

Original Research Article

Health system determinants of gestational diabetes mellitus screening of pregnant patients in public health facilities of district Jhansi: a cross sectional study

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ABSTRACT

Background: Worldwide, one in 10 pregnancies is associated with diabetes, 90% of which are gestational diabetes mellitus (GDM). Undiagnosed or inadequately treated GDM can lead to significant maternal and fetal complications. Due to this high prevalence, currently universal screening is being done for all pregnant women. The present study aims to assess the status of screening at these facilities and the factors which can improve this further.

Methods: The status of screening was determined by GDM reporting format for last six months preceding the study from April 2018 to September 2018 and 100 auxiliary nurse midwives (ANMs) were selected from 4 blocks were interviewed to assess the factors and challenges which are associated with GDM screening with the help of a predesigned questionnaire.

Results: Overall 40.05% (73.17-14.27%) antenatal women are being screened in Jhansi district at public health facilities. The percentage of screened women found positive for GDM were 4.71% (1.36-8.99%). The factors found to be associated with screening were factors like age, years of service and education, availability of logistics, distance of sub-center within 10 km of the Community Health Centre (CHC), having both Accredited Social Health Activist (ASHA) and Anganwadi worker (AWW) as motivators and doing screening at all sites (sub-center and out-reach). ANMs who had their own vehicle were found to do better screening.

Conclusions: To make screening for GDM universal at all public health facilities continuous monitoring of sub-centers and VHNDs, support to ANMs in the form of availability of logistics, and involving the ASHA and AWW in routine screening are essential.

Keywords: Gestational diabetes mellitus, Pregnant women, Screening, DIPSI method

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance (IGT) with onset or first recognition during pregnancy. Worldwide, one in 10 pregnancies is associated with diabetes, 90% of which are GDM. Undiagnosed or inadequately treated GDM can lead to significant maternal and fetal complications. According to the hyperglycemia and adverse pregnancy outcome (HAPO) study the adverse pregnancy outcomes increase

with any one of the three values being increased, the fasting, the one hour and the two hour value.¹ Moreover, women with GDM and their off springs are at increased risk of developing type-2 diabetes later in life i.e. "transgenerational transmission occurs". Independent of genetic risk, offspring of hyperglycaemic pregnancies are at increased risk of early onset type 2 diabetes mellitus (type 2 DM) and obesity. Differences exist in offspring risk of diabetes and obesity based on time and type of diabetes

exposure in utero. There is a risk gradient and data suggest, glucose dose dependence in risk transmission.²

In India one of the most populous countries globally, rates of GDM are estimated to be 10-14.3% which is much higher than the west.³ The ICMR INDIAB study conducted between 2008-2013 showed the overall prevalence of diabetes in all 15 states of India was 7.3% (95% CI 7.0–7.5). The prevalence of diabetes varied from 4.3% in Bihar to 10.0% in Punjab and was higher in urban areas 11.2%, than in rural areas 5.2%, ($p < 0.0001$) and higher in mainland states 8.3% than in the northeast 5.9% ($p < 0.0001$).⁴ In a study from North India the overall prevalence of GDM was observed as 10%, with a regional prevalence of 10.77% at Bhilai, lower prevalence at Muzaffarpur 3.07% and 14% in Delhi with a mixed population.⁵

Due to this high prevalence currently, universal screening is being done for all pregnant women at the first antenatal visit and once thereafter in the second trimester if found negative in the first screening. Screening and appropriate management of GDM offers a unique opportunity to prevent DM in two generations the mother and the child. Indian study endorses the "single step procedure" for screening and diagnosis of GDM by 75 gm glucose challenge and checking the two-hour postprandial blood sugar. It is a simple and economical procedure and feasible in community based universal screening.⁶ In a hospital-based study by Chudasama et al using diabetes in pregnancy study group India (DIPSI) criteria 20.4% pregnant women were found to be positive at a tertiary care hospital in Rajkot, Gujrat.⁷ Universal screening of all pregnant women for GDM is being carried out in all public healthcare facilities in Uttar Pradesh from district hospitals right upto sub-centres. This had been introduced one year before this study was performed. The present study aimed to find out the status of implementation of this screening at Community Health Centres (CHCs) and sub-centres.

Objectives

The objectives of the study were to assess: the proportion of antenatal woman screened at public health facilities at CHCs of Jhansi district; the prevalence of GDM among antenatal women screened; and the factors which can facilitate this screening.

