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Original Research Article

Maternal outcome in pregnancies with overt diabetes

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Abstract

Introduction: Over the years pregnant patients with overt diabetes is increasing**.** Hence it is worthwhile to have a clinical study on overt diabetes complicating pregnancies. This study helps to know the frequency of occurrence of overt diabetes and its complications. This will help to know the importance of ante- natal care in preventing end organ damage such as blindness, renal damage, diabetic keto-acidosis etc.
Design of the study: Prospective study.
Method: All cases of pregnant mothers with overt diabetes registered over a period of 1 year .They were followed up till 7th day after delivery.
Results: There were 72 overt diabetes cases in 16022 obstetric admissions. Mean age was 29 years (SD 5.5).>=30 yrs – 45.8%, <30 yrs – 54.16%.; Rural: Urban= 79%:21%, Hindu: Christian: Muslim=69.4%:11.1%:19.4%
Above poverty line: Below poverty line=75%: 25%, 52 cases were multigravida, 20 cases were primigravida, Class B=65, D=1, C=3,& R=3, Elevated serum creatinine level-6(8.33%), Past obstetric hazards: Abortions-34%, IUD-13%, NND-5%, Increased HbA1c-13(18%), Vaginal delivery-29(40.28%), Instrumental delivery-14%, CS-47.22%, Maternal mortality- nil.
Conclusion: Overt Diabetes in obstetrics patient is a high risk situation for both mother and the baby. Proper management from the pre conceptional period till delivery can bring about a very favorable outcome.
Keywords: Overt diabetes, Pregnancy, Maternal outcome.

1. Introduction

The first recorded case of diabetic pregnancy was reported in 1823, the mother survived but a 5.4 kg baby died during delivery due to dystocia[1]. Data from birth certificates of our country indicate that maternal diabetes complicates 14% of all pregnancy. Two major forms of maternal diabetes may occur during pregnancy: preexisting or "pre gestational" diabetes, and gestational-onset or gestational diabetes mellitus. Only the former is known prior to pregnancy, and this form constitutes 10% of cases of maternal diabetes. Thus, prevalence rates for pre gestational diabetes appear to be in the range of 0.1%-0.3% of all pregnancies. These pregnancies are at risk for both maternal and fetal complications.[1]

Infants of mothers with preexisting diabetes experience double the risk of serious injury at birth, triple the likelihood of cesarean delivery, and quadruple the incidence of newborn intensive care unit admission.[7] Recent studies indicate that the risk of these morbidities in individual cases is proportional to the degree of maternal hyperglycemia.

For this reason, the excessive fetal and neonatal morbidity attributable to diabetes in pregnancy should be considered preventable.

Patients with symptoms of diabetes and a casual plasma concentration 200 mg/dl or more is considered overt diabetes. The condition may be pre existing or detected during the present pregnancy for the first time. Overt Diabetes is a syndrome of disordered metabolism with inappropriate hyperglycemia due to an absolute deficiency of insulin secretion or a reduction in biologic effectiveness of insulin or both.

Various anomalies and risks of birth defects have been associated with pregnancies with overt diabetes. However over the years, with strict metabolic control of diabetes and intensive fetal surveillance, the perinatal mortality has been reduced to less than 3 percent, nearly the same as in normal non-diabetic pregnancies. The maternal mortality was reduced to nil. Even the high incidence of congenital malformations in diabetic pregnancies has been reduced from 12 to 5- 6 percent by pre-pregnancy counseling, antenatal care and control of diabetes prior to conception.

Over the years pregnant patients with overt diabetes is increasing**.** Hence it is worthwhile to have a clinical study on *overt diabetes complicating pregnancies.* This study helps to know the frequency of occurrence of overt diabetes and its complications. This will help to know the importance of ante-natal care in preventing end organ damage such as blindness, renal damage, diabetic keto -acidosis etc. According to the National Diabetes Data Group (NDDG) women with PGDM (Pre-Gestational Diabetes Melitus) account for 4-15/1000 pregnancies.

