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**Original research article**

# Prevalence of gestational hypertension in north India

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**Abstract**

**Objective**: To compare the observed and expected prevalence rate of gestational hypertension in north India

**Design:** observational cross sectional study

**Subjects**: The total sample size was taken 200, out of which 31 were gestational hypertensive and 169 the gestational normotensive based upon a set of inclusion criteria and exclusion criteria.

**Main Outcome Measures:** The prevalence rate of gestational hypertension among pregnant women in north India, i.e., 13-15% showed the same as of national range which in this study proved by the p value being lesser than 0.05. The p value probability is 0.016244 which is lesser than 0.05. (0.05>0.016244).

**Conclusion:** Gestational hypertension is both the cumbersome and burdensome health hazard upon both among population and government authorities. Since the national prevalence rate range from 12% to 13%, this rate actually varies in different regions, which in here according to the present study the prevalence rate shows higher than the national range.

**Keywords:** Hypertension, pregnancy, gestational, prevalence rate, chi square

## 1. Introduction

Gestational hypertension or pregnancy-induced hypertension (PIH) is the development of new hypertension in a pregnant woman after 20 weeks' gestation without the presence of protein in the urine or other signs of pre-eclampsia [1]. Gestational hypertension is defined as having a blood pressure greater than 140/90 on two occasions at least 6 hours apart [1]. Beside, they are also presented with the signs like edema, sudden weight gain, blurred vision or sensitivity to light, nausea and vomiting ,persistent headaches [1]. Gestational hypertension (GH) is one of the causes for increased maternal morbidity and mortality and leads to 15% of preterm births, whose pathophysiological role of origin is mainly attributed to Dyslipidemia and hyperuricemia [2]. Background Preeclampsia is a multifactorial pregnancy-related disorder which affect both women and fetuses [3]. Normal pregnancy is associated with immense changes in various metabolic processes which induce major physiological adaptations in the pregnant individual.

Working group of the National High Blood Pressure Education Program (2000) describes four types of hypertensive disorders:

1. Gestational hypertension (formerly Pregnancy Induced Hypertension),
2. Preeclampsia and Eclampsia syndrome,
3. Preeclampsia syndrome superimposed on chronic hypertension and
4. Chronic hypertension 1. According to the norms of American college of obstetrics and Gynecologists, the diagnostic criteria for gestational hypertension [Pregnancy Induced Hypertension (PIH)] is 1) Systolic Blood pressure ≥140 mm/Hg 2) Diastolic Blood pressure ≥90 mm/Hg Or 3) increase of ≥30 mm/Hg in Systolic pressure Or 4) increase of ≥15 mm/Hg in Diastolic pressure, in a previously normotensive woman [4]. It has been reported that renal abnormalities occur in a considerable number of pregnancies complicated by preeclampsia [5, 6], resulting in very poor prognosis to maternal and fetal outcomes [7, 8]. Pre-eclampsia, the most common medical complication of the second half of pregnancy is a complex multi-organ disorder that is characterized by hypertension, edema and proteinuria, most frequently observed in the primigravida, contributing significantly to maternal and neonatal mortality and morbidity. The manifestations of preeclampsia arise from reduced organ perfusion due to intravascular coagulation, vasoconstriction and diminished maternal blood volume. Liver and kidney function, including clotting ability are affected in individuals afflicted by this disorder [9–11].

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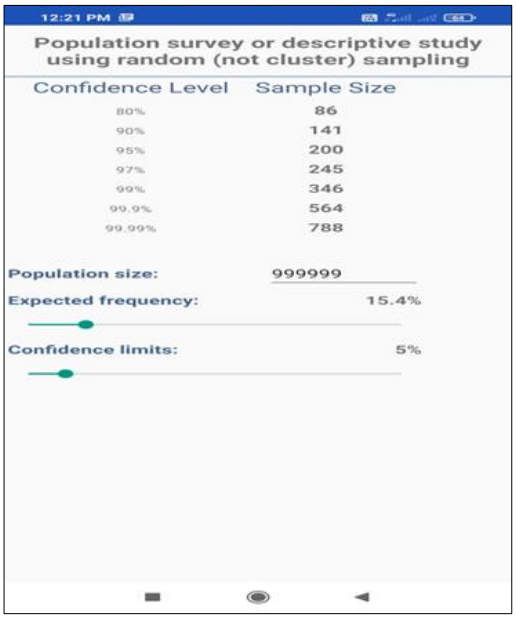
These all the above mentioned health burdens bring financial troubles too for both the population and government authorities.

