

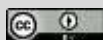
Original Article

Effects of Insulin in The Last Trimester in Diabetic And Gestational Diabetic Pregnant Women

DOI: dx.doi.orgNurun Naher¹,  Natasha Hashem Kazi², Fariha Tabassum Faria³

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ABSTRACT

Introduction: Pregnancy is a challenging time for diabetic women due to frequent fluctuations. Insulin plays an important role in the third trimester of pregnancy in diabetic and gestational diabetic women. The study aimed to evaluate the efficacy of insulin in the last trimester in Diabetic and gestational diabetic pregnant women.

Methods & Materials: This prospective study was carried out at the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, from July 2006 to June 2007 with a total of 100 participants. The women were divided into two equal groups. In group A: PGDM (pre-gestational diabetes mellitus) & in group B: GDM (gestational diabetes mellitus). **Results:** In group A, 40% women belonged to the age group 31-35 years, in group B

majority 50% belonged to the age group 20-30 years. The most common complication was PPH, with twelve 24% in group A, and eleven 22.0% in group B. In group A, insulin requirement was 30-75 IU in twenty-seven 54%, <30 IU in fourteen 28%, and >75 IU in nine 18% women, and in group, B was <30 IU in thirty-one 62%, 30-75 IU in fifteen 30% and >75 IU in four 8% women. In both the groups (A and B), the fetal complication was present irrespective of insulin dose. **Conclusion:** Insulin therapy is an effective method for managing diabetes in pregnant women. It has been found to improve glycemic control, reduce the risk of adverse outcomes, and improve overall maternal and fetal outcomes

Keywords: Insulin, Diabetic women, Complications

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1. Registrar, Department of Obstetrics and Gynaecology, BIRDEM Women and Children Hospital, Dhaka, Bangladesh
2. Assistant Registrar, Department of Obstetrics & Gynaecology, BIRDEM General Hospital, Dhaka, Bangladesh
3. Student, Mymensingh Medical College (MMC), Mymensingh, Bangladesh

INTRODUCTION

Pregnancy is a great stressful physiological condition in a woman during their reproductive period. From a physiological point of view, pregnancy brings about important changes in the structures and metabolic and endocrine function of the mother ^[1]. These changes along with the placenta in the early part, the fetoplacental unit associated with pregnancy-all are adaptive in nature, allowing the mother to nurture the growing fetus. Pregnancy is a challenging time for diabetic women due to frequent fluctuations in their blood sugar levels ^[2]. Diarizing and monitoring insulin levels are essential for the health and safety of both the mother and the baby ^[3]. According to the World Health Organization, approximately 20 million pregnant women are affected by diabetes mellitus worldwide ^[4]. The prevalence is highest in Middle Eastern, North African, and South Asian countries, where up to 10% of pregnant women have diabetes mellitus ^[5,6]. The rate of diabetes mellitus is also increasing in high-income countries due to changing lifestyles and dietary habits ^[7]. According to a study conducted in Bangladesh from 2017 to 2018, approximately 9.7% of pregnant women in Bangladesh suffer from gestational diabetes mellitus ^[8]. This number is projected to increase due to the growing rate of obesity and changes in lifestyle. The study also found that maternal diabetes during pregnancy is associated with a higher risk of adverse pregnancy outcomes, such as an increased risk of cesarean delivery, macrosomia (large baby size), preterm labour, and gestational hypertension ^[9]. Insulin plays an important role in the third trimester of pregnancy in diabetic and gestational diabetic women. Insulin is a hormone that helps the body

control and regulates the levels of sugar in the bloodstream ^[10]. During pregnancy, the body naturally produces more insulin than usual, but for those with diabetes, this can lead to dangerously low or high blood sugar levels ^[11]. To prevent these levels from becoming too imbalanced, pregnant women with diabetes or gestational diabetes must take supplemental insulin. Insulin therapy helps to balance the levels of glucose in the blood, even during pregnancy ^[12]. It helps keep the fetus from taking too much of the mother's glucose, thus preventing congenital disabilities and other complications like preeclampsia ^[13]. Further, it helps to maintain the blood sugar levels of the mother as well, ensuring that she does not develop any diabetic complications during her pregnancy ^[14]. In this article, we will discuss the effects of insulin in the last trimester of pregnancy in diabetic and gestational diabetic women. We will discuss the importance of insulin therapy, the risks associated with its use, and the importance of monitoring and adjusting insulin levels. Finally, we will offer recommendations and resources to help diabetic women get the best treatment and care during their pregnancy, so they can have a healthy and safe delivery.

OBJECTIVES

General Objective:

To find out whether the dose of insulin in the last trimester has any effect on pregnancy outcome.

Specific Objective:

- Maternal outcome in pregnancy complicated with Diabetes.
- Fetal outcome in pregnancy complicated with GDM.

