MEDICAL SCIENCE

To Cite:
Jain A, Taksande A. Outcome of neonates born to mother with pregnancy induced hypertension: A clinical study. *Medical Science* 2023; 27: e335ms2863.
doi: https://doi.org/10.54905/disssi/v27i138/e335ms2863

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Peer-Review History
Received: 25 January 2023
Reviewed & Revised: 28/January/2023 to 02/August/2023
Accepted: 09 August 2023
Published: 14 August 2023

Peer-review Method
External peer-review was done through double-blind method.

Medical Science
pISSN 2321–7359; eISSN 2321–7367

Outcome of neonates born to mother with pregnancy induced hypertension: A clinical study

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ABSTRACT

Introduction: Eclampsia as well as associated complications can be evaded with proper antenatal care, early recognition of pre-eclampsia, and early intervention. Thus, the present study was undertaken to compare outcome of neonates born to mothers with pre-eclampsia, eclampsia and gestational hypertension. *Materials and Method:* The present study was conducted among neonates born to a mother with PIH. Outcome of the neonate who satisfied the inclusion criteria was documented. Qualitative data was analysed using Chi square test and Fischer's exact test. Differences between means were compared by unpaired student's t-test. P value less than 0.05 is considered as level of significance. *Results:* 33% were born to mothers with gestational hypertension, 60% were born to mothers with pre-eclampsia and 7% were born to mothers with eclampsia 9% neonates required resuscitation at birth and 91% neonates did not require any resuscitation. 32.5% were born to mother with gestational hypertension of which 87.18% were discharged, 6.41% were IUD, 3.8% died, 60.4% were delivered by mothers with pre-eclampsia of which 97.6% were discharged, 2.3% were IUD, 6.9% were born to mothers with eclampsia, out of which 66.6% were discharged and 11.1% were IUD, 22.2% died. There is statistically significant association between type of PIH and outcome. *Conclusion:* The placental alterations along with various fetal are associated with pregnancy-induced hypertension. Hence, it is pivotal to closely scrutinise these infants as a primary measure to decrease morbidity. Therefore, as a preventive method and detect pre-eclampsia, it is crucial to provide appropriate antenatal care to all pregnant women.

Keywords: Gestational Hypertension, Pre-eclampsia, Eclampsia, PIH

1. INTRODUCTION

The Greek word for lightning is where the name eclampsia comes from. Hippocrates provided the first recorded account of the condition (Mohler and Townsend, 2006). One of the frequent consequences of pregnancy is pregnancy-induced hypertension, which has a considerable negative impact on maternal and neonatal morbidity and mortality. Gestational Hypertension,

pre-eclampsia and eclampsia are three categories for PIH. Gestational hypertension is defined as a sustained systolic blood pressure of at least 140 mm Hg or a sustained diastolic blood pressure of at least 90 mm Hg, or a rise in systolic blood pressure more than or equal to 25 mm Hg and a diastolic blood pressure greater than or equal to 15 mm Hg (two readings were collected, four hours apart).

Pre-eclampsia is the development of hypertension after 20 weeks of pregnancy in a woman who has no known history of either renal illness or hypertension and whose blood pressure was normal during the first half of pregnancy and reverted to normal after birth. Frequently, the urine also contains a sizable amount of protein. Eclampsia is defined as convulsions and/or coma that happen during pregnancy or puerperal period in a woman, the condition of the woman also satisfies the criteria for pre-eclampsia but are not brought on by coincidental neurologic disorder. The actual cause of PIH is still a mystery (Cunningham et al., 2018).

In India, the rate of maternal death among women with eclampsia ranges from 8% to 14%. Eclampsia and its related problems can be avoided with appropriate antenatal care, early detection of pre-eclampsia and prompt intervention (Dutta, 2015). Thus, the present study was undertaken to compare outcome of newborns delivered by pregnant woman with gestational hypertension, pre-eclampsia and eclampsia.

