

# Hypertensive disorders of pregnancy and feto-maternal outcomes in a tertiary health care centre, Koppal

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## Abstract

**Background:** Hypertensive disorders of pregnancy are known to cause adverse maternal and fetal complications and outcomes. In view of assessing its burden and feto-maternal complications and outcomes in the current study setting, the study was conducted.

**Material and Methods:** This is a retrospective study conducted among 8941 women with more than 20 weeks of gestation, admitted for delivery under the department of Obstetrics and Gynaecology at Koppal Institute of Medical Sciences during the study period of 2 years from July 2019 to June 2021. The primary outcome was assessed in terms of proportions of hypertensive disorders of pregnancy and eclampsia. Secondary outcomes were assessed in terms of feto-maternal complications and outcomes among those with hypertensive disorders of pregnancy. All the quantitative data were presented in percentages.

**Results:** The proportions of hypertensive disorders of pregnancy were 10.64% and eclampsia was noted to be 1.9%. Majority (63.1%) of the study subjects were between 18 to 23 years, mostly from rural areas (89.8%) and belonged to lower socio-economic status (95.1%). The highest proportion of them (87.9%) had crossed a gestational age of 34 weeks and also primigravida formed the majority (68.4%). None of them were booked and 41.7% of them underwent lower segment caesarian section. 5.3% of the study subjects had maternal complications with common complications being HELLP syndrome, renal complications, pulmonary edema and cerebral venous thrombosis. 0.7% of them died. 28.9% of neonates had complications viz., low birth weight, preterm and small for date babies. Intrauterine deaths were noted among 8.1%.

**Conclusion:** 1 in 10 mothers had hypertensive disorders of pregnancy and nearly 2 of such 100 hypertensive mothers landed in eclampsia. Feto-maternal complications were documented among 5.3% mothers and 28.9% neonates. Maternal mortality was reported in 0.7% and 8.1% of fetuses had intrauterine deaths contributing to perinatal deaths.

**Keywords:** Hypertensive disorders of pregnancy, eclampsia, HELLP syndrome, maternal complications

## Introduction

Hypertensive disorders of pregnancy have been one of the top causes leading to maternal and perinatal mortality and pre-eclampsia has been noted to complicate the pregnancies among 2 to 8% of them globally. In Africa and Asia, hypertensive disorders contribute to 9.0% of maternal deaths. And they are attributed to 16.0% of maternal deaths even in the high income countries <sup>[1]</sup>. The incidence of eclampsia has been reported to be 1.6 to 10 per 10000 deliveries in developed countries and contrastingly it is more than 5 to 15 times higher in the developing countries with its incidence reported as 50 to 151 per 10,000 deliveries <sup>[2]</sup>. In India pre-eclampsia incidence varies from 5% to 15% and eclampsia is noted in around 1.5% of them.

Maternal age both too young ( $\leq 20$  years) and advanced ( $> 35$  years), low socio-economic

statuses, some races especially black and Hispanic race, obese women, excess weight gain during the period of pregnancy, statuses of nulliparity, multiple gestations, chronic hypertension, lack of good pre-natal care are the important risk factors which are identified [2-4].

Abnormal placentation is linked to preeclampsia where in a normal pregnancy, fetal cytotrophoblasts are said to remodel the vasculature of the endometrium which will be supplying the placenta. However, in preeclampsia, there will be poor remodeling of the spiral arteries, leading to insufficient blood supply to the placenta because of inadequate cytotrophoblasts invasion. Placental ischemia and oxidative stress leads to endothelial damage secondary to the release of free radicals and cytokines like vascular endothelial growth factor 1 (VEGF). Even the release of angiogenic or pro-inflammatory proteins contributes to maternal endothelial function negatively. Such disruption of endothelium occurs both at the site of the uterus and also cerebral endothelium thus contributing to neurological disorders, including eclampsia. Another proposed theory says that the elevation in blood pressure causes hampered autoregulation of the cerebral vasculature, leading to hypoperfusion, endothelial damage or edema [5].

