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RESEARCH ARTICLE

Prevalence and Determinants of Pregnancy Outcomes among Mothers with Hypertensive Disorders at Woliso Saint Luke Hospital, Southwest Ethiopia

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ABSTRACT

Objective: The study aimed to determine the prevalence of hypertensive disorders of pregnancy and determinants of its maternal and neonatal outcomes among pregnant mothers admitted to maternity wards of Woliso Saint Luke hospital, Ethiopia.

Materials and Methods: Retrospective, institution-based cross-sectional study was conducted by reviewing records of pregnant mothers admitted to the maternity ward of the hospital between January 01, 2018, and December 31, 2020. The data were extracted using a structured checklist and analyzed using SPSS v. 24. Descriptive statistics of findings, univariate and multivariate logistic regression analysis were performed to identify the independent effect of predictor variables on the maternal and perinatal clinical outcomes.

Results: During a three-year period, 15,097 pregnant mothers were admitted to the hospital's maternity ward. The prevalence of hypertensive disorders of pregnancy was 197(1.3%); more than half 121(61%) attributed to preeclampsia. From the total cases 37(18.8%) of mothers encountered adverse pregnancy outcomes of which 5(2.5%) of them died of its complications. Over half (51.8%) of neonates encountered adverse pregnancy outcomes; 17(20%) were born extremely LBW and 32(16.2%) died. Mothers who had blood pressure level of < 160/110 mmHg during admission were 63% less likely to have adverse maternal outcomes compared to higher levels (AOR = 0.37, 95% CI = 0.14-0.94). The earlier gestational age at admission for hypertensive disorder associated to higher odd of adverse pregnancy outcome of neonates (AOR = 18.272, 95% CI = 6.330-52.742).

Conclusion: The magnitude of hypertensive disorders of pregnancy showed significant rate. Besides, the complications or adverse pregnancy outcomes were higher compared to other previous studies. Earlier diagnosis during gestation, prompt management of complications and effective antenatal care are crucial in minimizing adverse outcomes for both mothers and newborns. Provision of focused and better quality care for high-risk mothers from pregnancy to post-partum period is highly recommended.

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- Antenatal care
- Ethiopia

INTRODUCTION

Globally, estimated 15% of pregnant women encounter life-threatening complications during pregnancy; at delivery or post-partum [1,2]. According to World Health Organization (WHO) report of 2019, 295,000 women died because of pregnancy and childbirth related causes. Of these deaths, about 50% occur in Africa, 42% in Asia, 4% in Latin America and Caribbean and less than 1% in the developed countries [3,4].

Hypertensive Disorders of Pregnancy (HDP) is a general term for increased blood

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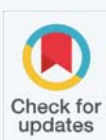
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pressure during pregnancy, including Pregnancy-Induced Hypertension (PIH), Preeclampsia (PE) and eclampsia, and chronic hypertension [5]. HDP is significant contributors to these complications and sufferings. Hypertension is the most common medical disorder of pregnancy and reported to complicate one in every ten gestations [6]. HDP occurs approximately in 10% of all pregnancies, leading to fetal/infant morbidity and mortality, and is a second leading cause of maternal death worldwide [7,8].

Complications of HDP include placental abruption, pulmonary edema, thrombocytopenia, hemolytic anemia, fetal growth retardation, stroke, recurrent seizure, renal damage, hepatic injury and others [9]. Hemolysis Elevated Liver Enzymes and Low Platelets syndrome (HELLP) occurs in about 0.5 to 0.9% of all pregnancies and fatally complicates 10 to 20% of pregnant women with severe preeclampsia [7,10].

In Ethiopia, the perinatal mortality rate was estimated to be 33 per 1000 pregnancies by the end of 2016 [11] and the pooled prevalence of maternal death was estimated to be 4% [12]. Both perinatal and maternal mortality is three to five folds higher in women with HDP compared to those without the disorders [13]. Higher perinatal mortality were reported during circumstances of antepartum occurrence of the disease, low birth weight, hepatic injury, earlier gestational age at diagnosis, presence of eclampsia, and born of multipara mothers [12,14].

Hospital based study from Jimma University; South-West of Ethiopia reported HDP prevalence of 8.5%, of which Preeclampsia and eclampsia accounted for 51.9% and 23.4% respectively [15,16]. Other study from Debre Berhan hospital, Northern Ethiopia depicted 3.9% (340/8626) of mothers who gave birth at the hospital had HDP, accounted for 2.5% of maternal and 30.8% of fetal mortality [17].

There is a significant risk of both maternal and perinatal morbidity and mortality in pregnancies affected by HDP. The steadily increasing prevalence of HDP is threatening lives of mothers and newborns, perplexed by delayed recognition and intervention due to lower utilization of antenatal care [18].

