RESEARCH ARTICLE

Exploring the perceptions, practices and challenges of gestational diabetes detection and management among health care providers in a district of Bangladesh [version 1; peer review: 2 approved with reservations]

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Abstract

Background: Gestational diabetes mellitus (GDM) is one of key maternal morbidities during pregnancy globally. It is one of the neglected threats during pregnancy that constitutes pregnancy-related complications. Moreover, a significant number of GDM positive women later develop type 2 diabetes after delivery following an interval of 5-10 years. However, the real magnitude of GDM in Bangladesh is still undetermined. The objective of this study was to explore the perceptions, practices and challenges of GDM detection and management among health care providers (HCPs) in the Tangail district of Bangladesh.

Methods: A mixed method study was conducted between November 2017 and January 2018. Quantitative data was collected through a survey of providers, whereas qualitative data collection included in-depth interviews with providers and direct observation of 41 health care facilities. Descriptive analysis was performed for quantitative data and qualitative data analysis was performed thematically.

Results: The study revealed that 66.6% of HCPs did not know about GDM related complications for affected mothers and their babies, 81.2% did not know about the risk factors of GDM, 95.8% were not aware about the management and/or treatment of GDM, 79.1% never conducted GDM screening of pregnant women and almost none of the interviewees received any special training on GDM. We observed that only 31.3% of women were tested for blood sugar in antenatal care and of those, 12.5% were identified as having elevated blood sugar levels. GDM related information was collected in 4.2% of cases.

Conclusions: There is limited knowledge and skills among the HCPs to detect and manage GDM at the community level. More programmatic emphasis is required to strengthen the capacity of community health care workers in detecting and treating GDM.

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Keywords

Gestational diabetes mellitus, community, perception, practice, challenges, Bangladesh

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Introduction

Diabetes in pregnancy is a neglected cause of maternal morbidity, with one in every six pregnancies affected by GDM globally¹. Around 88% of cases of GDM are found in low- and middle-income countries². Prevalence of GDM varies from 1% to 28% depending on population characteristics, diagnostic measurement and screening methods, with the South East Asian region indicated to have a high prevalence (24.2%)³. Bangladesh is one of the top ten contributors to diabetes cases globally and this number is expected to double in the next 20 years⁴. It is estimated that in Bangladesh alone, more than two million people suffer from diabetes but are as yet undiagnosed⁵. The current prevalence of diabetes is 5.5% and the expected rise to 8.2% by 2030 renders diabetes in Bangladesh a major public health problem that has to be addressed by the national health system in the near future^{4,6}. Diabetes is associated with transitions in lifestyle and industrialization, which is more common in urban areas but increasingly extends to rural settings⁷.

Findings in Bangladesh have shown that 23% of patients with diabetes mellitus are treated at outpatient departments of upazila health complexes (primary health care centers) and 23% in district hospitals (secondary health care centers)⁸. In the past five years, there has been an increased focus in Bangladesh on improving service delivery at the primary level and at referral centers, including union health and family welfare centers (the lowest level of primary health care centers), as well as at the community level through community clinics and community health workers⁹. Nevertheless, most of the programme still focuses on the provision of emergency obstetric and newborn care, with poor focus on other maternal and newborn health related areas that are on the incline, such as the impact of non-communicable diseases on maternal and newborn health¹⁰. A new operational plan provides a structure for improving care with regards to preconception, pregnancy, childbirth and the immediate post-partum period¹¹. Areas prioritized for the provision of quality maternal and neonatal health services include populations with a

high maternal mortality ratio and those living in impoverished areas and facing geographical and social disadvantages¹². Bangladesh has developed the 2013–2020 Action Plan for the prevention and control of non-communicable diseases, a national strategy for maternal health that highlights the importance of GDM¹³.

