Original Article

Prevalence of hypertension in pregnancy and its associated factors among women attending antenatal clinics in Bengaluru

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Abstract

Background: Hypertension in pregnancy is a major challenge in antenatal practice due to its impact on obstetric and foetal outcomes. **Objective:** To assess the prevalence of hypertension during pregnancy and its associated risk factors among pregnant women availing of antenatal care at public sector hospitals in Bengaluru, Southern India. **Methods:** The sample frame included pregnant women who were attending the antenatal clinic at three public sector hospitals. The data were analyzed for 783 pregnant women who had completed their baseline visit over a period of 18 months (September 2017 to March 2019). The blood pressure was categorized based on the American College of Cardiology/American Heart Association 2017 guidelines. **Results:** Out of the 783 respondents who were examined, 13.9% were found to be hypertensive. The adjusted Odd's ratio was significantly higher for those who were employed outside the house and obese respondents. Other factors such as higher maternal age, lower socioeconomic status, pregnancy-related anxiety, prenatal depression, nulliparity appeared to increase the risk. **Conclusion:** Hypertension during pregnancy continues to be a matter of concern. Risk factor profiling of pregnant women is of utmost importance to identify those who may be likely to develop hypertensive disorders during pregnancy.

Keywords: Hypertension, pregnancy, prevalence, risk factors

Introduction

Hypertension in pregnancy is a major challenge in antenatal practice due to its impact on obstetric and fetal outcomes. Hypertension plays a significant role in up to 15% of complications over the course of pregnancy and the postpartum period.[1] Hypertensive disorders of pregnancy encompass preexisting (or chronic) hypertension, gestational hypertension, preeclampsia, and eclampsia; accounting for an estimated prevalence of 5% to 10% in women belonging to the reproductive age group.[2,3] These are a significant contributor to maternal and perinatal morbidity and mortality and account for 30,000 maternal deaths annually at the global level and 10% to 15% of maternal deaths in low- and middle-income countries.[4,5] A multicenter study performed in four developing countries (India, Nigeria, Pakistan, and Mozambique) found that one out of every ten pregnant women had hypertension.[6]

Studies have found pregnancy-induced hypertension to be a significant independent risk factor for developing gestational diabetes mellitus.[7] The risk of developing cardiovascular diseases (CVD) in later life is reportedly higher among women

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with a history of raised blood pressure during pregnancy.[8-10] This has been attributed to the presence of common CVD risk factors such as type 2 diabetes, chronic hypertension, and raised blood lipids associated with rapid urbanization and changing lifestyles.[11,12] The incidence of hypertension during pregnancy is on the rise and is associated with an increased risk of fetal growth retardation and adverse birth outcome.[13] Studies from India report that hypertension during pregnancy may contribute to up to one-third of maternal deaths.[14,15] While blood pressure measurement is routinely monitored as a part of antenatal care, it is important to get a better understanding of the burden of hypertension during pregnancy and its associated risk factors. Primary care physicians are usually the first point of contact and it is essential for them to be sensitized concerning hypertension during pregnancy. Identification of modifiable risk factors would be vital for primary prevention of this condition and in avoiding adverse maternal and fetal outcomes.

Given this background, the present study aims to assess the prevalence of hypertension during pregnancy and its associated risk factors among pregnant women availing antenatal care at public sector hospitals in Bengaluru, Southern India.

Methods

Study setting and participants

The present study is part of a cohort study to assess the effect of prenatal exposure to maternal cortisol and psychological distress on infant development in Bengaluru.[16] The sample frame included pregnant women who were attending the antenatal clinic at three public sector hospitals: Jayanagar General Hospital, Kempu Cheluvarajamanni (KC) General Hospital, and H Siddaiah Referral Hospital. While Jayanagar General Hospital and K.C General Hospital are state government sub-district hospitals, H Siddaiah Referral Hospital is managed by the city's municipal corporation. The eligibility criteria for being selected for this study included pregnant women (i) who were between 18 to 40 years of age, (ii) having a gestational age of fewer than or equal to 24 weeks, and (iii) without any reported obstetric complication. Pregnant women who met the inclusion criteria and volunteered to participate in the study were recruited into the study. The data were analyzed for 783 pregnant women who had completed their baseline visit over a period of 18 months (September 2017 to March 2019).

