

Awareness Regarding Gestational Diabetes Mellitus among Antenatal Women of Rural West Bengal : A Mixed-method Study

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Abstract:


Introduction: Awareness regarding Gestational Diabetes Mellitus (GDM) among antenatal women is necessary for early diagnosis and management of the disease for ensuring a safe motherhood and a healthy child. **Objective:** This study envisaged to assess the awareness regarding GDM and its determinants among antenatal women attending healthcare facilities in a rural area of West Bengal and to explore the perspectives of health workers with regard to gaps in proper awareness generation activities among antenatal women. **Method:** This mixed-method study was conducted from April 2021 to July 2021 at 4 health facilities in Singur, West Bengal. Quantitative data were collected from 195 antenatal women using a pretested questionnaire which were analysed using SPSS software. Qualitative data were collected via in-depth interviews among 6 health workers working in the health facilities and were analysed thematically. **Results:** Overall, 75.4% of participants were not aware of GDM. Multivariable logistic regression analysis showed that secondary education and below (AOR=3.48, 95% CI=1.63-7.42), no history of GDM among family & relatives (AOR=7.24, 95% CI=2.12-24.66), lesser number of antenatal visits (AOR=3.48, 95% CI=1.63-7.42) and non-receipt of counselling regarding GDM during antenatal visits (AOR= 3.09, 95% CI =1.45-6.58) had a significant association with poor awareness. From health workers' perspectives, lack of reorientation training, shortage of supplies for testing, and overburdening with other responsibilities were the major gaps identified in proper awareness generation activities. **Conclusion:** Present study revealed majority of study participants possessed poor knowledge regarding GDM. Reorientation training of health workers, organizing awareness campaigns at the community level, and relevant counselling regarding GDM during each antenatal visit should be given utmost priority for improving knowledge about the disease.

Keywords: Awareness, Gestational Diabetes Mellitus, Mixed-method, Rural

Introduction:

According to the International Diabetes Federation (IDF), worldwide, 1 in 6 live births (20 million) is affected by hyperglycemia in pregnancy, 84% of which have gestational diabetes mellitus (GDM).^[1] GDM is defined as any degree of glucose in-

tolerance with onset or first recognition during pregnancy.^[2,3] As per IDF report on 2019, the prevalence of GDM in the Southeast Asian region and India is estimated to be 27% and 28.5% respectively.^[1] Evidences show that, in India, women are at much higher risk of developing glucose

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Halder R, Paul B, Bandyopadhyay L, Bhattacharya M, Das R, Banerjee A. Awareness Regarding Gestational Diabetes Mellitus among Antenatal Women of Rural West Bengal: A Mixed-method Study. Healthline. 2022; 13(1): 22-30.
	DOI : 10.51957/Healthline_318_2021	

intolerance during pregnancy as compared to white women. In pan India study conducted by The Federation of Obstetric and Gynaecological Societies of India (FOGSI) and Diabetes in Pregnancy Study Group of India (DIPSI) shows about 1/3rd of the pregnant women are diagnosed with GDM during the 1st trimester and over a quarter of them have a history of fetal loss in the previous pregnancies.^[4] Awareness of the condition among antenatal women will result in the prevention of the disease through lifestyle modification, better healthcare-seeking patterns, screening, early diagnosis, better self-care practice, and management.

However, studies around the world have shown a low level of awareness regarding the same among pregnant women. A study done by Almutairi et al.^[5] has found four out of five women (79.5%) to have a poor level of awareness toward the impact of maternal DM on the infant. Studies done in Uganda (Byakwaga et al)^[6] and Bangladesh (Bhowmik et al)^[7] found around 69% and 73.7% of women respectively do not have any awareness about GDM. Shriram, et al,^[8] in Tamil Nadu has found only a small proportion of rural antenatal women (17.5%) to have good knowledge about GDM.

As per the National Guidelines on Diagnosis and Management of GDM, 2014, revised in February 2018, the Government of India (GOI) integrated GDM diagnosis and management within antenatal care package in public health system. It recommends universal screening of pregnant women for GDM during antenatal period. Despite improvements in the access to antenatal care services across the country, there still remain gaps in providing some essential components such as awareness generation, universal testing and management of GDM.^[4]

It is the responsibility of the health system to generate awareness regarding such an important health issue like GDM. Understanding the stakeholders' perspectives, like the health workers, will help us understand the gaps in the delivery of essential components to achieve this goal. Hence qualitative exploration, in addition to quantitative

data is much more apt considering the current scenario.

