

# Risk Factors of Gestational Diabetes Mellitus and its Awareness among Pregnant Women: A Study from a Tertiary Care Hospital of Kolkata

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## ABSTRACT

**Introduction:** Gestational diabetes mellitus (GDM) has been defined as "any degree of glucose intolerance with onset or first recognition during pregnancy." Study aimed to find out the risk factors of gestational diabetes mellitus and awareness among pregnant women attending antenatal clinic of a tertiary care hospital.

**Material and methods:** An observational cross-sectional study was conducted on 142 pregnant women who visited the Outpatient Department of Obstetrics by using a pretested predesigned structured interview schedule. The study variables included socio-demographic variables like age, education, occupation, and socioeconomic status. The risk factors of GDM included parity, gravida, positive family history of diabetes mellitus or GDM, history of ever being diagnosed with GDM, irregular menstrual history, birth complications, absence of regular exercise, infrequent consumption of fruits and vegetables and excess consumption of processed and salty food. Knowledge regarding gestational diabetes was assessed by using a pretested, predesigned, structured, questionnaire. For each correct response one mark was ascribed, which added up to a total score of 14.

**Results:** 60% of the women were multigravida and only one fifth reported engaging in at least half an hour of physical exercise daily. 42.2% of the study population had fair knowledge about gestational diabetes mellitus. Knowledge score was found to be significantly ( $p < 0.05$ ) associated with age and regular physical exercise in multivariate analysis and regular physical exercise in univariate analysis. Majority of the study population had obtained their knowledge from either family or friends/neighbours (26% respectively), followed by doctors (25%).

**Conclusion:** This study unearths the fact that education regarding gestational diabetes mellitus and motivation for lifestyle modifications diabetes is of utmost importance in preventing gestational diabetes mellitus.

**Keywords:** Gestational Diabetes Mellitus; Parity; Gravida; Diet; Exercise

them were due to gestational diabetes. The vast majority of cases of hyperglycaemia in pregnancy were in low- and middle-income countries, where access to maternal care is often limited.<sup>3</sup>

India currently has the second highest number of people with type 2 diabetes (66 million)<sup>2</sup> in the world; almost half of these cases are women. International Diabetes Federation estimates that 6 million births are affected by some form of hyperglycaemia in pregnancy in India alone, of which 90% are due to GDM.<sup>2</sup> Numerous factors raise a pregnant woman's risk of developing gestational diabetes, including tendency of obesity before becoming pregnant, age > 25 years, history of GDM, relatives with diabetes<sup>4,6</sup>, greater parity, history of macrosomia, history of adverse perinatal outcomes<sup>4</sup>, history of smoking before getting pregnant, non-white race<sup>5</sup> and history of irregular menses.<sup>6</sup>

In the above background, it is very important for pregnant women to be aware of the risk factors of GDM and its consequences on themselves and their babies, both during and after pregnancy. This can be a major way of primordial and primary prevention of type 2 diabetes mellitus, apart from preventing stillbirths and macrosomia. Data on awareness of women regarding this disease are therefore necessary to employ methods of further increasing their understanding and motivating them to lead a healthier life. Such data have been obtained through a few researches<sup>7,8,9,10,11</sup> but there is lack of data regarding this issue in eastern India. Therefore, this study attempted to find out the risk factors of gestational diabetes mellitus among pregnant women attending antenatal clinic of a tertiary care hospital.

