

Relation of Maternal Blood Glucose Level, Foetal Cord Blood Glucose and Fetal Birth Weight in Pregnancy Induced Hypertension

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Abstract: Pregnancy is a condition where carbohydrate is an important constituent for normal functioning of mother and the foetus. The foetus has been at times described as glucose dependent parasite¹ the glucose provides about 100% energy to the foetus. The various literatures over the years has shown deranged carbohydrate metabolism in pregnancy induced hypertension with a greater preponderance for lower blood sugar values in preeclampsia and eclampsia. The foetus in later part of pregnancy is directly dependent on maternal blood glucose level so any lower in its level will affect birth weight. To determine relation between maternal blood glucose at term of PIH patients in relation to foetal cord blood glucose and birth weight. This was a prospective study conducted in the department of Obstetrics and Gynaecology of Gauhati medical college and hospital during the period of 2013-2014. A total of 160 patients were included in the study. Where 100 normal blood pressure patients were served as control and 60 patients with pregnancy induced hypertension were included in the study as cases. Fasting blood glucose level and cord blood sample are measured along with foetal birth weight. There was no significant difference between cases in regarding age and parity. In the study it was found that cord blood glucose was lower than maternal blood glucose levels in all cases. No constant relation could be observed among maternal blood glucose level cord blood glucose and baby birth weight in normal pregnant women. In PIH cases it was observed that maternal blood glucose levels decreased in proportion to the increase in severity of PIH. It was also found that there is direct correlation between among maternal blood glucose level, cord blood glucose and foetal birth weight in PIH cases. Birth weight also decreased with the increase in severity of PIH in our study. Severity of PIH affect blood glucose, cord blood glucose level and birth weight.

Keywords: pregnancy induced hypertension, blood pressure, foetal outcome, cord blood glucose.

INTRODUCTION

Pregnancy induced hypertension (PIH), one of the hypertensive disorders of pregnancy, affects about 5-8% of all pregnant women worldwide [1]. It is one of the fore most causes of death among mothers and foetuses. Fetal birth weight can be influenced by both endogenous and exogenous factors. These factors include gestational age at delivery, physiological factors (altered glucose metabolism, hemoglobin concentration, macro vascular integrity), pathological factors (hypertension, uterine malformation), and complications of pregnancy (gestational diabetes mellitus, preeclampsia [2]. Pregnancy is a condition where carbohydrate is an important constituent for normal functioning of mother and the foetus. The foetus has been at times described as glucose dependent parasite [3]. The glucose provides about 100% energy

to the foetus[4-6] Gluconeogenesis is virtually absent in the fetus so that the fetus obtains its glucose almost entirely from circulating levels in the mother [7]. Maternal glucose and other metabolic fuels thus provide the energy for fetal growth and facilitate the passage of nutrients from mother to fetus [4, 5, 6, 8]. The arterial plasma glucose concentration gradient from the mother to the foetus is the physiological driving force that determines placental glucose uptake and transfer to the foetus. The capacity for placental transfer increases with gestational age as does the placental concentration of GLUT-1 Transporter. But if hypoxic stress eg hypertension or maternal starvation is present, foetal catecholamines secretion may promote glycogenolysis and decreased foetal insulin concentration as well as glucose utilization.

Decreased perfusion of the foeto-placental unit would decrease foetal size, even before the appearance of the defining criteria of pre-eclampsia (hypertension and proteinuria)[9,10]. During pregnancy lower level of maternal glucose have been associated with reduced infant birth weight and increased risk for small for gestational age babies [11].

The various literatures over the years has shown deranged carbohydrate metabolism in pregnancy induced hypertension with a greater preponderance for lower blood sugar values in preeclampsia and eclampsia. Some studies have shown lower blood glucose level in PIH [3, 12, 13] while some other studies have shown increase in maternal glucose level. The lower foetal glucose level was explained by depleted placental store of glycogen in later part of pregnancy causing foetus totally dependent on maternal glucose level directly[14].

Another study conducted at Gujrat showed that the mean foetal birth weight of normotensive patients were 2640 gm, in mild hypertension group it was 2480 gm and in severe hypertension group it was 2050 gm[14]. A multivariate analysis study conducted in 1994 showed higher incidence of low birth weight babies in severe hypertensive patients [15].

AIMS AND OBJECTIVES

To determine relation between maternal blood glucose at term of PIH patients in relation to foetal cord blood glucose and birth weight.

MATERIALS AND METHODS

This was a prospective case control study conducted in the department of Obstetrics and Gynaecology of Gauhati medical college and hospital, Guwahati, Assam during the period of 2013-2014. A total of 160 patients were included in the study. Where 100 normal blood pressure patients were served as control and 60 patients with pregnancy induced hypertension were included in the study as cases.

