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SERUM LIPIDS AND MALONDIALDEHYDE LEVELS IN PRIMIPAROUS PATIENTS WITH PREGNANCY INDUCED HYPERTENSION

Shruti Mohanty[1], Nalini Nayak[2], N.N. Nanda[2], Pragna Rao[1]

[2] MKCG Medical College, Berhampur, Orissa, India
[1] Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, Andhra Pradesh - 508 254, India

ABSTRACT

BACKGROUND : Pregnancy induced hypertension (PIH) contributes to 15.6% maternal mortality in India. In Behrampur, Orissa, maternal deaths due to PIH was 32%, which is twice the national incidence. Hence in this population, some factors associated with severity of PIH were studied. Serum lipid concentrations and malondialdehyde (MDA) levels were correlated with severity of PIH and birth weight of the neonate

Patients & Methods : 70 primiparous PIH patients and 20 healthy controls were studied. Serum lipids and MDA were estimated. Maternal blood pressures and birth weights of the neonate were recorded.

Results and Conclusion: Serum cholesterol, triglyceride, LDL, VLDL and MDA were significantly elevated in primiparous PIH patients when compared to control subjects. Average birth weight of babies born to mothers with PIH was less than those born to control subjects. The most significant factor was that in this geographical area, 26% of the primiparous patients with PIH were below 20 years of age while only 15% of the controls were less than 20 years, indicating that younger maternal age was a contributing factor to PIH.

KEYWORDS

Serum lipids, Lipid peroxidation, MDA, PIH, birth weight.

INTRODUCTION

Pregnancy induced hypertention (PIH) is a syndrome of hypertension in pregnancy, with or without proteinuria and oedema. In India, the national incidence of PIH is 15.2%, with the incidence in nulliparous women being four times greater than in multipara (1) In the area where this study was conducted (Berhampur, Orissa, India) maternal deaths due to PIH was 32% which is twice the national incidence (2, 3). The higher incidence of PIH in this area led us to study the possible factors associated with PIH and the resultant fetal outcome in these patients.

Author for Correspondence :

Dr. Shruti Mohanty
Kamineni Institute of Medical Sciences,
Narketpally, Nalgonda District,
Andhra Pradesh - 508 254, India.
E-mail : shruti_mohanty@yahoo.co.in

Serum lipids increase significantly during pregnancy and are further elevated two fold during PIH (4, 5, 6). Several studies have shown that lipid peroxides like malondialdehyde (MDA) are significantly elevated in mild and severe PIH (7, 8, 9).

This study was carried out in a semirural area where social norms favour early marriages for females.The aim of this study was to correlate fetal outcome with the concentration of maternal serum lipids and lipid peroxidation products in the primiparous patients with severity of PIH.

MATERIALS AND METHODS

The study was carried out in MKCG Medical College, Berhampur, Orissa. 20 healthy subjects and 70 PIH primiparas were inducted into the study, attending the obstetrics and gynaecology department of the same hospital. All patients survived till the end of the study period. There was no fetal deaths or anamolies in the neonates born. The diagnosis of PIH was done as per the norms of American college of Obstetrics and Gynaecologists (4). The definition includes. 1) systolic blood pressure $\geq$ 140 mm Hg, 2) diastolic blood

pressure ≥ 90 mmHg or 3) increase of ≥ 30 mmHg in systolic pressure or 4) increase of ≥ 15 mmHg in diastolic pressure. PIH was diagnosed when any of these criteria were present on at least two occasions. The study was approved by the ethics committee of the medical college. Maternal venous samples were collected after overnight fasting for estimation of serum cholesterol, triacylglycerol, HDL and lipid peroxidation product, malondialdehyde (MDA). Birth weight of the neonate was recorded immediately after birth.

Serum cholesterol was estimated by Zak's method (10), HDL by Lepes Virellar *et al*. method (11) and serum triacylglycerol by the method of Nere and Fringe (12) LDL and VLDL values were calculated using Friedwald's formula [13]. Malondialdehyde was estimated using thiobarbituric acid method (14). Both systolic and diastolic blood pressures were recorded on two occasions separated by an interval of six hours. The patients were categorised into mild and severe PIH by taking 110 mmHg for diastolic BP and 150 mm Hg for systolic BP as the cut off levels.

Statistical analysis was done using MS excel. Pvalue less than 0.05 was taken as the level of significance.

RESULTS

The demographic details of the PIH primiparas and control subjects are presented in Table 1.

The average birth weight of babies born to primiparous patients with PIH was less than that born to controls. However, the difference was statistically not significant (Table 1). In 23% of primiparous PIH patients the birthweight of the babies delivered was between 1500-1900 gms, whereas only 15% of the control group had babies with birth weight in the same range. Although both the control subjects and PIH patients had similar average maternal age, 26% of PIH patients were less than 20 years of age while only 15% of controls were below 20 years.

Serum cholesterol, triglycerides, LDL and VLDL were found to be significantly elevated in patients of PIH when compared to the control population (Table 2). HDL however was not elevated in PIH patients. Irrespective of the severity of hypertension (PIH) as expressed in terms of systolic and diastolic blood pressures, PIH patients had significantly elevated serum cholesterol, triglycerides, LDL and VLDL levels (< 0.005). HDL levels remained similar to control levels in both severe and mild PIH primiparas.

