

Clinical Management and Maternal Outcomes Among Women with Gestational Diabetes Mellitus

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Abstract

Original Research Article

Background: Effective clinical management, whether through dietary modification alone or supplemented with insulin therapy, is central to minimising maternal morbidity in gestational diabetes mellitus (GDM), yet the descriptive relationship between management approach and maternal outcome remains under-reported in South Asian tertiary-care populations. This study aimed to describe the clinical management approach adopted for GDM and its associated maternal outcomes at a tertiary-level hospital. **Methods:** This cross-sectional observational study included 100 women with confirmed GDM managed at a tertiary hospital in Dhaka between March and August 2017. Data on antenatal management, postpartum insulin requirement, antenatal complications, mode of delivery and postnatal complications were extracted from antenatal and hospital records and analysed using SPSS version 20, with the chi-square test applied at a significance level of $p < 0.05$. **Results:** Dietary modification alone was sufficient for 56% of patients, while 44% additionally required insulin during pregnancy; postpartum, this requirement fell sharply, with 90% of patients managed on diet alone and only 10% continuing to require insulin. Antenatal complications occurred in 56% of patients, most frequently urinary tract infection (18%), polyhydramnios (12%) and pre-eclampsia (10%). Caesarean section was performed in 76% of deliveries. Postnatal maternal complications, principally postpartum haemorrhage, wound infection and urinary tract infection, occurred in 28% of patients, with no maternal mortality recorded. **Conclusion:** The majority of GDM patients in this cohort were successfully managed through dietary modification, with a marked reduction in insulin requirement following delivery and no maternal mortality despite a substantial antenatal complication and caesarean delivery burden, supporting the value of structured, vigilant, multidisciplinary management of GDM.

Keywords: Gestational diabetes mellitus; clinical management; insulin therapy; maternal outcome; caesarean section.

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INTRODUCTION

The clinical management of gestational diabetes mellitus (GDM) rests on a tiered approach in which dietary and lifestyle modification form the first line of therapy, with pharmacological treatment, most commonly insulin, reserved for women in whom glycaemic targets cannot be achieved through diet and physical activity alone [1]. This stepped approach reflects the underlying pathophysiology of GDM, in which pregnancy-induced insulin resistance, mediated by placental hormones including human placental lactogen, cortisol and progesterone, is superimposed upon variable degrees of pre-existing beta-cell reserve, such that the proportion of women ultimately requiring insulin depends both on the severity of the underlying metabolic defect and on the timeliness and rigour of antenatal glucose surveillance [2].

The comparative maternal and neonatal implications of diet-only versus insulin-supplemented management have attracted growing research interest internationally. A large retrospective cohort study from the Netherlands comparing diet-only and insulin-treated GDM pregnancies found broadly comparable neonatal and obstetric outcomes between the two management groups, although the incidence of large-for-gestational-age infants was elevated in the GDM population overall relative to the general obstetric population [3]. Similarly, a Belgian cohort study reported that women who required insulin therapy had a higher-risk clinical profile at baseline, characterised by impaired beta-cell function and reduced insulin sensitivity and experienced higher rates of large-for-gestational-age infants and caesarean section compared with diet-treated women [4]. More recently, a meta-analysis of randomised controlled trials comparing metformin with insulin in the pharmacological management of GDM demonstrated that the choice of pharmacological agent itself and not

merely the need for medication, was associated with measurable differences in caesarean section rate, gestational hypertension and neonatal hypoglycaemia [5], underscoring that management approach is not a peripheral logistical detail but an independent determinant of maternal and neonatal outcome.

Clinical practice guidelines from major professional bodies, including the American Diabetes Association [6] and the International Workshop-Conference on Gestational Diabetes Mellitus [7], as well as national guidance such as that issued by the National Institute for Health and Clinical Excellence [8], converge on this same stepped principle, recommending an initial trial of medical nutrition therapy and structured glucose monitoring before pharmacological escalation, while acknowledging that the threshold and pace of escalation should be individualised according to the severity of glycaemic dysregulation and locally available resources.

Within Bangladesh, where GDM has become an increasingly prevalent complication of pregnancy in parallel with rising obesity and urbanisation, structured evidence describing how patients are actually managed in routine tertiary-care practice and what maternal outcomes accompany that management, remains comparatively scarce [9]. Most locally available evidence reports aggregate outcome rates for GDM as a single diagnostic entity without describing the underlying treatment pathway, leaving a gap in understanding of how the intensity of antenatal management and its evolution across the pregnancy and into the postpartum period, relates to the maternal complication burden actually observed in practice.

