

Pregnancy Induced Hypertension: Clinicopathological Characteristics and Clinical Correlations

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Abstract Gestational hypertension (GH) or pregnancy induced hypertension (PIH) is a condition characterised by high blood pressure during pregnancy. PIH can lead to serious condition called Pre-Eclampsia or Toxemia. The condition prevents placenta from getting enough blood resulting in low birth weight. Present study is a prospective case control study elucidating the effect of various demographic, clinicopathological and obstetric parameters on PIH. A total of 120 females with PIH and 150 normotensive pregnant females were included in the study. The survey was conducted using an interviewer administered questionnaire. The mean systolic and diastolic Blood Pressure (BP) of subjects with PIH was found to be 148.2 ± 5.5 and 96.2 ± 5.8 respectively. PIH was found to be statistically associated with occupation, socio-economic status, history of PIH, previous miscarriage, family history of hypertension and diabetes ($P \leq 0.05$). The results of the present study clearly pinpoint the cluster of factors that are associated with gestational hypertension. Identifying these factors may provide a window to clinicians and help them to recognize mothers who have higher chances to develop hypertensive disorders.

Keywords Pregnancy induced hypertension, Gestational hypertension, Pregnancy, Blood pressure

1. Introduction

Pregnancy is a unique and special time for the mothers as well as their families. Nonetheless the condition is associated with certain risks to the mother and the child she bears. These risks are common in every society and every setting but in developed countries these risks have been largely overcome because every pregnant woman has access to special care. Hypertension during pregnancy is one such condition that has an impact on the mother and child. It represents a global concern and complicates 5 to 10% of pregnancies [1]. In fact, these disorders are a major cause of maternal and perinatal mortality and morbidity worldwide accounting for more than 40,000 maternal deaths annually [1]. The prevalence of hypertensive disorders in pregnancies varies according to geographic regions of world which can be attributed to the racial differences and socio economic status [2]. However, in developing countries hypertensive disorders account for 1/3rd of maternal mortality [3, 4].

PIH is characterized by new onset elevation of blood pressure after 20 weeks of gestation which usually resumes

back to normal after the delivery of the child. PIH though temporary in nature may be a future alarm for chronic hypertension. It serves as a marker for chronic hypertension later in life and can help to design preventive medical strategies [5, 6]. Risk factors postulated to influence the risk of pregnancy induced hypertension among mothers include socio demographical factors, genetic factors, pregnancy factors or personal medical history of diabetes mellitus and chronic renal disease. A study by Assis *et al.* identified several risk factors for hypertensive disorders in pregnancy and these can be related to regional and ethnic factors [7].

In 2017, Rouf *et al.* reported 20% incidence of pregnancy induced hypertension (PIH) in a block of Srinagar district [8]. However, there is paucity of information about the characters associated with gestational hypertension from our part of the world (North India). Thus, this study is designed to have understanding about the socio-demographic and psychosocial and obstetric characters of hypertensive mothers of Kashmir valley.

2. Materials and Methods

Study design

The present study is a hospital-based prospective case control study conducted in the Department of Clinical Biochemistry in collaboration with Department of Obstetrics and Gynecology, Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Srinagar. All the study subjects with PIH

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attending Department of Gynecology, SKIMS, Srinagar were included in the study. A written informed consent was obtained from all the subjects. Ethical approval was given by the Institutional Ethical Committee of SKIMS.

Patients and Controls

A *case* was defined as a woman of 20-40 years in the prenatal care diagnosed by the gynecologist as hypertensive. In this regard, gestational hypertension is defined as systolic blood pressure >140 mmHg and diastolic blood pressure >90 mm Hg originating after 20 week of gestation. A *control* was defined as age and gestation period (post 20 week) matched normotensive pregnant women.

The survey was conducted using an interviewer administered questionnaire in the native language of the respondent using a local, commonly understood term for all the health problems during pregnancy. The questionnaire included information regarding socio- demographic and obstetric characteristics of women keeping in view the aims of the study.

Sample size

A total of 270 subjects in the age of 20-40 years were examined in this study. Out of these, 120 were pregnant hypertensive females (cases) and 150 were pregnant normotensive females (controls).

Inclusion and exclusion criteria

Clinically diagnosed hypertensive mothers with gestational age of >20 weeks; normal pregnant women in the same gestational age were included in the study while as women with known hypertension, renal diseases, liver diseases, severe anemia and diabetes were excluded from the study.

Statistical Analysis

The data was described as mean \pm SD. Analysis was done by student's *t*-test, Mann Whitney U-test and F-test (ANOVA). $P < 0.05$ was considered significant. Data was analyzed using SPSS ver. 20.0.