The prevalence of GDM ranges from 8.2% in rural Bangladesh¹⁴ to 12.9%¹⁵, with estimates dependent on the diagnostic criteria used¹⁶. Undiagnosed women with diabetes in pregnancy are a key concern in Bangladesh due to the low social status of women, which results in inequalities in healthcare access and nutrition¹⁷. Women often do not receive treatment for sickness and therefore often resort to self-medication or seek care from unqualified practitioners¹⁸. Women with GDM have an increased risk of developing obstetric complications like prolonged labor and are prone to develop type-2 diabetes in the future. Their babies might be born overweight and develop childhood obesity or type-2 diabetes later in life¹⁹. As there is already an existing community network, this can be used to refer all pregnancies that have been identified at the community level for antenatal care (ANC) and GDM screening facilities²⁰.

The aim of this study is to determine the perceptions and practices of GDM detection and management in a selected sub-district of Bangladesh and explore existing barriers to adequate detection and management of GDM.

Methods

Study design

A total of 47 face-to-face surveys and 10 in-depth interviews (IDIs) were conducted with health care providers (HCPs) and with health managers. Furthermore, 30 ANC consultations were observed at 30 primary facilities at the community, union health center and upazila health complex level. Finally, 41 facility inventories were carried out using a preformatted checklist. **Table 1** provides a summary of the study methods.

Table 1. Description of the study methods.

Study Design	Method	Participant	Total
Qualitative	In-depth interview	Nurse - 2 Family planning inspector (FPI) - 1 Health inspector (HI) - 1 Community health care provider (CHCP) - 4 Family welfare visitor (FWV) - 2	10
Quantitative	Providers survey	Sub-assistant community medical officer (SACMO) - 5 Family planning inspector (FPI) - 5 Health inspector (HI) - 5 Family welfare visitor (FWV) - 5 Community health care provider (CHCP) - 7 Health assistant (HA) - 10 Family welfare assistant (FWA) - 10	47
Observation	Antenatal care observation	Upazila health complex (UHC) - 1 Union health and family welfare center (UHFWC) - 5 Community clinic (CC) - 24	30
	Inventory Checklist	Kumudini hospital - 1 Upazila health complex (UHC) - 1 Union health and family welfare center (UHFWC) - 9 Community clinic (CC) - 30	41

Study sites

This was a mixed methods study applying both quantitative and qualitative methods. It was conducted from November 2017 to January 2018 in the Mirzapur sub-district of Tangail district, Bangladesh. The sub-district has a population of 274,088, with 65 facilities including 53 community clinics, 10 union health and family welfare centres, one upazila health complex and one medical college hospital (tertiary facility). Out of 63 primary health care facilities (community clinics and union health and family welfare centers), 30 community clinics and nine union health and family welfare centers were randomly selected by simple randomization, achieved via the random number generator in Microsoft Excel 2010. The study also included the upazila health complex and medical college hospital for data collection.

Provider survey

A structured questionnaire was developed by the research team of the study, available as *Extended data*²¹. This questionnaire was pretested outside the study area to finalize the questionnaire. Pretesting was carried out among HCPs at one community clinic and one union health and family welfare centre in a different upazila within the district of Tangail. No changes were made to the questionnaire after pre-testing and no validity testing was performed. Then, the structured questionnaire was used to collect quantitative data from selected HCPs, which include grassroots level health workers, such as health assistants (HAs), family welfare assistants (FWAs), health inspectors (HIs), family planning inspectors (FPIs), and community health care providers (CHCPs), and also health workers from the lowest level primary health care centers such as family welfare visitors (FWVs) and sub-assistant community medical officers (SACMOs) (Table 1). The questionnaire included general information, health workers' perspectives on GDM and availability of equipment and logistics to provide services for GDM patients in the primary health care centers. An official letter from the Mirzapur Upazila Health Complex was circulated among the health workers (n=52) in the 41 facilities, which explained the objectives and invited them to participate in the study. A copy of this letter is available as *Extended data*²¹. Four trained field data collectors were responsible for collecting data. Health workers were invited and those who willingly wanted to participate in the study were enrolled purposively. Five of the invited participants were not willing to participate as they were busy at that time with their own work. Data collection was conducted at their place of work and it took approximately 20 minutes to complete each of the face to face interviews.