Eligibility criteria included patients attending antenatal OPD or admitted in the ward at term pregnancy.

Exclusion criteria

cases with insufficient information -where last menstrual period was not known , cases with severe anaemia, cases with chronic hypertension, chronic renal disease, cases having proteinuria before 20 weeks of gestation, cases diagnosed diabetes before pregnancy or diagnosed during pregnancy, cases where 5% dextrose drips were used and cases of prolonged labour were excluded.

Collection of blood samples-the blood samples for the study was taken in the following manner

- The first sample of blood taken at term, fasting, immediately before going into labour.
- The cord blood glucose sample was collected from the cut end of the umbilical cord at the time of delivery of foetus in a sterile glass container and blood sugar estimation done within an hour.
- Blood glucose estimation done by auto-analyzer.

RESULTS AND OBSERVATIONS

Table-1: Distribution of patients

Serial no	Group	No. Of cases n=160	Percentage
1	Control	100	62.5%
2	Cases	60	37.5%

Table-2: Age distribution

Age group	Control	Cases
15-20 years	10	12
21-25 years	18	24
26-30 years	42	18
>30 years	30	06

Table-3: Distribution of parity among control and cases

parity	Control	Cases
Primi	40	42
Para 1-3	48	18
Para 4 and above	12	0
Total	100	60

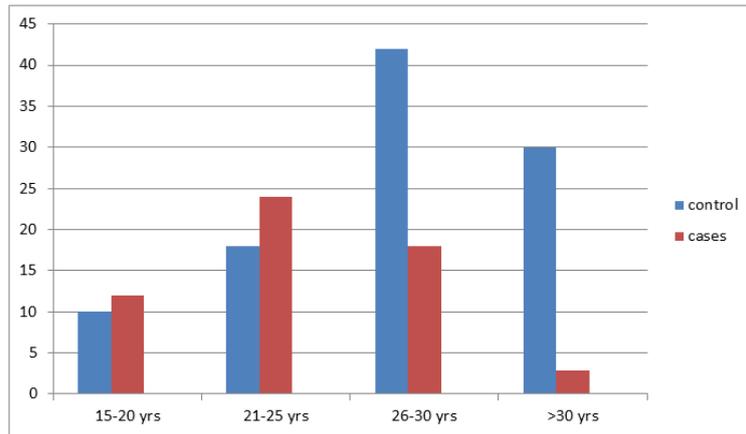


Fig-1: P value is found to be 0.25 which is not significant
 There were no significant differences between cases and controls (p value 0.46)

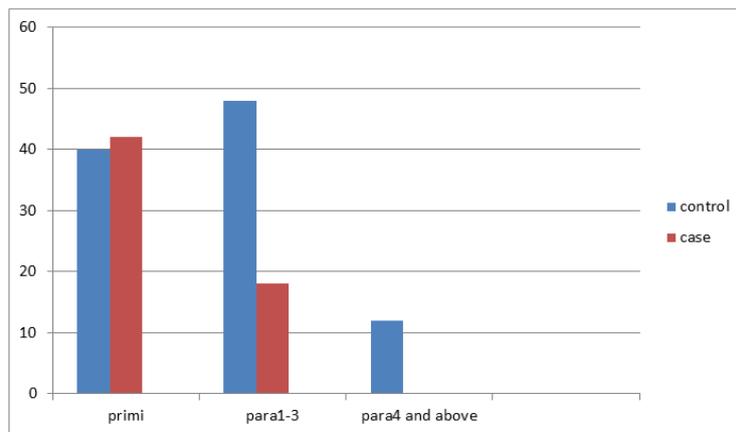


Fig-2: There were no significant differences between cases and controls (p value 0.46)

Table-4: Distribution of cases upon severity of PIH

Severity of PIH	No. Of cases	Percentage
Mild hypertension	16	26.7
Severe hypertension	32	53.3
Eclampsia	12	20
Total	60	100

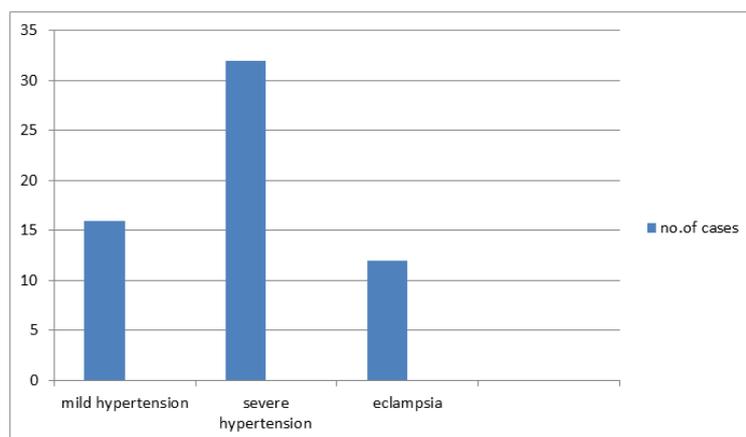


Fig-3

Table-5: Relation of maternal blood glucose level with cord blood glucose level and foetal birth weight in control group