2. MATERIALS AND METHOD

The present study was carried out in the Department of Paediatrics, Jawaharlal Nehru medical college and Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha among neonates born to a mother with PIH over a period of 2 years between December 2020 to December 2022. Institutional Ethical Committee clearance was taken before the start of the study with approval number-DMIMS (DU)/IEC/2020-2021/9283. Inclusion Criteria comprised of neonates born to pregnant woman with PIH delivered in hospital and mothers with PIH who came for at least 2 ANC visits in our hospital.

Exclusion criteria consisted of neonates born to mother with chronic hypertension, neonates born to mother with renal disease, heart disease and connective tissue disease. The patients admitted at AVBRH fulfilling the inclusion criteria after taking well informed, written consent from the parents were included in the study. All the essential information was gathered in the predesigned proforma. The intentions of this study were told to the parents in detail and they were enrolled in the study after taking written informed consent.

Detailed history including antenatal, natal and postnatal etc. was taken. A thorough clinical examination at the time of delivery including the anthropometric measures was performed. The infant's gestation age was calculated as the number of days passed between the first day of mothers last menstrual period (LMP) and herdate of delivery. If mother was not being sure about the LMP, New Ballard score was used and 1st trimester scan (if available) was used. Vitals of the study participants were recorded at the time of birth. Cardiovascular (CVS), respiratory, per abdomen and neurological (CNS) examination was conducted at the time of birth. Outcome of the neonate who satisfies the inclusion criteria was documented. Various associations between the variables were documented.

Descriptive and inferential statistical analysis was done using Stata software (Stata 10, Stata Corporation Texas, USA). Quantitative data was analysed using mean, median and standard deviation. Qualitative data was summarized using percentage and proportions differences in proportion were compared by chi square test and Fischer's exact text. Differences between means were compared by unpaired student's t-test. P value less than 0.05 is considered as level of significance.

3. RESULTS

Out of 122 live birth neonates, 78 neonates were born to mothers with pre-eclampsia, 41 neonates were delivered by mothers with gestational hypertension, and mothers with eclampsia delivered 8 neonates as in (Table 1). Out of 7 IUDs, 5 neonates were born to mothers with pre-eclampsia, 1 neonate was born to a mother with gestational hypertension and 1 neonate was born to a mother with eclampsia. Inference was the majority of the neonates were born to mothers with pre-eclampsia.

Out of 122 live neonates, 6 neonates had abnormal cardiovascular system like 2 neonates have heart murmur, 2 neonates have continuous tachycardia, 1 neonate had bradycardia, cyanosis, 0 neonates have abnormal pulses and 13 neonates had abnormal respiratory system like 4 neonates have apneic attack, 2 neonates have dyspnea, 4 neonates have cyanosis, 1 neonate have grunting, 1 neonate have stridor, 1 neonate wheezing (Table 2). Inference was that the majority of the neonates who were born to PIH mothers have an abnormal respiratory system.

Table 1 Neonates distributed accordin to type of PIH

PIH	No of neonates	Percentage
Gestational hypertension	42	33%
Pre-eclampsia	78	60%
Eclampsia	09	07%
Total	129	100

Table 2 Neonates distributed according to System involvement

System	Gender		P-value
	Male	Female	
CVS (n=122)			0.450
Normal	57	59	
Abnormal	2	4	
Respiratory (n=122)			0.179
Normal	55	54	
Abnormal	4	9	
Per abdomen (n=122)			
Normal	59	63	
Abnormal	0	0	
CNS (n=122)			
Normal	68	54	
Abnormal	0	0	

Table 3 Neonates distributed according to Resuscitation required

Resuscitation required	No of neonates	Percentage
Absent	110	91
Present	12	09
Total	122	100

Out of 122 neonates with live birth, 110 neonates did not require resuscitation and 12 neonates required resuscitation. Out of 12 neonates 9 neonates survived after resuscitation (Table 3). Inference was that the majority of neonates who were born to PIH mothers do not require anyresuscitation.