IDIs

Two research assistants (anthropologists) were assigned to collect qualitative data through IDIs with the HCPs working at the facility level. A pretested interview guide was used for the interviews, available as *Extended data*²¹. Pretesting was carried out among HCPs at one community clinic and one union health and family welfare centre in a different upazila within the district of Tangail. Minor

changes were made to the interview guide after pre-testing. No validity testing was performed. HCPs were chosen purposively and written consent was sought before participation in the face-to-face interviews. Out of 13 respondents, three participants weren't able to participate in the IDIs due to their other engagements. The research assistant described the objectives of the study before data collection. Each of the interviews took approximately 20–25 minutes and were conducted at the facilities. Interviews were audio recorded upon permission and the research assistant took some key notes.

Observation

A total 30 ANC checkups were observed at different facility levels. Of them, eight were at Kumudini hospital, two at the upazila health complex, eight from union health and family welfare centers and twelve from community clinics. Four trained field data collectors used a pretested checklist to do the observations, available as *Extended data*²¹. Pretesting was carried out among HCPs at one community clinic and one union health and family welfare centre in a different upazila within the district of Tangail. No changes were made to the checklist after pre-testing and no validity testing was performed.

Permission to collect the data was obtained from the health department, the patients and HCPs. The checklist contained some key areas including infrastructure, logistics, waste management and staff. The observation was made during routine antenatal check-ups at the ANC area of the facility by a doctor or nurse during the hospital working hours.

Facility inventory

Facility inventory was conducted for 31 purposively selected community clinics, eight union health and family planning centers, one upazila health complex and from the Kumudini hospital. The field level data collectors used a structured checklist to collect the inventory data, available as *Extended data*²¹. Key areas covered supplies included furniture and durable equipment, clinical supplies and other optional equipment. During this process, the data collectors used hospital records and sought support from the responsible persons to fill out the checklist.

Data analysis

Quantitative data were cleaned and missing data were checked by the data supervisors. If any data were missing, the data collector revisited the home using previously collected sociodemographic data to contact participants for this purpose and collected the missing data from that responder. SPSS statistical software (version 21.0 for windows) was used for descriptive analysis.

The qualitative data were transcribed from the local language (Bengali) from audio recordings and translated into English by the anthropologists. The principal researcher randomly selected transcripts (10%) by simple randomization to review the quality of transcripts. Peer debriefing was also performed

to maintain the reliability of the data. Initial open coding was performed and themes were identified, followed by selective coding, done manually by repeated reading of the transcripts. Themes were identified from the data^{22,23} and analyzed thematically.

Ethical statement

The study is under the project named ‘Evaluating community-based detection and surveillance of gestational diabetes’, which has been approved by the national ethical review committee of Centre for Injury Prevention and Research, Bangladesh (CIPRB) (Memo - CIPRB/ERC/2017/20). Informed written consent was received from each of the interviewees for participation before collecting their data for the study.

Results

The results section of this paper is presented in two sections. The first section contains information about the perceptions, knowledge, attitude and practices of the Health Care Providers (HCPs) and health managers on GDM through the provider survey and qualitative IDIs. The second section presents the findings of the ANC observations and the facility inventory checklists.

Knowledge and attitudes

Basic knowledge about GDM. The majority of the respondents who participated in the survey had never heard of diabetes that occurs during pregnancy or gestational diabetes (81%, n=38). Furthermore, 81.2% of respondents (n=38) were not aware of the risk factors for GDM and among them, 16.6% (n=8) stated that there are no risk factors (Figure 1). Data from the IDIs gave similar findings. HCPs had no clear perception of GDM and some considered GDM to be the same as diabetes.

“There is no difference between the diabetes and gestational diabetes. When diabetes occurs in pregnancy then it is called gestational diabetes and will not cure like diabetes. All the management and treatment of diabetes during pregnancy is similar to the diabetes.” (P2, Community Health Care Provider (CHCP))

Figure 1. Health care providers' knowledge on risk factors for gestational diabetes mellitus.

Knowledge on the complications of GDM. Around 66.6% (n=31) of HCPs did not know about GDM related complications for mothers and their babies. Furthermore, 16.7% (N=8) thought that there are no GDM related complications and 16.7% (n=8) knew that there are some GDM related complications that could affect mothers and babies (Figure 2). Some respondents stated newborns could develop abnormally, pregnant mothers may have diabetes later in life and some might develop unspecific problems as a result of GDM complications.

