

DETERMINANTS OF PREGNANCY INDUCED HYPERTENSION AMONG THE ANTENATAL MOTHERS IN AN URBAN AREA OF KANCHEEPURAM DISTRICT TAMILNADU – A CASE CONTROL STUDY

K. Renuka¹, R. Umadevi²

^{1,2}Department Of Community Medicine, SreeBalaji Medical College and Hospital Chennai
*umadevi.r@bharathuniv.ac.in

ABSTRACT

This case control study was carried out among the antenatal mothers attending a tertiary care hospital in the study area of Kancheepuram district of Tamilnadu to assess the sociodemographic and the obstetric determinants of Pregnancy Induced Hypertension To determine the Sociodemographic factors associated with Pregnancy Induced Hypertension among the antenatal mothers with PIH (cases) and antenatal mothers without PIH.

Keywords

hypertension, blood pressure, preeclampsia and eclampsia.

Introduction

Worldwide about 830 women die each day due to pregnancy related complications, and most of the deaths occur in the low and middle income countries with resource poor settings. 1 At present the Maternal Mortality Rate (MMR) is 216 per 100000 live births globally and in India it is 174 per 100000 live births and in Tamilnadu it is 60 per 100000 live births 2

Hypertension during pregnancy ranks third among the top five causes of maternal mortality. It is an important cause for severe morbidity, mortality and long term disability in mothers as well as in their babies. It complicate about 8 to 10% of pregnancies worldwide. 4 Hypertensive disorders of pregnancy includes gestational hypertension, chronic hypertension, preeclampsia and eclampsia. Among them Gestational Hypertension or Pregnancy Induced Hypertension (PIH), Pre-eclampsia and Eclampsia stands out as the major cause for maternal and perinatal morbidity and mortality.

India the prevalence of Pregnancy Induced Hypertension (PIH) is about 6.9%.5 Pre-eclampsia affects 2 to 8% of the pregnancies worldwide. 6 In India incidence of pre-eclampsia is reported to be 8 to 10% among the pregnant mother. 7 Pregnancy induced hypertension (PIH) is systolic blood pressure of at least 140 mmHg or diastolic blood pressure of at least 90 mmHg on at least two occasions at least 6 hours apart after the 20th week of gestation in a women known to be normotensive before pregnancy before 20 weeks of gestation. 8

Though the maternal and the fetal complications are not severe in PIH (except in severe forms of PIH), about 15% – 25 % of the antenatal mothers presenting with PIH land up in Pre - eclampsia.9-11

Pre-eclampsia is gestational hypertension with proteinuria of unknown etiology with multi system involvement. It is a disorder of wide spread vascular endothelial malfunction and vasospasm that occurs after 20 weeks of gestation and can present as late as 4 to 6 weeks post-partum. eclampsia, HELLP syndrome, acute kidney injury, pulmonary edema, placental abruption, intra uterine fetal demise.12

Majority of the complications due to PIH could be prevented through early registration of pregnancy, regular antenatal checkup and provision of timely and effective care to those women

who are presenting with these symptoms. Optimizing health care to prevent and treat women with hypertensive disorders is a necessary step in order to achieve Target 1 in Goal 3 of Sustainable Developmental Goal (SDG) i.e.by 2030 to reduce the Global MMR to less than 70 per 100000 live births.

METHODOLOGY

Study design:

This is a hospital based case control study conducted in Kancheepuram district of Tamilnadu.

Study area:

SreeBalaji Medical College and Hospital, located at Kancheepuram district of Tamilnadu, is a tertiary care institution pledged to the service of community catering to the health care needs of the people especially to the under privileged. It is an 1150 bedded hospital catering the needs of the population. The obstetrics and Gynecology department has both inpatient and outpatient clinics and the outpatient clinic takes care of nearly 1000 cases a month. It provides round the clock service which include cesarean sections, emergency laparotomy for obstetric and gynecological cases.

Study population:

The population covered by this study was antenatal mothers above 20 weeks of pregnancy attending the Obstetric Out Patient Department (OPD) in SreeBalaji Medical College and Hospital.

Study period:

The study period is for 6 months from May 2018 to October 2018.

Sample size:

The sample size for this study was calculated using the proportion of exposed among cases and controls in a reference

Exclusion criteria:

Mothers who are diagnosed as pre eclamptic, eclamptic, chronically hypertensive or with history of renal or cardiovascular diseases and who were not willing to participate were excluded from the study.