Table 4 Neonates distributed according to diagnosis

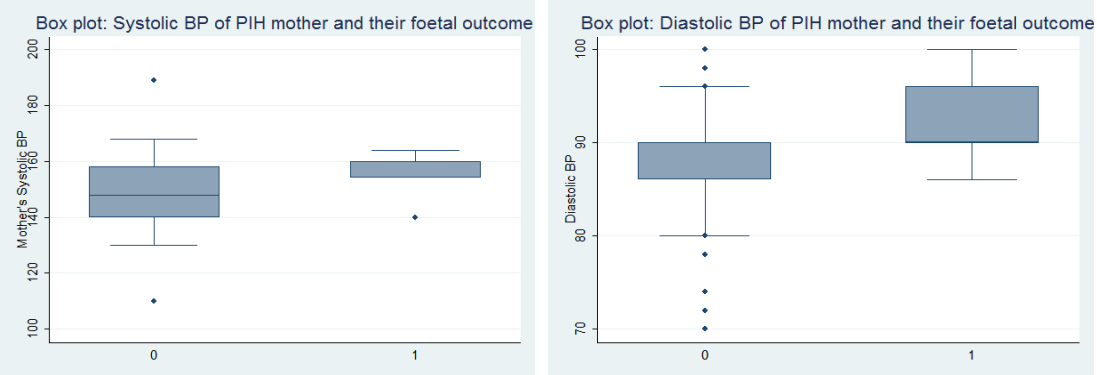
Diagnosis	Gender		Total
	Male	Female	
Sepsis	00	04	04
Birth Asphyxia	03	03	06
Respiratory distress syndrome (RDS)	03	09	12
Transient Tachypnea of Newborn (TTN)	11	07	18
Pulmonary Haemorrhage	01	00	01

Out of 122 neonates, 4 neonates had sepsis, 6 had birth asphyxia, 12 had RDS, 18 had TTN and 1 neonate had pulmonary hemorrhage. Sepsis and RDS are commonly foundin the female neonates whereas the TTN were more frequently found in the male neonates (Table 4). Inference found was the majority of female neonates had RDS than the male neonates.

Table 5 and Graph 1 shows that the systolic BP of the PIH mother who delivered IUD babies (156.28±7.86) is greater than the PIH mother who delivered live neonates. Similarly, the diastolic BP of the PIH mother who delivered IUD babies (92.28±4.68) is greater than the PIH mother who delivered live neonates but not statistically significant. Inference found was higher blood pressure was found in the PIH mother who delivered IUD babies than in live neonates.

Table 5 Association between blood pressure of PIH mother and their foetaloutcome

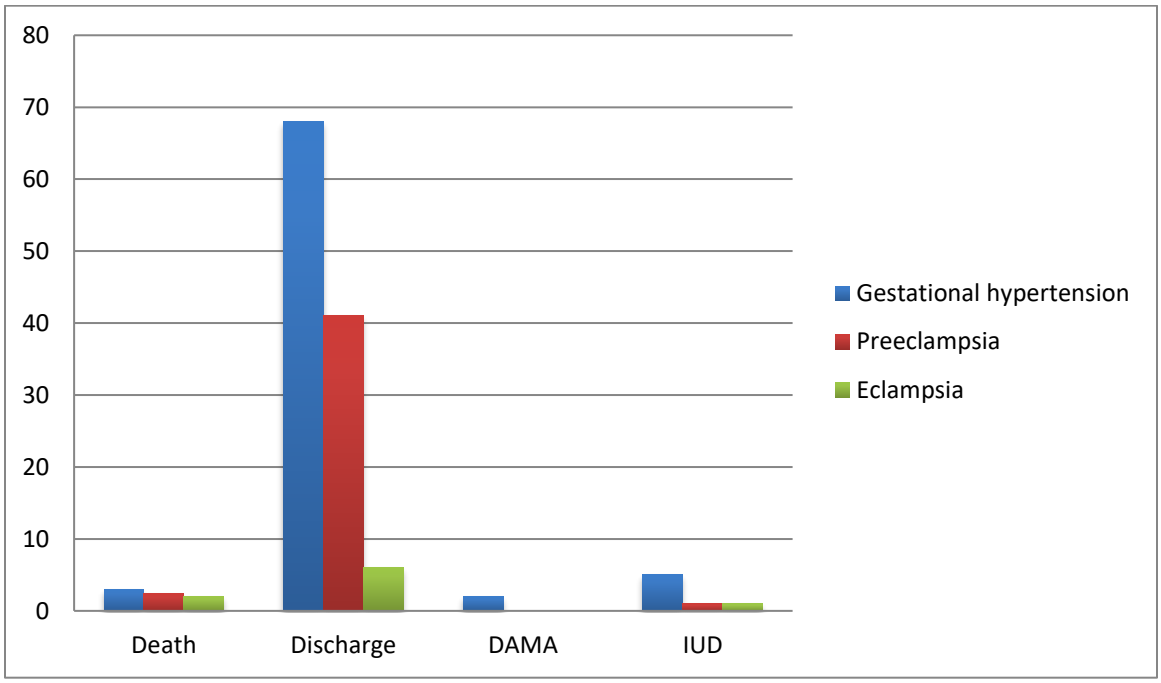
PIH Mother (n=129)	Live neonate (n=122) (Mean±SD)	IUD (n=07) (Mean±SD)	P value
SBP	148.81±10.73	156.28±7.86	0.070
DBP	87.65±6.54	92.28±4.68	0.060



