Original Research Article

International Journal of Silkroad Institute of Research and Training (IJSIRT)

Vol-3. No. 1, Jan-Jun 2025 DOI: 10.3126/ijsirt.v3i1.80088 ISSN: 2990-7837 (Online & Print)

Examining Ethnic Disparities in Pregnancy Induced Hypertension and Risk Factors in Pregnant Lady Visiting Devdaha Medical College and Research Institute-A Retrospective Study

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ABSTRACT

Background: Pregnancy induced hypertension (PIH), a major pregnancy complication marked by high blood pressure, significantly impacts maternal and fetal health. Pre-eclampsia and other pregnancy-related hypertension disorders (Gestational hypertension, Severe pre-eclampsia and eclampsia) falls under the umbrella term "PIH". Few major risk factors for PIH include extremes in mother age, passive and active smoking, primigravida and multipara (≥5), aided vaginal delivery, elective cesarean section. The aim of this study is to assess the prevalence of PIH, identify and compare the risk factors associated with it across different ethnicities and assess potential influences of socioeconomic factors and life style habits.

Method: This was a retrospective study conducted in 174 reproductive age female of 18-42 years age who delivered by any mode in obstetrics & gynecology department of Devdaha Medical College and Research Institute, Rupandehi, Nepal. Data regarding demographics, socioeconomic status, obstetrics, were obtained from hospital records. The data was analyzed in SPSS version 16.

Result: No significant associations were found between PIH and several maternal or obstetric factors like Religion, ethnic group etc., severe cases were clearly linked to adverse fetal outcomes such as IUFD and stillbirth.

Conclusion: Women with lower socioeconomic status are less likely to take folic acid supplements, and more effort should be made to increase their awareness of the importance of supplementation. Unplanned pregnancy is another strong risk factor for not supplementing with folic acid, and thus should be avoided. But there seems to be no association between parity, maternal education status and religion in the intake of folic acid.

Key words: ethnicity; obstetric complications; pregnancy induced hypertension.

Received: 9th February, 2025 Accepted: 12th May, 2025 Published: 20th July, 2025

INTRODUCTION

PIH is defined as hypertension (blood pressure ≥ 140 / 90 mmHg) with or without proteinuria (≥ 300 mg / 24 hours) emerging after 20 weeks gestation, but resolving up to 12 weeks postpartum.[1] Preterm birth, intrauterine growth retardation (IUGR), perinatal death, antepartum haemorrhage, postpartum haemorrhage, and maternal death are outcomes likely to occur in pregnancies with hypertension diseases.[2] Pregnancy-related deaths can be reduced by early detection and institutional care.[3] Placental ischemia causes the maternal vascular endothelium to become dysfunctional, which increases the production of endothelin, thromboxane, increases the sensitivity of the vasodilators to angiotensin II, decreases the production of vasodilators. PIH is classified as (a) pre-existing hypertension, (b) gestational hypertension and preeclampsia (PE), (c) pre-existing hypertension plus superimposed gestational hypertension with proteinuria, and (d) unclassifiable hypertension. [5]The severity of hypertension is closely linked to maternal mortality in Nepal. It also increases the likelihood of induced labour, limits fetal growth.[6]

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METHODS

This was a retrospective study conducted in 174 reproductive age female of 18-42 years age who delivered by any mode in obstetrics & gynecology department of Devdaha Medical College and Research Institute, Rupandehi, Nepal. Data regarding demographics, socioeconomic status, obstetrics, were obtained from hospital records. The sample size was determined by using formula $n= Z^2p(1-p)/d^2$ where n= sample size, Z= standard normal coefficient=1.96, P= The value of proportion as decimal percent=6.43, d= desired precision level expressed as half of the maximum acceptable confidence interval width=0.05. Therefore, the sample size is calculated as n=92.45≈93.

In the selected hospital the past records of patients was used and all the required information was entered into a proforma which included socio-demographic data, questions regarding §maternal risk factors, fetal risk factors and the outcomes. The forms were assessed for completeness, which are then indexed. The data was entered in Microsoft Excel. The entered data are cleaned and exported to Statistical Package for the Social Sciences (SPSS) for further data analysis. For descriptive data; percentage (%), mean and standard deviation will be calculated and also the graphical and tabular presentation will be made. While for inferential statistics Chi-square test will be applied to find the significant association between categorical variables. To assess the difference between pre-test and post-test, independent and paired t-test will be used. P value <0.05 will be considered as statistically significant.