3. Results

Systolic and Diastolic Blood Pressure (BP) of normotensive pregnant women & women with PIH is shown in *Table 1*. The mean systolic and diastolic Blood Pressure (BP) of pregnant subjects with hypertension was found to be 148.2 ± 5.5 and 96.2 ± 5.8 respectively (*Table*

1). Two blood pressure readings were taken and average of both readings was taken. Those pregnant women who had average reading of systolic blood pressure of ≥ 140 mmHg and a diastolic blood pressure of more than 90 mmHg were taken as hypertensive. The *Table 2* shows the mean maternal age and gestational age in the normotensive pregnant and hypertensive pregnant group.

Table 3 defines the demographic and obstetric characteristic of cases and controls. Out of 120 cases, 17.5% (21 of 120) were urban dwellers and out of 150 controls only 10% (15 of 150) were urban dwellers ($P > 0.05$). Almost 36% of patients with PIH were employed as compared to only 20% of controls who were employed ($P = 0.003$). 80% of patients belonged to Lower middle class families compared to only 34.6% of controls with lower middle class background and the difference was statistically significant ($P < 0.0001$). It is very much pertinent to mention that the 65% patients had previous history of PIH as compared to controls were only 10% were having previous history of PIH ($P < 0.0001$). Also, 23.3% of patients had recurrent miscarriage as compared to only 5.3% of controls with who have had miscarriage ($P < 0.0001$). Family history of hypertension and diabetes were significantly associated with patients when compared with controls ($P < 0.0001$). No statistical significance was found between cases and controls as far as other demographic and obstetric characteristic were considered ($P > 0.05$).

Table 1. Systolic and Diastolic Blood Pressure (BP) of normotensive pregnant women & pregnant hypertensive

Blood Pressure (BP) (mmHg)	Normotensive Pregnant or Control group (n=150)	Pregnant with Hypertension or Cases (n=120)
Mean Systolic	118.1 \pm 6.1	148.2 \pm 5.5
Mean Diastolic	77.3 \pm 6.2	96.2 \pm 5.8

Table 2. Age (in years), gestational age (in weeks) in normal pregnancy and with pregnancy induced hypertension

Age in years	
Normotensive Pregnant group (Controls)	28.54 \pm 3.24
Hypertensive Pregnant group (Cases)	30.12 \pm 3.26
Gestational Age in weeks	
Normotensive Pregnant group (Controls)	38.29 \pm 2.32
Hypertensive Pregnant group (Cases)	38.32 \pm 3.23
All values are mean \pm SD	

Table 3. Demographic and Obstetric characteristic of cases and controls

S. No.	Characteristics	Cases (n=120)	Controls (n=150)	OR (95% CI)	P Value
1.	Residence				
	Urban	21 (17.5)	15 (10.0)	0.5 (0.2-1.06)	0.07
	Rural	99 (82.5)	135 (90.0)		
2.	Occupation				
	House maker	77 (64.1)	120 (80.0)	2.2 (1.3-3.8)	0.003
	Employed	43 (35.9)	30 (20.0)		

S. No.	Characteristics	Cases (n=120)	Controls (n=150)	OR (95% CI)	P Value
3.	Family type				
	Joint	104 (86.6)	140 (93.3)	2.1 (0.9-4.9)	0.06
	Nuclear	16 (13.4)	10 (16.7)		
4.	Socio Economic status				
	Lower middle class	96 (80.0)	52 (34.6)	0.13 (0.07-0.23)	<0.0001
	Middle class	24 (20.0)	98 (65.4)		
5.	Stay during pregnancy				
	In laws	60 (50.0)	80 (53.3)	1.1 (0.7-1.8)	0.5
	With parents	60 (50.0)	70 (46.7)		
6.	History of PIH				
	Yes	78 (65.0)	15 (10.0)	0.06 (0.03-0.1)	<0.0001
	No	42 (35.0)	135 (90.0)		
7.	Previous Miscarriage				
	Yes	28 (23.3)	08 (5.3)	0.18 (0.08-0.42)	<0.0001
	No	92 (76.7)	142 (94.7)		
8.	Pregnancy type				
	Singleton	118 (98.3)	149 (99.3)	2.5 (0.2-28.1)	0.4
	Twin	02 (1.7)	01 (0.7)		
9.	Family history of Hypertension				
	Yes	74 (61.6)	27 (18.0)	0.35(0.25-0.49)	<0.0001
	No	46 (38.4)	123 (82.0)		
10.	Family history of Diabetes				
	Yes	66 (55.0)	12 (8.0)	0.07 (0.03-0.14)	<0.0001
	No	54 (45.0)	138 (92.0)		