Graph 1 Box and whisker plot of association between blood pressure of PIH mother and their fetal outcome

Table 6 Association between type of PIH and perinatal Outcome

PIH	Outcome				P-Value
	Death	Discharge	DAMA	IUD	
Gestational hypertension	3 (3.85)	68 (87.18)	2 (2.56)	5 (6.41)	0.043
Pre-eclampsia	00	41 (97.62)	00	01 (2.32)	
Eclampsia	02 (22.22)	06 (66.67)	00	01 (11.11)	



Graph 2 Association between Type of PIH and perinatal Outcome

Out of 129 neonates, 78 neonates were delivered from mothers with gestational hypertension, of which 68 neonates were discharged, 5 were IUD, 3 died and 2 were discharged against medical advice. 41 neonates were discharged and 1 was IUD, among 42 neonates born to women with pre-eclampsia. Out of 9 neonates born to mothers with eclampsia, 6 neonates were discharged, 2 died, 1 was IUD. A significant statistical association was reported in between PIH and neonatal outcome (Table 6) (Graph 2). Inference found was majority of the neonates born to mother with Gestational hypertension was IUD.

4. DISCUSSION

One of the most frequent obstetric problems in pregnancy is hypertensive disorders. Because these diseases are linked to a range of negative maternal outcomes and short- and long-term newborn problems, they present significant challenges for obstetricians and neonatologists. Gestational hypertension, pre-eclampsia and eclampsia, all have significant effects on the fetus, indicating that they are not just simple gestational disorders but rather a clinical syndrome involving significant maternal and foetal vascular alterations that can last and result in diseases in later life.

The present study was conducted with aim to evaluate the outcomes of neonates born to females with pregnancy induced hypertension. It was commenced in the Department of Paediatrics, Jawaharlal Nehru medical college and Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha among neonates born to a mother with PIH over a period of 2 years. All the essential information was gathered in the predesigned proforma. Detailed history including antenatal, natal and postnatal and a thorough clinical examination at the time of delivery including the anthropometric measures were performed.

The results of present study found that among 122 live birth neonates, 60.4% neonates were born to mothers with pre-eclampsia, 32.5% neonates were delivered by mothers with gestational hypertension, and mothers with eclampsia delivered 6.7% neonates. Similar to our study, Mitsui et al., (2016) reported that majority of the women have pre-eclampsia than the gestational hypertension and eclampsia. Kennady et al., (2017) also reported similar findings as revealed by our study in which majority of the neonates were born to pre-eclampsia mothers than gestational hypertension and eclampsia.