“I don't know clearly about the complications. But I perceive that a GDM mother has more chances for eclampsia, pre-eclampsia, intra-uterine death, stillbirth, pre-term delivery.” (P7, HI)

Knowledge on the GDM tests. Among the 47 respondents, 54.1% (n=25) said that a GDM screening test is essential for pregnant women, 29.1% (n=14) did not know and 16.6% (n=8) said a screening test is not necessary during pregnancy. Almost none (97.8%, n=46) could mention the exact timing for when a screening test should be performed during pregnancy (Figure 3). None of the participants (100%, n=47) had knowledge of the screening process.

“We have no clear idea on gestational diabetes screening test of pregnant mothers. The test need to done during antenatal care; however, we do not practise. We need training on GDM and logistics for screening need to available during ANC.” (P4, CHCP)

Knowledge about GDM treatment. Regarding treatment, 95.8% (n=45) of the respondents did not know if there was

Figure 2. Health care providers' knowledge on complications of gestational diabetes mellitus (GDM).

Figure 3. Health care providers' knowledge on gestational diabetes mellitus testing (GDM).

any treatment for GDM available and 4.1% (n=2) said there is no treatment. Regarding delivery, 4.1% (n=2) mentioned that GDM patients should deliver by caesarian section and 95.8% (n=45) had no idea about the recommended mode of delivery for a woman with GDM. Regarding the necessity for follow-up after delivery, 70.8% (n=33) did not know whether follow-up was necessary and 22.9% (n=11) said postpartum follow-up is not needed for women with gestational diabetes.

"I think exercise and insulin are the only treatment for mothers who are suffering from diabetes during pregnancy" (P3, FPI)

GDM related practices

GDM screening. Regarding the screening practice, 79.1% (n=37) of HCPs never screened pregnant women for GDM and 18.7% (n=9) had no idea about screening. In addition, 68.7% (n=32) did not know what tests are available to screen for GDM in their health facility/department and 20.8% (n=10) said they have no screening equipment at their facility. One of the respondents described how to do a blood sugar test, but none of the other respondents knew the process (97.8%, n=46).

GDM management practices. Almost all (95.8%, n=45) of the providers did not know about a management protocol for GDM affected mothers. Regarding advice given to GDM positive mothers, 91.6% of providers (n=43) did not know what to advise, 6.2% (n=3) said they do not give any advice and only one HCP (2.1%, n=1) recommended exercise, diet and insulin for GDM mothers. Almost all (95.7%, n=45) did not know about drug therapy for GDM mothers. Some (4.3%, n=2) perceived that both oral medicine and insulin can be used for GDM management.

"We don't have any management protocol for gestational diabetes. I perceive that after a woman is diagnosed, she is immediately referred to hospital for further treatment." (P6, CHCP)

"Insulin is the only drug of choice for a GDM patient" (P8, FWV)

"In our hospital if a mother identified with diabetes during pregnancy, we refer to district hospital for management" (P-10, Nurse)

Follow-up of GDM patients. Around half (56.2%, n=26) of respondents did not know about follow-up for GDM patients. Additionally, 27.1% (n=13) providers said they did not advise GDM mothers to go for a blood glucose checkup at secondary or tertiary facilities and 62.5% (n=29) did not know what to advise a mother suffering from GDM. Nearly all of the providers (97.9%, n=46) did not know about follow-up for women who had GDM after delivery. None of the respondents knew about newborn blood glucose checkups after delivery.

"I advised the mothers having diabetes during pregnancy to do a blood glucose test on a weekly basis at the medical college hospital" (P2, CHCP)

Challenges of GDM management

Nearly none of the providers (97.9%, n=46) received any special training on diabetes mellitus and/or GDM during training or on the job. Many of the interviewed providers (97.9%, n=46) never got an opportunity to deal with GDM patients. Moreover, there are limited resources (equipment, material) for testing in their facilities. As the majority of providers are not very knowledgeable on GDM, they do not feel competent to discuss the topic with the women who come for ANC. In terms of equipment, 93.7% (n=44) of the providers said they have only blood pressure devices. Only two providers (4.2%) stated that glucometers are available in their facilities and one provider (2.1%) stated the availability of a blood pressure device, an ultrasound machine, urine dipstick and leaflets on nutrition at her facility.