Current study objectives were to assess the level of knowledge regarding gestational diabetes in the study population, to assess the prevalence of risk factors of gestational diabetes in the study population and to study the socio-demographic

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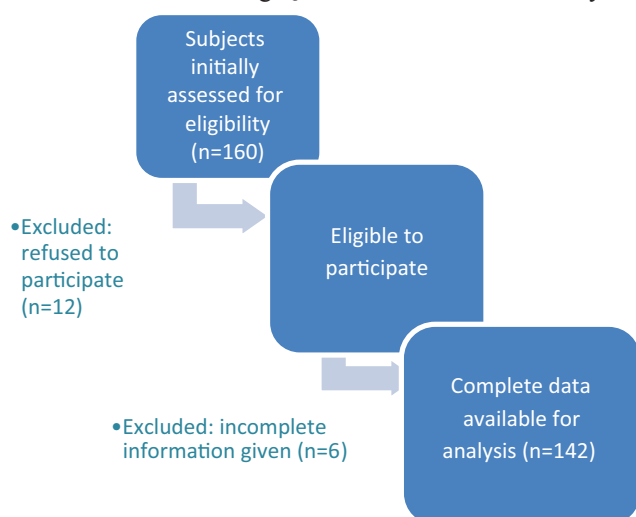


variables of the study population.

## MATERIAL AND METHODS

An Observational(type) cross-sectional study was conducted on 160 women attending the Outpatient Department (OPD) of Obstetrics in Institute of Post Graduate Medical Education & Research for antenatal check-up from January to August, 2018. The Out Patient Department of Obstetrics runs from 9 am to 2 pm from Monday to Friday. The researcher visited the Obstetric OPD every day (from Monday to Friday) for a period of two weeks during the month of July, 2018 for data collection. Data was collected by exit interview of every 10th patient during this period after obtaining informed consent from the participants, maintaining anonymity. Any severely ill patient or those who were unable to follow any one of the three languages: English, Bengali or Hindi were excluded from the study.

Flow Chart of Screening Qualified Women in the Study:



**Inclusion criteria:** All consenting pregnant women attending the obstetrics out patient's department of Institute of Post Graduate Medical Education and Research, Kolkata.

**Exclusion criteria:** Those who were very ill or were unable to understand any one of the three languages: English, Bengali or Hindi or refused to proceed after initial consent.

**Sample size:** Sample size was calculated taking 9.7% as the prevalence (p)<sup>19</sup> of diabetes in India, q as (p-100%) and allowable error (e) as 5% and putting them into the formula: sample size=4pq/e<sup>2</sup>. Therefore, the expected sample size was approximately 140. Data collection was carried out over a period two weeks during the month of July 2018, when the Outpatient Department of Obstetrics was visited everyday (from Monday to Friday). During these two weeks every tenth patient was interviewed, which totalled to a number of 142.

**Data collection:** Data was collected using a pre-designed, pre-tested, validated, structured schedule. After designing the schedule, it was pretested and validated by experts of Community Medicine. It was translated into local languages (Hindi and Bengali) for participants understanding and re-

translated and validated by experts to ensure reliability.

The schedule consisted of 28 questions divided into 3 parts. The first part of the schedule was for recording socio-demographic variables like age, occupation, literacy, etc. The second part of the schedule was for recording the risk factors of GDM like parity, gravida, positive family history of diabetes mellitus or GDM, history of ever being diagnosed with GDM, irregular menstrual history, birth complications, absence of regular exercise, infrequent consumption of fruits and vegetables and excess consumption of processed and salty food.

The third part of the questionnaire elicited knowledge of the participants regarding GDM like knowledge regarding risk factors and causes of GDM, source of knowledge etc.

Knowledge regarding gestational diabetes was scored by ascribing 1 mark to each correct response of the knowledge questions, which added up to total of 14. The total score thus obtained was divided into good, fair and poor using quartiles. This study was approved by the Institutional Ethics Committee with protocol number Inst/IEC/2018/489 on 23 June, 2018. Data were collected maintaining anonymity. Informed written consent was also obtained prior to data collection.