Majority of the neonatal outcome of preterm, LBW, female sex, primigravida corresponds to both the studies. On the other hand, in study done by Hassan et al., (2015) was reported that 60% neonates were born to mother with Gestational hypertension than pre-eclampsia and eclampsia. The various studies revealing comparative data to present study and distribution of neonates according to type of PIH as reported in (Table 7).

Table 7 Literature analyses reveals neonates distributed according to type of PIH

Author	Year of Publication	Gestational hypertension	Pre-eclampsia	Eclampsia	Total
Hassan et al., (2015)	2015	44 (60%)	21 (29%)	3 (4%)	68 (93%)
Mitsui et al., (2016)	2016	8 (27.6%)	16 (55.2%)	5 (3.4%)	-
Kennady et al., (2017)	2017	79 (46.4%)	79 (46.5%)	12 (7.1%)	170 (100%)
Pradhan et al., (2020)	2020	295 (60%)	63 (12.8%)	21 (4.3%)	-
Pandya et al., (2021)	2021	21 (65.6%)	9 (28.1%)	2 (6.2%)	32 (100%)
Rocha-De-Moura et al., (2021)	2021	151 (49%)	51 (16.6%)	48 (15.6%)	-
Present Study	2022	42 (32.5%)	78 (60.4%)	09 (6.9%)	129 (100%)

Table 8 Literature analysis neonates distributed according to diagnosis at birth

Author	Year of Publication	Sepsis	Birth Asphyxia	RDS	TTN	Others
Bangal et al., (2012)	2012	-	8/97 (8.2%)	-	-	-
Hassan et al., (2015)	2015	30	6 (20%)	18 (60%)	-	10
Obsa et al., (2018)	2018	-	12 (5.3%)	-	-	14 (6.2%)
Ramya et al., (2020)	2020	2/58 (3.4%)	-	-	3/58 (5.1%)	-
Uwizeyimana et al., (2020)	2020	-	-	43 (37.8%)	17 (14.9%)	23.8%
Gaur et al., (2021)	2021	23/78 (29.4%)	21/78 (26.9%)	31/78 (39.7%)	-	-
Present Study	2022	04 (3.1%)	06 (4.6%)	12 (9.3%)	18 (13.9%)	01 (0.7%)

The present study found that among 122 neonates, 3% neonates had sepsis, 4.6% had birth asphyxia, 9.3% had RDS, 13.9% had TTN and 0.7% neonate had pulmonary hemorrhage. Sepsis and RDS were more reported in the female neonates whereas the TTN was more frequently found in the male neonates as revealed (Table 4). Comparative to present study, Hassan et al., (2015) reported that 6 (20%) neonates suffered from birth asphyxia born to mothers with PIH. Similar study commenced by Obsa et al., (2018) and Gaur et al., (2021) also reported that 5.3% and 26.9% of the neonates respectively suffered from birth asphyxia born to mothers with PIH. In our study also 4.6% of the neonates suffered from birth asphyxia.

Study done by Hassan et al., (2015), Uwizeyimana et al., (2020) and Gaur et al., (2021) reported that 60%, 50%, 37.8%, 39.7% of neonates respectively suffered from RDS born to mother with PIH. In our study also 9.3% neonates have RDS after the delivery. Most of the surfactant is produced up to 32-34 weeks, but as in neonate born to PIH mother there is more number of preterm delivery therefore most of the neonates have RDS after the delivery. The comparative analysis of literature as per distribution of neonates according to diagnosis at birth and comparison to present study as reported in (Table 8).

Table 9 Literature analyses reveals neonates distributed according to the fetal outcome

Author	Year	DAMA	Discharge	Death	IUD	Total
Hassan et al., (2015)	2015	-	54 (90%)	6 (10%)	-	60 (100%)
Muti et al., (2015)	2015	-	-	3 (5.3%)	-	56 (100%)
Kennady et al., (2017)	2017	-	-	-	16 (9.4%)	170 (100%)
Patel et al., (2017)	2017	-	-	1 (1.5%)	1 (1.5%)	64 (100%)
Obsa et al., (2018)	2018	-	-	8 (3.5%)	20 (8.8%)	225 (100%)
Pradhan et al., (2020)	2020	-	-	6 (1.2%)	19 (3.8%)	492 (100%)
Atta et al., (2021)	2021	-	-	8 (6.1%)	6 (4.6%)	130 (100%)
Present Study	2022	2 (1.5%)	115 (89.1%)	5 (3.8%)	7 (5.4%)	129 (100%)