**2. Materials and Methods**
2.1 Serum uric acid kit
2.2 Protein estimation kit
2.3 Sphygmomanometer
2.4 Weighing machine
2.5 Measuring tape
2.6 Lab reports from the pathology lab

**3. Source of data:** The study had been carried out using sample size by Epi info software recommended by WHO.




The observational cross sectional study was conducted over a period of 3 years with the sample size of 200. The study was performed based on the following inclusion and exclusion criteria for gestational hypertensive and gestational normotensive respectively.

**3.1 Inclusion Criteria**
**3.1.1** Pregnant women above 18 years
**3.1.2** Pregnant women after 20 weeks of gestation;
**3.1.3** Pregnant women but clinically normal subjects devoid of diabetes, hypertension, liver disease.
**3.1.4** Age matched healthy pregnant women of 28-40 weeks of gestation without any major illness and who are not on any medication were included.

**3.2** Exclusion Criteria
**3.2.1** Pregnant women who are already hypertensive
**3.2.2** Pregnant women having secondary causes of hypertension.
**3.2.3** History of chronic hypertension that was present before pregnancy.
**3.2.4** History of diabetes mellitus and/or who are on insulin therapy or hypoglycemic drugs.
**3.2.5** Those who are taking antihypertensive or hypolipidemic drugs.
**3.2.6** Those with diagnosed liver, cardiac or renal diseases or any other major illness.
**3.2.7** Urinary tract infection, history of other renal disease
**3.2. 8** Active or chronic persistent infection or inflammatory disorders, neoplastic disorders
**3.2.9** Thyroid disorders, liver dysfunction, history of other diseases.

The patients who met the study criteria were included for the study and institutional human ethics was obtained from SVIEC. The patients consent forms were obtained before commencement of study. The demographic details and laboratory data of selected study population will be entered in pre-designed data collection form. The data collection form should also contain variables including parity, BMI, mode of delivery, history of hypertension, family history of hypertension, history of pre-eclampsia in early pregnancy, gestational period, maternal and fetal outcome, antihypertensive drugs prescribed, USG

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details. Data was processed using epi info software recommended by WHO. Study started after getting approval from SVIEC.

**4. Methodology**

1. Evaluation Of Blood Pressure In Pregnancy Induced Hypertension was done by auscultatory method. Gestational hypertension or pregnancy-induced hypertension (PIH) is the development of new hypertension in a pregnant woman after 20 weeks' gestation devoid of protein in the urine or other signs of pre-eclampsia. Hypertension is defined as having a blood pressure greater than 140/90 mm Hg.
2. Evaluation of Serum uric acid: A simple spectrophotometric method based-uricase enzyme for the detection of uric acid.
3. Evaluation of blood urea and serum creatinine**:** A simple spectrophotometric method for the detection of blood urea and serum creatinine and urea.
4. Urinalysis by dipstick
5. Statistical analysis**:** Statistical analyses had been carried out using the Epi info software
6. Descriptive Statistic: For variable range, mean & standard deviation had been calculated and for Categorical variables proportion and percentage had been obtained.
7. Chi. sq test to know the expected frequency
8. One way ANOVA TEST and student "T" test had also been calculated.

**5. Results**

The mean SBP and DBP of both non gestational hypertensive and gestational hypertensive are 114.4191617 and 161.3548 for SBP and 78 and 115.6774 for DBP among 200 pregnant women which had both normotensive and hypertensive gestational women. The count for both the gestational hypertensive and normotensive are 31 and 169 respectively which also can be called observed frequency. Hence, the incidence rate(prevalence rate) becomes 1 5.5%.By calculating the expected frequency through chi square test, the probability that the mean of the gestational hypertension in this study is p=0.016244 which is lesser than 0.05.Hence, the prevalence rate of gestational hypertension nationwide in north India is also like the rest of the India (13-15%).