"I only heard about the term gestational diabetes. But I never received any training on screening. I even have a limited idea on counseling pregnant women to prevent GDM" (P1, FPI in IDI)

"We don't have any special facilities for GDM management at our union family welfare center." (P10, FWV in IDI)

ANC observation

A total of 30 ANC sessions were observed in the facilities. In 31.3% of observed consultations (n=9), blood sugar test related information was collected. Of all the observations, a high blood sugar level was found in 12.5% (n=4). In only one (4.2%) of the ANC observations did the patient receive GDM related information. None of the patients were asked about any previous history of GDM. In 45.8% (n=14) of the observations, the blood pressure of the pregnant woman was measured. In none of the ANC observations did providers counsel on GDM and provide information on the risk of developing diabetes later in life, the disappearance of GDM after pregnancy or when to diagnose. Furthermore, in none of the observed ANC consultations was a capillary sugar test or urine sugar test carried out, nor were any women referred to a laboratory for a sugar test (Table 2).

Facility inventory

The inventories of the facilities were assessed using a structured checklist. Among the 41 facilities assessed, 95.1% (n=39) provided outpatient services. All facilities provided ANC and postnatal care (PNC) but limited equipment for essential tests like glucose tests, urine tests and hemoglobin tests for ANC. Only two (4.8%) facilities had a separate breast-feeding corner, ANC corner and PNC corner and equipment for ultrasonography and hemoglobin testing. The referral facility (Kumudini Hospital) had a consultant trained on GDM. Nine (21.9%) of the facilities provided 24/7 services.

Table 2. Distribution of antenatal care related observation findings among the facilities.

Indicators	KH (n=8)	UHC (n=2)	FWC n=8)	CC (n=12)	Total (n=30)
Information about sugar test in pregnancy	-	100%	25%	-	31.3%
Mention possibility of having high sugar levels in pregnancy	-	50%	-	-	12.5%
Speak about "gestational diabetes"	-	-	8.3%	8.3%	4.2%
Explore risk factors for gestational diabetes	-	-	-	-	-
Measure weight	100%	-	-	66.6%	41.7%
Measure height (BMI)	-	-	100%	58.3%	39.6%
Ask for diabetes in family	-	-	100%	25%	31.3%
Ask about previous abortions	100%	-	-	16.6%	29.2%
Ask if previous baby weighted more than 4 kg	-	50%	-	-	12.5%
Ask about previous history of GDM (if not <i>primi gravida</i>)	-	-	-	-	-
Check blood pressure	100%	-	-	83.3%	45.8%
Mentions potential complications of GDM	-	-	100%	-	25%
Counsel on delivery complications in general	-	-	-	8.3%	2.1%
Counsel on shoulder dystocia	-	-	-	-	-
Counsel on postpartum bleeding	-	-	-	-	-
Counsel on hypertension/preeclampsia	12.5%	-	-	-	3.1%
Counsel on complications for the newborn	-	-	-	8.3%	2.1%
Counsel on macrosomia	-	-	25%	-	6.3%
Counsel on respiratory problems	50%	-	-	8.3%	14.6%
Counsel on GDM related factors	-	-	-	-	-
Mention that GDM can be treated	-	50%	-	-	12.5%
Show diet chart	100%	-	-	100%	50%
Counsel on insulin	-	-	100%	-	25%
Provide leaflet for danger signs in pregnancy	-	100%	-	16.6%	29.2%
Give next appointment	100%	-	33.3%	100%	58.3%

KH, Kumudini Hospital; UHC, Upazila Health Complex; FWC, Family Welfare Centre; CC, community clinic; BMI, body mass index; GDM, gestational diabetes mellitus.

Record keeping. During September to November 2017, a total of 6805 pregnant women received ANC from 41 selected facilities. Only six GDM women were detected in the referral hospital, whereas other facilities didn't identify any women. Among the 41 facilities, 78% (n=32) did not perform any deliveries in last three months. A total of 31 preeclampsia/eclampsia cases, 125 premature babies, 215 cases of premature membrane rupture, 45 still births and four maternal deaths were reported in

Kumudini hospital but such records about obstetric and newborn complications were not available in the other facilities (Table 3).