Sampling method was used for selection.

Statistical analysis:

Statistical analysis of the data was done by using descriptive and analytical statistics. The descriptive statistics analyzed were presented as frequency distribution and percentage. The analytical statistics used were Chi square, Odds Ratio and 95% confidence interval. The association of sociodemographic factors, obstetric history, medical history, family history, anthropometric measurements and laboratory parameters with pregnancy induced hypertension was assessed. P value < 0.05 was considered as statistically significant value.

RESULTS

Sociodemographic characteristics of the cases and controls are shown in Table – 1. A total of 118 cases and 118 controls were recruited into the study. The cases and controls were matched based

on the age group. Among the cases majority of them (42.3%) belonged to the age group of 26 to 30 years. Similarly among the controls majority of them (42.3%) belonged to the age group of 26 to 30 years. With regard to religion, majority of both cases and controls belonged to Hindu religion. Among the cases, 74.6% of them are unemployed and among the controls, 80.5% of them are unemployed. With regard to educational status as shown in (Figure -1), 64.4% of the controls have completed their graduation whereas among the cases only 52.6% of them have completed their graduation. Among the cases and controls majority of them belonged to a nuclear family.

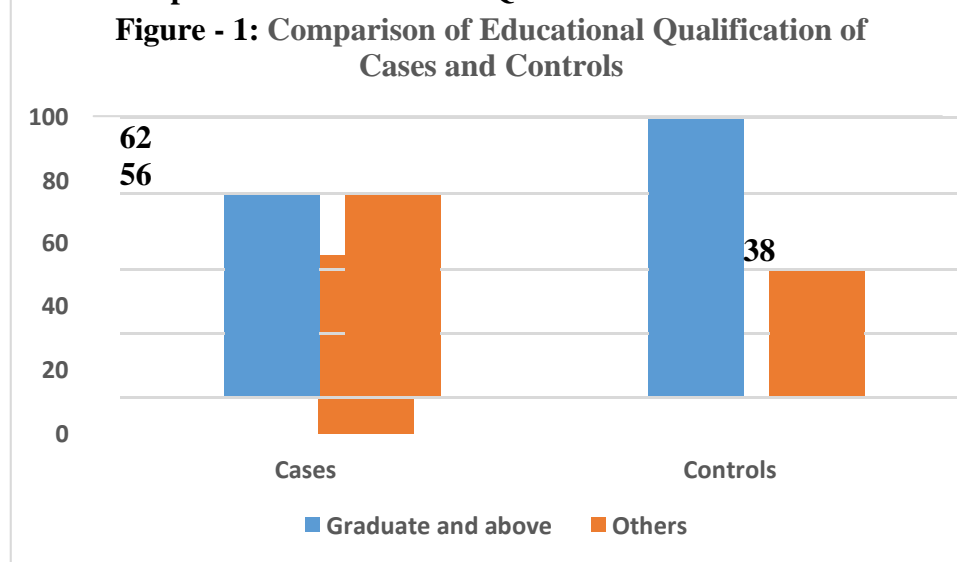
Socio economic status was characterized according to Modified Kuppuswamy Scale classification (last updated on 2019). Among the cases, 47.5% of them belonged to upper lower class, 22.9% belong to lower middle class, 16% belong to upper middle class and 13.6% belong to upper class. Among the controls 37.3% belong to upper lower class, 30.5% belong to lower middle class, 29.7% belong to upper middle class and 2.5% belong to upper class.

Table – I: Socio Demographic Characteristics of the Study Participants

S.no	Characteristic	Cases N = 118		Controls N = 118	
		Frequency	Percentage%	Frequency	Percentage%
1.	Age in years				
	< 25	44	37.5	44	37.5
	26 – 30	50	42.3	50	42.3
	31 – 35	21	17.7	21	17.7
	>35	3	2.5	3	2.5
2.	Religion				
	Hindu	97	82.3	100	84.7
	Christian	9	7.6	7	5.9
	Muslim	12	10.1	11	9.4
3.	Occupation				
	Employed	30	25.4	23	19.5
	Unemployed	88	74.6	95	80.5
4.	Family type				
	Nuclear	68	57.6	63	53.4
	Joint and extended	50	42.4	55	46.6