Socio demographic variables like Maternal age(0-15,16-20,21-25,26-30,31-35,36-40,>40yrs), address (urban, rural), religion (hindu, muslim, buddhist, christin), ethenic group (Bahun, Cheetri, Hill Janjati, Hill Dalit, Terai Janjati, Terai Middle, Terai Dalit, Newar & Muslim) were included. Maternal variables included parity (0, 1, 2, 3 or more), Gravida (1,2,3,4), Abortion (0,1,2,3,4), Outcome (Alive, still birth, IUFD), Mode of delivery (Vaginal delivery, Elective LSCS, Emergency LSCS, Instrumental delivery).

Risk factors included smoking (smoker, non-smoker), type of PIH (GHTN, pre-eclampsia, severe pre-eclampsia, eclampsia), comorbidities (yes, no). Fetal factors included sex of the baby (Male, Female).

Prevalence of congenital anomalies was calculated based on the total number of congenital cases reported and total number of live births in the same period. Cross tabulation was done for socio-demographic, obstetric and neonatal characteristics. Binary logistic regression was performed to analyse the level of association between the characteristics and birth defects. The significance was determined at $p<0.05$. All variables with $p<0.2$ in the univariate analysis were considered for multi-variable logistic regression analysis. Ethical approval was received from Ethical Review Board of Nepal Health Research Council (Reference no. 26–2017).

RESULTS

No significant associations were found between PIH and several maternal or obstetric factors like Religion, ethnic group etc., severe cases were clearly linked to adverse fetal outcomes such as IUFD and stillbirth. These findings highlight the need for regular antenatal monitoring and call for further research to better understand PIH and improve clinical management.

The study involved 174 participants, with a majority of them being in the age group of 21-25 years (40.2%), followed by 16-29 years (25.9%), followed by the age group of 26-30years (22.4%), age group of 31-35years accounts to (8%), 36-40 years (2.3%) and only a small proportion (1.1%) being older than 40 years. Most participants resided in rural areas (92.5%), while 7.5% were from urban areas. The majority of participants identified as Hindu (94.3%), followed by Muslim (5.7%). There were no participants who belong to Buddhist or Christian religion. The majority of the participants belong to Terai Janjati (24.1%) followed by Terai Dalit (16.7%), Terai Middle (13.2%), Hill Janjati (11.5%), Chettri (10.9%), Hill Dalit (10.3%), Muslim (5.2%), Bahun (4.6) and the least belong to Newar community (1.7%) (Table 1).

Regarding maternal parity, the highest proportion of women (43.3%) had one child, followed by 29.8%

Table 1. Sociodemographic profile of participants. (n=174)	
Variables	**Frequency (%)**
Age (years)	
16-20	45(25.9)
21-25	70(40.2)
26-30	39(22.4)
31-35	14(8)
36-40	4(2.3)
>40	2(1.1)
Address	
Urban	13(7.5)
Rural	161(92.5)
Religion	
Hindu	164(94.3)
Muslim	10(5.7)
Christian	0
Buddhist	0
Ethinic Group	
Chhetri	19(10.9)
Bahun	8(4.6)
Hill Janjati	20(11.5)
Hill Dalit	18(10.3)
Terai Janjati	42(24.1)
Terai Dalit	29(16.7)
Terai Middle	23(13.2)
Newar	3(1.7)
Muslim	9(5.2)

with two children, and 18.1% were primiparous. When we look at the number of abortions, we found that majority of the participants did not have any abortions (83.9%), few of them reported to have had 1 abortion (13.2%), 1.7% had 2 abortions and 1.1% of them had 3 abortions. Majority of outcome of the pregnancy was live birth (96.6%), with a few IUFD (2.3%) and only 2 cases were reported to be of still birth (1.1%). The most used mode of delivery was seen to be Emergency LSCS (58%), followed by Elective LSCS (20.7%), with a small percentage of vaginal delivery (Table 2).

There were no smokers found among the participants. About 77.6% of the participants did not have any comorbidities while 22.4% had comorbidities. Among the participants 61.5% had GHTN, 18.4% had pre-eclampsia, 10.9% had eclampsia and 9.2% of them suffered from severe pre-eclampsia (Table 3).