METHODS

This study is a cross sectional study, partly record based. The first two objectives are being fulfilled by record review of GDM reporting format from CMO office from which the frequency of screening for GDM in antenatal patients and the prevalence of GDM among antenatal women screened were determined. The third objective was fulfilled by interviewing the ANMs who carried out this screening. The GDM reporting format of each CHC was obtained from CMO office for a period of six months from April 2018-September 2018, after proper permission from

the Chief Medical Officer (CMO) of Jhansi district. The reporting format is a monthly report in a fixed format where all screenings done at its facilities (subcenters, PHCs and the CHC itself) are recorded along with the testing outcome and follow up details of the GDM positive women. The total number of antenatal registrations, the number of women screened and the number found positive in all eight CHCs were noted. This gave us an idea of the proportion of registered antenatal women screened and the proportion of screened women who were positive.

To determine the factors which would improve screening ANMs were interviewed. Permission was also taken from the CMO office to interview ANMs from 4 CHCs after explaining the purpose of the study. A self-designed questionnaire was used to interview ANMs to determine the factors associated with better screening. This questionnaire had details about the ANM like their age, years of service, place of posting, the number of pregnancies registered under them currently, training for GDM screening and challenges they faced. The questionnaire was pilot tested with ten ANMs. Nine out of ten ANMs were fully aware of the testing procedure and were doing it in their regular sessions.

Sample size calculation

Using 90% as the prevalence of optimum knowledge about screening and with z -alpha as 1.96, and taking 5% error using Laplace's equation.

$$\text{Laplace's equation} = z^2 pq / l^2$$

The sample size was found out to be 138. Since this sample size would be for an infinite population, we applied the correction for a finite population. The total number of ANMs in Jhansi district at the time of study were 329.

$$n = SS / [1 + (SS - 1) / N]$$

Applying the formula given below, we found n as 97.18, where SS is sample size for infinite population (138) and N is size of finite population (329). So, we decided to interview 100 ANMs.

Sampling

Out of the eight CHCs in Jhansi district, four were selected by lottery method and the CHCs were Babina, Badagaon, Chirgaon and Bangra. The Medical Officer in charge was contacted and on the day of their monthly meeting the ANMs were interviewed in the CHC after the meeting. The purpose of the study was explained to the ANMs and 25 ANMs were selected from those present again by lottery method. The names of ANMs present were added to a box and the slips withdrawn. Those who did not wish to participate were excluded. The principal investigator went to each of these CHCs on separate days and interviewed all ANMs. Written consent was taken from them and 25 ANMs were interviewed from each block.

Place of study

CHC of Babina, Badagaon, Chirgaon and Bangra all under district Jhansi were places of study for the research.

The data was entered in excel sheet and results displayed as frequencies and percentages. Chi-square test was applied to test for significance by Open Epi software. A p value of <0.05 was considered significant.

RESULTS

Figure 1 shows the number of women at all CHCs screened every month in Jhansi district. The total number of pregnant women screened in the district shows an increasing trend with every month, being 748 in April 2018 and 1581 in September 2018. Overall, 7391 patients were screened in 6 months.

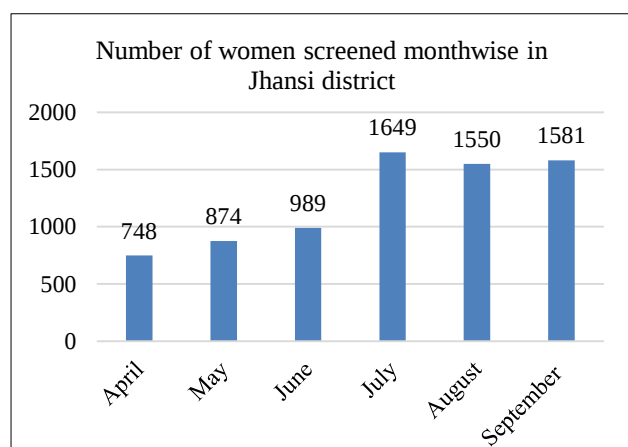


Figure 1: The number of women screened in Jhansi district every month.

Table 1 shows number of women screened and found positive from April 2018 to September 2018 at each CHC. Overall, 40.05% of antenatal women are being screened at CHCs of Jhansi district with Bangra (73.17%) and Babina (14.27%) districts screening the maximum and minimum numbers respectively. The total number of screened women found positive for GDM screening were 4.71% (1.36-8.99%).

Table 2 shows the results for the factors associated with better screening. The number of women screened by ANMs as a proportion of the total registered pregnancies in their areas were compared by the variables as under. Chi square test was applied to check for association and $p < 0.05$ was considered significant. Among all the factors studied age of the ANM, duration of service, education, availability of logistics, distance of sub-center within 10 km of the CHC, having both ASHA and AWW as motivators and doing screening at all sites were all found to be associated with the number screened. ANMs who had their own vehicle were found to do better screening. Training did not show significant association. This apparent paradox could be explained by the fact that almost all ANMs had received training so the lack of training did not contribute to the reduction in screening of women. Having a diabetic in the family of the health worker did not show a difference in the number screened. It was thought that having a diabetic in the family would make the health worker more sensitive to the need for screening pregnant women for GDM so that diabetes can be prevented in both the mother and the child.

