

# Prevalence and Pregnancy Outcome of Gestational Diabetes Mellitus Among Bangladeshi Urban Pregnant Women

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## Abstract:

**Objective:** To assess the prevalence of gestational diabetes mellitus (GDM) among the pregnant women of Dhaka city and to find out the consequences or effects of GDM on pregnancy outcome.

**Materials and methods:** This was a descriptive type of cross sectional study followed by cohort type of study, conducted in different hospitals in Dhaka city. Initially 960 pregnant women of 24<sup>th</sup> to 28<sup>th</sup> weeks were selected purposively; plasma glucose was measured at fasting and two hours after taking 75g oral glucose load. Modified method of Carpenter and Coustan criteria was followed to diagnose GDM. For each GDM case diagnosed, one non-GDM pregnant women was taken as control after matching age and parity. Both groups were followed up to 4 wks after delivery to find out maternal and neonatal mortality and morbidities.

**Results:** Out of 960 pregnant women 72 were GDM positive (7.5%). There was no maternal mortality but morbidities like hydramnios ( $p < 0.001$ ), pre-eclampsia ( $p < 0.001$ ), urinary tract infection ( $p < 0.05$ ), puerperal sepsis ( $p < 0.05$ ) and surgical interventions ( $p < 0.001$ ) were more prevalent in GDM compared to non-GDM groups. The prevalence of antipartum haemorrhage, post partum haemorrhage, and eclampsia did not vary between the groups. There was one still birth, one perinatal mortality (due to respiratory distress syndrome) and one congenital anomaly observed in neonates of GDM mothers. More pre-term ( $p < 0.01$ ), post-term ( $p < 0.01$ ), low birth weight ( $p < 0.001$ ) and macrosomic ( $p < 0.001$ ) babies were found among the babies of GDM mothers than non-GDM mothers. More babies also suffered from neonatal jaundice ( $p < 0.05$ ) and respiratory distress syndrome ( $p < 0.05$ ) in GDM groups than non GDM groups.

**Conclusion:** The prevalence of GDM in urban Bangladeshi population is about 7.5%. Maternal morbidities like hydramnios, pre-eclampsia, infections and operative interventions were observed more in GDM mothers. Pre-term, post-term and LBW babies along with perinatal morbidities like respiratory distress syndrome, macrosomia and neonatal jaundice were more common in babies of GDM mothers.

**Keyword:** Gestational Diabetes Mellitus, maternal morbidities and neonatal morbidities.

## Introduction:

Diabetes is one of the most important medical disorders encountered in pregnancy and affects each other adversely.<sup>1-3</sup> Any degree of glucose intolerance first time detected in pregnancy is called gestational diabetes mellitus G.DMS.<sup>1,4</sup>

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The prevalence of GDM varies widely. In Caucasians it is 1-2%, in Afro-Caribbeans 2-3% and among Asians 4-5%.<sup>5-7</sup> GDM is well known for its disastrous impact on the fetus in terms of perinatal mortality and morbidity and also on the mother for obstetrical complications.<sup>8-16</sup>

Hyperglycemia in the first trimester of pregnancy may lead to congenital malformations. Common malformations are anencephalus, hydrocephalus, spina bifida, caudal regression, ear and eye anomalies, ventricular septal defect, atrial septal defect, transposition of great vessels, and renal and rectal anomalies. So GDM is one of the important risk factors for perinatal and infant morbidity and mortality.<sup>16-23</sup> In Bangladesh, 7-14% women are the victims of diabetes in their reproductive age.<sup>24-25</sup> Effects of gestational diabetes in mother and fetus produce important health hazards. Effects on mothers are abortion, repeated urinary tract infections, and increased incidence of pre-eclampsia (25%),

hydramnions (25-50%), maternal distress, prolongation of labor (due to big baby), shoulder dystocia, perinatal injuries, post-partum haemorrhage, operative interference, puerperal sepsis, and failure of lactation; effects on fetus are foetal macrosomia (30-40%), congenital malformation (6-8%) and birth injury. Neonatal complications include hypoglycemia, respiratory distress syndrome, hyperbilirubinemia, polycythemia and hypocalcemia.<sup>7,11,17-23</sup> The overall perinatal risk is increased 2-3 times in diabetics than the non-diabetics.<sup>18-20</sup> The stillbirths are usually limited to the last four weeks of pregnancy and are more related to ketoacidosis of the mother or foetal hypoglycaemia. The neonatal deaths are principally due to foetal hypoglycaemia or respiratory distress syndrome.<sup>11-15</sup>