Table 2. Maternal factors. (n=174)	
Variables	**Frequency (%)**
Parity	
0	126(72.4)
1	37(21.3)
2	10(5.7)
3	1(0.6)
Gravida	
1	106(60.9)
2	48(27.6)
3	15(8.6)
4	5(2.9)
Abortion	
0	146(83.9)
1	23(13.2)
2	3(1.7)
3	2(1.1)
Outcome	
Alive	168(96.6)
Still Birth	2(1.1)
IUFD	4(2.3)
Mode of delivery	
Vaginal Delivery	35(20.1)
Elective LSCS	36(20.7)
Emergency LSCS	101(58)
Instrumental Delivery	2(1.1)

Table 3. Risk factors associated. (n=174)	
Variables	**Frequency (%)**
Smoking	
Smoker	-
Non smoker	174(100%)
Comorbidities	
Present	39(22.4)
Absent	135(77.6)
Type of PIH	
GHTN	107(61.5)
Pre-eclampsia	32(18.4)
Severe Pre-eclampsia	16(9.2)
Eclampsia	19(10.9)

The gender of the infants was predominantly male (59.8%) & only around 40.2% of the delivered babies were female (Table 4).

Table 4. Gender of the baby. (n=174)	
Variables	**Frequency (%)**
Sex of the baby	
Male	104(59.8)
Female	70(40.2)

With 47 cases, the age group with the highest prevalence of gestational hypertension (GHTN) is 21–25 years old. Although the prevalence of pre-eclampsia is highest (6 instances) in the 16–20 age group, it appears to be rather evenly distributed throughout age groups. The most common age group for severe pre-eclampsia is 26–30 years old ,i.e.,4 cases. Eight occurrences of eclampsia occur in the 16–20 age range, but fewer cases occur in other age groups. Given that the p-value is more than 0.05, the chi-square test for age yielded a p-value of 0.132, indicating that there is no significant correlation between age and the type of PIH in this sample (Table 5).

In the above table we can see that all the factors of the mother which include parity, history of abortion, gravida, and mode of delivery were examined in correlational relations to the type of pregnancy induced hypertension (PIH) from a sample size of 174 patients. Certain trends were seen, like the greater proportions of nulliparous women and the more severe forms of PIH having emergency cesarean sections, but statistical analyses using the chi-square test found no significant associations. All p-values were above the level of significance in this case ($p>0.05$) which suggests that none of the examined maternal factors had a significant relationship with the type or severity of PIH (Table 6).

In Table 7, we see that, the sex of the baby showed no significant association with the severity of PIH ($p = 0.646$). However, the variable outcome of pregnancy demonstrated a highly significant association ($\chi^2=41.86$, $p<0.001$), with stillbirths and intrauterine fetal deaths (IUFD) occurring exclusively in cases of severe pre-eclampsia and eclampsia. These findings underscore the potential fetal risks associated with more severe forms of hypertensive

Table 5. Association of Socio-demographic factors with type of pregnancy induced hypertension. (n=174)

Variables	GHTN	Pre-eclampsia	Severe Pre-eclampsia	Eclampsia	OR	χ^2 (p-value)
Age						
16-20	27(60.0%)	6(13.3%)	4(8.9%)	8(17.8%)	17.5	0.132
21-25	47(67.1%)	13(18.6%)	39(4.3%)	7(10.0%)		
26-30	23(59.0%)	8(20.5%)	4(10.3%)	4(10.3%)		
31-35	8(57.1%)	2(14.3%)	4(28.6%)	-		
36-40	2(33.3%)	3(50.0%)	1(16.7%)	-		
>40	-	-	-	-		
Address						
Rural	100(62.1%)	30(18.6%)	14(8.7%)	17(10.6%)	1.04	0.79
Urban	7(53.8%)	2(15.4%)	2(15.4%)	2(15.4%)		
Religion						
Hindu	102(62.2%)	30(18.3)	15(9.1%)	17(10.45)	1.05	0.789
Muslim	5(50.0%)	2(20.0%)	1(10.0%)	2(20.0%)		
Christin	-	-	-	-		
Buddhist	-	-	-	-		
Ethnic Group						
Chhetri	12(63.2%)	5(26.3%)	1(5.3%)	1(5.3%)	22.96	0.522
Bahun	6(66.7%)	2(22.2%)	1(11.1%)	-		
Hill Janjati	12(57.1%)	4(19.0%)	2(9.5%)	3(14.3%)		
Terai Janjati	30(71.4%)	8(19.0%)	1(2.4%)	3(7.1%)		
Terai Middle	11(47.8%)	2(8.7%)	5(21.7%)	5(21.7%)		
Hill Dalit	10(55.6%)	2(11.1%)	4(22.2%)	2(11.1%)		
Terai Dalit	18(62.1%)	7(24.1%)	1(3.4%)	3(10.3%)		
Newar	3(100%)	-	-	-		
Muslim	5(50.0%)	2(20.0%)	1(10%)	2(20.0%)		