5.	Socio economic class (Modified Kuppuswamy classification 2019)				
	Upper	16	13.6	3	2.5
	Upper middle	19	16.0	35	29.7
	Lower middle	27	22.9	36	30.5
	Upper lower	56	47.5	44	37.3

Figure - 1: Comparison of Educational Qualification of Cases and Controls



Comparison of obstetric history among cases and controls

Obstetric characteristics of the cases and controls are shown in Table – II and Figure 2 and 3. Among the cases (Figure -2) 52.5% of them are primi and 47.5% of them are multigravida. Among the controls 27.1% of them are primi and 72.9% of them are multigravida. Among the cases, (Table – II) 28.7% of them have a previous history of abortion whereas among the controls 18.6% of them have a previous history of abortion. Among the cases, 91.5% of the study participants attained menarche at an early age whereas among controls 67% of the study participants attained menarche at an early age. Among the cases, 76.7% of the study participants have a history of regular menstrual cycle and 20.3% of the study participants have a history of irregular menstrual cycle. Among the controls 87.3% of the study participants have a history of regular menstrual cycle and 12.7% of the study participants have a history of irregular menstrual cycle.

Among the cases, 13.6% had a history of consanguineous marriage and 86.4% of them have a history of non- consanguineous marriage. Among the controls, 18.6% of them had a consanguineous marriage and 81.4% had a non - consanguineous marriage. With regard to the contraceptive usage, 12.7% of the cases had a history of contraceptive usage whereas among the controls only 6.8% of them had a history of contraceptive usage. Among the cases (Figure – 3)

10% of the study participants had a bad obstetric history whereas among the controls 3% of the study participants had a bad obstetric history.

Comparison of Family History among Cases and Controls

Family history of both cases and controls are shown in Table – III. Among cases and controls 17.8% of the study participants have a positive family history of hypertension and 82.2% of the study participants have a negative family history of hypertension. Among cases, 29.7% of the study participants have a positive family history of diabetes and among controls, 34.7% of the study participants have a positive family history of diabetes.

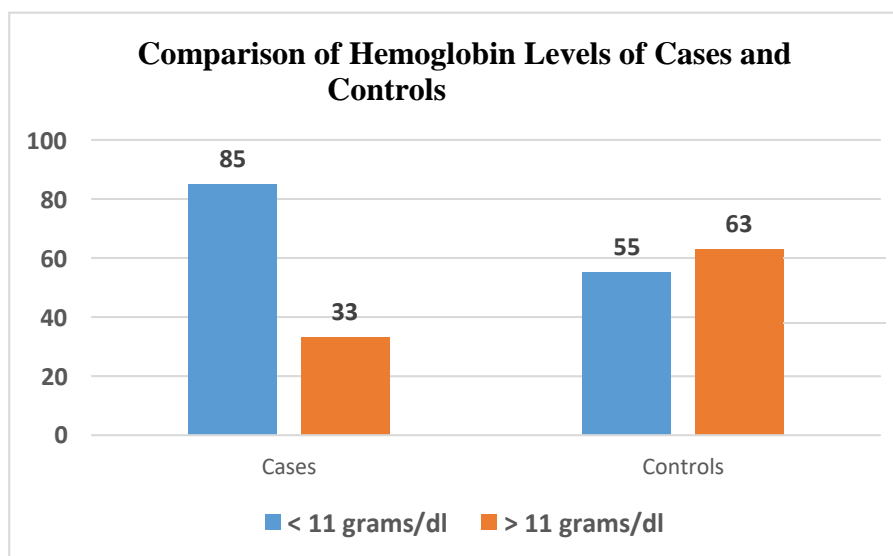
Table -II: Family history of the Study Population

S.no	Characteristic	Cases N = 118		Controls N = 118	
		Frequency	Percentage%	Frequency	Percentage%
1.	Family history of hypertension				
	Present	21	17.8	21	17.8
	Absent	97	82.2	97	82.2
2.	Family history of diabetes				
	Present	35	29.7	41	34.7
	Absent	83	70.3	77	65.3
3.	Family history of pre-eclampsia				
	Present	16	13.6	10	8.5
	Absent	102	86.4	108	91.5

Comparison of Laboratory Parameters of both Cases and Controls

Laboratory parameters of cases and controls are shown in Table – IV. Among the cases, majority of the study participants (34.7%) had “O” blood group and 29.7% of the study participants had “B” blood group. Similarly among controls majority of the study participants (50%) had “O” blood group and 30.5% of the study participants had “B” blood group. With regard to the Rh factor, majority of the study participants in both cases and controls belong to Rh positive factor.