Against this background, the present study describes the clinical management approach adopted for GDM, spanning both the antenatal treatment modality and its evolution following delivery, alongside the accompanying antenatal, intrapartum and postnatal maternal outcomes, among women managed at a tertiary-level hospital in Dhaka. By characterising both the treatment pathway and its associated maternal outcome profile within a single cohort, this study aims to provide locally grounded evidence to support structured, resource-appropriate management protocols for GDM in comparable tertiary-care settings.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Dhaka, over a six-month period from March 2017 to August 2017 and included 100 women with a confirmed diagnosis of gestational diabetes mellitus admitted to the department during this period. Eligible participants were women with a singleton pregnancy beyond 28 weeks of gestation with any degree of glucose

intolerance first recognised during the current pregnancy and possessing complete antenatal and diabetic records, while women with pre-existing diabetes, multiple pregnancy, gestational age below 28 weeks, or incomplete records were excluded. Diagnosis of GDM was confirmed using the oral glucose tolerance test performed on venous plasma glucose according to World Health Organization criteria and the BIRDEM screening protocol, following which each participant's antenatal management, either dietary modification alone or dietary modification supplemented with insulin, was recorded, along with the corresponding evolution of insulin requirement into the postpartum period. Demographic, clinical and outcome data, including antenatal complications, mode of delivery and postnatal maternal complications, were extracted from antenatal cards, diabetic record books and hospital case notes after each participant provided written informed consent following a detailed explanation of the study's purpose, risks and benefits, with confidentiality of all patient information strictly maintained throughout and participants free to withdraw at any stage without affecting their clinical care; ethical clearance was obtained from the institutional ethical review committee prior to the commencement of data collection. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 20, with quantitative variables expressed as mean and standard deviation and qualitative variables as frequency and percentage; the chi-square test was applied to compare the distribution of antenatal complications and mode of delivery across the cohort and a p-value of less than 0.05 was considered statistically significant, consistent with the results, which showed a markedly elevated caesarean section rate and a substantial burden of antenatal and postnatal maternal complications despite the predominance of diet-based management.

RESULTS

Table 1: Age and parity distribution of the study subjects (n=100)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	20–25	18	18.0
	26–30	28	28.0
	31–35	40	40.0
	36–40	12	12.0
	>40	2	2.0
	Mean ± SD	30.50 ± 5.29 years	
Parity	Primiparous	36	36.0
	Multiparous	64	64.0

Table 1 shows that the mean age of the study subjects was 30.50±5.29 years, with the largest proportion (40%) aged between 31 and 35 years and that multiparous women constituted 64% of the cohort.

Table 2: Socio-economic and educational status of the study subjects (n=100)

Variable	Category	Frequency (n)	Percentage (%)
Socio-economic status	Low income	8	8.0
	Lower middle income	78	78.0
	Upper middle income	10	10.0
	High income	4	4.0
Level of education	Illiterate	28	28.0
	Primary–SSC	40	40.0
	HSC–Graduate	32	32.0

Table 2 shows that the majority of patients belonged to the lower middle-income group (78%) and that primary-to-SSC level education was the most

common educational attainment (40%), followed by illiteracy (28%) and HSC-to-graduate level education (32%).

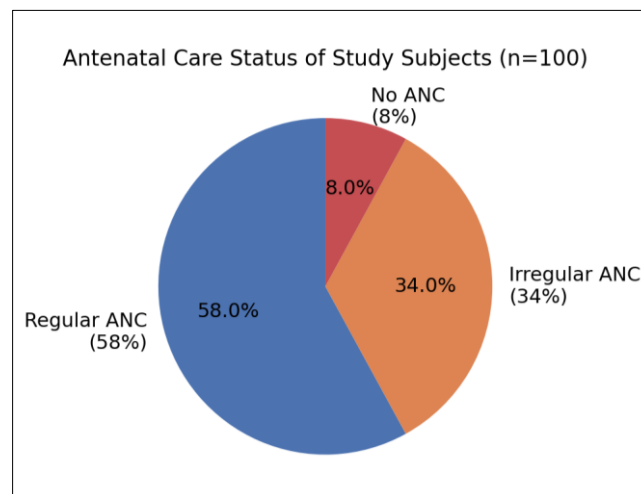
**Figure 1: Antenatal care status of the study subjects**

Figure 1 shows that regular antenatal care was received by 58% of the study subjects, while 34% attended irregularly and 8% received no antenatal

checkup at all, highlighting a meaningful proportion of the cohort with suboptimal antenatal engagement.