Human Resources. Only 29.2% (n=12) of the facilities have an obstetric consultant and 17% (n=7) have a SACMO, none of whom were trained on diabetes. Moreover, 26.8% (n=11) have a midwife/FWV, almost all (93.5%, n=29) community clinics have CHCPs and 41.4% (n=17) facilities

Table 3. Distribution of facilities based on record keeping status.

Indicators	KH (1)	UHC (1)	FWC (8)	CC (31)
Population coverage of the facility	407253	407250	24264-57897	6000-12292
24/7 services in the facility	100%	100%	87.50%	-
Number of ANC appointments provided in last three months	580	400	5772	53
Deliveries in last three months	915	40	20	-
No. of normal vaginal deliveries (NVD)	402	25	20	-
No. of caesarean sections (CS)	513	15	-	-
No. of CS of GDM patients	2	-	-	-
No of obstructed labor in last three months	11	-	-	-
No of shoulder dystocia in last three months	-	4	-	-
No of macrosomic babies (>4kg) born in last three months	2	-	-	-
No of GDM cases diagnosed in last three months	6	-	-	-
No of premature babies in last three months	125	-	-	-
No premature rupture of membranes (PROM)	215	-	-	-
No of preeclampsia	31	-	-	-
No of eclampsia	31	-	-	-
No of prematurely baby born	125	-	-	-
No of stillbirth	45	-	-	-
No of maternal deaths	4	-	-	-

KH, Kumudini Hospital; UHC, Upazila Health Complex; FWC, Family Welfare Centre; CC, community clinic; GDM, gestational diabetes mellitus; CS, caesarean sections; ANC, antenatal care; NVD, normal vaginal deliveries; PROM, premature rupture of membranes.

have community skilled birth attendants (CSBAs). GDM-trained medical officers and nurses are only available in Kumudini hospital.

Equipment and resources. Weighing machines were present in all facilities, 26.8% (n=11) had glucometers but only 4.8% (n=2) had glucose test strips. In terms of other equipment, 95.1% (n=39) had blood pressure devices, 7.3% (n=3) had a fetoscope, 12.1% (n=5) had an equipped labor room (with remaining facilities having an unequipped labor room), 87.8% (n=36) had a patient examination table and 95.1% (n=39) had a baby weighing machine (scale). Laboratory testing and the availability of ultrasound scanning existed only at Kumudini Hospital and Mirzapur Upazila Health Complex. Supplies of glucose to do oral glucose tolerance tests were available only at the Mirzapur Upazila Health Complex. Metformin tablets and insulin injections were not available at any of the facilities (Table 4).

Discussion

Gestational diabetes is still undetermined in the rural communities of Bangladesh. The primary health care

facilities are not well equipped for GDM screening. The perception of, knowledge of and practices regarding GDM among the HCPs were found to be very poor. The majority of the findings show that HCPs do not know about GDM. There is a serious gap between the knowledge of diabetes (any type) and diabetes during pregnancy. The capacity of HCPs and resources for GDM detection and management were not available in the facilities.

An assessment of the primary health care facilities in Bangladesh found limitations regarding resources and equipment for the diagnosis and treatment of diseases. The maternal health care services were also found to be poor, especially essential tests like glucose, hemoglobin and urine protein ANC tests. HCPs at the community level were found to be incapable of conducting all the tests on pregnant women⁹. This study also found similar results.

The maternal health task force in 2017 raised the issue of GDM as one of the important neglected causes of maternal mortality and morbidity. The diagnosis of women with GDM during ANC was found to be neglected among the HCPs^{2,3}, which supported this study finding. The UN

Table 4. Distribution of facilities based on the availability of equipment and resources.