Birth weight in kg	No. Of patients	Mean maternal fasting blood glucose	Mean Cord blood glucose level after delivery
Upto 2.5kg	8	71.3	73.2
2.6-3 kg	38	72.9	67.8
3.1-3.5 kg	44	78.9	68.5
>3.5 kg	10	87	74

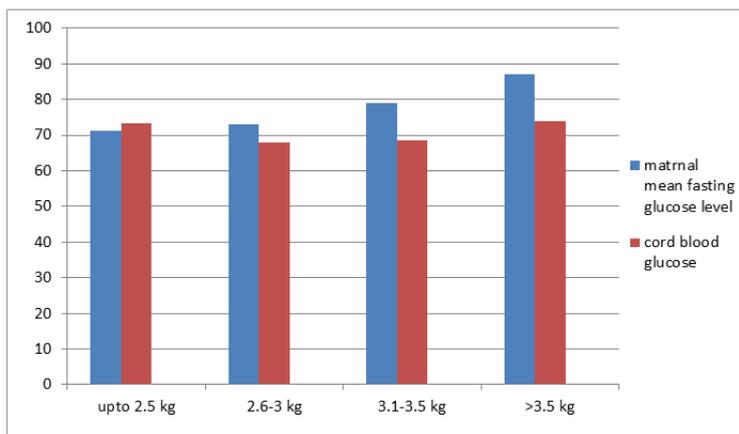


Fig-4

Table-6: Relation of maternal fasting blood glucose level, cord blood glucose level and foetal birth weight In PIH group

Foetal birth weight	No. of cases	Maternal fasting blood glucose level	Mean Cord blood glucose level after delivery
Upto 2.5 kg	34	78.2	61.8
2.6-3 kg	20	67.6	63.6
3.1-3.5 kg	06	69.6	58
>3.5 kg	nil		

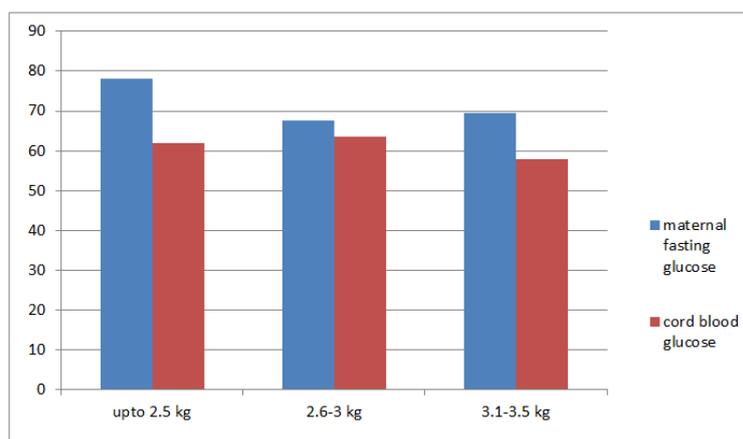


Fig-5

Tabl-7: Comparison of mean maternal fasting blood glucose level, cord blood glucose level and mean birth weight in study population

Sl.no	Group1	Maternal fasting blood glucose level(mg/dl)	Cord blood glucose level after delivery (mg/dl)	Mean birth weight kg
1	Normal pregnant woman	83.52	69.24	3.11
2	Mild hypertensive	75.13	63.25	2.86
3	Severe hypertensive	72.3	55.93	2.33
4	Eclampsia	73.3	53.66	2.10

It was observed that in PIH, maternal blood glucose level is lower than normal pregnant women. In all cases cord glucose levels are significantly lower than

the maternal blood glucose levels. As significant fall in cord blood glucose levels seen when compared to maternal blood glucose level ($p < 0.05$) was observed.