Despite HDP being the leading cause of maternal and perinatal morbidity, the contributing factors for these adverse outcomes are scarce and not fully been elucidated in Ethiopia. There is an urge in seek of studies exploring the contributors to lay a foundation for evidence based policy. Hence, the study aimed to determine the prevalence and identify determinant factors that influence maternal and perinatal outcomes of HDP among pregnant women admitted to Woliso Saint Luke hospital from January 01, 2018 to December 31, 2020, South West Shewa, Ethiopia.

MATERIALS AND METHODS

Study area and period

The study was conducted at Woliso St. Luke Hospital, Southwest Showa Zone, and Oromia Regional State, Ethiopia. It is located 114 km South West of Addis Ababa, capital of the country. The general hospital serves over 1.2 million catchment population, providing almost all major spheres including medical, surgical, obstetrics and gynecology services. It had functioning 200 beds, of which 24 and 14 allocated for maternity and gynecology ward respectively. The study was conducted from January 13 to June 30, 2021.

Study design

Facility-based, cross-sectional study design using three years retrospective record review was employed. The survey's primary intent was to measure prevalence followed by determining predictors of maternal and neonatal pregnancy outcomes.

Source and study population

All mothers admitted to the labor and maternity wards of Woliso St. Luke hospital considered as source population, whereas, the mothers who were admitted to the labor and maternity wards of the hospital from January 01, 2018 to December 31, 2020, that fulfilled inclusion criteria were considered as study population. From the hospital record, 15,097 pregnant mothers admitted over the three years.

Inclusion and exclusion criteria

All records of pregnant mothers admitted to the labor, maternity wards from January 01, 2018 to December 31, 2020 (total of 15,097) were included in the study to measure prevalence of HDP and its predictors. Records of mothers who were admitted to the ward for reasons other than pregnancy, labor, multiple gestations and incomplete records were not included in the study.

Sampling procedure and data collection

The records of all pregnant mothers who were admitted to the labor and maternity wards of Woliso St. Luke hospital from January 01, 2018 to December 31, 2020 were included in the study. The study included medical records of 15,097 admitted pregnant mothers for measuring magnitude and used all 197 records of pregnant mothers with HDP to determine predictors of its pregnancy outcomes.

A structured checklist consisting of socio-demographic variables, obstetric history, medical history, signs and symptoms at presentation, family history, maternal outcomes and neonatal outcomes used to extract data. After the tool was designed in English, it pretested and modified for consistency to capture the target data. Pregnancy outcome

of mothers with HDP were outcome variable of the study. Predictor variables was maternal age, residence, gravidity, parity, antenatal visits, history of diabetic mellitus, fetal weight, gestational age, level of blood pressure, level of proteinuria, platelets count and creatinine.

Hypertensive disorders of pregnancy is operationalized as pregnant mother diagnosed with systolic Blood Pressure (sBP) ≥ 140 and diastolic Blood Pressure (dBP) ≥ 90 mmHg, on two consecutive measurements, including all women with chronic hypertension, gestational hypertension, and superimposed preeclampsia admitted to Woliso St. Luke hospital from January 1, 2018 to December 31, 2020.

Adverse maternal outcome is defined as any negative impact of HDP on the maternal well-being during pregnancy, labor and postnatal period that can be complications or death.

Adverse neonatal outcome is defined as any deviation or deficit from wellbeing of normal newborn associated to HDP.

Data analysis

After verifying the checklist for completeness and consistency, data were coded, entered and analyzed using SPSS version 24. Descriptive statistics were used to present summaries. Univariate logistic regression was performed to identify the association between each independent and dependent variable. All predictor variables associated with adverse pregnancy outcomes after univariate analysis at $p \leq 0.25$ was further candidate for multivariable logistic regressions analysis. Effect of multi-collinearity was checked and ruled-out. Finally, statistical significance at $p < 0.05$ and 95% confidence level were used to identify independent effect of predictor variables on pregnancy outcome of mothers with HDP.

RESULTS

Socio-demographic and clinical characteristics

Records of 15,097 pregnant mothers admitted to Woliso St. Luke hospital between January 01, 2017 and 31 December 2019 were retrieved. From 197 (1.3%) diagnosed with HDP, the majority 91(46.1%) had moderate hypertension. From categories of hypertensions, preeclampsia were leading with 150(76.1%), followed by PIH 21(10.7%), eclampsia 11(5.6%), PE superimposed 8(4.1%) and chronic HTN 7(3.6%) (Figure 1).

Majority of mothers diagnosed with HDP 172(87.2%) were in the age range of 18–35 years, and 14(7.1%) were greater than 35 years. More than half of these mothers 107(54.3%) were from rural area and 104(52.8%) multigravida (Table 1).