Table 6. Association of maternal factors with type of pregnancy induced hypertension. (n=174)						
Variables	**GHTN**	**Pre-eclampsia**	**Severe Eclampsia**	**Eclampsia**	**OR**	**χ^2 (p-value)**
Parity						
0	77 (61.1%)	22(17.5%)	10(7.9%)	17(13.5%)	9.79	0.367
1	25(67.6%)	6(16.2%)	5(13.5%)	1(2.7%)		
2	5(50.0%)	3(30.0%)	1(10.0%)	1(10.0%)		
3	0(0%)	1(100%)	0(0%)	0(0%)		
Abortion						
0	89(61.0%)	25(17.1%)	14(9.6%)	18(12.3%)	6.37	0.702
1	13(56.5%)	7(30.4%)	2(8.7%)	1(4.3%)		
2	3(100%)	0(0%)	0(0%)	0(0%)		
3	2(100%)	0(0%)	0(0%)	0(0%)		
Gravida						
0	81(%)	22	11	17	4.95	0.549
1	24	8	4	2		
2	2	2	1	0		
Mode of delivery						
Vaginal Delivery	16(45.7%)	9(25.7%)	4(11.4%)	6(17.1%)	10.36	0.322
Elective LSCS	25(69.4%)	7(19.4%)	3(8.3%)	1(2.8%)		
Emergency LSCS	65(64.4%)	16(15.8%)	9(8.9%)	11(10.9%)		
Instrumental	1(50.0%)	0(0%)	0(0%)	1(50.0%)		

Table 7. Association of fetal factors with type of pregnancy induced hypertension. (n=174)						
Variables	**GHTN**	**Pre-eclampsia**	**Severe pre-eclampsia**	**Eclampsia**	**OR**	**χ^2(p-value)**
Sex of the baby						
Male	67(64.4%)	19(18.3%)	9(8.7%)	9(8.7%)	1.66	0.646
Female	40(57.1%)	13(18.6%)	7(10.0%)	10(14.3%)		
Outcome of pregnancy						
Alive	107(63.7%)	32(19.0%)	15(8.9%)	14(8.3%)	41.86	<0.001
Still birth	0(0%)	0(0%)	1(50.0%)	1(50.0%)		
IUFD	0(0%)	0(0%)	0(0%)	4(100%)		

disorders in pregnancy, reinforcing the importance of early detection and management to prevent adverse outcomes (Table 7).

DISCUSSION

The aim of this study is to assess the prevalence of PIH, identify and compare the risk factors associated with it across different ethnicities and assess potential influences of socioeconomic factors and life style habits. In a Descriptive cross sectional study done in a tertiary care hospital by Thapa Taniya. Et al., the prevalence of pregnancy induced hypertension was found to be 91 (6.43%) (3.83- 9.03 at 95% Confidence Interval) representing 71 (78.1%), 12 (13.2%), and 8 (8.7%) as gestational hypertension, preeclampsia and eclampsia respectively.[7]

In a descriptive cross sectional study was conducted in the Department of Obstetrics and Gynaecology of tertiary care centre by Lama. Shushma et al. the prevalence of hypertensive disorder among pregnancies was similar to the other studies done in similar settings. Hypertensive disorder poses a major issue in pregnant women so should be taken into a serious matter as it causes major problems in maternal and fetal outcomes.[8] In a cross-sectional study conducted over period of one year in the department of Obstetrics & Gynecology in NHL municipal college, Ahmadabad done by Mehul T Parmar, Harsha M Solanki, Vibha V Gosalia, they found that among PIH cases severe cases were more. The incidence of PIH

was higher among teenage pregnancy, primigravidas, those having h/o PIH in previous pregnancy, Family h/o PIH, Obesity. Perinatal death was more among PIH women who delivered in emergency, PIH women having diastolic blood pressure > 90 mm Hg & more proteinuria & neonate with low birth weight.[2]