Table 3: Clinical management of gestational diabetes mellitus, antenatal and postpartum (n=100)

Period	Management category	Frequency (n)	Percentage (%)
Antenatal	Diet alone	56	56.0
	Diet plus insulin	44	44.0
Postpartum	Diet alone	90	90.0
	Continued insulin	10	10.0

Table 3 shows that dietary modification alone was sufficient to achieve glycaemic control in 56% of patients during pregnancy, while 44% required supplemental insulin therapy. Following delivery, the

requirement for insulin fell markedly, with 90% of patients managed on diet alone and only 10% continuing to require insulin therapy postpartum.

Table 4: Antenatal maternal complications of current pregnancy among GDM patients (n=100)

Complication	Frequency (n)	Percentage (%)
Urinary tract infection	18	18.0
Pre-eclampsia	10	10.0
Polyhydramnios	12	12.0
Pregnancy-induced hypertension	4	4.0
Premature rupture of membranes	6	6.0
Vulvovaginitis	6	6.0
None	44	44.0

Table 4 shows that a little over half of the patients (56%) experienced at least one antenatal complication, urinary tract infection being the most

common (18%), followed by polyhydramnios (12%) and pre-eclampsia (10%).

Table 5: Mode of delivery among GDM patients (n=100)

Mode of delivery	Frequency (n)	Percentage (%)
Vaginal delivery	24	24.0
Caesarean section	76	76.0

Table 5 shows that caesarean section was the predominant mode of delivery in this cohort, performed

in 76% of cases, considerably exceeding the 24% of women who delivered vaginally.

Table 6: Postnatal maternal complications among GDM patients (n=100)

Postnatal complication	Frequency (n)	Percentage (%)
Postpartum haemorrhage	10	10.0
Wound infection	8	8.0
Urinary tract infection	10	10.0
None	72	72.0

Table 6 shows that postnatal maternal complications occurred in 28% of patients, with postpartum haemorrhage and urinary tract infection each affecting 10% and wound infection affecting 8%; no maternal mortality was recorded in this cohort.

DISCUSSION

The findings of this study demonstrate that the majority of women with gestational diabetes mellitus in this cohort could be adequately managed through dietary modification alone, with only 44% requiring supplemental insulin during pregnancy, a proportion that fell dramatically to 10% in the postpartum period. This pattern of rapid postpartum de-escalation of insulin requirement is consistent with the well-established physiological principle, cited by Beard and Marsh, that insulin requirement falls rapidly after delivery due to the rapid disappearance of placental anti-insulin hormones once the placenta is expelled [1] and mirrors the treatment pattern reported by Parul and Farhana in comparable South Asian cohorts, in which the substantial majority of patients likewise reverted to diet-only management after delivery [2]. Breastfeeding, which is known to improve maternal insulin sensitivity, may represent an additional contributory mechanism underlying this rapid normalisation, particularly given that most patients in this cohort were encouraged to breastfeed as part of routine postnatal care.

The proportion of patients requiring insulin during pregnancy in this study, 44%, is broadly comparable with international data on GDM management pathways, although direct comparison is complicated by differing diagnostic thresholds and screening protocols across settings. A large retrospective cohort study from the Netherlands similarly found that a substantial minority of GDM patients, 44% in that cohort, required additional insulin therapy alongside dietary modification and importantly reported that

neonatal and obstetric outcomes were broadly comparable between diet-only and insulin-treated groups, although the overall incidence of large-for-gestational-age infants was elevated relative to the general obstetric population regardless of management category [3]. By contrast, a Belgian cohort study found that women who required insulin therapy displayed a distinctly higher-risk clinical profile at baseline, with impaired beta-cell function and lower insulin sensitivity and experienced significantly higher rates of large-for-gestational-age infants and caesarean section compared with diet-treated women, even after adjustment for confounders [4]. Taken together, these international comparisons suggest that while the proportion of patients requiring insulin may be broadly similar across settings, the extent to which insulin requirement itself signals an intrinsically higher-risk pregnancy, as opposed to simply reflecting a different point along a shared management continuum, may vary according to population characteristics and the timing of GDM diagnosis.