Data collection and measurements

The participants were explained about the nature of the study, and a participant information sheet was given to them for further reference after which a written informed consent was obtained. The study questionnaire was digitally recorded through an App (CASCADE version 2.1.3) installed on an Android tablet. The questionnaire captured detailed information on socio-demographic data, social support, domestic violence, marital discord, medical history, obstetric history, and measures of depression and anxiety. Edinburg Postnatal Depression Scale was used to screen for depression in pregnant women. It is a 10-item self-report scale widely used for screening of prenatal depression.[17] Screening for anxiety during pregnancy was performed using the 10-item Pregnancy-Related Anxiety (PRA) Scale.[18] Social support was captured using the Multidimensional Scale of Perceived Social Support (MSPSS). It has 12 items to assess the subjective perceptions of support from family, friends, and "significant others" with scores ranging from 1 to 7.[19] The revised Kuppuswamy Scale was used to measure socioeconomic status.[20] Domestic violence and marital discord were identified using the Modified Conflict Tactics Scale and the Revised Dyadic Adjustment Scale, respectively.[21] The anthropometric measurements were recorded at the final stage of the interview using a standardized calibrated weighing scale for weight and a stadiometer for height for subsequent estimation of body mass index (BMI), expressed as weight in kilograms divided by height in meter square (kg/m^2).

Blood pressure was recorded using the Omron HEM 7130 ®blood pressure monitor during each antenatal visit. The participant was asked to sit quietly and rest for 15 min with their legs uncrossed. The measurements were taken with the participant sitting upright with proper back support, and with the arm supported on a table or a surface at the level of the heart. Three readings were taken at an interval of 5 min, and the average of the three readings was taken as the final blood pressure reading. The blood pressure was categorized based on the American College of Cardiology/American Heart Association 2017 guidelines.[22] Blood Pressure in adults was categorized into four: 1) Normal (systolic blood pressure <120 mm Hg and diastolic <80 mm Hg); 2) Elevated (120–129 mm Hg systolic and <80 mm Hg diastolic); 3) Hypertension stage 1 (129–139 mm Hg systolic and 80–89 mm Hg diastolic); and 4) Hypertension stage 2 (≥140 mm Hg systolic and ≥90 mm Hg diastolic). The guidelines have recently been adopted by the American College of Obstetricians and Gynecologists (ACOG) for the treatment of chronic hypertension in pregnant women.[23]

Statistical analysis

The data wereretrieved from the App in Microsoft excel sheet format, cleaned, and exported to SPSS version 22. The exposure variables were categorized according to the data type and included. (i) Socio-demographic data: age, religion, educational status, socioeconomic status, occupation. (ii) Psychosocial variables: social support, marital discord, domestic violence, depression, anxiety, and unplanned pregnancy. (iii) Obstetric and medical variables: parity, history of hypertension, body mass index. Tobacco use was reported by only five women; hence, it was not included for analysis.

Descriptive statistics were used to present the socio-demographic characteristics of the study population. Bivariate analysis was performed to explore the association between independent and dependent variables and was expressed in terms of crude odds ratio with 95% confidence interval. The variables were

dichotomized, and those which were found to be associated at a significance level ($P < 0.2$) in the bivariate analysis were entered into a multivariate logistic regression model to calculate the adjusted odd's ratio and to eliminate the effects of confounding. Variables with a P value of < 0.05 in the multivariate analysis were considered to be significant in the study.

Ethical considerations

Ethical clearance was obtained from the Ethics Committee of the Indian Institute of Public Health Bangalore campus (IIPHHB/TRCIEC/118/2017) dated 15/3/2019. Participants were briefed about the study purpose, objectives, risk, and voluntary decision to decide their participation, and a written informed consent was obtained. Privacy and confidentiality of the individuals were strictly ensured throughout the study. Personal identification was masked using participant ID.