Figure -2: Comparison of Hemoglobin Levels of Cases and Controls



Association between Sociodemographic Factors and Pregnancy Induced Hypertension

The association of sociodemographic factors to the development of PIH was analyzed in the study population. The odds of developing PIH is 1.9 times higher for individuals who are not graduated compared to those who are graduates. Other factors such as religion, occupation, type of family and socioeconomic class didn't show any statistical significance.

Table – III: Socio Demographic Factors and its association with Pregnancy Induced Hypertension

S.no	Factor	PIH n (%)	NO PIH n (%)	OR (95% CI)	Chi Square	p value
1.	Religion					
	Hindu	97	100	0.83 (0.41 – 1.65)	0.276	0.59
	Others	21	18	Ref		
2.	Occupation					
	Employed	30	23	1.408 (0.76 – 2.60)	1.192	0.27
	Unemployed	88	95	Ref		
	Education					

3.	Up to higher secondary	56	38	1.9 (1.12 – 3.22)	5.7	0.01*
	Graduate and above	62	80	Ref		
4.	Family type					
	Nuclear	68	63	1.18 (0.71 – 1.98)	0.42	0.51
	Joint and extended	50	55	Ref		
5.	Socio economic class					
	Lower class	83	80	1.12 (0.64 – 1.95)	0.17	0.67
	Others	35	38	Ref		

OR: odds ratio; CI: confidence interval; ref: reference; *P value <0.05 is significant at 95% CI.

Table – IV: Family history and its association with Pregnancy Induced Hypertension

S.no	Factor	PIH n (%)	NO PIH n (%)	OR (95% CI)	Chi Square	p value
1.	Family history of hypertension					
	Yes	21	221	0.75 (0.39 – 1.42)	0.75	0.38
	No	97	97	Ref		
2.	Family history of diabetes					
	Yes	35	41	0.79 (0.45 – 1.36)	0.69	0.40
	No	83	77	Ref		
3.	Family history of PIH					
	Yes	16	10	1.69 (0.73– 3.90)	1.55	0.21
	No	102	108	Ref		

OR: odds ratio; CI: confidence interval; ref: reference; *P value <0.05 is significant at 95% CI

Association between Laboratory parameters and development of Pregnancy Induced Hypertension

The association between the laboratory parameters and the development of PIH is illustrated in Table IV. The odds of developing PIH is lesser in mothers who had “O” blood group compared to others.(OR-0.53, 95%CI-0.31-0.89, p value-0.01). There is no statistically significant

association between PIH and Rh typing of the study participants. The odds of developing PIH is 2.9 times higher in mothers who are anemic compared to others who are not anemic (OR-2.95, 95%CI- 1.71 – 5.06, p value -0.007). Similarly the odds of developing PIH is 3.2 times higher in mothers who had thrombocytopenia compared to those who do not have thrombocytopenia (OR-3.29, 95% CI-1.15-9.37, p value-0.01). The odds of developing PIH is 3 times higher in mothers who are hypothyroid compared to those who are not hypothyroid (OR-3.1, 95%CI-1.34 – 7.40, p value- 0.006).

Thus there is a statistically significant association between mothers who are anemic, mothers with low platelet count, hypothyroid mothers and the development of PIH.

Table – V: Lab Parameters and its association with Pregnancy Induced Hypertension

S.no	Factor	PIH (%)	n NO PIH (%)	OR (95% CI)	Chi Square	p value
1.	Blood group					
	“O” blood group	41	59	0.53 (0.31-0.89)	5.62	0.01*
	Others	77	59	Ref		
2.	Rh Factor					
	Positive	11	9	0.80 (0.31-2.01)	0.21	0.64
	Negative	107	109	Ref		
3.	Hemoglobin					
	< 11grams	85	55	2.95 (1.71-5.06)	15.80	0.007*
	> 11 grams	33	63	Ref		
4.	Platelet					
	< 1.5 lakhs / cumm	15	5	3.29 (1.15-9.37)	5.46	0.01*
	> 1.5 lakhs / cumm	103	113			
5.	Thyroid function test					
	Hypothyroidism	22	8	3.15 (1.34-7.40)	7.48	0.006*
	Euthyroid	96	110	Ref		

