers' knowledge regarding GDM is a timely and important action that ultimately leads to healthy pregnancy outcomes.

**Keywords:** Gestational diabetes mellitus, Pregnant mothers, Knowledge, Attitudes, Associated factors

### Introduction

Gestational Diabetes Mellitus (GDM) is defined as “carbohydrate intolerance resulting in hyperglycaemia of variable severity with the onset of first recognition during pregnancy” [1]. It is one of the most common metabolic disorders that occur during pregnancy and affects up to 12.9% of pregnancies worldwide [2]. This disorder is often diagnosed between the 24<sup>th</sup> and 28<sup>th</sup> weeks of a

\*Corresponding author: deminiwimalajeewa@gmail.com  
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Pregnancy. The prevalence of GDM is rapidly rising throughout the world and, the highest prevalence of GDM has been reported from the South-East Asian region [4]. According to a study conducted in a suburban district in Sri Lanka in 2014/2015, the prevalence of GDM in Sri Lanka was 13.9% [5], and it is a 65.5% rise with the prevalence of GDM reported in 2004 (8.4%) [6]. Pathophysiology of GDM is similar to Type 2 Diabetes Mellitus (T2DM) and occurs due to peripheral insulin resistance associated with insulin secretory defects. This resistance is developed due to the reduction of insulin action by human placental lactogen and certain other hormones produced during pregnancy [7].

The occurrence of GDM can lead to life-threatening complications in both the mother and the offspring. The common perinatal and neonatal adverse outcomes of GDM include fetal macrosomia, shoulder dystocia, birth injuries, hypoglycemia, polycythemia, and hyperbilirubinemia [8]. In addition, the offspring of mothers with GDM are at a greater risk of developing childhood obesity and early onset of T2DM later in their life [9]. Moreover, women with GDM have a greater risk of developing T2DM in their life with a seven-fold rise when compared to women without GDM [10]. A Sri Lankan study had reported that the women with GDM in the index pregnancy are 10.6 times more likely to develop diabetes within ten years than women without GDM. The same study had also reported that the incidence density of diabetes in mothers with GDM is 56.3 per 1000 person-years, but it is 5.4 per 1000 person-years in mothers without GDM [11].

This common metabolic disorder in pregnancy can be preventable through early diagnosis and proper management of the disease. However, insufficient awareness regarding the severity of this disease and its preventive measures leads to poor control and self-management of this disorder. Therefore,

pregnant mothers, especially those in their first trimester, require proper education about GDM. This would help the mother to maintain good control of her blood sugar level throughout the pregnancy. Ultimately, it may lead to a healthy pregnancy outcome by overcoming maternal and fetal complications associated with GDM.

Assessment of knowledge and attitudes regarding GDM and its associated factors among pregnant mothers has a vital contribution to the society. It helps to determine the current knowledge level of GDM among the pregnant population and arrange more effective continuous education programmes for antenatal women to overcome this rising metabolic disorder. Thus, this study was conducted to assess the knowledge and attitudes of pregnant mothers on GDM and its associated factors in a selected population of pregnant mothers attending antenatal clinics in Sri Lanka. The findings of this study will help to upgrade the maternal health information in Sri Lanka and reduce negative maternal outcomes associated with GDM.

## **Methods**

### ***Study design***

This descriptive cross-sectional study was carried out among eight antenatal clinics in the Mathugama MOH area, Kalutara District, Western Province, Sri Lanka from October to November 2018.

### ***Study population***

Pregnant mothers under 20 weeks of gestation and attending eight antenatal clinics in the Mathugama MOH area, Kalutara District, Sri Lanka were recruited by convenience sampling. Sample size for this study was calculated using Lwanga and Lemeshow formula  $[n=z^2p(1-p)/d^2]$ , n-desired sample size, d-standard error (d=0.05), z-standard normal variation (z=1.96), p-the most recent community prevalence of GDM in Sri Lanka (0.139) [5]. Although the calculated sample size

was 184, a sample of 150 was enrolled for the current study due to the limited time and resources. Pregnant mothers who had been diagnosed to have pre-existing diabetes were excluded from the study.

### **Data collection**

Data collection procedure was carried out while the participants were waiting for their clinic appointments without disturbing clinic routines using a pre-tested interviewer administered questionnaire. The first part of the questionnaire (Part A) consisted of socio-demographic characteristics and pregnancy related information. Part B and C consisted of questions to assess the knowledge and attitudes on GDM and its associated factors, respectively. They were developed using a guiding questionnaire designed by Madras Diabetes Research Foundation for Women in India for GDM Strategy (WINGS) project, with their permission [12]. The questionnaire consisted of both open and closed-ended questions and some questions had allowed giving multiple answers for the participants. The questionnaire was translated into Sinhala by the investigator, and it was presented in both Sinhala and English languages. The data collection instrument was pre-tested before going to the actual study population using a sample of ten pregnant mothers. All questions included in the questionnaire were checked for their completeness, language, correctness and free of issues, and understandability by the participants.