Results

Socio-demographic characteristics of the study participants

The mean age of the study population was 23.6 ± 4.47 years, and the mean gestational age was 16.7 ± 4.4 weeks. The socio-demographic characteristics are shown in Table 1. The majority (88.8%) of the study participants were of or less than 28 years of age and more than half of them were of Islamic faith and were parous. About 90 percent of the respondents were homemakers and over one-third of them had received education up to high school. Almost 43.9 percent of them belonged to the upper lower class and more than 50 percent were receiving high social support from family, friends, and significant others.

Table 1: Socio-demographic characteristics of the study participants (*n*=783)

Variables	Frequency (*n*)	Percentage
Age groups		
≤28 years	695	88.5
29 years	88	11.2
Religion		
Hinduism	349	44.6
Christianity	15	1.9
Islam	419	53.5
Education		
Illiterate	33	4.2
Primary School	21	2.7
Middle School	182	23.2
High School	304	38.8
PUC or diploma	158	20.2
Graduate	80	10.2
Postgraduate	5	0.6
Occupation		
Housewife	709	90.3
Unskilled worker	29	3.7
Semi-skilled worker	25	3.2
Skilled worker	3	0.4
Clerical or Farmer	6	0.8
Semi professional	4	0.5
Professional	7	0.9
Socio economic status		
Upper class	2	0.3
Upper middle class	128	16.3
Lower middle class	309	39.5
Upper lower class	344	43.9
Social Support		
Low	107	13.7
Moderate	247	31.5
High	429	54.8
Evidence of domestic violence		
No	775	99.0
Yes	8	1.0
Marital discord		
No	404	51.6
Yes	379	48.4
Body Mass Index		
Underweight	126	16.0
Normal	423	54.0
Overweight and obese	234	30.0
Parity		
Nonparous	363	46.4
Parous	420	53.6

Prevalence of hypertension

Out of the 783 respondents who were examined, 13.9% were found to be hypertensive [Figure 1].

Association of socio-demographic variables with hypertension

Among the socio-demographic variables, the risk of hypertension in pregnancy was observed to be 1.7 times higher among women above the age of 28 years. This finding was significant on bivariate analysis but not after adjustment of confounders. The women who were employed outside the home were twice as likely to suffer from hypertension when compared to the homemakers; this being significantly higher on multivariate analysis (COR = 2.000; 95% CI: 1.01–2.28, AOR = 1.481; 95% CI: 0.97–2.24) [Table 2].

Association of psychosocial variables with hypertension

The odds of hypertension was 1.3 times higher among women with moderate to low social support although this was significant only on bivariate analysis. Pregnancy-related anxiety was found to be a positive predictor of hypertension (COR = 1.519; 95% CI: 1.01–2.28, AOR = 1.481; 95% CI: 0.97–2.24). Women who were depressed were 1.2 times more likely to be hypertensive, but this likelihood was not significant [Table 2].

Association of physiologic parameters with hypertension

While no significant association could be demonstrated between a history of hypertension, gravidity, and hypertension in the present pregnancy, it was observed that obese pregnant women

were twice as likely to be hypertensive than nonobese women, with an AOR of 2.036 (95% CI 1.328–3.122) [Table 2].

Discussion

The present study examined the prevalence of hypertension in pregnancy and its associated factors using the American College of Cardiology/American Heart Association 2017 guidelines. The prevalence of hypertension in the present study was observed to be 13.9 percent. This happens to be exactly equal to the observed rate of 13.9% demonstrated by Ganguly and Begum in a hospital-based study in Dhaka, Bangladesh.[24] There appears to be a striking geographic variation in the prevalence of hypertension across different states of India. The prevalence found in our study is slightly lesser than the reported prevalence rate of 15.5% from a hospital-based study conducted in Kolkata[25] but much higher than that elicited from other similar settings: 7.49% in Indore,[26] 5.38% in Varanasi,[27] and 10.4% in Salem.[28] This could be attributed to the use of JNC VII report for classification of hypertension in other studies, which used higher cut off values of BP ≥140/90 mm Hg. Lower values of prevalence have also been recorded in community-based studies such as reported rates of 6.9% and 5.8% in rural settings of Haryana and Punjab,[29,30] respectively. The use of an expanded definition for hypertension as used in the present study may help to identify more women who would benefit from timely management.