Table 1. Demographic details of primiprous PIH patients and control subjects

Parameter	PIH patients (n=70)		Control (n=20)	
	Mean ± S.D	Range	Mean ± S.D	Range
Age (Years)	22.57 ± 3.36	18-30	22.75 ± 3.00	19-30
Systolic BP (mmHg)	143.97 ± 7.68	130-160	106.25 ± 4.97	90-120
Diastolic BP (mmHg)	98.95 ± 7.93	90-120	73.5 ± 4.97	68-80
Baby birth weight (gms)	2190.54 ± 263.1	1730 -2650	2760 ± 302.8	2350 -3150

Table 2. Serum lipids in controls and PIH patients

Group	Total cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Control Mean + S.D (n=20)	231.75±28.18	179.35±14.33	69.6±5.79	123.43±27.13	35.37±3.61
Range	198-295	155-205	58-80	92-192	26-41
PIH Patients Mean + S.D (n=70)	310.56±48.61	271-32±48.61	68.95±9.87	183.71±25.62	54.65±9.62
Range	275-380	189-392	48-86	147-248	37.8-78.4
p	P<0.0005	P<0.0005	NS	P<0.0005	P<0.0005

Table 3. Serum Lipids in PIH patients when diastolic blood pressure (DBP) is less than or greater than 110 mmHg (n=70)

Parameter	DBP < 110 mmHg n=56	p. value compared to controls	DBP > 110 mmHg n=14	p value compared to controls
Cholesterol Mean ± S.D.	305.46 ± 22.38	p < 0.005	330.37 ±14.78	P < 0.0005
Triglycerides Mean ± S.D.	267.05 ± 48.74	p < 0.005	300.00 ± 40.00	P < 0.025
HDL Mean ± S.D.	70.26 ± 9.76	NS	64.78 ± 8.16	NS
LDL Mean ± S.D.	181.64 ± 22.94	p<0.005	205.04 ± 21.22	P < 0.0005
VLDL Mean ± S.D.	181.64 ± 22.94	p<0.005	205.04 ± 21.22	P < 0.0005

Table 4. Serum Lipids in PIH patients when systolic blood pressure (SBP) is less than or greater than 150 mmHg

Parameter	SBP < 150 mmHg n=48	P. Value Compared to controls	SBP > 110 mmHg n=14	P value compared to controls
Cholesterol Mean ± S.D.	304.4 ±20.54	p<0.005	323.55 ± 23.63	P < 0.0005
Triglycerides Mean ± S.D.	263.27 ± 46.58	p<0.005	296.25 ± 46.44	P < 0.0005
HDL Mean ± S.D.	70.10 ± 9.75	NS	67.05 ± 10.00	NS
LDL Mean ± S.D.	181.47 ± 21.9	p<0.005	197.29 ± 24.86	P < 0.005
VLDL Mean ± S.D.	53.35 ± 9.64	p<0.025	59.4 ± 8.18	P < 0.025

Table 5. Age distribution in cases and controls

Age	Controls n=20	PIH Patients n=70
≤ 20 yrs	03	18
Per cent	15	26
20-25 yrs	10	26
Per cent	50	38

Serum malondialdehyde levels were significantly elevated in patients of PIH when compared to controls (2.73 ± 0.43; 1.04 ± 0.18; P<0.005). Serum MDA levels correlated well with serum levels of cholesterol (r=0.60), triglycerides (r=0.59), LDL (r=0.6) and VLDL (r=0.5). This indicates that elevation of different fractions of serum lipids is accompanied by elevations of the lipid peroxidation product, MDA.

DISCUSSION

Several studies have reported the elevation of serum lipids during pregnancy in general and during PIH in particular. This study also showed similar serum lipid elevations in PIH. In these primiparous PIH patients, however, the absence of increase of HDL despite the increase of other lipid parameters is a potential risk factor for atherosclerosis (15).

The risk of PIH is higher when the maternal age is below 25 years (16). In our study, 26% of the patients were less than 20 years of age. Hence in the geographical area where this study was conducted, younger maternal age is an important factor contributing to the higher incidence of PIH when compared to the national incidence.

Maternal hypertension is associated with occurrence of large placental infarcts and reduced placental growth. These in turn, result in decreased placental

perfusion, fetal malnutrition and reduced fetal growth.

In the population studied, the mean birth weight of babies born to mothers with PIH was less than the control subjects. PIH is therefore a contributing factor to the lower birth weight in the study population.

Elevated levels of MDA were found to be associated with elevated serum lipid levels, indicating that PIH is associated with excessive free radical formation. Their studies have also shown highly significant relation between a rising blood pressure and increasing free radical activity (6). Several investigations have hypothesized that the interaction between a disordered lipide profile, endothelin cell and oxidative stress is of major significance to the patho-physiology of preeclampsia (18, 19).

In conclusion, younger maternal age contributes to an increased incidence of PIH among the population studied. PIH in turn is associated with elevated serum lipids, MDA and lower birth weight.

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