Diabetes mellitus is now classified as follows:

1. Insulin dependent-Type 1.
2. Non-insulin dependent-Type 2.
 A- Non-obese; B-Obese.
3. Secondary diabetes.
4. Impaired glucose tolerance.
 A-Non-obese; B-Obese; C-Secondary.
5. Gestational diabetes.
 A-Diet control; B-Insulin required.

The White classification was originally published in 1949, based on the patient's condition before pregnancy, duration of diabetes and the presence of vascular disease.

White's classification of pregnant diabetic women [2]

Class A: Gestational diabetes, any age of onset or duration A1 managed by diet alone A2 insulin needed

B: Onset >20yrs duration<10 yrs, no vascular disease, Insulin needed

C: Onset 10-19yrs, duration 10-19 yrs, no vascular disease, Insulin needed

D: Onset< lOyrs, duration>20yrs, vascular diseases present, Insulin needed.

F: Any age of onset or duration, nephropathy, Insulin needed.

H: Any age of onset or duration, coronary artery disease, Insulin needed.

R: Any age of onset or duration, proliferative retinopathy, Insulin needed.

T: Any age of onset or duration, renal transplant, Insulin needed

RF: Criteria for both R&F classes coexists

2. Materials and Methods

2.1 Design of the study: Prospective study

2.2 Setting: A tertiary care hospital in South Kerala

2.3 Population/participants

People from south Kerala and adjacent areas of Tamil Nadu. All diabetic patients attending the antenatal clinic as overt diabetic in the hospital.

2.4 Sample size: All cases of pregnant mothers with overt diabetes registered over a period of 1 year. They were followed up till 7th day after delivery.

2.5 Data collection: Researcher administered structured questionnaire

2.6 Data analysis: By using statistical packages viz. EPI6, SPSS.

2.7 Selection of cases: All cases of pregnant women with overt diabetes.

(A women with random plasma glucose level >200mgs/dl and classical symptoms and signs such as polydipsia, polyuria, unexplained weight loss, fasting glucose level of 126mgs/dl or more is considered to have overt diabetes.)* American diabetes association 1999b.

2.8 Exclusion criteria: Pregnant women with gestational diabetes were excluded.

2.9 Outcome variables: Maternal-mortality and morbidity

3. Results

- There were 72 overt diabetes cases in 16022 obstetric admissions
- Mean age was 29 years(SD 5.5).>=30 yrs – 45.8% , <30 yrs – 54.16%.
- Rural: Urban= 79%:21%
- Hindu: Christian: Muslim=69.4%:11.1%:19.4%
- Above poverty line:Below poverty line=75%:25%
- 52 cases were multigravida, 20 cases were primigravida
- Class B=65, D=1, C=3,& R=3.
- Elevated serum creatinine level-6(8.33%)
- Past obstetric hazards: Abortions-34%,IUD-13%,NND-5%
- Increased HbA1c-13(18%)
- Vaginal delivery-29(40.28%), Instrumental delivery-14%, CS-47.22%
- Maternal mortality- nil

4. Discussion

During the study period there were 16022 number of obstetrics admission out of this 72 were overt diabetic cases with prevalence of 0.44%. It is reported that the prevalence of overt diabetes is gradually increasing.

The increase in prevalence can be due to

a. Early detection of diabetes by screening of high risk cases.

b. Reference of high risk cases from periphery to this tertiary centre

c. Increased survival of juvenile diabetics,

d. The early onset of type 2 diabetics due to life style changes.

4.1 Age distribution

In the present study the mean age was 29yrs (SD 5.5). In this study 67 are booked cases and 5 are unbooked. These cases accounts for the favorable perinatal outcome. In a previous study done in SAT Hospital during 1996 also shows the maximum number of patients between the age group 25&34. The mean age of SAT admissions during the study period was 25.1yrs. The increase in the mean age of study group may be due to the obstetrics mishaps in the study group.