As mentioned earlier, preeclampsia and eclampsia not only contributes to maternal and perinatal mortality, but also leads to maternal and perinatal morbidity throughout the world. Some of the fatal complications of pre-eclampsia include multisystem complications affecting brain through eclampsia cerebral haemorrhage and hypoxic cerebral damage, complications of cardiovascular system, hepatic failure, acute renal failure, affects respiratory system leading to pulmonary oedema and ARDS (Adult Respiratory Distress syndrome), also causes DIC (Disseminated Intravascular Coagulation) HELLP syndrome (Haemolysis, Elevated Liver enzymes, Low Platelet), retinal detachment and cortical blindness. Complications among the fetuses include Intrauterine Growth Restriction (IUGR), low birth weight, and even intrauterine fetal death and other complications due to prematurity [6].

Proper antenatal care, early diagnosis and prompt treatment are known to improve maternal and perinatal outcome in patients with severe preeclampsia and eclampsia [7]. With the insufficient data in our study setting, identifying the cases of pregnancy induced hypertension and among them the occurrence of eclampsia and observing their outcomes help us to know the burden and also evaluate the current management strategy and work on detailing the interventions in our study setting. Hence we conducted this study to determine the occurrences of eclampsia and also assess the maternal and fetal outcomes.

## Materials and Methods

### Study design, study period and study setting

This is a retrospective study conducted for a period of 2 years from July 2019 to June 2021 among 8941 pregnant women with more than 20 weeks of gestation who were admitted to the department of Obstetrics and Gynaecology (OBG), Koppal Institute of Medical Sciences (KIMS), Koppal for delivery. KIMS is a tertiary care centre located in Koppal with attached district hospital which has bed strength of 650 and total average deliveries of nearly 300 to 350 are conducted per month.

### Sampling and sample size calculation

Adopting purposive sampling, the number of deliveries conducted during the study period was considered for assessing the proportion of hypertensive disorders of pregnancy.

However to assess the maternal and fetal complications and outcomes, a sample size was estimated using the formula,  $n=z^2(pq/d^2)$ .

Considering a prevalence of eclampsia (p) as 10.3% as per the literature [3],  $q=100-p$  i.e., 89.7%, and with an absolute precision of 2% (d), z value being 1.96 at 95% confidence interval, the total sample size was estimated to be 886 based on the formula,  $n=z^2(pq/d^2)$ . Considering 7.5% of 886 i.e. 66 as lost to follow up, a sample size of 952 was

estimated.

### **Study subjects**

The pregnant women who had crossed at least 20 weeks of gestation and were admitted for delivery under the department of Obstetrics and Gynaecology (OBG), Koppal Institute of Medical Sciences (KIMS), Koppal during the study period were considered for the study.

### **Inclusion criteria**

The study included 8941 pregnant women with more than 20 weeks of gestation admitted for delivery under the department of Obstetrics and Gynaecology (OBG), Koppal Institute of Medical Sciences (KIMS), Koppal during the study period, to determine the proportions of hypertensive disorders of pregnancy. However, to assess the outcomes and complications, 952 pregnant women diagnosed with hypertensive disorder of pregnancy who were admitted in HDU under the department of OBG, Koppal Institute of Medical Sciences, Koppal during the study period from July 2019 to June 2021 were included in the study.

### **Exclusion criteria**

The pregnant women diagnosed with convulsions due to other causes were excluded from the study.

### **Study procedure**

Ethical clearance was obtained from the Institutional ethical committee. The data were retrospectively collected from the medical record sheets and the information were collected using a semi-structured questionnaire with details on demographic variables and on gestational age, parity, mode of delivery, antenatal care booking (booked or unbooked) and maternal and fetal complications and outcomes. All the patients underwent routine lab investigations like Complete Hemogram, liver and renal function tests, coagulation profile-PT, APTT, INR, urine microscopy and urine albumin. Important data on the investigations were also collected.

### **Primary outcome**

The primary outcome was defined as the proportion of occurrence of hypertensive disorders of pregnancy and eclampsia among the pregnant women who delivered in the current study place during the study period.

### **Secondary outcome**

The secondary outcomes were defined as the proportions of maternal and fetal complications and outcomes among those with hypertensive disorders of pregnancy admitted to HDU in the current study place during the study period.

### **Operational definitions**

**Hypertensive disorder of pregnancy (HDP):** HDP includes chronic hypertension existing before the pregnancy, those which are induced by pregnancy viz., pre-eclampsia or eclampsia and gestational hypertension and those that are aggravated by pregnancy such as pre-eclampsia superimposed on chronic hypertension.