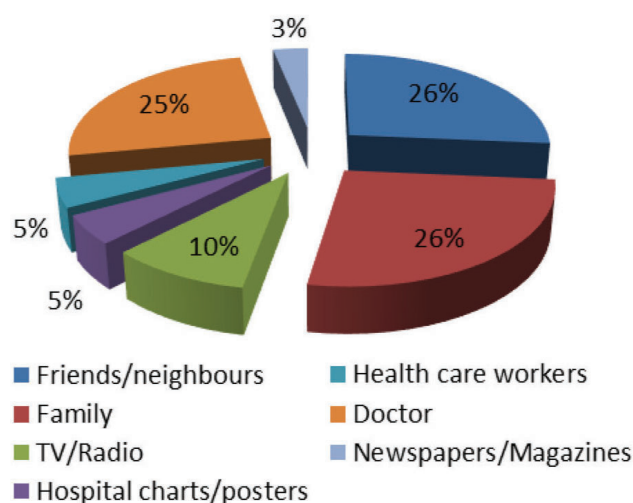
## STATISTICS ANALYSIS

Level of knowledge was scored by ascribing one mark to every question related to various aspects of GDM and adding them up to a total of 14. The score was graded using the quartile method. Data analysis was done using MS excel and SPSS(version 25, IBM)

## RESULTS

### Sociodemographic characters of the population

About half (49.3%) of the study population was aged between 19 and 25 years. And 43.0% was aged between 26 and 35 years. Very few were aged less than or equal to 18 years or were above 35 years of age (6.3% and 1.4%, respectively). Nearly 17% of the population had graduated and only 2.1% were illiterate. Majority (62.7%) of the study population



**Figure-1:** Distribution of study population according to their source of knowledge regarding GDM (n=142).

Age (in years)	Frequency	Percentage (%)
<=18	9	6.3
19-25	70	49.3
26-35	61	43.0
36-45	2	1.4
Education	Frequency	Percentage (%)
Illiterate	3	2.1
Non-formal education	1	0.07
Primary school	14	9.9
Middle school	34	23.9
Secondary	34	23.9
Higher secondary	32	22.5
Graduate and above	24	16.9
Socioeconomic status [SES]	Frequency	Percentage (%)
Upper middle class	15	10.6
Middle class	26	18.3
Lower middle class	89	62.7
Lower class	12	8.5
Occupation*	Frequency	Percentage (%)
Unemployed	126	88.7
Unskilled worker	6	4.2
Semiskilled worker (fast food shop owner, tailor)	6	4.2
Skilled worker	2	1.4
Professional	2	1.4

\*1. Unskilled worker<sup>20</sup>

An unskilled employee is one who does operations that involve the performance of simple duties, which require the experience of little of no independent judgment or previous experience although familiarity with the occupational environment is necessary.

2. Semi-skilled worker<sup>20</sup>

A semiskilled worker is one who does work generally of defined routine nature wherein the major requirement is not so much of the judgment, skill and but for proper discharge of duties assigned to him or relatively narrow job and where important decisions made by others.

3. Skilled worker<sup>20</sup>

A skilled employee is one who is capable of working efficiently of exercising considerable independent judgement and of discharging his duties with responsibility.

4. Professional<sup>21</sup>

Person formally certified by a professional body of belonging to a specific profession by virtue of having completed a required course of studies and/or practice. And whose competence can usually be measured against an established set of standards.

**Table-1:** Distribution of the study population according to their socio-demographic profile (n=142)

belonged to the lower middle class group, followed by middle class group (18.3%) as per modified B.G Prasad scale 2017.<sup>13</sup> Majority (88.7%) of the study population were unemployed (Table 1).

### Presence of risk factors of gestational diabetes

About a third (32.4%) of the study population had a family history of diabetes. Regarding gynaecological history, it was found that nearly 60% of the population was multigravida. 8.5% of the study population had been diagnosed with GDM either in their current pregnancy or in their previous

Risk factor	Frequency	Percentage (%)
Positive family history of diabetes mellitus (n=142)	46	32.4
Multigravida (n=142)	84	59.2
Being parous (n=142)	86	60.5
Positive history of ever being diagnosed with gestational diabetes diagnosed with GDM (n=142)	12	8.5
Positive history of irregular menstrual periods (n=142)	85	59.9
Positive history of birth complications in previous pregnancies (n=86)	30	34.9
No habit of regular exercise (n=142)	110	77.5
Consumption of less than 4 days of fruits (n=142)	47	33.1
Consumption of less than 4 days of vegetables (n=142)	12	8.4
Consumes sweets and processed food (n=142)	47	33.1
Always/often adds extra salt with meals (n=142)	61	43.0
Always/often consumes salty snacks (n=142)	43	30.3

**Table-2:** Distribution of the study population according to the presence of risk factors of gestational diabetes (n=142).