So detection of GDM cases are important so as to control their glycemic state to prevent these maternal and fetal complications. The present study was undertaken to detect the prevalence and complications of GDM.

#### Materials and Methods:

This was a descriptive type of cross sectional study followed by cohort study. After obtaining informed consent, a total number of 960 pregnant women of 24<sup>th</sup> to 28<sup>th</sup> weeks of gestational age were selected purposively during the study period. Patients with known diabetes before pregnancy, serious comorbid diseases or using drugs significantly affecting glucose metabolism were excluded. The purpose of the study was explained in details to each subject and informed written consent was taken.

*Place and period of the study:* The study was conducted in Sir Salimullah Medical College Hospital, Azimpur Maternity Center and some selected private hospitals in Dhaka city. The study period was one year duration from July,2006 to June,2007.

*Determination of GDM:* All pregnant women were screened for GDM in their 24<sup>th</sup> to 28<sup>th</sup> wks of gestation. Screening was done by sampling blood fasting and one and two hours after ingestion of 75 gram oral glucose solution. Modified method of Carpenter and Coustan criteria was followed.<sup>26</sup> Blood glucose fasting >5.3 mmol/L and 2 hr after taking 75gm glucose drink >8.6 mmol/L respectively were taken as a cut point for the diagnosis of GDM. Plasma glucose was measured by glucose oxidase method. For quality assurance, the sensitivity of the auto analyzer was checked before each run.

*For follow up:* After identifying the pregnant women with GDM, for each GDM pregnant women, one non-GDM pregnant women was taken as control after matching age and parity (Table-1). Both groups were followed up to 4 wks

early neonatal period to find out the association of GDM with maternal morbidity (like antepartum haemorrhage, polyhydramnios, pre-eclampsia, postpartum haemorrhage, urinary tract infection, postpartum haemorrhage, eclampsia, surgical intervention, and puerperal sepsis) and mortality as well as neonatal morbidity (like prematurity, postmaturity, low birth weight, large baby, still birth, macrosomia, congenital malformations, neonatal jaundice and respiratory distress syndrome) and mortality during the postnatal period.

*Data processing & analysis:* After collecting data in prescribed form, data entry and analysis was done using SPSS program. Chi Squard ( $X^2$ ) and other appropriate statistical tests were done. P values <0.05 were considered significant.

#### Results:

Out of 960 pregnant women of 24-28 weeks of gestation, 72 were found to have GDM and the prevalence rate was 7.5% Table-I. From the non-GDM subjects, 72 matched control subjects were selected Table-II and maternal and neonatal complications were compared.

**Table-I**

*Frequency of GDM cases among pregnant women*

Diabetes status	Number of patients	Percentages
GDM positive	72	7.5
GDM negative	888	92.5
Total	960	100

**Table-II**

*Matching characteristics of GDM and non GDM pregnant women*

Gestational Age	GDM(n=72)		Non GDM (n=72)	
	No	%	No	%
24 <sup>th</sup> week	13	18.0	13	18.0
25 <sup>th</sup> week	14	19.4	14	19.4
26 <sup>th</sup> week	13	18.0	13	18.0
27 <sup>th</sup> week	15	20.8	15	20.8
28 <sup>th</sup> week	17	23.4	17	23.4
Parity of subjects				
Primipara	17	23.4	17	23.4
Para-2	24	33.3	22	30.6
Multipara	31	43.3	31	43.3
Age groups (yrs)				
15-25	50	69.5	34	47.2
26.35	17	23.6	35	48.6
36-45	5	6.9	3	4.2