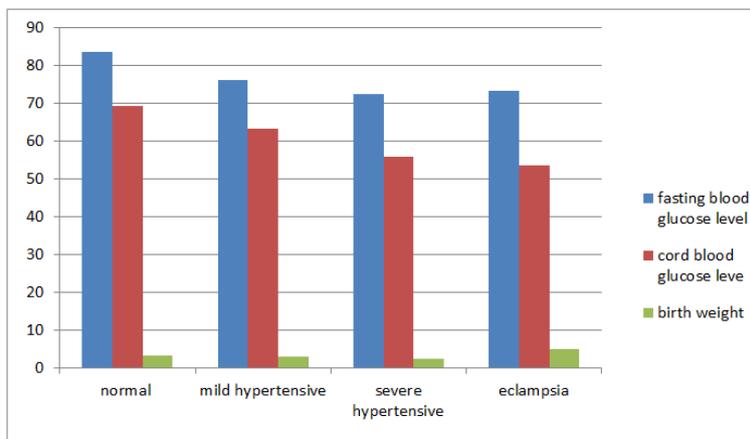


Fig-6

Table-8: Distribution of birth weight in relation to severity of PIH

Foetal weight	Control		Mild PIH		Severe PIH		Eclampsia	
	N=100	%	N=16	%	N=32	%	N=12	%
<2.5 kg	08	08	02	12.5	22	68.75	10	83.3
2.5-3 kg	38	38	10	62.5	08	25	02	16.7
3.1-3.5 kg	44	44	04	25	02	6.25		
>3.5 kg	10	10						

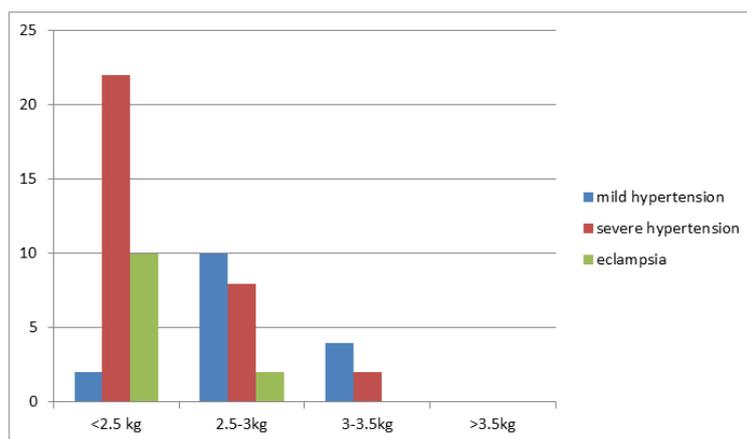


Fig-7

DISCUSSION

Majority subjects in control group were belonged to 26-30 age group while, in PIH 21-26 age group has maximum number of cases. Maqueo M *et al.* observed that increased incidence of hypertensive

disordered seen in early age group, which is also seen in this study [16].

The observation of our study is compared with other studies as below-

Table-9: Relation of blood glucose with birth weight

Group	Sumitra <i>et al.</i> 1984[3]			Our study		
	MBG	CBG	BW	MBG	CBG	BW
Control	89	71.76	3	83.52	69.24	3.11
Mild hypertension	80	62.16	2.7	76.125	63.25	2.86
Severe hypertensive	73.13	53.06	2.48	72.35	55.93	2.33
Eclampsia	69.6	49.5	2.3	73.33	53.66	2.10

Table-10: Relation of birth weight with severity of hypertension

Fetal weight	Gupta <i>et al.</i> 2018 [24]			Our study		
	Mild hypertension N=61	Severe hypertension N=28	eclampsia N=11	Mild hypertension N=16	Severe hypertension N=32	eclampsia N=12
<2.5 kg	09 (14.75%)	18 (64.28%)	08 (72.72%)	02 (12.5%)	22 (68.75%)	10 (83.3%)
2.5-3 kg	49 (80.32%)	10 (35.72%)	03 (27.28%)	10 (62.5%)	08 (25%)	02 (16.7%)
> 3kg	03 (4.91%)			02 (25%)	02 (6.25%)	

Similar to gupta *et al.* study [24], in severe hypertensive group our study also has maximum number of cases in <2.5 kg birth weight group

Present study shows, the mean birth weight low with increasing grades of hypertension compared to controls which is in accordance with the study of Das B *et al.* and Mohan H *et al.* [17, 18].

However, Xo Xing *et al.* [19] concluded in his article that babies born to mothers with preeclampsia at term have foetal growth similar to that of normotensive mothers.

S.A.Obed *et al.* [20] in his study concluded that mother with eclampsia ave low birth weight babies than mothers who donot have preeclampsia.

Latifa a Rahman *et al.* [21] in their case control study in 312 mothers found that PIH was independent risk factors for low birth weight. They found a significant association between LBW and PIH.

Irwindia *et al.* [22], Paetal *et al.* [23], Gupta *et al.* [24] had shown a similar effect of PIH in foetal birth weight like our study.

CONCLUSION

Pregnancy induced hypertension is a common medical disorder with pregnancy. In pih there is decrease in cord blood glucose level. Foetal birth weight decreases with increase in severity of pih. Our study have shown that there is a significant association of low blood sugar ,low cord blood level and low foetal birth weight in pregnancy induced hypertensive mothers than normotensive mothers.

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