The present study 45.8% of overt diabetic pregnancies belong to >30yrs & 54.16% below 30yrs of age group where as it is only 23.8% & 76.2% viz. in the total hospital admissions . This may be due to the obstetrics mishaps in the study group. When maternal complications are concerned the women having age more than 30 yrs had an Odds Ratio of 3.65.

The mean years of marriage before pregnancy were 6.47 yrs. 80% of the normal couple conceives within a year. Here only 6(8.3%) become pregnant within one year. The maximum years of 16 were noted in 4 persons (5.6%).

4.2 Domicile

In the present study 79% patients belongs to the rural population and 21% from urban where as it is 53.8% 8b 46% respectively in the current admissions. This may be due to increased reference of overt diabetics from periphery hospitals. In India 65% of people live in rural area.

4.3 Religion

In this study the proportion of overt diabetics with pregnancy among Hindu: Christian: Muslim=69.4%: 11.1%: 19.4% where as the proportion among the current SAT admissions are 71.2%: 5.8%: 23.1%.

4.4 Socio Economic Status

In the present study the ratio of people belonging to Above Poverty Line: Below Poverty Line was 75%:25% where as admission during the study period has got a ratio of 91.6%: 8.4%. This may be due to the fact that people belonging to the affordable group accept treatment from private institutions having modem facilities and increased reference of BPL group from periphery to here.

4.5 Gravida wise distribution

The gravida wise distribution shows that 52 cases are multi gravida. This is due to the obstetric mishaps in diabetic women. In this study 20 are primi and 15 are multi gravida without children.

Table 1: Gravida Wise Distribution (P= 0.039)

Gravida	Number	%		Parity	Number	%
1	20	27.8		0	35	48.6
2	23	31.9		1	27	37.5
3	16	22.2		2	9	12.5
>3	13	18		3	1	1.4

4.6 Class of disease

In this series 65 of the total 72 were under Class B, only one in D and 3 each in C & R.

4.7 Eye examination

Of the total 72 pregnancies 3(4.2%) having retinopathy. All the 3 had type 1 retinopathy changes. Retinopathy was classified into four types. In grade zero the patients showed no retinal changes. In grade I there was background diabetic retinopathy with micro aneurysms, and in grade II (pre-proliferative retinopathy) the criteria included hard exudates, haemorrhages and infarcts. Grade III was classified as proliferative retinopathy with neo-vascularisation and fibrous tissue. Aggravation of retinopathy was defined as any progression of preexistent retinal changes during pregnancy [3].

4.8 Renal function

The results shows that 6(8.33%) has elevated S. Creatinine level. Several studies of diabetic nephropathy in pregnant women have shown that moderate to severe renal insufficiency at conception (serum creatinine > 1.4 mg/dl) is associated with a high risk for progression of the renal disease during pregnancy [4]. But reports of whether the same predisposition to progression is seen in diabetic women with mild renal insufficiency are controversial. The well known phenomenon of tubular secretion of creatinine, which increases variably with decreased renal function and proteinuria, reduces the rise in serum creatinine and falsely elevates Creatinine Clearance (Cr Cl) in patients with renal insufficiency. GFR is therefore overestimated when one calculates Cr Cl, especially when the filtration rates are below 20 ml/min.

Table 2: Classification based on class of diabetes

Class of Disease	Number	%
B	**65**	**90**
C	**3**	**4.16**
D	**1**	**1.3**
R	**3**	**4.16**

4.9 Past obstetrics hazards

The present study results shows that previous pregnancies were complicated by 34%abortions, 13% intrauterine deaths and 5% neonatal deaths. These bad obstetrics performances may be due to poor metabolic control. In a similar study conducted in SAT Hospital in 1996 abortion rate was 27.4%, intrauterine death 8.82% and 7.84% neonatal deaths.