METHODS & MATERIALS

This prospective study was carried out at the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, from July 2006 to June 2007. A total of 100 diabetic population (N=100) were enrolled during the study period. The women were divided into group A: PGDM (pre-gestational diabetes mellitus) & other fifty mothers (n=50) were enrolled in group B: GDM (gestational diabetes mellitus). Diagnosis of gestational diabetes was made on the basis of WHO criteria. The diabetic patients were managed by dietary regulation and by subcutaneous insulin therapy with goals to maintain the fasting blood glucose level at <105mg/dl and postprandial glucose <140 mg/dl. Relevant data of each of the study subjects were recorded on a questionnaire. Verbal consent was taken before recruiting the study population. Ethical clearance was taken from the Bangladesh College of Physicians and Surgeons (BCPS)

Data analysis:

The study coordinators performed random checks to verify data collection processes. Completed data forms were reviewed, edited, and processed for computer data entry. Frequencies, percentages, and cross-tabulations were used for descriptive analysis. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 22.0. The significance level of 0.05 was considered for all tests

Inclusion Criteria

- Gestational diabetic women and pre-gestational diabetic pregnant women require insulin during the last trimester.

- Pre-gestational diabetic women already on insulin

Exclusion Criteria:

- Patients with nephropathy or retinopathy-related disorder
- Patients unwilling to participate in the study.

RESULTS

Among the study subjects (N=100), fifty mothers (n=50) were classified into group A: PGDM (pre-gestational diabetes mellitus) & other fifty mothers (n=50) were enrolled in group B: GDM (gestational diabetes mellitus). In group A, most of the women (20,40.0%) belonged to the age group 31-35 years, in group B majority (25,50.0%) belonged to the age group 20-30 years. One-fifth of the babies (10,20.0%) were preterm in group A & one-fourth of the babies (13,26.0%) were term. Most of the mothers (40,80.0%) in both group A & group B received regular antenatal care (ANC). In the group, the maximum number of study subjects (41,82.0%) belonged to multigravida & around three-fourths of the study subjects (37,74.0%) belonged to group B were multigravida. Most of the mothers (42,84.0%) underwent lower uterine cesarean section (LUCS) in group A, & in group B, around three-fourths of the mothers (38,76.0%) underwent LUCS (Table I). The maximum number of women were delivered by LUCS due to a history of previous caesarean section in both groups A (19,45.2%) and B (18,47.4%) (Table II). Post-delivery complications were present in sixteen (16,32.0%), and eighteen (18,36.0%) women of groups A, and B respectively. The most common complication was PPH, with twelve (12,24.0%) in group A, and

eleven (11,22.0%) in group B. In this series, there was no maternal death. Birth weight low was (<2.5 kg) in four (4,8.0%), and two (2,4.0%) of group A, and B babies. Normal birth weight was, in order of frequency, in forty-eight (48,96.0%) of group B, and forty-six (46,92.0%) of group A babies. Most of the babies in group A (47,94.0%) and group B (49,98.0%) presented complaints. Admission of babies to the neonatal care unit (NNCU) among the babies born with complications was very low, with six (6,12.8%) in group A, and seven (7,14.3%) in group B (Table III). In group A, insulin requirement was 30-75 IU in twenty-seven (27,54.0%), <30 IU in fourteen (14,28.0%) and >75 IU in nine (9,18%) women, and in a group, B was <30 IU in thirty-one (31,62%), 30-75 IU in fifteen (15,30%) and >75 IU in four

(4,8.0%) women (Table IV). PPH was found in half of the mothers (7,50.0%) out of fourteen mothers who required <30 IU dose of insulin & in group B around one-fifth of the mothers (7,22.6%) out of thirty-one required <30 IU dose of insulin. In both the groups (A and B), the fetal complication was present irrespective of insulin dose. In group A, thirteen neonates (13,92.9%) received <30 IU insulin doses fourteen neonates. In group B all neonates (31,100.0%) out of thirty-one received <30 IU insulin dose (Table V). Admission of babies to NNCU was very low irrespective of the dose of insulin by mothers of both groups A and B & the relation between neonatal admission to NNCU with fetal complications was not statistically significant ($p=>0.10$) (Table VI).