There was no maternal mortality in both groups. But morbidities more prevalent in GDM patients than controls were polyhydramnions (33.3% vs 2.8%,  $p<0.001$ ), pre-eclampsia (25% vs 1.4%,  $p<0.001$ ), urinary tract infection (18.1% vs 4.2%,  $p<0.05$ ), surgical intervention (like lower uterine caesarian section) (48.6% vs 13.9%,  $p<0.001$ ) and puerperal sepsis (19.4% vs 4.2%,  $p<0.05$ ), but the prevalence of antipartum haemorrhage, post partum haemorrhage (PPH), and eclampsia did not vary between the groups Table-III.

**Table-III**

*Distribution of maternal complications in GDM and non GDM groups*

Variables	GDM		Non GDM		Level significance
	No	%	No	%	
<b>Before delivery</b>					
<b>APH</b>					
Yes	2	2.8	1	1.4	NS
No	70	97.2	71	98.6	
<b>Hydramnios</b>					
Yes	24	33.3	2	2.8	$p<0.001$
No	48	66.7	71	97.2	
<b>Pre-Eclampsia</b>					
Yes	18	25	1	1.4	$p<0.001$
No	54	75	71	98.6	
<b>UTI</b>					
Yes	12	18.1	3	4.2	$p<0.05$
No	59	81.9	69	95.8	
<b>At delivery</b>					
<b>PPH</b>					
Yes	10	13.9	8	11.1	$p>0.05$
No	62	86.1	64	88.6	
<b>Eclampsia</b>					
Yes	2	2.8	1	1.4	NS
No	70	97.2	71	98.6	
<b>Surgical interference</b>					
Yes	35	48.6	10	13.9	$p<0.001$
No	47	51.4	60	86.1	
<b>After delivery</b>					
<b>Puerperal sepsis</b>					
Yes	14	19.4	3	4.2	$p<0.05$
No	58	50.6	69	95.8	

There was only one still birth in GDM group (Table-IV). One perinatal mortality due to respiratory distress syndrome and one congenital anomaly were also observed in neonates of GDM mothers. Increased number preterm (16.7% vs 4.2%,  $p<0.01$ ), post term (6.9% vs 4.2%,  $p<0.01$ ) and low birth weight (29.2% vs 8.3%,  $p<0.001$ ) babies were found in GDM group than control group. More babies also suffered from neonatal jaundice (22.2% vs 8.4%,  $p<0.05$ ), fetal macrosomia (13.9% vs 2.8%,  $p<0.001$ ) and respiratory distress syndrome (11.1% vs 4.17%,  $p<0.05$ ) in GDM groups than non GDM groups.

**Table-IV**

*Distribution of foetal and neonatal outcome in GDM and non GDM groups*

Variables	GDM		Non GDM		Level significance
	No	%	No	%	
<b>Termination</b>					
Pre-term	12	16.7	3	4.2	NS
Post-term	5	6.9	3	4.2	
<b>Birth weight</b>					
<2.5 kg(low BW)	21	29.17	6	8.3	$p<0.001$
>3 kg(Large-B)	11	27.78	10	13.9	
<b>Still birth</b>					
Yes	18	1.4	00	00	$p<0.05$
No	71	98.6	72	100	
<b>Perinatal mortality</b>					
Yes	1	1.4	00	00	$p<0.05$
No	71	98.6	72	100	
<b>Jaundice</b>					
Yes	16	22.2	6	8.4	$p<0.05$
No	56	77.8	66	91.6	
<b>Congenital Malformation</b>					
Yes	1	1.39	00	00	$p<0.05$
No	71	98.61	72	100	
<b>Foetal macrosomia</b>					
Yes	10	13.9	2	2.8	$p<0.001$
No	62	80.1	70	97.2	
<b>Respiratory distress syndrome</b>					
Yes	08	11.1	3	4.17	$p<0.05$
No	64	88.9	69	95.83	

**Discussion:**

Earlier research has shown that pregnant women with diabetes have an increased risk of developing obstetric complications, ketoacidosis, hypoglycemia and micro vascular complications. In the present study, there was no maternal mortality but morbidity like hydramnions, preeclampsia, infections like UTI, puerperal sepsis were more in the GDM women than the non-GDM women and is in accordance with others studies.<sup>21</sup> More maternal infections during pregnancy in the GDM women was explained by different authors as due to lower immunity.