The present study found a significant statistical association between PIH and neonatal outcome with inference that majority of the neonates born to mother with gestational hypertension was IUD. The total deaths among the babies of PIH mothers in our study were 3.8% while 4.65% were IUD. Among 129 neonates enrolled in the present study, 60% (78) neonates were delivered from mothers with gestational hypertension, of which 87% neonates were discharged, 6.4% were IUD, 3.8% died and 2.56% were discharged against medical advice. Among 42 (32.5%) neonates born to women with pre-eclampsia, 41 neonates were discharged and 1 was IUD. Out of 9 (6.9%) neonates born to mothers with eclampsia, 6 neonates were discharged, 2 died, 1 was IUD.

In a comparative study by Bangal et al., (2012) out of 100 PIH women 19.0% had IUGR, 17.0% IUFD, 5.0% neonatal death which was comparable with the findings of the present study. A similar study carried out by Kennady et al., (2017) shows that 9.4% neonates were IUD, and study conducted by Obsa et al., 2018 reported that 8 neonates died after birth and 20 neonates were IUD. Study done by Pradhan et al., (2020) revealed that 19 neonates were IUD and another study by Atta et al., (2021) reported that 6 neonates were IUD, this is corresponding to our study which reported that 7 neonates were IUD and 5 neonates died. More number of IUD in mothers with PIH is due to chronic placental insufficiency that leads to hypoxia and leads to IUD (Wardinger and Ambati, 2022).

In PIH there is high resistance flow in the placenta that leads to prematurity, RDS, birth asphyxia, MAS in the babies born to mothers with PIH than the normotensive women that lead to increased mortality in neonates born to PIH mother (Shin et al., 2020). The majority of deaths in PIH are caused by its consequences rather than hypertension itself. The development of prenatal care in big cities has made severe cases of toxaemia and eclampsia largely preventable. However, it is still a significant obstetric issue in developing nations. The comparative review of various studies that reports distribution of neonates according to the fetal outcome and comparison to present study is reported in (Table 9).

Similarly, Siromani et al., (2015) stated the prevalence of neonatal deaths was 2.74% in their study. Patel et al., (2017) reported that out of 64 delivery 12 (18.75%) of babies were required NICU admission for various causes. 1.56% were IUFD and 1.56% were neonatal deaths. Seyom et al., (2015) in their study on maternal and foetal outcome of pregnancy related to hypertension in Karl Referral Hospital, Ethiopia reported 10.2% rate of stillbirth, 30.5% of low birth weight, abortion 10.7% and preterm delivery 31.4%. The limitation of the present study is that long term complications were not assessed as the babies were not followed up and secondly, the area is rural so findings cannot be generalized to the population.

5. CONCLUSION

Pregnancy-induced hypertension involves placental alteration and is linked to various problems for the fetus. Since babies delivered to hypertensive mothers are more likely to experience a variety of difficulties, it is important to closely monitor these infants in an effort to reduce morbidity and promote better growth, development, and survival. To prevent and detect pre-eclampsia, all pregnant women must receive appropriate antenatal care. Pre-eclampsia and other hypertensive disorders should be treated in medical facilities that are sufficiently equipped to make early detection and handle such cases, and community awareness raising initiatives should be put into place. The neonatal prognosis can be improved by increased public health awareness,

education of primary healthcare providers, and improvements in socioeconomic conditions. At the community level, efforts should be made to reduce the risk factors contributing to the high occurrence of eclampsia and pre-eclampsia.

Acknowledgement

We thank the participants who were all contributed samples to the study.

Author Contributions

Details of contribution of each authors regards manuscript work & production.

Informed consent

Not applicable.

Funding

This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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