Indicators	KH (1)	UHC (1)	FWC (8)	CC (31)
Number of beds in the facility	750	31	0–3	-
Weighing machine	100%	100%	100%	100%
Laboratory	100%	100%	-	-
Glucometer	-	100%	-	34.50%
Glucose test strips	-	100%	-	3.40%
Glucose 7.5% dextrose	-	100%	-	0%
Metformin tablets	-	-	-	-
Insulin injections	-	-	-	-
Sphygmomanometer	100%	100%	100%	93.10%
Stethoscope	100%	100%	100%	93.10%
Fetoscope	100%	100%	12.50%	3.40%
Ultrasonography machine	100%	100%	-	-
Equipped labor room	100%	100%	25%	3.40%
Patient examination table	100%	100%	100%	82.70%
Baby weighting scale	100%	100%	100%	82.70%

KH, Kumudini Hospital; UHC, Upazila Health Complex; FWC, Family Welfare Centre; CC, community clinic.

Sustainable Development Goals for 2030 also emphasized the prevention of non-communicable diseases, especially gestational diabetes³.

Community health workers have already proved to be important in improving diabetes outcomes in low-income countries²⁴. Besides this, community health workers are also useful in patient education, identification and referral of high-risk mothers²⁵. In our study, the health workers did not have sufficient knowledge to deal with GDM. However, the well-structured health system in Bangladesh and experienced community health workers at the grassroots level are key strengths for improving the identification and treatment of GDM.

Until now, there has been no routine screening of all pregnant patients for gestational diabetes in Bangladesh. However, a national maternal and neonatal health guideline has been approved by the Ministry of Health and Family Welfare for the systematic management of affected patients based on current evidence and best practice.

Lo *et al.* conducted a qualitative study on the provider view on GDM and found a lack of depth of understanding and skills regarding GDM. A lack of knowledge and misperception were also found among the providers. Although specialist care is available at tertiary centers that are represented by medical colleges, GDM related activities conducted at health services, particularly at primary level, are erratic or not available²⁶.

A cross-sectional survey on the equipment available for GDM screening in low- and middle-income countries found

that primary health care facilities at a community level were not well equipped for GDM screening and management. There was a lack of medicine for the treatment of GDM indicated in that study, which also found similar barriers and challenges for the facilities to the current study²⁷. Another study in Morocco also described similar findings regarding the knowledge and skill gaps of HCPs on GDM²⁸.

This study addressed the perception and practices of HCPs on GDM screening and management at upazila, union and community levels in Mirzapur, Tangail district. Existing barriers for adequate detection and management of GDM are also identified.

Conclusion

GDM is one of the major public health issues in Bangladesh. There is a significant need for the development of knowledge and skills of HCPs to detect GDM in the community. Quality ANC during pregnancy is needed to ensure GDM screening for every pregnant woman to reduce the burden of and morbidity due to GDM in Bangladesh.

Data availability

Underlying data

Data is stored at the Centre for Injury Prevention and Research, Bangladesh (CIPRB). Due to sensitivity of the data (contains identifying information), permission is required from the Ethical Review Committee (ERC) of CIPRB, Dhaka, Bangladesh for sharing data with a third party. Data can be requested from the CIPRB, who will contact the ERC to gain approval to share the data. The conditions for gaining data access are a formal request with a clear objective and formal permission from the ERC. Please contact the

corresponding author in order to request the data through email at info@ciprb.org.

Extended data

Figshare: Qualitative tools for GDM study in Bangladesh. <https://doi.org/10.6084/m9.figshare.11925318.v1>²¹

- Survey Questionnaire.docx
- IDI_Discussion Guide.docx
- Revised ANC observations checklist.docx
- Inventory Checklist.docx

- Copy of official letter.pdf

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

Acknowledgements

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Reviewer Report 04 October 2022

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Micaela Morettini

Università Politecnica delle Marche, Ancona, Italy

The presented study aims to investigate the perceptions and practices of gestational diabetes mellitus (GDM) detection and management in a selected sub-district of Bangladesh at different healthcare facility levels. Results could be useful to elucidate the required actions to be planned for the improvement of GDM screening and treatment/follow-up. Overall, the manuscript is well structured but lacks attention to detail in the presentation of the results and in the discussion of the main achievements and it is also cumbersome in some parts of the text. The study sample is quite limited (and this should be at least acknowledged as a limitation of the study) and this does not allow generalization of the results.