**5.1. Results**

**Table 1:** Descriptive Studies

| | **Gestational normotensive** | | **Gestational hypertensive** | |
|---|---|---|---|---|
| **Parameters** | **SBP** | **DBP** | **SBP** | **DBP** |
| Mean | 114.4191617 | 78 | 161.3548 | 115.6774 |
| Standard Error | 0.262255254 | 0.408939851 | 1.152415 | 3.6149 |
| Median | 115 | 78 | 162 | 108 |
| Mode | 110 | 70 | 160 | 106 |
| Standard Deviation | 3.389084785 | 5.284667524 | 6.416377 | 20.12691 |
| Sample Variance | 11.48589568 | 27.92771084 | 41.16989 | 405.0925 |
| Kurtosis | -1.34511437 | -1.284504033 | 3.48657 | 2.28125 |
| Skewness | 0.036668285 | -0.046103683 | -1.86916 | 1.783964 |
| Range | 10 | 16 | 24 | 70 |
| Minimum | 110 | 70 | 144 | 94 |
| Maximum | 120 | 86 | 168 | 164 |
| Count | 169 | 169 | 31 | 31 |

**5.2. Results**

**Table 2:** Chi Square Test

| **category** | **hypothesisized proportion** | **observed** | **Expected** | **chi.sq** |
|---|---|---|---|---|
| Gestationa | 0.13 | 31 | 0.2587 | 3652.986184 |
| Non gestational | 0.87 | 169 | 1.4703 | 19088.75766 |
| SUM | 1 | 199 | 172.9 | 22741.74384 |
| pvalue | 0.05 | 0.016244 | | |
| Chisq.inv.rt | 3.841458821 | 5.776261 | | |

**6. Discussion**

In US, The need for preterm delivery from early-onset preeclampsia, complication followed after gestational hypertension with associated proteinuria, suggests its costs are substantial: very (28–31 weeks) and extremely (<28 weeks) preterm birth cost approximately 40 and 100 times a term pregnancy, respectively [12]. Pregnancy hypertension incidence was lower in Pakistan (9.3%) than India (10.3%),

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Mozambique (10.9%), or Nigeria (10.2%) ($p = 0.001$). Most hypertension was diastolic only (46.4% in India, 72.7% in Pakistan, 61.3% in Mozambique, and 63.3% in Nigeria). At first presentation with elevated BP, gestational hypertension was most common diagnosis (particularly in Mozambique [8.4%] versus India [6.9%], Pakistan [6.5%], and Nigeria [7.1%]; $p < 0.001$), followed by pre-eclampsia (India [3.8%], Nigeria [3.0%], Pakistan [2.4%], and Mozambique [2.3%]; $p < 0.001$) and chronic hypertension (especially in Mozambique [2.5%] and Nigeria [2.8%], compared with India [1.2%] and Pakistan [1.5%]; $p < 0.001$) [13]. In the nationwide large scale cross-sectional study, then three main data sets were categorized as (i) self-reported symptoms of pre-eclampsia prevalence; (ii) geographical differences in prevalence; and (iii) risk factors for prevalence, the prevalence of pre-eclampsia was (55.6%) , higher compared to earlier studies in Asian population [14]. This was attributed to cross-sectional symptomatic nature of the study rather than clinical confirmation. Secondly, we found striking differences geographically and between specific states regarding pre-eclampsia prevalence. Prevalence ratios for pre-eclampsia showed more than two fold variation between the lowest prevalence state (Haryana-33.3%) and highest prevalence state (Tripura-87.5%). This substantial state wise differences in pre-eclampsia prevalence clearly warrant further investigation. State specific analysis using multilevel methods could be carried out to explore the substantial differences in prevalence in Indian states. Some potential explanations for these differences are that in high prevalence states there is a very high rate of smoking particularly among rural women, diabetes and more terminated pregnancy cases along with a high schedule tribe population coupled with poorer access to health care services (expect for Kerala) compared to rest of India. An alternative explanation may be related to climatic differences across Indian regions. Scuh seasonal changeshave been reported with a higher incidence of preeclampsia associated with conception during the spring and summer months [15, 16]. The mechanisms may be attributed todiet,infections, regulation of calcium and vitamin D metabolism [15, 16]. Thirdly, we identified a number of specific risk factors for pre-eclampsia prevalence. Some of the risk factors for pre-eclampsia among Indian women are similar as found among Asian women [14] or those of other ethnic groups, while some vary. Some studies have found that the risk of preeclampsia is greater in twin rather than in singleton pregnancies. The reported incidence of pre-eclampsia is 13%-37%, which is 2-3 times higher than singleton pregnancies [17-20] and about 24.3% in case of triplets and quadruplicate pregnancies [21]. The finding that obese women are at a higher risk of pre-eclampsia is similar to studies which showed obesity is a risk factor for pre-eclampsia [22-27], but the mechanisms involved are not known. Women with the lowest BMI are relatively protected against preeclampsia [28], which is also confirmed in our study (OR:0.95;CI:0.90-1.00).