With this backdrop, this mixed-method study was envisaged to assess the awareness level regarding GDM and its determinants among antenatal women residing in a rural area of West Bengal and to explore the perspectives of health workers with regard to gaps in proper awareness generation activities among antenatal women.

Method:

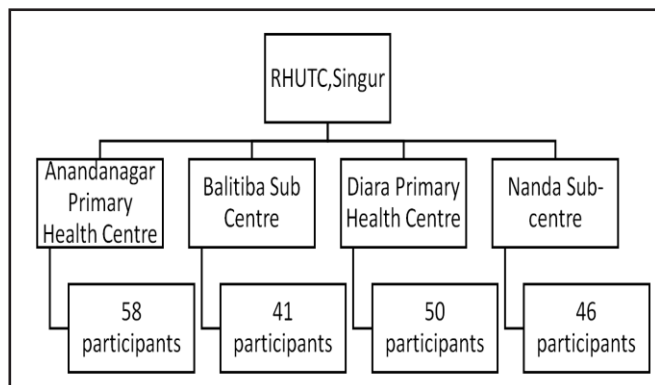
A descriptive cross-sectional study was conducted using mixed-method (both quantitative and qualitative) approach from April 2021 to July 2021 among the beneficiaries and service providers of the antenatal clinics of 4 randomly selected health centres in the field practice area of All India Institute of Hygiene and Public Health, Singur of Hooghly district, West Bengal.

Sampling: The study population for the quantitative part, were all the pregnant women availing antenatal care in these health centres who registered for antenatal care in the last 1 year before the start of data collection. Unwilling women, those who didn't give written informed consent were excluded from the study. A study done in Tamil Nadu^[8] showed prevalence of poor awareness regarding GDM among antenatal women to be 25.8%. So sample size for this study was calculated taking $p = 0.258$, confidence level-95%, Z value-1.96 and relative error of precision 25%, using the standard Cochran's formula,^[9] i.e., $\text{sample size} = Z^2pq/d^2 = (1.96)^2 \times 0.258 \times 0.742 / (0.0645)^2 = 176.7$ i.e., 177 Taking 10% as non-response the final sample size came to be $177 + 18 = 195$.

The first stage of the multistage sampling technique comprised of random selection of 4 health centres from the list of 6 health centres via lottery method under RHU&TC, Singur. Line-listing from the ANC register for all the pregnant women fulfilling eligibility criteria, was then done in the 2nd stage. In the third stage, proportionate allocation for each health centre was done according to the sample size. After that, participants were finally selected

randomly by lottery method from the available list of each health centre.

Figure 1: Flow chart showing the sampling procedure



For the qualitative part of the study, 6 field health workers working in these health centres (for at least 1 year duration) were purposively selected. It was ensured that from each health centre, at least one health worker was interviewed at first before going for next health worker from the same health centre. Data was collected till the point of data saturation Only those who were willing and gave informed written consent were included in the study.

Data Collection, Study Tools, and Parameters Used:

Study technique for the quantitative part of the study was face to face interview using pre-tested, pre-designed structured questionnaire. This tool was translated in Bengali language and pre-tested among 30 similar antenatal women outside study settings. It consists of:

- I) socio-demographic, clinical, obstetric, antenatal service-related variables, sources of information
- ii) Awareness regarding GDM among pregnant women was assessed with the help of a 20 item scale which was prepared after extensive literature review. It encompassed the following domains: natural history (2 items), risk factors (5 items), diagnosis (2 items), treatment (3 items), severity (4 items), prevention (3 items), beneficial activities to prevent GDM (1 item). Reliability of the scale was checked with Cronbach's alpha (0.69) along with inter-item correlation. Face & content validity was checked by public health experts. Each item was given the option

of 'Agree', 'Don't know' and 'Disagree' except the 2 items under the domain Knowledge on diagnosis of GDM (2 items), which was provided with options with only one correct response. Each correct response was given a score of 1 and incorrect response 0. The total score was calculated by adding the score of each item (ranged from 0 to 20). The cut off for having poor awareness was taken to be 50% of the attainable total scores i.e. 10. This means, those who scored 10 and below were considered to have poor awareness regarding GDM.