In our study, the rate of delivery by caesarian section was more in GDM group. However complications associated with GDM such as fetal macrosomia or maternal hypertension may increase the likelihood of caesarian section. Because macrosomia is associated with shoulder dystonia, it is particularly important to diagnose it before labor.<sup>1-3</sup>

There were more macrosomic babies in GDM group than non-GDM subjects in our study. Normally fetal pancreas is relatively unresponsive to physiological levels of glucose. When maternal hyperglycemia is present (as in GDM), the fetus responds to elevated glucose levels by beta cell hypertrophy and there is increased production of insulin in utero. Insulin acts as a growth factor in the fetus. This hyperinsulinemia and hyperglycemia lead to an increase in organ size and total adipose tissue mass and subsequent fetal weight gain. Macrosomia is probably the most widely known complication affecting the fetus of diabetic women. A consequence of the increase size of the infant is an increased caesarian section rate also.

In the neonates, the respiratory distress syndrome was observed more ( $P < 0.01$ ) in the babies of GDM mothers than the babies of non-GDM mothers in our study. The increased incidence of respiratory distress syndrome has long been noted with many factors such as the increased incidence of prematurity and caesarian section delivery. Some studies have suggested that polyhydramnions associated with diabetic pregnancy may contribute to decreased lung lecithin level and that maternal diabetes itself may lead to some abnormality in lecithin synthesis and metabolism in the fetus.<sup>7,11,15</sup> However, these factors remain unclear and require further investigation.

Several studies have concluded that the rate of perinatal mortality (including stillbirths and neonatal deaths) was increased in women with GDM in the past.<sup>27-29</sup> In the present study, there is one still birth and one perinatal mortality in GDM group.

There is increased preterm and low birth weight babies in GDM mother in our study. Increased prevalence of low birth weight is due to placental vascular insufficiency.

Infants born to diabetic mother are 4 times more likely to have congenital anomalies of the brain, heart, kidney, intestine and skeleton.<sup>30</sup> These complications occur in the periconceptional period, due to raised blood glucose. In the present study, in GDM group, one congenital anomaly was seen. Macrosomia occurs in <20-30% of infants whose mothers have GDM.<sup>31</sup> The excess glucose and the resulting hyperinsulinemia stimulate fat storage and leads to macrosomia. Fetal macrosomia is increased in babies of GDM mother in our study.

The primary respiratory problem in infants of GDM mother is respiratory distress syndrome (RDS). This is caused by surfactant deficiency or by retained fetal lung fluid. RDS occurs more in infants of diabetic mothers due to the lack of maturity in the type II alveolar cells.<sup>32</sup> In our study, prevalence of RDS is more in babies of GDM mother.

Jaundice was seen more ( $P < 0.05$ ) in babies of GDM mothers than the babies of non-GDM mothers in our study. It is probably related to a decreased ability of the liver to conjugate bilirubin resulting from the breakdown of the increased volume of red blood cells.<sup>13,17,33</sup>

So, in conclusion, the study result shows the prevalence of GDM in urban Bangladeshi population is about 7.5%. Maternal morbidities like hydramnios, pre-eclampsia, UTI, puerperal sepsis were observed more in GDM mothers. Delivery by Cesarean section was also more common in pregnant women with GDM. Pre-term, post-term and LBW babies along with perinatal morbidities like respiratory distress syndrome, macrosomia and neonatal jaundice were more common in babies of GDM mothers.

**Conflict of Interest :** None

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