**Chronic hypertension:** When the blood pressures were recorded to be more than 140/90 mm Hg prior to the onset of pregnancy or before the 20th week of gestation.

**Pre-eclampsia:** When the blood pressures were recorded to be more than 140/90 mm Hg and was associated with proteinuria (>300 mg/24 hours or 300 mg/g creatinine) in previously normotensive women.

**Eclampsia:** The occurrence of convulsions and/or coma in women with pre-eclampsia and not associated to other cerebral disorders with seizures of grand mal type present before labor.

**Pre-eclampsia/eclampsia superimposed on chronic hypertension:** This was defined as chronic hypertension accompanied by pre-eclampsia or eclampsia.

**Socio-economic status classification:** Modified BG Prasad scale of socio-economic status was applied and based on income they were classified as follows <sup>[8]</sup>:

Social Class	Monthly per capita income
Class I (Upper)	≥7008
Class II (Upper Middle)	3504 to 7007
Class III (Middle)	2102 to 3503
Class IV (Lower Middle)	1051 to 2101
Class V (Lower)	≤1050

### Statistical analysis

All the data were collected and entered into Microsoft Excel. The data were analysed and expressed in proportions. The analysis was conducted using SPSS version 18.0. The proportion of occurrence of eclampsia was estimated using the formula:

$$\frac{\text{Number of pregnant women diagnosed as eclampsia}}{\text{Total deliveries conducted during the study period.}} \times 100$$

### Results

A total of 8941 deliveries were conducted in the study period and among them hypertensive disorders of pregnancy were noted among 952 women attributing to 10.64% and eclampsia was noted to be among 170 women which forms a proportion of 1.9%. [Table-1]

Majority i.e. 63.1% of the study subjects were in the age group between 18 to 23 years. Most of them hailed from rural areas (89.8%). 95.1% of them belonged to lower socio-economic status. [Table-2]

Highest proportion of them (87.9%) belonged to more than 34 weeks of gestational age. Majority i.e. 68.4% were primigravida. None of them were booked and 41.7% delivered via lower segment caesarian section. More than 50.0% i.e. 53.1% of the neonates weighed more than 2.5 kg. [Table-3]

Maternal complications were noted among 5.3% of the study subjects and maternal deaths were noted among 0.7% of those who delivered at our study place (n=850). Among those maternal complications, HELLP syndrome was the most common maternal complication (40.0%) followed by 20.0% had renal complications. Pulmonary edema and cerebral venous thrombosis were noted among 8.0% of them each and the least common complications were cardiomyopathy, DIC and blindness observed among 4.0% each. Neonatal complications like low birth weight, pre term and small-for-date were noted among 28.9% who required SNCU admissions. Unfavourable outcome of intrauterine death was noted among 8.1% of the fetuses. [Table-4 and Graph-1]

**Table 1:** Proportion of pregnancy induced hypertension and eclampsia among the total deliveries conducted during the study period

Hypertensive disorders of pregnancy (HDP)	Frequency of HDP/Total deliveries	Percentage (%)
Pregnancy induced hypertension	952/8941	10.6
Eclampsia	170/8941	1.90

**Table 2:** Distribution of socio-demographic variables among the study subjects

Socio-demographic variables	Frequency (n)	Percentage (%)
<b>Age-group in years (n=952)</b>		
18 to 23	600	63.1
24 to 28	256	26.9
>28	96	10
<b>Residence (n=952)</b>		
Urban	97	10.2
Rural	855	89.8
<b>Socio-economic status (n=952)</b>		
Upper class	0	0
Middle	47	4.9
Lower	905	95.1

**Table 3:** Distribution of study subjects based on some antenatal and postnatal characteristics

Antenatal and postnatal characteristics	Frequency (n)	Percentage (%)
<b>Gestational age (n=952)</b>		
<28wks	20	2.1
29-34wks	95	10.0
>34wks	837	87.9
<b>Gravida Status (n=952)</b>		
Primigravida	651	68.4
Multigravida	301	31.6
<b>Antenatal booking status (n=952)</b>		
Booked	00	0.0
Unbooked	952	100.0
<b>Mode of delivery (n=850)<sup>‡</sup></b>		
Vaginal	453	47.6
LSCS	397	41.7

<b>Birth weight of the neonates delivered in Kg (n=850)<sup>‡</sup></b>		
<2.0	156	18.3
2.0 – 2.5	243	28.6
>2.5	451	53.1

<sup>‡</sup>102 has been excluded as they were referred to higher centre either due to maternal complications which could not be managed at our study place.