Simultaneously, for the qualitative part of the study, Key informant interviews (KIIs) using pre-designed pre-tested semi-structured interviewer guide, audio recorder and field notes, were conducted. Data collection was done till the point of data saturation. Field Health Workers were interviewed regarding their perspective on gaps in delivery of essential components for proper diagnosis and management of GDM (H1= working for 8 yrs in PHC, H2=working for 5 years in PHC, H3=working for 7 yrs in SC, H4= working for 4 yrs in SC, H5= working for 3 yrs in PHC, H6= working for 0 yrs in PHC). The time duration of each interview was around 20 minutes.

Data Analysis:

Quantitative data was analysed using Microsoft Excel 2016 and Statistical Package for Social Sciences software (version 16). Descriptive statistics for the predictor variables and the outcome variable (Awareness regarding GDM among pregnant women) were shown by frequency table, mean, median and interquartile range. Factors were then seen by test of significance (p-value<0.05) at 95% confidence interval in Univariate Regression Model after excluding multicollinearity. The final multivariable model included all the biologically plausible significant predictors in the respective univariate analysis.

Codes were used to extract information from the KIIs. The assessment was done regarding the gaps in proper awareness generation activities from the transcripts of the recorded KIIs. The responses of the participants were coded based on the guides

developed beforehand. Simultaneously, the field notes were also considered side by side to put the codes in appropriate context. Similar codes were put together and themes were generated.

Ethical Approval: Permission was taken from Institutional Ethics Committee of All India Institute of Hygiene and Public Health. Informed written consent was taken from each participant before data collection. Confidentiality was maintained throughout the process.

Results:

Among the 195 participants, median age of the study participants was 24 years {Interquartile Range (IQR)=22-28}. Majority of them were Hindu (89.2%) housewives (92.8%). Regarding socio-economic status (income calculated using BG Prasad scale^[10] for May 2021, Consumer Price Index (CPI) = 119.6),^[11] most of them belonged to class II (40%) followed by class I (32.8%). The median per capita income was 2250 (1285.7-3125). Most of the women had completed secondary education (31.8%).

Clinical characteristics showed majority of women (99.5%) having no history of gestational diabetes in current pregnancy. Only few (4.1%) of the study participants had a history of gestational diabetes mellitus in past pregnancy. Majority of women (91.3%) have no history of gestational diabetes mellitus among family & relatives. A very few participants (2.6%) were already diabetic from before current pregnancy. Some (36.4%) participants also presented with a family history of diabetes.

With respect to obstetric variable, around half of the women were Multigravida (51.3%) with about 27.2% of women having history of abortion in the past. Around 16.4% of the study participants had other complications such as hypothyroidism, headache, high blood pressure, edema and pain abdomen in current pregnancy. Only 8.2% of women had such complications in past pregnancy.

Antenatal service-related variables showed that around 44.1% women were in 1st trimester, followed by 37.4% women in 2nd trimester and the rest 18.5%

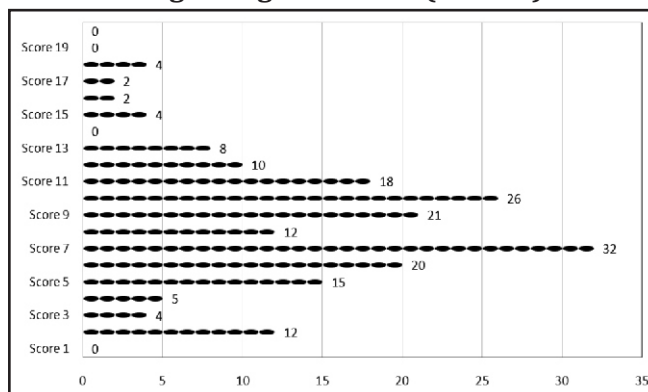
in their third trimester during the time of data collection. Majority (84.6%) of women had registered their pregnancy in 1st trimester. But most (64.1%) hadn't received any counselling regarding GDM during their antenatal visits. Those who received counselling regarding GDM, mainly (94.3%) received from field health workers.

Results showed that the major sources of information to the pregnant women regarding GDM were family and friends (34.9%), followed by health workers (23.6%). Doctors, hospital charts and posters combined comprised only 12.3% of source of information.

Awareness regarding GDM among pregnant women:

This study showed that about 3/4th (75.4%) of the study participants had poor awareness regarding GDM. Distribution of study participants according to the scores obtained are shown in Figure 2.

Figure 2: Dot Plot showing the scores obtained by the study participants in awareness regarding GDM scale (N= 195)



The median score obtained by the participants was 8 (IQR= 6-10). The awareness of the women on the various aspects of GDM is given in Table 1.