The increase in rates of abortion and IUDs may be due to the increase in the reference of cases with BOH from the periphery. The decrease in the NND may be due to the better neonatal facilities now available.

4.10 HbAlc Level:

The HbAlc was found to be increased in 13(18%) in this study. The correlation between control of the diabetes and the risk of congenital malformations was first noted in the 1970s. In 1978, the hemoglobin A1C (a measure of the average blood glucose over the lifespan of the red blood cell, 90 tol20 days) was correlated with major anomalies [5]. The higher the A1C above normal, the greater the percentage of abnormalities and early pregnancy losses. Hypoglycemia does not increase the rate of anomalies in humans. Hemoglobin A1C values should to be in the normal range prior to the pregnancy.

Table 3: Bad obstetric indicators from past obstetric history

Bad obstetrics indicators	Number	Percentages (%)
Abortion	34	34
Neonatal Death	5	5
Vulvitis	14	14
Urinary Tract Infection	21	21
PIH	12	12
Hydramnios	8	8
Macrosomia	10	10
IUD	13	13
Traumatic Delivery	1	1
Congenital Anomalies	3	3
DKA	1	1
Infertility	18	18
Prom	5	5
Preterm Labor	5	5

4.11 Present obstetric hazards:

The results show that vulvitis and urinary tract infections are the most common ailments. There were 30% Pre eclampsia, 16% hydramnios and 7% preterm labour. A similar study from SAT hospital in 2000 shows 31.96% of pre eclampsia in diabetic population & 8% in non diabetics, 18% hydramnios and 10% pre term labour. Fetal loss rate (abortion) =13%.Women with overt diabetes exhibit a threshold of pre-gestational glycemic control above which spontaneous pregnancy loss is increased.

Table 4: Bad obstetric indicators in present obstetric history

Bad Obstetrics Indicators	Number	Percentages
Abortion=9(2nd trimester abortion = 2)	9	13
Hypermesis	2	2.7
UTI	31	43
Vulvitis	29	40
PIH (Pre Eclampsia)	22	30
Hydramnios	12	16
IUD(before 28 weeks of gestation)	4	5
Traumatic Delivery	1	1.3
Hypoglycemia	3	4
Congenital Anomalies	1	1.3
DK	1	1.3
PROM	14	19
Preterm	5	7

4.12 Mode of delivery

In this study, Of the 72 cases 29(40.28%) had vaginal delivery of which 14% was instrumental delivery. 47.22% had CS of which 21% of CS was due to fetal distress. The Caesarean section rate in diabetic pregnancy is high; in addition to the increased rates of failed inductions, macrosomia and foetal distress contribute to this. Caesarean section rates in diabetic women have been reported to be 45-50%, the corresponding percentages being 9-12 in the background population [6]..

4.13 Complications during labour:

Birth weight

There was 8% macrosomia, low birth weight 25%, prematurity 7% in this study. In a previous study the proportions were 27.6% for macrosomia, 21.1% for prematurity [7]. The decreased rate of macrosomia & prematurity may due to the good glycemic control and ante natal care.

Table 5: Complications during labour

Complications	Number	%
Hypoglycemia	2	2.7
PPH	6	8.3
Shoulder Dystocia	1	1.3
Single Umbilical Artery	1	1.3

In the post partum period 31% developed post partum complications.

Co-morbid conditions

One person was HbS Ag, HbE Ag Positive. No maternal mortality in the present series. In a similar study in 1996 in SAT Hospital also did not show any maternal mortality. Studies by Agarwal *et al* 1983[8] and Goyal U 1980[9] also showed similar results.