Table 3 shows the major problems faced by ANMs in the screening process. The main problems mentioned by ANMs were 2 hours of waiting time for the test and involvement of either ASHA or AWW but not both to facilitate the screening.

Table 1: Total number of registered pregnancies, number of women screened and found positive in each CHCs.

Name of CHC	Number of pregnancies registered	Pregnancies screened		Pregnancies found positive	
		Number	%	Number	%
Bamour	1757	661	37.62	9	1.36
Bangra	2214	1620	73.17	64	3.95
Babina	2312	330	14.27	8	2.42
Moth	2291	994	43.38	31	3.12
Chirgaon	2477	647	26.12	9	1.39
Gursarai	2384	817	34.27	72	8.81
Badagaon	2198	845	38.44	76	8.99
Mauranipur	2391	1477	61.77	79	5.35
Total in Jhansi	18246	7391	40.50	348	4.71

Table 2: Association of sociodemographic and other variables with screening.

Determinants of screening	Total pregnancies registered	Pregnant women screened		Statistical significance		
		Number	%	Chi square value	Degrees of freedom (df)	P value
Age of ANM (in years)						
<30	693	597	86.15			

Continued.

Determinants of screening	Total pregnancies registered	Pregnant women screened		Statistical significance		
		Number	%	Chi square value	Degrees of freedom (df)	P value
30-45	2646	2057	77.74	27.774	2	<0.001
>45	1276	1045	81.9			
Years of service						
<5	1170	1012	86.5			
5-10	1937	1404	72.5	124	2	<0.001
>10	1508	1203	85.08			
Education						
Upto 12 th standard	2391	1877	78.5			
Graduate	1724	1457	84.5	40.772	2	<0.001
Post graduate	500	365	73			
Training						
Yes	4223	3374	79.9	2.406	1	0.152
No	392	325	81.8			
Availability of logistics						
Yes	4374	3534	80.8	21.83	1	<0.001
No	241	164	68.4			
Motivator						
One (ASHA/AWW)	1676	1205	71.9	7.27	1	0.007
Both	2939	2494	84.86			
Screening sites						
One site (subcenter)	1039	719	75.27	20.02	1	<0.001
All sites (subcenter and outreach)	3580	2920	81.56			
Own vehicle						
Yes	1513	1149	75.94	25.07	1	<0.001
No	3102	2550	82.21			
Distance from CHC (km)						
<10	1179	916	77.69	6.017	1	0.014
>10	3436	2783	81			
History of diabetes in ANM's family						
Yes	1035	779	75.27	2.52	1	0.112
No	3580	2920	81.56			

Table 3: Problems faced by ANMs.

Problem	No. of ANMs
2 hours waiting time for the test was mentioned to be a problem. The women did not want to wait for 2 hours	37
Many mentioned that ASHAs and AWWs should be trained and involved in screening	20
Refresher training	5
Inadequate logistics	5

DISCUSSION

Among the total number of pregnancies registered 40.05% pregnant women are being screened in all the CHCs in Jhansi district. In a study conducted by Giridhara et al in 2019 it was found that 96% public health facilities in South India practiced GDM screening.⁸ The difference is probably because this study was conducted after only one year of the implementation of this screening program. Moreover, some CHCs are screening upto 70% of their registered pregnancies. The prevalence of GDM in the

present study was found to be 4.71% all patients being from the rural area except Badagaon which is close to the city and shows 8.99% of screened women positive. Gursarai CHCs also showed a very high prevalence of GDM 8.81% the reason for which is not clear. According to a survey in South India prevalence of GDM was estimated to be GDM was detected in 17.8% women in urban, 13.8% in semi urban and 9.9% in rural areas.⁹ In the WINGS 6 study by Balaji et al in 2016 the overall prevalence of GDM after adjusting for age, body mass index (BMI), family history of diabetes and previous

history of GDM was 18.5% by International Association of the Diabetes and Pregnancy Study Groups criteria (IADPSG) criteria with no significant urban/rural differences (urban 19.8% versus rural 16.1%, $p=0.46$).¹⁰ Another study from rural central India showed a very low prevalence only 1.9% who met diagnostic criteria for GDM.¹¹

A systematic review published in 2018 including 64 studies showed that the prevalence varied by the criteria used. By the DIPSI criteria the prevalence was 7.37% (5.2, 10.16).¹² In a study conducted by Giridhara et al in 2019 it was found that the prevalence of GDM in public health facilities in South India was 4.3% compared to 15.4% when universal screening was undertaken. Also, only one in five among those diagnosed came back for follow up treatment.⁸

As there is limited available evidence on assessment of the factors related to health care workers, which influence the screening it is difficult to compare our results with other studies. Factors associated with screening were age of the ANM, duration of service and education, availability of logistics, distance of sub-center within 10 km of the CHC, having both ASHA and AWW as motivators and doing screening at all sites at sub-centers and outreach sessions.