1. The connection between the last sentence of the first paragraph in the introduction and the rest of the paragraph seems to be missing. I suggest rephrasing.
2. Please add relevant references for the statement in lines 8 to 11 of the third paragraph of the introduction.
3. The introduction lacks some key information regarding the reference guidelines/practices on GDM detection and management to compare with and determine how good/bad the situation in Bangladesh is managed.
4. Please replace the acronym in the titles with a full description.
5. Please specify in the data analysis section how quantitative data were cleaned.
6. In Figure 2 and Figure 3 measurement units are missing. The layout of Figure 3 should be revised, since the data and bar overlap.
7. Table 3 legend should be modified in "Distribution of indicators based on record keeping status among the facilities".
8. Typo in Table 4 line 3.

9. The authors should discuss what the study adds with respect to previous findings.
10. Please revise the discussion in order to emphasize the main results with the addition of study limitations.
11. The extended data IDI Discussion Guide needs to be translated into English.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Metabolism, bioengineering

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 31 March 2022

<https://doi.org/10.5256/f1000research.23489.r127221>

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John Punnose

Department of Endocrinology, St. Stephen's Hospital, New Delhi, Delhi, India

This study gives insight into inadequacies of GDM awareness, GDM monitoring and management

in Bangladesh. It may be considered as a pilot study, as there are major concerns to select it as a full scientific paper. Main objections are the validity of the conclusions based on the limited data. No statistical analysis. The presentation of data requires substantial modifications. Please refer to my comments to authors.

Comments to authors:

This study is an attempt to identify the GDM knowledge among Health Care Personnel, assess the infrastructure of the health care facilities and to audit the present GDM screening strategies in a selected sub-district of Bangladesh. The authors have designed an acceptable study protocol (without prior validation) and applied it to selected health centers. The study conveys suboptimal/highly inadequate GDM management facilities/skills at community level in Bangladesh.

As a pilot study, the findings of this study is useful to plan augmentation of GDM screening facilities and management skills of health care workers in Bangladesh and other developing countries. But as a scientific study, there several concerns for this study.

1. Was a proper sample size calculation done for selecting the number of centers and health care workers? The detailed interviews were limited to 10 participants. Is the number enough to draw conclusions of national significance (for Bangladesh)?
2. Introduction 3rd paragraph: "Increased risk of obstetric complications like pronged labor". Many more important complications are missed.
3. Introduction last paragraph; "...explore existing barriers to adequate detection and management of GDM". This is put as an aim, but there are no attempts in the study to find the barriers in the study.
4. The methodology especially selection of study population is presented in a confusing manner. I suggest a diagram showing different arms, showing the selection of centers, ANC checks, facility checking etc. Table 1 gives this data in a different form but using titles like Qualitative and Quantitative as the main heading confuses the reader.
5. The presentation of findings needs to be improved e.g. is Fig. 1 with yes/no pie diagram required for a study like this? The authors can state the finding in the manuscript.
6. Fig. 2: No labeling of real measure in Figure. Is it a percentage? What is the difference between bar one and two? One knowledge and second no GDM complication.
7. Fig. 3: No proper labeling. Again is GDM test not a required part of knowledge?
8. Table 2: Title has to be modified to show that data is in percentage. Why distribution? Language edition required for the indicators. Rather than Ask, Speak etc., can mention availability of BP records, height records, family history records. Leaving '-' in columns is also confusing. Does it mean 0%, if so show it as 0%.
9. Table 3: Title needs correction. The mention of 'No' for Number is to be avoided. There is a mix up of % and numbers in the table. For many slots only '-' is shown. Is it 0%?

10. Table 3 shows that many obstetric complications are not observed in many centers. What is the relevance of this information for GDM? What the authors mean from absence of these complications is not clear. Are no records available? Otherwise it may indicate less severe cases being managed or good obstetric care. The Sample number is not adequate to assess these queries.
11. Table 4 title is also to be modified. Terms like 'Insulin Injections' are inappropriate for a scientific paper. Do you mean Insulin vials?
12. The discussion section should have a limitation section highlighting the inadequacies of this study.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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