Table 6: Postpartum Complications

No Complications	50	79%
Complications	Number	%
Wound Infection	3	4.7
Other Infections	3	4.7
DKA	5	7.9
Hypoglycemia	3	4.7

Table 7: Antenatal Care

Good	**54**	**75%**
Poor	**18**	**25%**

4.15 Cross tabulation

Table 8: Age group maternal complications

Age Group	Maternal Complications		Total
	Adverse	Nil	
>=30 YRS	25	8	**33**
<30 YRS	18	21	**39**
Total	**43**	**29**	72

P=0.016; OR=3.65(1.19-11.49)95%CI

Table 9: Metabolic Control* Maternal Complication

Metabolic Control	Maternal Complication		Total
	Adverse	Good	
Poor	14	13	27
Good	29	16	45
T TOTAL	43	29	72

Odds Ratio 0.59 (95%CI 0.20-1.75)

Table 10: Antenatal Care* Maternal Complication

Antenatal Care	Maternal Complication		Total
	Adverse	Good	
Poor	8	10	18
Good	35	19	54
Total	43	29	72

Odds Ratio= 0.43 (95%CI 0.13-1.46)

The present study clearly supports the hypothesis that good metabolic control (p=0.009) and good antenatal care (p=0.047) reduces bad fetal outcome. (Bad Outcome-neonatal death, congenital anomaly, babies required resuscitation).

But the study could not find a statistical significance, between maternal complications, metabolic control (p=0.292) and antenatal care (p=0.127).

There is 3.65 times risk for mothers having overt diabetes more than or equal to 30 yrs to develop complications. (P=0.010). 'Maternal complication was assessed by considering that PIH, Hydramnios, DKA,

Hypoglycaemia and Preterm Labour as bad outcome [10]. Pedersen & Moelsted (1965) presented four groups with a poor prognosis for the infant in diabetic pregnancy. These prognostically bad signs of pregnancy were clinical pyelonephritis, pre-comatose or severe acidosis, pre-eclampsia and negligence of care. In a study accepted by Oulu University on September 21st 2001 shows [11] poor glycaemic control during the first weeks of pregnancy was found to be the most important factor predicting adverse neonatal outcome such as increased CS rate, neonatal morbidity and mortality in diabetic pregnancy. There is 4 times risk for a bad fetal outcome when the mother had bad metabolic control and 3 times risk if had bad antenatal care.

Table 11: Maternal Complications As Outcome Variable

	B	S.E	Wald	Df	Sig.	Exp(B)
Antenatal care	-3.135	1.554	4.070	1	.044	0.043
Metabolic control	.023	1.077	.000	1	.983	1.023
Yrs. Marriage	-.102	.120	.716	1	.397	0.903
Pre-Obstetric outcome	2.189	1.146	3.650	1	.056	8.925
Age	-.030	.083	.129	1	.719	0.971
Gravida	-.236	.400	.347	1	.556	0.790
Mode of delivery	-2.158	.569	14.383	1	.000	0.116
Constant	5.698	2.234	6.507	1	.011	298.234

The multivariate analysis shows

When maternal complications was taken as outcome variable, antenatal care (p value=0.044), & mode of delivery (p=0.000) found to be significant.

5. Summary and Conclusion

Overt diabetes in obstetrics patient is a high risk situation for both mother and the baby. Proper management from the pre-conceptional period till delivery can bring about a very favorable outcome.

In the present study 45.8% of overt diabetic pregnancies belong to >=30yrs (OR= 3.65(1.19-11.49) & 54.16% below 30yrs of age group. The mean years of marriage before pregnancy were 6.47 yrs. Of the total 6(8.3%) were become pregnant at or below lyr. The maximum duration of 16 years were noted in 4 persons (5.6%).

The present study clearly supports the hypothesis that good metabolic control (p=0.009) and good antenatal care (p=0.047) reduces bad fetal outcome.

The multivariate analysis shows that when maternal complications were taken as outcome variable, the antenatal care (p value=0.044) and mode of delivery (p=0.000) was found significant.

The prevalence of overt diabetes in the present series is 0.44%. It is clear that good glycemic control and antenatal care can bring down the adverse maternal and fetal outcomes. Introduction of pre-conceptional clinics and provision for estimation of glycosylated hemoglobin in the primary health centre levels will enable the patients to have a better outcome [12].

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