### **Statistical analysis**

A scoring system was performed as follows to assess the knowledge regarding GDM. For the closed-ended questions, correct answers were graded as “1” and incorrect answers (including don’t know answers) were graded as “0”. According to the above grading system, the maximum score for the knowledge section was ten and that was converted to 100%. Then the overall knowledge level regarding GDM was categorized

as follows using the visual binning statistical tool in Statistical Package for Social Science (SPSS); <20% as poor, 20-50% as average, and >50% as good. Descriptive statistics, visual binning, independent sample t-test and bivariate correlation were used as statistical tools. Attitudes of the study participants towards GDM were categorized as positive and negative. All the “yes” answers for the given attitudinal items were considered as “positive”, and “no” answers were considered as “negative”. All data were analyzed using SPSS version 23.0. The p value <0.05 was considered as the level of significance.

### **Ethical consideration**

The ethical approval for the study was obtained from the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura (Ref: Nur/13/18). The approval for the data collection procedure was sequentially obtained from the Provincial Director of Health Services, Colombo, the Regional Director of Health Services, Kalutara and the MOH, Mathugama. The purpose of the study was explained using an information sheet, and written consent was obtained from the participants before administering the questionnaire. After obtaining informed consent, the subjects who wished to participate in the study were interviewed individually.

### **Results**

Out of the 150 study participants, 34.0% were primigravida (n=51). Among the participants, the majority (84.0%) were Sinhalese, the major ethnic group of the country. The mean gestational age of the participants was 12±5 weeks. Only 4.7% of multigravida had developed GDM previously. The majority (32.7%) belonged to the age category of 25-29 years, and 36.7% had education up to the General Certificate of Education (Advanced Level). The socio-demographic characteristics of the participants are shown in Table 1.

Knowledge of the participants on the various aspects of GDM is shown in Table 2. Among the study participants, 40.0% knew that GDM is a type of diabetes that appears for the first time during pregnancy. When considering knowledge on risk factors of GDM, 58.0% identified family history of T2DM as a strong risk factor for developing GDM. The mean percent score for participants' knowledge regarding GDM was  $36.1 \pm 23.3\%$ , with a minimum of 0.0% score to a maximum of 90.0%. Overall, 35.3% had poor, 44.7% had average and 20.0% had a good knowledge regarding GDM.

The responses received for the statements related to the attitudes of the participants towards GDM are shown in Table 3. Most participants (96.0%) believed that it is good for all pregnant mothers to undergo screening for GDM during pregnancy and 87.3% believed that mothers with GDM must undergo a blood sugar test after their delivery. In comparison, 40.0% had negative attitudes towards the need for an annual blood sugar test for mothers with GDM after delivery. More than 50.0% of the participants had positive attitudes towards all the statements made on the management of GDM.

**Table 1:** Socio- demographic characteristics of pregnant mothers (n=150)

Characteristics	Category	Frequency (n)	Percentage (%)
Age (Years)	Less than 20	9	6.0
	20-24	18	12.0
	25-29	49	32.7
	30-34	43	28.7
	35 or above	31	20.7
Ethnicity	Sinhala	126	84.0
	Tamil	15	10.0
	Muslim	9	6.0
Highest level of education	Grade 1-5	4	2.7
	Grade 6-10	19	12.7
	Up to GCE O/L	50	33.3
	Up to GCE A/L	55	36.7
	Diploma	5	3.3
	Degree	17	11.3
Gravidity (Number of children delivered)	1	51	34.0
	2	51	34.0
	3	35	23.3
	4	10	6.7
	5 or above	3	2.0
BMI (Kgm <sup>2</sup> ) (Recorded at the booking visit)	Less than 18.5	23	15.3
	18.5- 24.9	74	49.3
	25.0- 29.9	43	28.7
	30.0 or above	10	6.7
Previous history of GDM (Out of 99 multigravida women)	Yes	7	4.7
	No	92	61.3

G.C.E.- General Certificate of Education, O/L- Ordinary Level, A/L- Advanced Level, BMI- Body Mass Index, GDM- Gestational Diabetes Mellitus