In another study done in 2020 by Hema Vyakaranam et al. the prevalence of pregnancy induced hypertension among women attending delivery service were 8.3%. It is more prevalent in younger age groups and is associated with multiple complications in the mother and baby. Early diagnosis and treatment through regular antenatal check-up helps to prevent PIH and its complications.[9] A study done by Patel R et al. in 2017, showed that pregnancy induced hypertension is a common medical disorder associated with pregnancy. We noted that PIH is more prevalent in younger age groups and nulliparous mothers. PIH lead to a various clinical manifestation some of this may use as early recognition of PIH. PIH also lead to increase adverse fetal outcome. Thus fetal morbidity and mortality can be reduced among PIH patients by early recognition and institutional management.[10]

A descriptive cross sectional study done in Lahore by NISSA F et al., showed that the mean age of the patients with pregnancy induced hypertension was found to be 28.39±4.58. The prevalence of pregnancy induced hypertension was found to be 78 (8.66%) representing 56 (71.79%), 13 (16.6%) and 7 (8.97%) as gestational hypertension, pre-eclampsia and eclampsia.[11] In a cross-sectional study in south Africa conducted by Peter B et al. The prevalence of PIH was high. Age, history of PIH, previous pregnancy, and marital status were predictors of PIH knowledge/ awareness and risk factors for PIH. Context-specific health education programmes during prenatal visits are crucial to improving pregnant women's knowledge of PIH. [12]

In a study done in Spain by K. sadananda et al. prevalence of hypertension in pregnancy in our series was 9.4%. GH and PE were the most common types of hypertension in pregnancy. Hyper- tension continues complicating pregnancies in terms of gestation duration, birth weight, and days of admission in both the mother and the newborn. These deleterious effects were mainly observed in cases with PE.[13]

In a review article done in 2010 by Osungbade k, Ige O, we see that the prevalence of pre-eclampsia in developing countries ranges from 1.8% to 16.7%. Many challenges exist in the prediction, prevention, and management of preeclampsia. Promising prophylactic measures like low-dose aspirin and calcium supplementation need further evidence before recommendation for use in developing countries. Treatment remains prenatal care, timely diagnosis, proper management, and timely delivery. Prevailing household, community, and health system factors limiting effective control of preeclampsia in these countries were identified, and strategies to strengthen health systems were highlighted.[14] A case control study done in Ethiopia by Belayhun Y et al., showed that being rural residents, illiterate, having a history of pregnancy-induced hypertension, and history of kidney disease, as well as the family history of hypertension were identified determinates of hypertensive disorders of pregnancy in the study area. Furthermore, fruit and vegetable intakes were identified as protective factors for pregnancy-induced hypertension. Therefore, early diagnosis and intervention of this disorder are warranted to reduce adverse outcomes.[15]

In a retrospective cohort study done in U.S.A by Bornstein E et al., results point to significant racial/ ethnic differences in the overall prevalence, as well as the temporal changes in the prevalence, of these pregnancy risk factors/complications during the 2007–2018 period. These findings could potentially contribute to our understanding of the observed racial/ethnic differences in maternal morbidity and mortality.[16]

Limitations: A community based study rather than a hospital based study can better indicate actual prevalence.

CONCLUSIONS

This study captures noteworthy details related to the demographic, obstetric, and clinical patterns of pregnancy-induced hypertension (PIH) among women

in a predominantly rural area. Although the analysis did not show statistically significant relationships with maternal age, parity, abortion history, mode of delivery, or infant sex, some patterns emerged, including a higher rate of emergency cesarean sections for severe PIH cases. There were, however, adverse fetal outcomes which were significantly associated to the severity of PIH. Cases of intrauterine fetal death (IUFD) and stillbirth were noted only in cases of severe pre-eclampsia and eclampsia, underlining the critical nature of these conditions with respect to fetal death. These aspects underscore the need for active monitoring of hypertension in pregnant patients through antenatal checks that help in identifying such disorders. There is a suggestion for further research to be conducted in the association of PIH with other indicators through sampling over a prolonged period of time to strengthen clinical practices.

Conflict of Interest: None

Funding: None

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Citation: Thakur NK, Kumari N, Roy A, Dubey R. Examining Ethnic Disparities in Pregnancy Induced Hypertension and Risk Factors in Pregnant Lady Visiting Devdaha Medical College and Research Institute-A Retrospective Study. IJSIRT. 2025; 3(1): 26-33.