The finding that current tobacco smoking is associated with significantly increased risk of preeclampsia is also consistent with previous research [29, 30]. Similar findings have been reported with other studies ,e.g ,history of miscarriage or terminated pregnancy[31, 32]; and ethnicity[33], socio-economic status [34] with pre-eclampsia risk. The likelihood of progression from gestational hypertension to pre-eclampsia may be increased by a prior miscarriage [35]. Underlying medical conditions [36, 37] such as diabetes [38, 39] or asthma is associated with higher prevalence odds of pre-eclampsia and our study findings are consistent with the earlier reports. In one study, age and parity were not found to be associated with pre-eclampsia in contrast to other studies [39]. High parity womem, extremes of maternal age and mnulliparous have been associated with high risk of preeclampsia in Saudi Arabia according to one study [40]. Such variation can be attributed to the differences in the population based and hospital based study. The identification and counseling of preeclampsia relies fundamentally on the frequency of antenatal care [41] and if their blood pressure was measured during the visit. Many women at rural level lack proper antenatal care, hence likely to develop serious complications. Antenatal care utilization is around 68% in LMIC compared to 98% in high resource settings [42]. The region of the world with the lowest levels of use is South Asia, where only 54% of pregnant women have at least one antenatal care visit [42] and in India 22.8% [43]. Not surprisingly, there is marked urban/rural differential in accessing antenatal care in LMIC including India. Whereas 86% of women in urban settings will have one antenatal visit, only 65% of women rural settings will have the same [42]. For repeated antenatal visits, 62.4% of women in urban India report four or more antenatal visits compared to 27.7% of rural women [43].

**6.1 Strength and limitations of the study**

The strengths of our study does include the study sample allowing comparisons to be made between hypertensive and normotensive women during pregnancy. But due to is limit size, could not provide enough stance to identify the potential risk factors and compensated for the ethnic variations in Indian populations. Furthermore, we could not evaluate the association of well known risk factors as potential confounders and effect modifiers including birth intervals, maternal age, type of pregnancy, diabetes, asthma, body mass index, and tobacco smoking Though the sample was small, we could ascertain the gestaional hypetension clinically verifying with the lab reports rather than the self reported questionnaire, hence, it is unlike that we missed gestational cases. Many of the studies are questionnaire based in population based study. Hence the study has an edge over self reported symptoms .The information of the symptoms of preeclampsia and eclampsia presented here is based on women's self reports and should

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therefore be interpreted with care. Although we cannot exclude misclassification within this context, Moreover no information is available on the pre-pregnancy gestational hypetension risk factors of the women which are otherwise the strong determinants to predict the gestational hypertension, like body mass index [27, 33, 17], familial aggregation[34] and genetic factors [34, 35].

**7. Conclusion**

Here in our study, the prevalence rate of the gestational hypertension in north India is same as that of nationwide. India lacks well documented population level studies, hence study can be important keeping in view to assess the determinants of gestational hypertension and their development through different stages , e.g., preeclampsia, eclampsia and severe eclampsia. Pregnant women in lower socio economic category suffer the most worldwide, which is in congruent with the present study that north India being largely underdeveloped is most vulnerable and takes a heavy toll on maternal and perinatal morbidity and mortality. Community assigned health workers can be greatly helpful in such timely need and management of pregnancy induced hypertension and its complications. Early prevention strategies is needed since its difficult to predict the development of PIH to preeclampsia. Many simplified and affordable techniques can be employed, e.g, sphygmomanometer to measure and serum uric acid kit to assess protein. This study can be of immense help, especially for the healthcare workers in ANC during period like preconception, antenatal and interconception. More research like this should follow to prevent the pregnancy induced hypertension and related disorders so that the authorities can formulate proper health policies This study provides empirical evidence of prevalence of pre-eclampsia and their associated risk factors in India. Our findings from a large nationally representative sample of Indian women indicate that, modifiable risk factors exist. Keeping in target to reduce the maternity and infant morbidity rate, pregnancy induced hypertension should be given a considerable due and further researches have tp be carried out for this noble mission.

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**7.2 Funding:** Self

**7.3 Conflicts:** No

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