Table I: Distribution of the study subject based on Characteristics (N=100)

Age group (years)	Group A (n=50)	Group B (n=50)	<i>p-value</i>
≤25	7,14.0%	6,12.0%	
20-30	13,26.0%	25,50.0%	<0.05*
31-35	20,40.0%	16,32.0%	
≥35	10,20.0%	3,6.0%	
Gestational age (weeks)			
<37 (preterm)	10,20.0%	13,26.0%	>0.10 ^{ns}
≥ 37 (term)	40,80.0%	37,74.0%	
ANC			
Regular	40,80.0%	40,80.0%	
Irregular	7,14.0%	9,18.0%	>0.10 ^{ns}
None	3,6.0%	1,2.0%	
Gravidity			
Primigravidas	9,18.0%	13,26.0%	>0.10 ^{ns}
Multigravidas	41,82.0%	37,74.0%	
Mode of delivery			
Normal vaginal delivery	8,16.0%	12,24.0%	>0.10 ^{ns}
LUCS	42,84.0%	38,76.0%	

Table II: Distribution of the study subject based on Indications for LUCS (N=80)

Indications	Group A (n=42)	Group B (n=38)	p-value
History of previous caesarean section	19,45.2%	18,47.4%	
Antepartum hemorrhage (APH)	1,2.4%	0	
Failed Induction	13, 31.0%	10,26.3%	
Bad obstetric history	2,4.8%	1,2.6%	>0.05 ^{ns}
Malpresentation	3,7.1%	0	
Fetal distress	4,9.5%	9,23.7%	
Premature rupture of membrane (PROM)	0	0	

Table III: Distribution of the study subject based on Complications (N=100)

Maternal complications	Group A (n=50)	Group B (n=50)	p-value
Postpartum hemorrhage (PPH)	12,24.0%	11,22.0%	
Wound infection	3,6.0%	1,2.0%	>0.10 ^{ns}
Urinary tract infection (UTI)	1,2.0%	6,12.0%	
None	34,68.0%	32,64.0%	
Neonatal complications	Group A (n=50)	Group B (n=50)	p-value
Birthweight			
Normal weight ≥ 2.5 kg	46,92.0%	48,96.0%	>0.10 ^{ns}
LBW <2.5kg	4,8.0%	2,4.0%	
Complications			
Present	47,94.0%	49,98.0%	<0.001***
Absent	3,6.0%	1,2.0%	
Present	n=47	n=49	
RDS	28,59.5%	29,59.2%	
Hypoglycemia	13,27.7%	9,18.3%	
Hyperbilirub- inemia	6,12.8%	8,16.3%	
Hypocalcemia	0	3,6.1%	
Admission to NNCU			
Yes	6,12.8%	7,14.2%	>0.10 ^{ns}
No	41,87.2%	42,85.7%	

Table IV: Distribution of the study subject based on Insulin requirements (N=100)

Insulin (IU)	Group A (n=50)	Group B (n=50)	<i>p-value</i>
<30	14,27.0%	31,62.0%	<0.01**
30-75	27,54.0%	15,30.0%	
>75	9,18.0%	4,8.0%	

Chi-square test/Unpaired Students' 't' test, **/** = Significant

Table V: Effect of insulin dose on Maternal & Neonatal outcome (N=100)

Maternal outcome	<30 IU	30-75 IU	>75 IU	<i>p value</i>
Group A	(n=14)	(n=27)	(n=9)	
None	7, 50.0%	21,77.8%	6,66.7%	
PPH	7, 50.0%	3,11.1%	2,22.2%	>0.10 ^{ns}
wound infection	0	2,7.4%	1,11.1%	
UTI	0	1, 3.7%	0	
Group B	(n=31)	(n=15)	(n=4)	
None	19,61.3%	10,66.7%	3,75.0%	
PPH	7,22.6%	3,20.0%	1,25.0%	>0.50 ^{ns}
wound infection	1,3.2%	0	0	
UTI	4,13.0%	2,13.3%	0	
Neonatal complication				
Fetal outcome				
Group A	(n=14)	(n=27)	(n=9)	
Present	13,92.9%	25,92.6%	9,100.0%	>0.50 ^{ns}
Absent	1,7.1%	2,7.4%	0	
Group B	(n=31)	(n=15)	(n=4)	
Present	31,100.0%	15,100.0%	3,75.0%	<0.01**
Absent	0	0	1,25.0%	
Birth weight				
Group A	(n=14)	(n=27)	(n=9)	
<2.5 (LBW)	0	4,14.8%	0	>0.10 ^{ns}
≥ 2.5 (normal weight)	14,100.0%	23,85.2%	9,100.0%	
Group B	(n=31)	(n=15)	(n=4)	
<2.5 (LBW)	1,3.2%	1,6.7%	0	>0.50 ^{ns}
≥ 2.5 (normal weight)	30,96.8%	14,93.3%	4,100.0%	

Table VI: Relationship of insulin dose on neonatal admission to NNCU based on Fetal complications

Admission to NNCU	<30 IU	30-75 IU	>75 IU	<i>p value</i>
Group A	(n=13)	(n=25)	(n=9)	
Yes	0	5,20.0%	1,11.1%	>0.10
No	13,100.0%	20,80.0%	8,88.9%	
Group B	(n=31)	(n=15)	(n=3)	
Yes	5,16.1%	1,6.7%	1,33.3%	>0.10
No	26,83.9%	14,93.3%	2,66.7%	