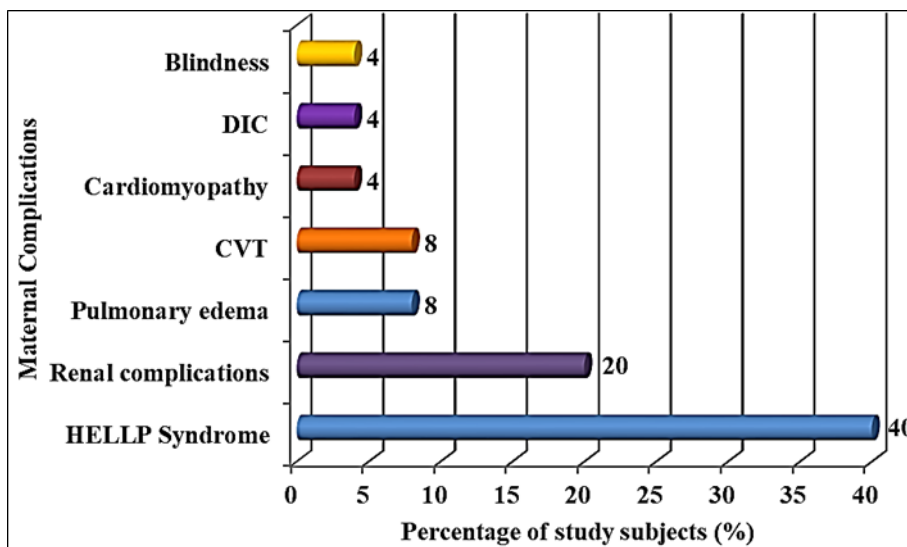
**Table 4:** Complications and outcomes of the study subjects with pregnancy induced hypertension

Complications and Outcomes	Frequency (n)	Percentage (%)
<b>Maternal Complications (n=952)</b>		
Yes	50	5.3
No	902	94.7
<b>Fetal Complications (n=795)<sup>§</sup></b>		
Yes	230	28.9

No	565	71.1
<b>Maternal Outcomes (n=850)<sup>‡</sup></b>		
Survived	844	99.3
Died	06	0.7
<b>Fetal Outcomes (n=795)<sup>§</sup></b>		
Live birth	731	91.9
IUD	64	8.1

<sup>‡</sup>102 has been excluded as they were referred to higher centre either due to maternal complications which could not be managed at our study place.

<sup>§</sup>102 were excluded as the outcomes could not be elicited among the mothers who were referred and 55 were excluded as those neonates were referred due to different neonatal complications.



**Graph 1:** Different maternal complications noted among the study subjects

**Discussion**

Pregnancy induced hypertension lead to adverse maternal and perinatal outcomes <sup>[9]</sup> and very little is known about such outcomes in the current study setting. Burden of pregnancy induced hypertension aids in better preparedness to manage and also avert the adverse outcomes. Hence the current study was conducted.

Sengodan SS and Sreepathi N, have noted the prevalence of hypertensive disorders in pregnancy as 10.4% <sup>[10]</sup>. In a meta-analysis conducted among Indian studies, based on the study design type the retrospective studies reported 7.2% prevalence of hypertensive disorders and 1.0% prevalence of eclampsia <sup>[11]</sup>. These are almost in correspondence to our study finding where hypertensive disorders of pregnancy were noted among 10.64% and eclampsia among 1.9%.

Most of the study subjects with hypertensive disorders of pregnancy belonged to the age group of 18 to 23 years in this study. Similarly Bhat A and Kharde S found that 22 to 27 years age group to be more predominant among their subjects with hypertensive disorders of pregnancy <sup>[12]</sup>.

Most of them in this study were from rural areas and also belonged to lower socio-economic status. However, some studies have identified lower socioeconomic status and rural residences as risk factors for hypertensive disorders of pregnancy and also eclampsia <sup>[13, 3]</sup>. But no associations have been assessed in our study.