Score	Frequency	Percentage (%)
0 to 4 (poor knowledge)	39	27.5
5 to 9 (fair knowledge)	60	42.2
10 to 14 (good knowledge)	43	30.3

**Table-3:** Distribution of the study population according to their knowledge score (n=142).

pregnancies. Three-fifths (59.9%) of the study population gave a history of irregular menstrual periods and 34.9% reported birth complications in their previous pregnancies. Regarding physical activity, it was found that majority (77.5%) did not have a habit of exercising regularly. Dietary patterns revealed that about a third (33.1%) of the population consumed fruits for less than 4 days of a week, although majority (91.5%) of the population took vegetables almost every day of a week (4 or more days). Nearly two fifths (43%) of the population always or often took salt during meals. And 30.3% always/often consumed salted and fried snacks (Table 2).

### Knowledge regarding gestational diabetes

Among the study population, 42.2% had fair knowledge about gestational diabetes mellitus, 27.5% had poor knowledge, and 30.3% had good knowledge (Table 3).

### Association of knowledge regarding gestational diabetes and socio-demographic variable

Among sociodemographic variables, knowledge score was found to be significantly associated with the age ( $\geq 25$  years) of the study population ( $P < 0.05$ ) on multivariate analysis. However other than age other socio-demographic variables

Age	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
<= 25	25(17.6)	34(23.9)	20(14.1)
>25	14(9.9)	26(18.3)	23(16.2)
Chi square=2.609; Df=2; p=0.27			
Education	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Graduate and above	6(4.2)	15(10.6)	3(2.1)
Not graduate	43(30.3)	62(43.7)	13(9.2)
Chi square=1.16; Df=2; p=0.56			
Occupation	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Unemployed	42(29.5)	51(35.9)	33(23.2)
Unskilled worker	2(1.4)	1 (0.7)	3(2.1)
Semiskilled worker	0(0)	3(2.1)	3(2.1)
Skilled worker	1(0.7)	1(0.7)	0(0)
Professional	0(0)	1(0.7)	1(0.7)
Chi square=7.04; Df=8; p=0.53			
Socioeconomic status	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Upper middle class	3 (2.1)	8 (5.6)	4 (2.8)
Middle class	7 (4.9)	14 (9.9)	5 (3.5)
Lower middle class	35 (2.5)	34(2.4)	20 (14.1)
Lower class	8(5.6)	2(1.4)	2 (1.4)
Chi square=9.596; Df=6; p=0.19			

**Table-4:** Distribution of the study population according to their socio-demographic profile and knowledge score (n=142).

Gravida	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Multigravid	18 (12.7)	41(28.9)	25 (17.6)
Primigravid	21 (14.8)	19 (13.4)	18 (12.7)
Chi square = 4.839; Df=2; p=0.09			
Parity	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Nulliparous	19(13.4)	20 (14.1)	17(12.0)
Parous	20(14.1)	40 (28.2)	26 (18.3)
Chi square=2.343; Df=2; p=0.31			
History of ever being diagnosed with gestational diabetes	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Yes	2 (1.4)	4 (2.8)	6 (4.2)
No	37 (26.1)	56 (39.4)	37 (26.1)
Chi square=2.48; Df=2; p=0.29			
History of irregular menstrual periods	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Yes	25(17.6)	32 (22.5)	28(19.7)
No	14(9.9)	27 (19.0)	16 (11.3)
Chi square =1.33; Df=2; p=0.51			
Regular exercise	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)
Yes	3(2.1)	14(9.9)	15(10.5)
No	37(26.1)	45 (31.7)	28(19.7)
Chi square=7.86; Df=2; p=0.01			

**Table-5:** Distribution of the study population according to their knowledge score and presence of risk factors of GDM (n=142).

did not show any significant relation with knowledge score either on univariate or multivariate analysis (Tables 4 and 6).