DISCUSSION

Diabetes and pregnancy may mutually affect each other over a range of interactions from Conception to delivery and possibly even later. Proper screening, diagnosis, and management can reduce both maternal and neonatal morbidity. In this current analysis, in group A, most of the women 40.0% belonged to the age group 31-35 years, and in group B majority 50.0% belonged to the age group 20-30 years. A randomized, double-blind placebo-control analysis found that the mean age of the mothers was 32.50 & 30.72 years respectively [15]. A study carried out in Ireland found that the mean age of both groups was 33.5 & 32.6 years respectively [16]. A review study suggested that most of the mothers were more than 30 years old [17]. In this study, the maximum number of women from all three groups (A, and B) belonged to the multigravida group (82%, and 74%). A contradictory study found that the majority of the mothers were primiparous [18]. Most of the mothers 84.0% underwent lower uterine cesarean section (LUCS) in group A, & in group B, around three-fourths of the mothers 76.0% underwent LUCS in this current analysis. An analysis conducted in Norway found that 8.8% & 22.1 % of both groups' mothers underwent

cesarean delivery [19]. A study demonstrated in Western China found that patients with diabetes experienced a high risk of caesarean section [20]. A study published in an American journal showed an increased rate of caesarean sections at 37% vs 15% (p=0.01) for GDM and control patients respectively [21]. A similar study suggested that 94% had caesarian section delivery while 6% had normal vaginal delivery [22]. There was no maternal death in the study group & most common maternal complication was PPH. A contrast finding revealed that vascular abnormalities in the urogenital tissues that impact genital lubrication and neuropathy-mediated changes in vaginal arousal response were the major complications of pregnant women with diabetes [23]. Another article revealed that major maternal complications associated with diabetes were coronary insufficiency, angina, transient ischaemic attack, peripheral artery disease, & heart failure [24]. Maternal overweight and obesity, later age at childbearing, previous history of GDM, family history of type 2 diabetes mellitus, and ethnicity were major GDM threats factor [25]. Regarding maternal complications, preeclampsia, diabetes ketoacidosis, PPH, and wound complications were the most common

complaints [22]. Admission of babies to the neonatal care unit (NNCU) from among the babies born with complications was very low, with six 12.8% in group A, and seven 14.3% in group B in this finding. Another finding revealed that some fetal complications were cardiac anomalies, neural tube defects, and intrauterine death. Some of the natal complications were prolonged labour, shoulder dystocia, stillbirth, and neonatal intensive care unit [22]. The result of this study indicates that the dose of insulin more in diabetic patients than in GDM patients. In my study, the insulin requirement in PGDM patients was 30 - 75 IU in 54% & in GDM patients was <30 IU in 62% of patients. A prospective cohort study suggested that 27% of pregnant women experienced falling insulin requirements of a median of 30% before delivery [26]. A similar study suggested that out of 80.1% of participants' insulin was required in around one-fifth of the mothers. This study also revealed that the median weight of the participants in the insulin group was significantly higher than the control group [27]. In groups A and B respectively, the incidence of PPH was 50 and 22.6%, wound infection was 0 and 3.2%, and UTI was 0 and 12.9% among women who required <30IU. For women who required insulin 30-75 IU, the incidence of PPH was 11.1 and 20%, wound infection was 7.4 and 0 % and UTI was 3.7 and 13.3% Women who were on insulin dose >75 IU, the incidence of PPH was 22.2 % and 25 %, wound infection was 11.1 and 0 %, and UTI 0%. During discharge, all our GDM patients were advised to have their blood sugar tested at 6 weeks and during the next pregnancy. If women were found diabetic during post-natal visits, were referred to a diabetic clinic for proper control of blood

sugar. Those with normal or impaired glucose tolerance should be on the importance of achieving and maintaining the ideal body mass index through diet and exercise.

CONCLUSION

In conclusion, insulin therapy is an effective method for managing diabetes in pregnant women. It has been found to improve glycemic control, reduce the risk of adverse outcomes, and improve overall maternal and fetal outcomes. Insulin use in the last trimester is especially important for diabetic and gestational diabetic women as it provides the best chance for a successful delivery. Pregnant women should consult their doctor for advice on how to safely use insulin to manage diabetes during pregnancy.

RECOMMENDATIONS

It is recommended that pregnant women with diabetes and gestational diabetes receive insulin therapy in the last trimester of their pregnancy. This will ensure optimal glycemic control and reduce the risk of adverse outcomes. Insulin should be monitored closely, and dosage adjustments should be made as needed. Women should also follow a healthy diet, get regular exercise, and attend regular prenatal check-ups to ensure the best possible outcomes for themselves and their babies.

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