Factors associated with awareness regarding GDM:

Significant factors associated with poor awareness about GDM were Secondary education and below [AOR=3.48, 95%CI=1.63-7.42], absence of history of GDM among family & friends [AOR=7.24, 95% CI=2.12-24.66], less number of antenatal visits [AOR=3.48, 95% CI=1.63-7.42] and non-reception of

Table 1: Response of study participants on various aspects of Awareness Regarding GDM (N=195)

Items	Responses Correct N (%)
Awareness on Natural history of GDM	
Diabetes can present for the first time during pregnancy.	94(48.2)
Diabetes appearing in pregnancy disappears after birth of the baby.	35(17.9)
Awareness on risk factors of GDM	
Age >30yrs old	59(30.3)
Pre-pregnancy overweight/obese	83(42.6)
GDM in previous pregnancy	63(32.3)
Family history of diabetes	114(58.5)
Previous birth of overweight baby(≥4kg).	22(11.3)
Awareness on diagnosis of GDM	
Tests applied -as blood test after oral glucose load	80(41.0)
Women who need to be tested i.e. all pregnant women	144(73.8)
Awareness on treatment of GDM	
Carbohydrate restricted diet	135(69.2)
Oral antidiabetic drugs as treatment	31(15.9)
Insulin injection as treatment.	44(22.6)
Awareness on severity of GDM	
Can cause abortion	55(28.2)
Can result in low-birth weight baby	21(10.8)
Difficult labour	94(48.2)
Women have increased risk of developing diabetes in future.	45(23.1)
Awareness on behavioural factors which can prevent of GDM	
Regular exercise	148(75.9)
Low intake of processed and high sugar content food	155(79.5)
Intake of lots of fruits and vegetables	181(92.8)
Awareness on preventive strategies of GDM	
Breastfeeding reduce future chance of developing high blood sugar.	37(19.0)

counselling during antenatal visits [AOR= 3.09, 95% CI =1.45–6.58].The multivariable regression model deduced was of good fit (non-significant Hosmer-Lemeshow test, P-value >0.05) while 24% to 32% of the variance of poor awareness regarding GDM could be explained by this model (Table 2).

Qualitative exploration of the perspectives of health workers with regard to gaps in proper

awareness generation activities about GDM among antenatal women

The KIIs revealed 2 major themes: (I) gaps in health system and (II) gaps among the beneficiaries. The major subthemes identified under the first theme were 'Health Personnel', 'Logistics' and 'Unavailability of services' (Figure 3).

Table 2: Factors associated with poor awareness about GDM among the study participants : Logistic Regression analysis (N=195)

Variables	Total N	Poor awareness n (%)	Unadjusted Odds ratio (95% CI)	p-value	Adjusted Odds Ratio (95% CI) [#]	p-value
Age						
≤25yrs	118	95(80.5%)	1.98(1.02-3.84)	0.04	1.72(0.79-3.72)	0.16
>25yrs	77	52(67.5%)	1(Ref)		1(Ref)	
Religion						
Hindu	174	128(73.6%)	1(Ref)		--	--
Muslim	21	19(90.5%)	3.41(0.76-15.23)	0.10	--	--
Educational Qualification						
Higher secondary& above	81	50(61.7%)	1(Ref)		1(Ref)	
Secondary & below	114	97(85.1%)	3.53(1.78-7.00)	<.001	3.48(1.63-7.42)	0.001
Occupational status						
Housewife	181	139(76.8%)	2.48(0.81-7.55)	0.10	--	--
Employed	14	8(57.1%)	1(Ref)		--	--
Socio-economi status						
Upper Middle class & above	142	104(73.2%)	1(Ref)		--	--
Below upper middle class	53	43(81.1%)	1.57(0.71-3.43)	0.25	--	--
Gravidity						
Primigravida	95	76(80.0%)	1.63(0.84-3.17)	0.14	--	--
Multigravida	100	71(71.0%)	1(Ref)		--	--
H/O abortion (n=100)						
Present	53	41(77.4%)	1(Ref)		--	--
Absent	47	39(83.0%)	1.42(0.52-3.86)	0.48	--	--
H/O Diabetes in family						
Yes	71	50(70.4%)	1(Ref)		--	--
No	124	97(78.2%)	1.50(0.77-2.93)	0.22	--	--
H/O Gestational Diabetes Mellitus among family & relatives						
Yes	17	5(29.5%)	1 (Ref)		1(Ref)	
No	178	142(79.8%)	9.46(3.13-28.59)	<0.001	7.24(2.12-24.66)	0.002
Antenatal visits done till date of data collection(↓) ^b			0.74(0.57-0.96)	0.027	3.48(1.63-7.42)	0.001
Counseling regarding GDM						
Received	70	41(58.6%)	1(Ref)			
Not received	125	106(84.8%)	3.94(1.99-7.80)	<0.001	3.09(1.45-6.58)	0.003