Sengodan SS and Sreepathi N have noticed that the proportion of hypertensive disorders was noted to be higher in primigravida <sup>[10]</sup>. Rajanna SP and Dharmavijay MN also reported



hypertensive disorders to be higher among primigravida and also majority were more than 35 weeks as per the gestational age. Our study reports majority of those with hypertensive disorders were primigravidae and belonged to more than 34 weeks of gestational age<sup>[14]</sup>. It is established that pregnancies with hypertensive disorder might be an indication for iatrogenic delivery because of maternal and/or fetal indications<sup>[15]</sup> and 69.6% of them were terminated with caesarian deliver according to Rajanna SP and Dharmavijay MN similar to ours<sup>[14]</sup>. The proportions were contrastingly different which might be because of different study setting, study subjects, availability and accessibility of maternal services in the study areas. None of them were booked in our study which might lead to failure of early diagnosis and intervention.

Sharma C *et al.*, have noted significant maternal morbidity in 17.3% cases and 2 maternal deaths were noted in theirs. They also noted maternal morbidities among 18.4% and the morbidities were HELLP syndrome/DIC, acute renal failure, acute respiratory distress syndrome, congestive heart failure. They also noted 30 still births and 7 early neonatal deaths. 41.2% required neonatal intensive care unit (NICU) admissions. Poor neonatal outcomes viz., higher NICU admissions, intrauterine growth retardation, low birth weight, small-for-gestational age were noted among the newborns. However, in ours the proportion of maternal complications and neonatal complications were lesser as compared to theirs which may be because of the fact that there were no severe eclampsia cases reported among ours and few of those which could not be managed at the facility were referred to other centres due to higher load of cases in our centre<sup>[16]</sup>. Abruptio placenta, neurological deficits, aspiration pneumonia, pulmonary complications like pulmonary edema, cardio-pulmonary arrest, renal complications like acute renal failure were the noted maternal complication according to Upadya M and Rao ST. They also noted maternal death among 1.0% where we also noted among 0.7% which was comparable to theirs<sup>[4]</sup>. Panda S *et al.*, reported abruption placenta, pulmonary edema, HELLP syndrome, post-partum haemorrhage, acute renal failure, cerebral hemorrhage as maternal complications in their study and 14.9% had perinatal mortality and preterm, fetal growth restriction, acute respiratory distress syndrome, hypoxia, intrauterine fetal demise and neonatal deaths were also noted in their study. 8.2% had intrauterine fetal demise. Similar to theirs we noted 8.1% IUDs in our study<sup>[17]</sup>. However the occurrence of maternal complications and fetal complications differed in our study compared to the other studies because of different study settings and the fact that more severe cases of eclampsia were not observed ours<sup>[4, 16, 17]</sup>. Biologically, it is said that the compromised cerebro, cardio and renal functions might be due to reduced placental perfusion in pregnancy induced hypertension due to abnormal cytotrophoblast invasion of spiral arterioles or abnormal placentation<sup>[5, 18]</sup>.

Prospective studies conducted with control groups might yield better information. However, our study indicates that there is a need to spread awareness in regard to attending antenatal care among mothers which creates an opportunity to better screen for the hypertensive disorders of pregnancy and intervene early and contribute to the prevention of occurrence of both foeto-maternal mortalities and morbidities.

## Conclusion

1 in 10 mothers had hypertensive disorders of pregnancy and nearly 2 of such 100 hypertensive mothers landed in eclampsia. Fetal complications like low birth weight, pre-term and small-for-date babies were noticed among 28.9% of the neonates. Maternal complications like HELLP syndrome, renal, pulmonary and cerebro-vascular complications were documented among 5.3% mothers. Maternal mortality was reported in 0.7% and 8.1% of fetuses had intrauterine deaths contributing to neonatal deaths. Hence educating the eligible women in the reproductive age group who would be at risk mothers for developing hypertensive disorders of pregnancy to attend frequent antenatal checkups, screening and early intervention would help in preventing foeto-maternal deaths and morbidities due to

hypertensive disorders of pregnancy.