#### Association of knowledge regarding gestational diabetes and presence of risk factors

When risk factors were considered, it was found that being multigravid, parity, history of gestational diabetes or of irregular menses did not have significantly higher knowledge in either univariate or multivariate analysis.

Also, knowledge scores were significantly higher among the respondents who had undertaken regular exercise compared with those who had no regular exercise ( $P < 0.05$ ) on both

univariate and multivariate analysis (Tables 5 and 7).

#### Source of knowledge regarding gestational diabetes

Majority of the study population had obtained their knowledge from either family or friends/neighbours (26%, 26% respectively), followed by doctors (25%). However, very few had obtained their knowledge from mass media like TV/Radio (10%), hospital charts/posters (5%) and newspaper/magazines (3%) or health care workers (5%) (Figure1).

#### DISCUSSION

In our study, 42.2% of the study population had 'fair'



		Estimate	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
Knowledge category (reference category = good knowledge)	Poor knowledge	.728	1.847	.694	-2.893	4.349
	Fair knowledge	2.609	1.864	.162	-1.044	6.263
Age		.082	.037	.025	.011	.154
Education	Graduate and above	.034	.404	.933	-.758	.826
	Not graduate	0	.	.	.	.
Occupation	Unemployed	-.203	1.543	.895	-3.227	2.821
	Unskilled worker	.781	1.783	.661	-2.714	4.276
	Semiskilled worker	1.040	1.783	.560	-2.454	4.534
	Skilled worker	-1.960	1.973	.320	-5.828	1.907
	Professional	0	.	.	.	.
Socioeconomic status Class	Upper	-22.060	.000	.	-22.060	-22.060
	Upper Middle	-.118	.614	.847	-1.321	1.085
	Middle	-.558	.679	.411	-1.889	.773
	Lower Middle	0	.	.	.	.

**Table-6:** Multivariate analysis of knowledge score and socio-demographic factors (n=142).

		Estimate	Standard error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
Knowledge (reference category= good knowledge)	Poor	.588	1.673	.725	-2.691	3.867
	Fair	2.545	1.687	.131	-.761	5.851
History of gestational diabetes mellitus	Present	1.211	1.047	.247	-.841	3.263
	Absent	.470	.861	.585	-1.217	2.157
History of irregular menstrual periods	Present	.971	1.410	.491	-1.793	3.734
	Absent	.903	1.420	.525	-1.881	3.687
Gravida	Nulligravid	-.913	.969	.346	-2.812	.987
	Multigravid	0	.	.	.	.
Regular Exercise	Yes	1.206	.422	.004	.379	2.033
	No	0	.	.	.	.
Parity	Nulliparous	.823	.977	.400	-1.092	2.738
	Multiparous	0	.	.	.	.

**Table-7:** Multivariate analysis of knowledge score and risk factors of GDM (n=142).

knowledge about gestational diabetes mellitus which is slightly lower compared with a study conducted by Shriram et al (56.7%).<sup>8</sup> Of the study population, 27.5% had 'poor' knowledge which is almost similar (25.8%) to that found by Shriram et al. However, a sizeable fraction (30.3%) of the study population had 'good' knowledge in contrast to the study conducted by Shriram et al (17.5%).<sup>8</sup>

In our study on multi variate analysis, it was found that knowledge scores were significantly associated with older age (>25 years) in contrast to that observed in the study conducted by Shriram et al.<sup>8</sup> However, Price et al<sup>7</sup> had found a significant relation between younger age and better knowledge of GDM. In our study, higher education (graduate and above) was not significantly associated with having fair to good knowledge regarding GDM similar to the study conducted by Shriram et al<sup>8</sup> but in contrast with the study conducted by Bhavadharini et al.<sup>14</sup>