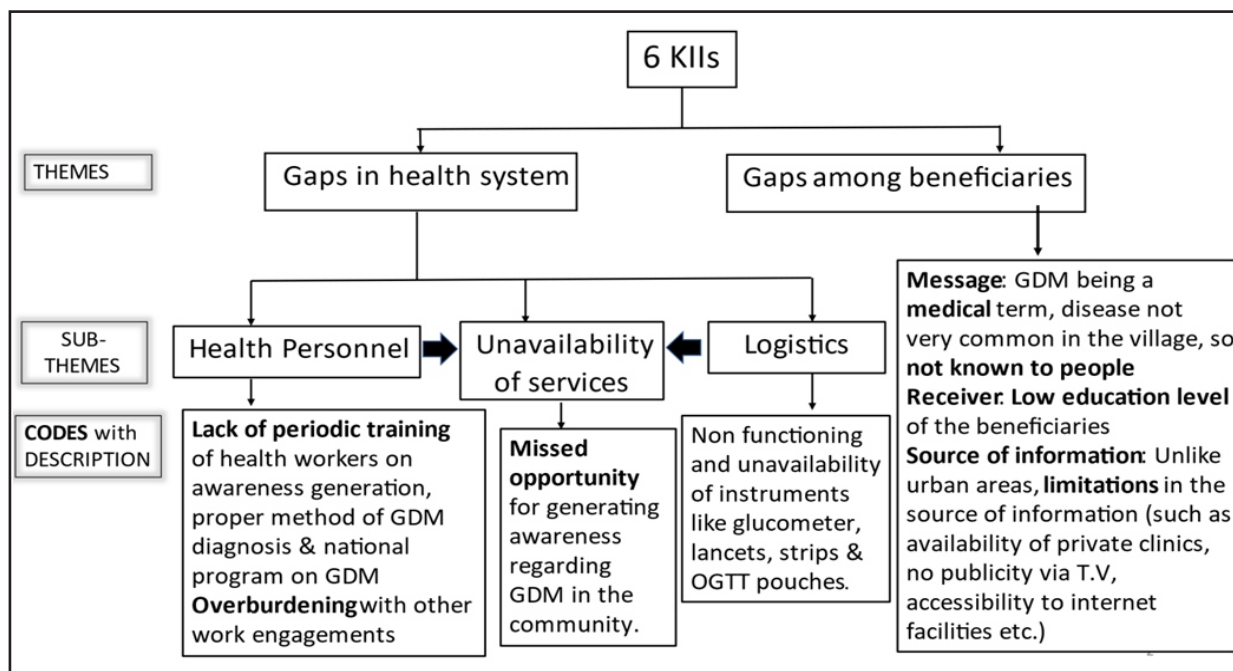
*continuous variables

[#]variables which have come significant in the univariate model have only been included in the final multivariable model (to estimate the adjusted odds ratio)

CI= Confidence Interval

Hosmer-Lemeshow test statistic=0.859, Cox and Snell's R²=0.241, and Nagelkerke's R²=0.321

Figure 3: Gaps in proper awareness generation regarding GDM



Under the 'Health Personnel' sub-theme, lack of periodic training of health workers on updates of GDM diagnosis and management and inadequate healthcare provider knowledge on GDM were the key gaps identified. Due to absence of standards, screening of women usually took place based on subjective judgement of providers. In this context, H5 & H6 respectively reiterated:

“No guideline or protocol is there regarding GDM. If we find any woman with high sugar level, we advise her in similar way as we advise any other high risk (Hypertensive, preeclampsia) women”

“I don't feel the need of counselling every pregnant women regarding gestational diabetes. This would cause unnecessary tension and anxiety even among them who don't have raised sugar level”

The major gap identified among the 'logistics' sub-theme was the unavailability of the instruments like glucometer, lancets, strips & OGTT (Oral Glucose Tolerance Test) pouches. Even if some of them were available, they were in non- functioning state. H2 said in this regard:

“Glucometer has been given to us but once the battery became non-functional, it was not replaced. Since we have laboratory attached with our PHC, we

also don't complain regarding that.”