The antenatal complication profile observed in this study, affecting 56% of patients and led by urinary tract infection (18%), polyhydramnios (12%) and pre-eclampsia (10%), reflects the well-recognised propensity of hyperglycaemic pregnancies toward glycosuria-related urinary infection and osmotic diuresis-related amniotic fluid volume disturbance. The caesarean section rate of 76% recorded here is considerably higher than rates reported in several comparator populations internationally and likely reflects a combination of clinician risk-aversion toward vaginal delivery in the context of diabetic pregnancy, the substantial burden of antenatal complications observed in this cohort and institutional practice patterns at a tertiary referral center where higher-risk pregnancies are preferentially concentrated. A recent meta-analysis of randomised controlled trials comparing metformin with insulin in GDM management found that the pharmacological agent used was itself independently associated with differences

in caesarean section rate, with metformin-treated patients experiencing a significantly lower rate than insulin-treated patients, suggesting that beyond the binary distinction between diet-only and pharmacologically treated GDM, the specific choice of pharmacological agent may carry further implications for delivery outcome that merit consideration in future management protocol design [5].

Postnatal maternal complications, affecting 28% of patients in this cohort and led by postpartum haemorrhage and urinary tract infection, occurred against a backdrop of no maternal mortality, a reassuring finding that is consistent with the broader international literature indicating that with vigilant multidisciplinary management, maternal mortality attributable to GDM has become rare even in resource-constrained settings. A recent comprehensive update on the epidemiology and management of GDM emphasised that favourable maternal outcomes are achievable across diverse healthcare settings provided that structured antenatal surveillance, appropriate escalation of treatment intensity and coordinated obstetric and endocrinological input are maintained throughout pregnancy and into the immediate postpartum period [9], a principle that appears to be broadly reflected in the outcomes observed in this cohort despite the notable antenatal complication and caesarean delivery burden. These findings collectively support the continued use of a stepped, diet-first management approach for GDM in resource-constrained tertiary-care settings, while highlighting caesarean delivery rate and postnatal maternal morbidity as areas warranting continued quality-improvement attention.

The antenatal complication burden observed in this cohort can be further contextualised against comparator studies: Jindal *et al.*, reported a caesarean section rate of 44% and polyhydramnios in 28% of GDM patients in an Indian series [10], while Rizk documented a urinary tract infection prevalence of 7.9% among GDM patients in a Middle Eastern hospital-based cohort [11], both considerably different from the present findings, underscoring how variation in screening intensity and population risk profile shapes the observed complication spectrum. Westgate *et al.*, similarly reported a caesarean section rate of only 24.6% in a New Zealand cohort managed under a different institutional protocol [12], while Qadir *et al.*, documented a broadly comparable spread of maternal and fetal complications in a South Asian tertiary-care population [13], reinforcing that the underlying pathophysiological drivers of GDM-related morbidity, described in detail by Kaaja and Rönnemaa [14] and formally codified in the diagnostic and management framework of the American College of Obstetricians and Gynecologists [15], operate similarly across settings even where the realised complication rates differ. Naylor *et al.*, previously cautioned that a proportion of the excess caesarean delivery rate observed in diabetic pregnancy may reflect clinician practice style

rather than objective obstetric indication alone [16], a consideration that merits attention when interpreting the elevated caesarean section rate documented in the present cohort. Comparable stepped management pathways, combining dietary counselling with selective insulin escalation, have been described in other tertiary centres across Asia [17,18] and structured national guidance specific to the Bangladeshi context [19], alongside the broader international clinical update on GDM management [20], both emphasise that consistent implementation of a stepped, multidisciplinary management protocol, rather than any single treatment modality in isolation, is what ultimately determines favourable maternal outcome.

Limitations and recommendations

This study was limited by its relatively small sample drawn from a single tertiary-care center over a short six-month period, restricting precise generalisation and by the absence of stratified outcome data linking specific antenatal complications directly to management subgroup, which limits causal interpretation of the relationship between treatment modality and maternal outcome.

CONCLUSION

The majority of women with gestational diabetes mellitus in this cohort were successfully managed through dietary modification alone, with a marked reduction in insulin requirement following delivery. Despite a substantial burden of antenatal complications and a high caesarean delivery rate, no maternal mortality was recorded. These findings support structured, vigilant and multidisciplinary management of gestational diabetes mellitus as an effective approach to achieving favourable maternal outcomes in resource-constrained tertiary-care settings.

Conflict of interest: None

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