Table 2: Bivariate and multivariate analysis of risk factor variables

Variables	Hypertensive *n* (%) (*n*=109)	Non-Hypertensive (%) (*n*=674)	Unadjusted Odds Ratio (95% CI)	*P*	Adjusted OR (95% CI)	*P*
Age groups						
≤28 years	91 (13.0)	604 (87.0)	1		1	
29-40 years	18 (20.4)	70 (79.5)	1.707 (0.972-2.997)	0.06	1.312 (0.723-2.382)	0.37
Education status						
Illiterate	05 (15.1)	28 (84.9)	0.902 (0.340-2.387)	0.80		
Literate	104 (13.3)	646 (86.1)	1			
Occupation						
Unemployed	92 (12.9)	617 (87.1)	1		1	0.02
Employed	17 (22.9)	57 (77.1)	2.000 (1.115-3.588)	0.01	1.492 (0.269-1.900)	
Socio economic status						
Middle class and above	57 (12.9)	382 (87.1)	1			
Lower class	52 (15.1)	292 (84.9)	1.193 (0.796-1.790)	0.39		
Social support						
Low/Moderate	42 (11.9)	312 (84.5)	0.875 (0.908-2.081)	0.31		
High	67 (15.6)	333 (87.9)	0		.	
Domestic Violence						
No	109 (14.1)	666 (85.9)	1	0.25		
Yes	0	8 (100)	0.859 (0.835-0.884)			
Marital discord						
No	63 (15.5)	341 (84.5)	1	0.16	1	
Yes	46 (12.1)	333 (87.9)	0.748 (0.497-1.126)		0.684 (0.450-1.041)	0.07
Pregnancy-related anxiety						
Nonanxious	58 (12.7)	389 (87.3)	1		1	
Anxious	51 (15.1)	285 (84.9)	1.519 (1.011-2.284)	0.04	1.481 (0.977-2.247)	0.06
Depression						
Non depressed	82 (14.6)	560 (85.4)	1			
Depressed	27 (23.6)	114 (76.4)	1.223 (0.762-1.961)	0.40		
Unplanned pregnancy						
No	65 (15.2)	360 (84.7)	1			
Yes	44 (12.2)	314 (87.8)	0.913 (0.605-1.378)	0.66		
Parity						
Parous	42 (13.1)	321 (86.9)	1		1	
Nulliparous	67 (18.9)	353 (81.1)	1.45 (0.959-2.195)	0.07	0.781 (0.505-1.206)	0.26
History of Hypertension						
No	107 (13.9)	662 (86.1)	1			
Yes	2 (14.2)	12 (85.8)	0.137 (0.115-0.163)	0.78		
Body Mass Index						
Nonobese	61 (11.1)	488 (88.9)	1		1	
Obese	48 (20.5)	186 (79.5)	2.065 (1.364-3.124)	0.001	2.036 (1.328-3.122)	0.001

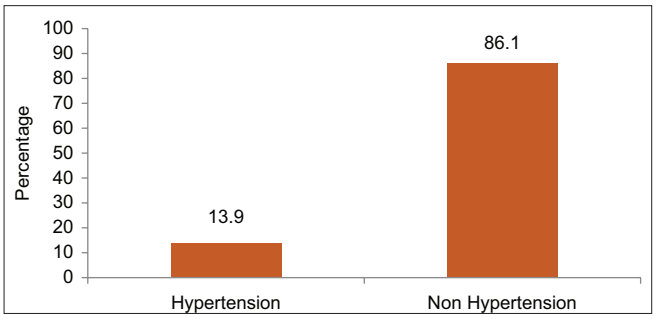

Figure 1: Prevalence of hypertension among the pregnant women (n = 783)