The two sub-themes mentioned above were in fact contributing to the next sub-theme identified i.e., 'Unavailability of services'. Absence/ inefficiency of resources, both manpower and material hampers proper delivery of services to the women visiting the antenatal clinics, thereby, missing an opportunity to generate awareness regarding this preventable complication of pregnancy.

Under the second theme, low literacy level of the mothers & exposure to limited source of information were the major gaps identified. Notable verbatim by H1 in this regard was:

“They don't understand GDM. Some of them who are educated enough, know about diabetes. But even they don't know the difference between GDM and other types of diabetes.”

Discussion:

This mixed method study aimed to assess the awareness level regarding GDM among antenatal women attending health facilities in rural West Bengal and to explore the perspectives of health workers with regard to gaps in proper awareness generation activities.

The findings revealed that 75.4% of study participants had poor awareness regarding GDM which is quite similar to the findings from other studies. A study done by Byakwaga et al.^[6] in Uganda, showed around 69% of women were not aware about GDM. Ogu et al.^[12] in Southern Nigeria, assessed awareness of GDM among women of reproductive age and not pregnant women as ours and found around 73.8% of them had poor knowledge about GDM. On the contrary, a study done in Saudi Arabia^[13] and another done in Tamil Nadu, India,^[8] found only 33.8% participants and 25.8% had poor overall GDM knowledge score which shows that a lesser proportion of women were unaware of the disease.

Our study also showed secondary or below level of education to be significantly associated with poor awareness level of the study participants. This is quite similar to the findings by Lakshmi et al.^[14] where, participants with higher educational status were found to have a significantly higher mean knowledge score than their counterparts having lesser knowledge.

No history of Gestational Diabetes Mellitus among family and relatives showed significant association with poor awareness level in our study. This shows the level of impact that friends, family and relatives have in our society.

Lesser number of antenatal visits were also associated with poor awareness level in our study. This can be explained by the fact that with increasing number of ANC checkups, women are more likely to have had more chance of exposure to information on GDM from ANC clinics attended.

Our study also showed that those who didn't receive counselling regarding GDM during antenatal visits were more likely to have poor awareness level than their counterparts. It proves the importance of the vital role played by the field level health workers who are the first ones to attend the mothers in the antenatal clinics of sub centres and primary health centres.

The findings from the qualitative part of our study also strengthens our quantitative findings. It is the responsibility of the health system to organize awareness generation activities about such an important issue like GDM. But there were many lacunae in the health system itself that holds it back from executing its work effectively. Similar finding was obtained from studies done by Wotichaet al.^[15] in Ethiopia and Hinnah et al.^[16] in Africa, which also shows lack of standards and guidelines and inadequate on job training are among repeatedly mentioned obstacle related to screening and management of GDM. Present study also reveals that health facilities have shortage of supplies & consumables which prevents early detection and management of GDM. So, health system planners and leadership should consider fulfilling essential supplies for screening of GDM. Both the qualitative and quantitative part of our study had convergent findings which indicated that education has a strong impact on health literacy. This is congruent to the findings obtained by Carolan et al.^[17] in Australia. Pregnant women with higher education status are able to read health posters and have better understanding of the health information given to them by the health personnel during antenatal care. Educated women also have better access to mass media like internet which they can use to gain information and knowledge.

Conclusion:

This study reported a significant proportion (75.4%) of antenatal women having poor awareness regarding Gestational Diabetes Mellitus. Absence of counselling and low level of education were found to be significantly associated with poor awareness level. Therefore, there is need to improve health education programs both at the health centres and at the community level to empower patients with information regarding this grave issue. Women who have attained secondary education or less should be specifically targeted when giving health education sessions so as to increase their level of awareness on GDM. To improve this situation, health care

administrators and policymakers should also ensure that all pregnant women should at least have 4 antenatal visits accompanied by counseling regarding GDM at each visit, there is an adequate and timely supply of logistics and consumables to all health facilities starting from sub-centers and there is regular re-orientation training of all field-level health workers regarding diagnosis and management of GDM as per national guidelines.

Limitations of the Study:

This study was done as a cross-sectional interview, and hence the causal relationship between awareness regarding GDM and its predictors could not be determined. While most of the responses were recall-based, bias might be possible.

Declaration:

Conflict of interest: Nil

Funding: Nil

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