PIH: Pregnancy induced Hypertension

4. Discussion

A mean maternal age greater than 30 years is an established risk factor for hypertension during pregnancy [9]. In our findings this association could not be demonstrated as our study is matched by age. In our study, we found similar prevalence of PIH in rural and urban Kashmir ($P>0.05$). The number of patients and controls from rural settings was more as compared to urban settings which might be due to the fact that the government hospitals mostly enrol patients of rural areas. These results are corroborated by report from Sachdeva *et al.* who pointed that the incidence of PIH is more in rural areas [10]. In our set up most of the urban dwellers tend to prefer private hospitals for antenatal care; hence these results cannot be generalized for the entire population. We observed a strong association between maternal employment and gestational hypertension. Job strain has been found to have a strong association with the development of essential hypertension [11, 12]. Our reports are in concurrence with the previous studies, who found that working mothers are at increased risk of PIH [13, 14].

In our study we found that mothers of lower middle class families were at a high risk and vulnerable to develop hypertension. One possible reason could be that women in low socio-economic status are often presented with nutritional issues, unhygienic conditions and receive reduced antenatal care. These results are in track with that of Parmar *et al.* [15]. Similarly, Shazia *et al.* reported that

PIH and caesarean section are significantly more in lower socio-economic class as compared to their upper socio-economic counterparts [16].

We wanted to figure out the influence of psycho-social aspects concerning the mothers. So we tried to dig out whether the need for respecting and caring for elders and other members and as such residing in a joint family which is usually perceived to be associated with an uneasy environment was an influencing factor for developing hypertension in pregnant women. It is an established fact that the quality of family relations is an important ingredient in shaping the maternal health [17]. However, our cohort did not show any difference whether residing in a joint or nuclear family. The women (both cases and controls) in our survey reported a healthy bonding with the members of their joint families. Nonetheless, in our social set up women prefer to stay at their parent's place during pregnancy. We got interested and evaluated whether choosing their place of stay has any impact on their hypertensive profile. However, we did not find any significant association between the two. One explanation for no apparent difference could be that our study did not cover all sections of the society since we present data of women coming to our hospital only.

History of gestational hypertension is a well-documented risk factor for hypertension in subsequent pregnancies. Our results supported the fact as majority of females in the hypertensive group had previous history of PIH. These results are very much in accordance with the previously

reported data [18].

Our study showed that in hypertensive mother's history of previous miscarriage was statistically significant. We found similar results with regard to the association of previous history of miscarriage and onset of hypertensive disorders in pregnancy [19]. One plausible explanation could be that miscarriages are often associated with high levels of distress for mothers. There are reports that confirm the release of corticotrophin releasing hormone in response to psychological stress thus establishing the link between social and biological processes. Also such mothers expressed helplessness and a feeling of guilt which could cause biological alterations in such mothers.

Although multiple pregnancy is a well-established risk factor for PIH [20] but to our surprise our study could not further establish the link owing to the fact that there were very low number of cases as well as control subjects with twin pregnancies.

Majority of hypertensive mothers mentioned at least one of their family members as being hypertensive. These results are in accordance with that reported by Ness *et al.* who reported that pregnant women with family history of hypertension were at higher risk for developing PIH [21]. Family history of diabetes was significantly higher in women with PIH as compared to the control group. Our observations support the findings of Sancheo *et al.* [22].

Although there is no known way to prevent PIH, it is important for all pregnant women to start prenatal care early and continue it throughout pregnancy. It is commonly believed that salt restriction during pregnancy helps in providing relief during increased blood pressure. However, there is lack of significant data to support the idea. Reports have suggested that hypertensive mothers have a higher chance to have a caesarean section. Hence, a healthy lifestyle should be necessarily adopted by mothers prior to pregnancy to prevent hypertension during pregnancy and its associated complications.

5. Conclusions

The results of the present study clearly pinpoint the cluster of factors that are associated with gestational hypertension. Identifying these factors may provide a window to clinicians and help them to recognize mothers who have higher chances to develop hypertensive disorders. In order to draw a better statistical correlation, the study needs to be elaborated by increasing the sample size so as to cover all the sections of the society. Despite limitations, these findings can serve as an important call for healthcare policy makers to develop strategies for high quality antenatal care in order to prevent hypertension and its sequel in the next generation.

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Compliance with Ethical Standards

The study was approved by the Ethical Clearance Committee of SKIMS (SIMS 1 131/IEC-SKIMS/2015-188).

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