The odds of hypertension were higher among women more than28 years of age although this was not statistically significant. Hypertension in pregnancy is known to be associated with advancing maternal age. This could be attributed to high levels of oxidative stress and low levels of nitric oxide that are associated with aging, which exerts an adverse influence on the relaxation of the endothelium.[31] Illiteracy has been reported to be an important risk factor for hypertension in pregnancy due to its relationship with early marriage and care-seeking behavior; however, no such observation was seen in the present study. We found that women who were employed outside the house were at a higher risk for hypertension. Other studies have also reported a similar association,[32-34] whereas some studies report that the risk is higher among homemakers.[35] Further research would be required to explain these differences as it may be determined by the nature and duration of work, whether done at home or outside.

Among the psychosocial variables, we could not establish any increase in risk with lower social support, unplanned pregnancy, and domestic violence. However, pregnancy-related anxiety appeared to be a positive predictor of hypertension. A plausible explanation is that stress during pregnancy is frequently associated with dysregulation of the hypothalamo pituitary adrenal (HPA) axis, resulting in a high endogenous cortisol level, which causes endothelial dysfunction.[36,37] Similarly, pregnant women who were depressed appeared to be at a higher risk of hypertension although this was statistically not significant. Thombre *et al.* in their study confirmed that pregnancy-related anxiety increased the risk of hypertension during pregnancy by 1.2 times even after adjusting for confounding variables.[38]

Although primi parity is implicated to be a risk factor for gestational hypertension,[39-41] we could not identify any such association on multivariate analysis. The association between primi parity and hypertension has been ascribed to an array of physiologic and immunologic pathways.[42] The risk of hypertension appeared to be more than twice as higher among obese pregnant women than nonobese and was significantly associated even after adjusting for confounders. This is synonymous with results from other studies from different countries.[43-45] The pathophysiologic mechanism, which accounts for the relationship between obesity and hypertension is the state of hyperinsulinemia induced by high body mass index, which causes endothelial dysfunction.[46] The risk of pre-eclampsia is also stated to be increased due to high levels of triglyceride and free fatty acids that are associated with obesity.[47]

The present study has helped to identify a few modifiable risk factors of hypertension during pregnancy, such as obesity, which conforms to those observed in other similar study settings. The adjusted odds ratio was significantly higher for those who were employed outside the house and obese respondents. Other factors such as higher maternal age, lower socioeconomic status, pregnancy-related anxiety, prenatal depression, nulliparity appeared to increase the risk. Risk factor profiling of pregnant women is of utmost importance to identify those who may be likely to develop hypertensive disorders during pregnancy. Many of these factors could be addressed during early pregnancy, which would go a long way in preventing morbid obstetric and fetal outcomes and also reduce the future risk of cardiovascular complications among women.

Study limitations

The settings for this study comprised urban public sector hospitals wherein antenatal care is mostly availed by pregnant women belonging to the lower- and middle-income groups. Therefore, the findings from this study cannot be extrapolated to pregnant women belonging to a higher socio-economic group due to differences in psychosocial factors and standard of living. As this study was conducted as a part of an ongoing cohort study, it was not possible to capture data and identify factors such as a family history of hypertension, hypertension in previous pregnancies, prepregnancy weight for measuring weight gain, diet, physical activity, and history of diabetes; as observed in other studies. By excluding respondents who had obstetric complications, we have focused on the nonobstetric risk factors of hypertension during pregnancy.

The results were generated out of an analysis of data recorded in the baseline visit done around 24 weeks of the cohort study; hence, the reported hypertension could not be segregated into categories of chronic hypertension, gestational hypertension, and preeclampsia/eclampsia.

Conclusion

The present study reports that hypertension during pregnancy is emerging as a major concern from a clinical and public health viewpoint, given that it could have serious short- and long-term consequences for maternal and offspring health. A substantial proportion of more than one-tenth of the pregnant women were found to be hypertensive in the present study. Primary care physicians have a critical role to play in the early identification and management of hypertension during early antenatal care.

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Conflicts of interest

There are no conflicts of interest.

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