Strengths

Our study highlights the importance of GDM screening as a part of primary health care so that all pregnant women can benefit from screening for GDM which if managed properly would be helpful in prevention of diabetes in the mother and child. Our study addresses a topic on which there is limited research and guides about the factors which can be improved upon so that universal screening can be implemented in public health facilities.

Limitations

Our study uses secondary data but this data is a valuable means of knowing the functioning of our health care facilities. A longer study period would probably give more information. Other aspects of the problem like how many out of those diagnosed had taken optimal treatment, the mode of delivery and the neonatal outcome can be studied. This study includes data of those patients who visit public health facility. Almost an equal number or even more visit private doctors and their data should be taken into account for calculating the actual prevalence in all pregnant women.

CONCLUSION

Screening for GDM in public health facilities is a major step towards tackling high risk pregnancy and with supportive supervision and facilitation, can be made universal for all antenatal patients.

This study addresses the final step of giving optimum care to an antenatal woman once she makes a decision to get the test done and reaches a health facility. Challenges to achieving universal screening would also include health education to antenatal woman to ensure their readiness to accept this screening and go to a health facility for the same.

Recommendations

Several steps could be taken to improve screening. These include: ensuring availability of logistics, regular monitoring of sub-centers and VHNDs at far off places, making the involvement of both ASHA and AWW in GDM screening mandatory, doing screening at all sites (sub-centers and outreach sessions both), refresher training for those trained by medical officers at block level, reinforcing the importance of screening for GDM at all monthly meetings will improve the performance, and monitoring and hand-holding at district level specially of poorly performing blocks would help to solve their problems and improve screening.

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REFERENCES

1. Coustan DR, Lowe LP, Metzger BE, Dyer AR. The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study: paving the way for new diagnostic criteria for gestational diabetes mellitus. *Am J Obstet Gynecol.* 2010;202(6):654.
2. Seshiah V, Kapur A, Balaji V, Shah SN, Das AK, Diwakar H, et al. Targeting Glycemic Level in Gestational Diabetes Mellitus to that of Normal Pregnancy would result in a better Maternal-Fetal Outcome. *J Assoc Physicians India.* 2019;67(4):66-70.
3. Seshiah V, Balaji V, Balaji MS, Sanjeevi CB, Green A. Gestational diabetes mellitus in India. *J Assoc Physicians India.* 2004;52:707-11.
4. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, et al. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR-INDIAB population-based cross-sectional study. *Lancet Diabetes Endocrinol.* 2017;5(8):585-96.
5. Siddiqui S, Waghdhare S, Panda M, Sinha S, Singh P, Dubey S, et al. Regional prevalence of gestational

- diabetes mellitus in North India. *J Diabetol*. 2022;10(1):25.
6. Govt of India. National guidelines for Diagnosis & Management of Gestational Diabetes Mellitus. Natl Guid Govt India. 2014;1(1):1-100.
 7. Chudasama RK, Kadri AM, Ratnu A, Jain M, Kamariya CP. Magnitude of gestational diabetes mellitus, its influencing factors and diagnostic accuracy of capillary blood testing for its detection at a Tertiary Care Centre, Rajkot, Gujarat. *Indian J Community Med*. 2019;44(2):142-6.
 8. Babu GR, Tejaswi B, Kalavathi M, Vatsala GM, Murthy GVS, Kinra S, et al. Assessment of screening practices for gestational hyperglycaemia in public health facilities: A descriptive study in Bangalore, India. *J Public health Res*. 2015;4(1):29-34.
 9. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, et al. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) - A community based study. *J Assoc Physicians India*. 2008;56:329-33.
 10. 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 Diabetes Endocrinol*. 2016;2(1):1-11.
 11. Chebrolu P, Kurbude R, Thakur M, Shah N, Jain R. Gestational diabetes in rural central India: low prevalence but absence of typical risk factors. *Heliyon*. 2021;7(7):e07431.
 12. Li KT, Naik S, Alexander M, Mathad JS. Screening and diagnosis of gestational diabetes in India: a systematic review and meta-analysis. *Acta Diabetol*. 2018;55(6):613-25.

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