**Table 2:** Knowledge of pregnant mothers on various aspects of gestational diabetes mellitus (n=150)

Knowledge elements	Percentage (n)
Is GDM a type of diabetes appearing for the first-time during pregnancy?	
Yes	40.0% (60)
No	31.3% (47)
Don't know	28.7% (43)
What are the known risk factors in developing GDM?*	
Family history of T2DM	58.0% (87)
Obesity	33.3% (50)
History of GDM in previous pregnancies	48.7% (73)
Advanced maternal age ( $\geq 35$ years)	34.0% (51)
Don't know	20.7% (31)
What are the long-term health effects of children born to GDM mothers?*	
Childhood obesity	26.0% (39)
Glucose intolerance	49.3% (74)
T2DM in childhood and adolescence	37.3% (56)
Don't know	30.7% (46)
In which trimester screening for GDM is carried out?	
First trimester (1-12 weeks)	62.7% (94)
Second trimester (13-28 weeks)	11.3% (17)
Third trimester (29-40 weeks)	6.7% (10)
Don't know	19.3% (29)
How long after delivery should a GDM woman perform a blood sugar test?	
At 6 weeks	24.0% (39)
At 3 months	16.7% (25)
At 6 months	4.7% (07)
Within one year	1.3% (02)
Don't know	53.3% (80)

GDM- Gestational Diabetes Mellitus, T2DM- Type 2 Diabetes Mellitus,

\* Multiple responses were allowed

Age ( $p=0.017$ ), level of education ( $p=0.024$ ), history of GDM in previous pregnancies ( $p=0.033$ ), and family history of diabetes in first degree relatives ( $p=0.025$ ) were significantly associated with the level of knowledge. There was no association between the mean knowledge score of pregnant mothers and history of miscarriages/stillbirths ( $p=0.208$ ). Further, the mean knowledge score was significantly correlated with gestational age ( $p=0.001$ ), and gravidity ( $p=0.023$ ) (Table 4).

## Discussion

This study was implemented to assess the knowledge and attitudes towards GDM and its associated factors among a group of pregnant women in Sri Lanka. The most significant information we derived from this study is that only a very low fraction of the study group (20.0%) had good knowledge of GDM while, more than 50.0% of the participants possessed a positive attitude towards all the statements asked on the management of GDM.

**Table 3:** Attitudes of the pregnant mothers towards gestational diabetes mellitus (n=150)

Statements	Response	
	Yes (Positive)	No (Negative)
It is good for all pregnant women to undergo screening for GDM during pregnancy.	96.0% (144)	4.0% (06)
Good control of blood sugar in GDM is necessary to prevent maternal and neonatal complications.	88.7% (133)	11.3% (17)
It is important for GDM mothers to make sure their blood sugar has returned to normal after delivery.	95.3% (143)	4.7% (07)
It is necessary for GDM mothers to have a blood sugar test performed after delivery.	87.3% (131)	12.7% (19)
It is necessary for GDM mothers undergo a blood sugar test annually after delivery.	60.0% (90)	40.0% (60)

GDM- Gestational Diabetes Mellitus

**Table 4:** Factors associated with the knowledge level of pregnant mothers regarding gestational diabetes mellitus

Factors	Frequency (n)	Mean	SD	p-value
Age 35 years or above	31	45.2	± 22.9	0.017
Tertiary education (Diploma and Degree)	22	45.5	± 19.5	0.024
History of GDM in previous pregnancies	7	58.6	± 21.9	0.033
Family history of diabetes in the first-degree relatives	36	43.6	± 20.7	0.025
History of miscarriages or still births	23	42.2	±25.0	0.208

GDM- Gestational Diabetes Mellitus

Nearly one-third of study participants (31.3%) responded that GDM is not a type of diabetes that occurs for the first-time during pregnancy. As experienced during the data collection procedure, those participants had a misconception about GDM and pre-existing diabetes mellitus. They believed that GDM could not be first diagnosed during pregnancy and it is diabetes that continues from the pre-conception period and, during pregnancy, it is called gestational diabetes. They didn't know that diabetes may be detected for the first-time during pregnancy, even in a previously

non-diabetic woman.

The observed mean knowledge level on GDM (36.1±23.3%) in this study was lower when compared to a study conducted in South Tamil Nadu where the mean knowledge score for GDM among their participants was 46.1% [12]. Another study conducted in Samoa has reported that 58.0% of their participants were aware that diabetes could occur for the first time during pregnancy [13]. The results of the current study revealed that the participants had confused information regarding

GDM and pre-existing diabetes mellitus. Lack of distribution of accurate and precise information to pregnant mothers about the difference between GDM and pre-existing diabetes mellitus had been noticed as the major reason for the participants' misconceptions.