OR: odds ratio; CI: confidence interval; ref: reference; *P value <0.05 is significant at 95% CI

DISCUSSION

This case control study was conducted to identify the determinants associated with PIH among the antenatal mothers attending a tertiary care hospital in Kancheepuram district, Tamilnadu. A total of 118 cases and 118 controls were recruited in to the study. Many interesting results were obtained in the study which were already explained. Findings of the study are discussed in comparison with other studies done in different settings.¹⁴

Among the socio demographic characteristics risk factor which had a significant association with PIH in the present study is lower education qualification of the study participant. Other factors such as religion, occupation, type of family and socioeconomic class didn't show any statistical significance.¹⁵

In the present study there was a statistically significant association between the lower educational qualification of the study participant and the development of PIH (OR-0.52, 95% CI-0.30-0.89, p value – 0.01). Similarly in a cohort study done by MinxueShen et.al in Ottawa showed that lower educational qualification of the study participant had a significant association with the development of PIH. ²⁶ In a case control study conducted by ShikhaSaxena et.al in Uttar Pradesh, India similar results.¹⁶⁻¹⁸

In the present study there was a significant association between the history of PIH in earlier pregnancy and the development of PIH (OR-5.48, 95%CI-2-15.04, p vaue-0.001). Similar results were obtained in a case control study conducted by Pierre Marie Tebeu in Cameroon (OR-7.0,95%CI-3-16.4,p value<0.001).⁷⁴ Similar results were obtained in a cross sectional study done by BharathiMehtha et.al in Rohtak, India (OR-11.48,95%CI-5.5-23.9,p value- 0.001).⁵

In the present study there was no significant association between the family history of hypertension of the study participant and the development of PIH (OR-0.75, 95%CI- 0.39-1.42, p value-0.38). Similar results were found in a cross sectional study done by Kuldip Raj et.al in Amritsar, India (p value -0.57).^{13,19} in contrast in matched case control study done by HailemariamBerheKahsay et.al in Ethiopia found out that there is significant association between family history of hypertension among the study participant and the development of PIH.²⁰

In the present study there was a significant association between low level of platelets among the study participants and the development of PIH (OR-3.29, 95%CI-1.15-9.37, p value-0.01). Similar results were obtained in a case control study conducted by Praveen et.al. in India (p value < 0.05). Likewise Sarah L Janes in her review article stated that thrombocytopenia may precede the development of PIH and severity of thrombocytopenia is directly proportional to the severity of hypertension in pregnancy. ²¹ Thrombocytopenia in pregnancy may be caused by hemodilution, increased platelet consumption at placental circulation and increased platelet aggregation due to increased levels of thromboxane A₂ levels.²²

In the present study there was a significant association between hypothyroid individuals and the development of PIH (OR-3.15, 95%CI-1.34-7.40, p value-0.006). Similar results were obtained in a case control study conducted by Nineetha et.al. in India (p value < 0.05). ²³ Similar results were obtained in a case control study done by Kumar et.al. in India (p value < 0.05).²⁴ This may be due to the fact that placental dysfunction causes low estrogen production leading on to decrease in the low levels of production of thyroid hormones.²⁵

CONCLUSION

This case control study assessed the sociodemographic characteristics, present and past obstetric history, family history and the basic blood parameters among the antenatal mothers in a tertiary care hospital in Kancheepuram district, Tamilnadu. The total sample size was 118 cases and 118 controls. They were selected based on the classification given by National High Blood Pressure Eradication Programme. The cases and controls were matched for age and in both (cases and controls) 42.3% of them belonged to the age group of 26 to 30 years.

This case control study highlights various risk factors associated with PIH. As the scope for primary prevention is very meagre much of light is focused on secondary and tertiary prevention in order to prevent complications arising due to PIH. Most of the risk factors are non-modifiable but they can be used to identify the antenatal mothers who are at high risk of developing PIH.

Though there is a National Health Programmes for maternal health in India, the strategies of these programmes do not specifically address PIH. Public Health programmes need to be planned at the National level to increase the awareness on the factors associated with the development of PIH. Health promotion activities can be planned at the level of Primary Health Centers and Sub Centers to address this public health issue.

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Ethical approval: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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