In our study, better knowledge score was not significantly associated with respondents with higher gravida and parity which is also corroborated by Shriram et al.<sup>8</sup>

Of the women in the present study, 8.5% had been diagnosed

with gestational diabetes in their previous or current pregnancies. This data was quite in par with the prevalence value found out in Western India<sup>16</sup> (9.5%) but a much lower value of 3.8% was reported in Kashmir.<sup>17</sup> Tamil Nadu<sup>14</sup>, Lucknow<sup>18</sup> and Punjab<sup>19</sup> were reported to have a much higher value, with 17.9%, 41.0%, 35.0%, respectively.

It was found in the current study that 59.9% of the women had history of irregular menstrual periods. A study conducted by Sivakumar et al<sup>6</sup> reported that 37.27% of women in their study had irregular menstrual cycle, of which 45.9% women developed GDM in their early period of gestation. Thus according to their study, irregular menstrual cycle is a risk factor for future GDM. But in our study, knowledge wasn't significantly associated with history of irregular periods.

Of the study population, 77.5% of the population didn't engage in regular physical exercise, and only 22.5% had undertaken regular physical activity. However, those who had regular physical exercise had significantly better knowledge regarding GDM. A similar observation was made in a study conducted in Cameroon.<sup>9</sup> They had noted that a majority (60.1%) of women were not sufficiently active and

only 12.4% were active prior to and during their pregnancy. In contrast, the study<sup>7</sup> conducted in Samoa reported that above 90% of the women in their study had stated that they exercised at least once a week through dance, walking or swimming.

Nearly one third of the study population always/often or sometimes consumed salted and fried snacks (30.3% and 29.6% respectively). Similar results (29%) were found by Price et al in their study.<sup>7</sup> The fact that 43.0% of the population always or often took salt during meals points towards a potential area of antenatal counselling to prevent the development of hypertension during pregnancy.

In the present study, majority of the study population had obtained their knowledge from either family or friends/neighbours (26%, 26% respectively), followed by doctors (25%). However, very few had obtained their knowledge from mass media like television/radio (10%), hospital charts/posters (5%) and newspaper/magazines (3%) or health care workers (5%). Similar results were obtained by Shriram et al in their study<sup>8</sup> conducted in South India. Majority of the women in their study reported television/radio, neighbours/friends and family members as a source of knowledge. However, doctors played a major role (37%) in the study conducted in Samoa by Price et al, which was quite remarkable.<sup>7</sup> This implies the need for health care workers and medical professionals to be much more involved in spreading awareness regarding various aspects of gestational diabetes to all pregnant mothers coming for antenatal check-up, irrespective of whether they are diagnosed with GDM or not.

Being aware of the risk factors of GDM and its consequences on pregnant mothers and their babies, can be a major way of primordial and primary prevention of type 2 diabetes mellitus, apart from preventing stillbirths and macrosomia. However, there is a lack of data on awareness of women regarding this disease. This study provides the much needed data especially from Eastern part of the country.

The study was primarily done in a tertiary hospital setting. It would have been more enriching if the data could be collected from community level or from primary health care facility.

## CONCLUSION

In conclusion, 27.5% of the study population had poor knowledge regarding GDM. Good knowledge of GDM was significantly associated with higher age of the mothers and habit of regular exercise. Source of acquiring knowledge was from either family or friends/neighbours, followed by doctors.

Considering the fact that risk factors for GDM was present in a considerable proportion of the population, it becomes extremely important to screen for the same in every pregnant women. Imparting knowledge of GDM should be made a priority during antenatal visits. This can be done at the level of primary health care facility to maximize the impact. Also, only a small proportion of the study population had obtained their knowledge from mass media like television/

radio, so mass media and catchy messages need to be utilised for imparting knowledge regarding GDM. Adequate posters and banners should be also displayed in waiting areas and antenatal clinics. Thus, the burden of GDM can be greatly reduced if proper measures are taken to impart adequate knowledge.

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