Knowledge about risk factors responsible for the development of GDM during pregnancy was significantly low among the study participants. When questioned about risk factors in developing GDM, 20.7% did not know any risk factor for GDM while, only 24.0% identified all four risk factors for developing GDM mentioned in the questionnaire (Family history of T2DM, obesity, previous history of GDM, and advanced maternal age  $\geq 35$  years). Similar to an earlier study conducted in South India [12], the majority (58.0%) in this study also identified family history of T2DM as an important risk factor for developing GDM. When questioned about long term health consequences on children born to GDM mothers, glucose intolerance was the most reported answer (49.3%). However, 30.7% of participants were unaware of any long-term complications of GDM occurring in children. In the present study, the majority (62.7%) of pregnant mothers responded that screening for GDM is carried out in the first trimester of pregnancy and, 11.3% responded as second trimester. A study conducted in South India had reported that 64.4% of their urban participants answered as first trimester for the same question [12].

It is recommended that all pregnant mothers with GDM should be screened for diabetes mellitus at six weeks postpartum [14]. However, most of the pregnant mothers (53.3%) in our study were not aware of the appropriate timing of post-partum screening for T2DM following GDM. Only 24.0% of participants reported that post-partum blood sugar testing should be performed six weeks after the delivery of a GDM mother.

According to study results, 40.0% of participants showed negative attitudes towards the need of GDM mothers to undergo annual blood sugar testing after the delivery. Among the participants who showed negative attitudes to the given attitudinal statements, the majority were multigravida. Only 60.0% of the participants showed positive attitudes towards all the above tested attitudinal items. There are very few previous studies to compare attitudes of pregnant mothers towards GDM. According to an earlier study conducted in Bangladesh, 84.1% of their participants had strongly agreed with the attitudinal statement "regular blood glucose testing is needed for women with GDM", while 9.3% had no desire for regular blood glucose monitoring after the pregnancy [15]. In the current study, the majority of pregnant mothers (96.0%) believed that it is suitable for all pregnant women to undergo screening for GDM during pregnancy while, 12.7% of pregnant mothers had negative attitudes towards the need for GDM mothers to have a blood sugar test performed after delivery.

In the current study, significant relationships were observed between mean knowledge score for GDM and women with age  $\geq 35$  years ( $p=0.017$ ), the highest level of education ( $p=0.024$ ), history of GDM in previous pregnancies ( $p=0.033$ ), and family history of diabetes in the first-degree relatives ( $p=0.025$ ). Further, positive correlations were found between the mean knowledge score and gestational age ( $p=0.001$ ) and gravidity ( $p=0.018$ ) of the participants. These findings align with the results of a previous study (conducted in Zambia), where a significant correlation was found between knowledge of GDM and gravidity ( $p=0.013$ ). The same study had further reported that multigravida mothers had more knowledge of GDM than primigravida mothers ( $p=0.013$ ), and parous women had more knowledge of GDM than nulliparous women ( $p=0.01$ ). However, the same study had reported no significant correlation

between knowledge score and pregnant mothers' level of education ( $p=0.12$ ) [16].

This study observed a low level of knowledge of GDM among the group of pregnant women in Sri Lanka. Also, the rate of GDM has increased in Sri Lanka [5]. According to two population-based studies conducted in Sri Lanka, the prevalence of GDM was 8.4% in 2004 [6] and 13.9% in 2014/2015 [5]. Since this is a considerable fraction, a lack of knowledge on the context seems to be a threat to good maternal outcomes. Since the pregnant mothers have a positive attitude towards the management of GDM, though the level of knowledge is low, the knowledge enhancing strategies would be easily implemented to enhance their knowledge.

Therefore, the present study recommends that educational strategies are needed to improve the knowledge on GDM and clear misconceptions among pregnant mothers regarding pre-existing diabetes mellitus and GDM. Thus, enhancing the knowledge of pregnant mothers regarding GDM will help them to maintain good practices to protect from this global health burden and ultimately lead to a healthy pregnancy outcome.

### Limitations of the study

Participation of relatively a smaller number of pregnant mothers from few antenatal clinics, use of convenient sampling method, and the use of categorized data for continuous variables like age and body mass index recorded at the booking visit of the participants could be considered significant limitations of the present study.

### Conclusions

Only a minority of studied pregnant mothers had a high level of knowledge on GDM while the majority possessed a positive attitude towards GDM. Pregnant women with age  $\geq 35$  years, the highest level of education, history of GDM in

previous pregnancies and family history of diabetes in first degree relatives had significant associations with knowledge of GDM of pregnant mothers, while there was no significant association between knowledge of GDM of pregnant mothers and history of miscarriages/stillbirths ( $p>0.05$ ). The present study findings can help the healthcare providers in the successful implementation of educational programs to improve the knowledge of pregnant mothers regarding GDM and minimize adverse outcomes of GDM in Sri Lanka.

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