## References

1. American College of Obstetricians and Gynecologists. Gestational hypertension and preeclampsia: ACOG Practice Bulletin, number 222. *Obstet Gynecol.* 2020 Jun;135(6):e237-60.
2. Bartal MF, Sibai BM. Eclampsia in the 21st century. *American journal of obstetrics and gynecology*, 2020 Sep.
3. Agrawal S, Walia GK, Staines-Urias E, Casas JP, Millett C. Prevalence of and risk factors for eclampsia in pregnant women in India. *Family Medicine and Community Health.* 2017Dec;5(4):225-44.
4. Upadya M, Rao ST. Hypertensive disorders in pregnancy. *Indian journal of anaesthesia.* 2018 Sep;62(9):675.
5. Magley M, Hinson MR. Eclampsia. [Updated 2020 Feb 1]. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2020. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554392/>.
6. Pillai SS. Fetomaternal outcome in severe preeclampsia and eclampsia: a retrospective study in a tertiary care centre. *Int. J Reprod. Contracept Obstet Gynecol.* 2017 Sep;6(9):3937-41.
7. Priyanka R, Sinha C. Maternal and perinatal outcome in severe preeclampsia and eclampsia. *JMSCR.* 2020;8(06):242-5.
8. Pandey VK, Aggarwal P, Kakkar R. Modified BG. Prasad Socio-economic Classification, Update-2019. *Indian journal of community health.* 2019 Jan;31(1):123-5.
9. Berhe AK, Ilesanmi AO, Aimakhu CO, Mulugeta A. Effect of pregnancy induced hypertension on adverse perinatal outcomes in Tigray regional state, Ethiopia: a prospective cohort study. *BMC pregnancy and childbirth.* 2020 Dec;20(1):1-1.
10. Sengodan SS, Sreepathi N. Prevalence of hypertensive disorders of pregnancy and its maternal outcome in a tertiary care hospital, Salem, Tamil Nadu, India. *Int. J Reprod. Contracept Obstet Gynecol.* 2020;9:236-9.
11. Dhinwa M, Gawande K, Jha N, Anjali M, Bhadoria AS, Sinha S. Prevalence of hypertensive disorders of pregnancy in India: A systematic review and meta-analysis. *J Med Evid.* 2021;2:105-12.
12. Bhat A, Kharde S. Hypertensive disorders of pregnancy and associated factors. *Int. J Health Sci. Res.* 2019; 9(1):128-131.
13. Kahsay HB, Gashe FE, Ayele WM. Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region, Ethiopia: matched case-control study. *BMC pregnancy and childbirth.* 2018 Dec;18(1):1-0.
14. Dr. Aarushi Kataria, Dr. Naveen Nandal and Dr. Ritika Malik, Shahnaz Husain -A Successful Indian Woman Entrepreneur, *International Journal of Disaster Recovery and Business Continuity* Vol.11, No. 2, (2020), pp. 88–93
15. Kumar, S. (2020). *Relevance of Buddhist Philosophy in Modern Management Theory. Psychology and Education*, Vol. 58, no.2, pp. 2104–2111.
16. Rajanna SP, Dharmavijay MN. Prevalence of pregnancy induced hypertension in our hospital. *International Journal of Clinical Obstetrics and Gynaecology.* 2020;4:32-5.
17. Sole KB, Staff AC, Laine K. Maternal diseases and risk of hypertensive disorders of pregnancy across gestational age groups. *Pregnancy hypertension.* 2021 Aug;25:25-33.
18. Sharma C, Gupta S, Tyagi M, Mani P, Dhingra J. Maternal & Perinatal outcome in Hypertensive Disorders of Pregnancy in a Tertiary Care Hospital in Northern India. *ObstetGynecol Int. J.* 2017;6(6):00229. DOI: 10.15406/ogij.2017.06.00229.
19. Panda S, Das R, Sharma N, Das A, Deb P, Singh K. Maternal and Perinatal Outcomes in Hypertensive Disorders of Pregnancy and Factors Influencing It: A Prospective Hospital-



- Based Study in Northeast India. Cureus, 2021, 13(3).
20. Granger JP, Alexander BT, Bennett WA, Khalil RA. Pathophysiology of pregnancy-induced hypertension. American journal of hypertension. 2001 Jun;14(S3):178S-85S.