Overall proteinuric hypertension was seen in 169(85.8%) of mothers diagnosed with HDP, out of which proteinuria of 2+ was seen among 68(34.5%), 3+ among 67(34%) and

CATEGORY OF HTN (%)

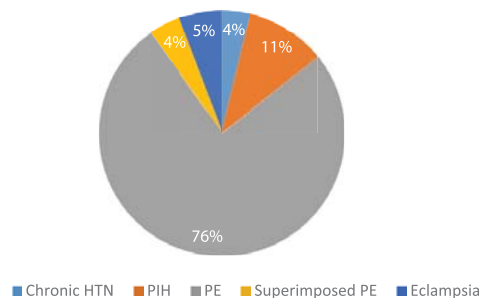


Figure 1 Category of hypertension among mothers diagnosed with HDP at Woliso St. Luke hospital, Southwest Showa, Ethiopia, 2020.

62(31.5%) mothers were negative for proteinuria. Majority of patients had platelet count of $> 150,000$ which accounts 137(69.5%), 189(95.9%) had SGOT ≤ 70 U/L and 191(97%) had serum creatinine of ≤ 1.2 mg/dl.

Among mothers diagnosed with HDP, 87(44.2%) had no experience of antenatal care visits). From those who did not utilize ANC, 72(36.5%) developed PE and only 5(2.5%) of them developed eclampsia. From 197 HDP deliveries, 33(16.8%) were induced labor, preeclampsia accounting for 27(13.7%) and superimposed preeclampsia 4(2%). Among 197 mothers diagnosed with HDP, 182(92.4%) were singleton pregnancies followed by twin 14(7.1%) and triplet 1(0.5%). Also, 15(7.6%) of mothers diagnosed with HDP had previous history of hypertension whereas only 7(3.6%) had history of DM.

Regarding mode of delivery, 50(25.4%) of them delivered by Caesarian Sections (CS), while 133(67.5%) and 14(7.1%) by Spontaneous Vaginal Delivery (SVD) and had instrumental delivery respectively. Uncontrolled PE was the most common indication for CS accounting for 19(38%) followed by eclampsia 14(28%), abruption placentae 11(22%), other obstetric indications 6(12%), failed induction and augmentation 2(4%) and oligohydramnios 1(2%).

Maternal outcomes

The study also assessed the pregnancy outcomes of mothers diagnosed with HDP. Accordingly, 38(18.8%), 95% CI = (13.6–24.9) mothers diagnosed with HDP developed adverse maternal outcomes from which majority of them 21(78.4%) were diagnosed with PE (Table 1).

The major complication that resulted in adverse maternal outcomes, 27(73%) was APH. Maternal death was estimated to be 5(2.5%), 95% CI = (0.8–5.8) %. From a total of 37 maternal adverse outcomes, 33(89.2%), three (8.1%) and 1(2.7%) mothers were diagnosed with PE, PIH and eclampsia respectively. Almost all 35(94.6%), the age category of mothers with maternal adverse outcome was

Table 1: Category of hypertension and its outcomes among mothers diagnosed with HDP at Woliso St. Luke Hospital, South West Showa, Ethiopia, 2020.

Category of HDP	Maternal outcomes		Perinatal outcomes	
	Normal No (%)	Adverse No (%)	Normal No (%)	Adverse No (%)
Chronic HTN	7(3.6)	0	1(0.5)	6(3)
PIH	18(9.1)	3(1.5)	16(8.1)	5(2.5)
PE	121(61.4)	29(14.7)	75(38.1)	75(38.1)
Eclampsia	10(5.1)	1(0.5)	0	11(5.6)
Superimposed PE	4(2)	4(2)	3(1.5)	5(2.5)
Total	160(81.2)	37(18.8)	95(48.2)	102(51.8)

Note: HTN: Hypertension; PIH: Pregnancy Induced Hypertension; PE: Preeclampsia

18–34 years and more than half (54.1%) were from the rural areas. Majority of mothers with adverse maternal outcomes, 22(59.5%) did not utilize any visits of ANC. The level of BP during admission of more than half of mothers with adverse outcomes 21(56.8) % was $\geq 160/110$ mmHg.

The study also identified the major determinants of adverse maternal outcomes using bivariate and multivariable logistical regression. Accordingly, mothers who did not utilize ANC care were 2.5 more likely developed adverse maternal outcomes compared to those who utilized the service (AOR = 2.54, 95% CI = 1.05–6.12). Mothers who had blood pressure level of $< 160/110$ mmHg during admission were 63% less likely to have adverse maternal outcomes compared to those with $\geq 160/110$ mmHg (AOR = 0.37, 95% CI = 0.14–0.94). Mothers with +1 proteinuria level 83% less likely to develop adverse maternal outcomes compared to those with +3 proteinuria level (AOR = 0.17, 95% CI = 0.03–0.96) (Table 2).

Neonatal outcomes

Half 102(51.8%) of neonates born to mothers who had HDP encountered unfavorable neonatal outcome; 32(16.2%) of neonates expired and LBW 85(43.1%) of which 17(20%) were extremely LBW. Newborns of mothers diagnosed with HDP who did not utilize antenatal care were 3.6 times likely developed unfavorable perinatal outcomes (AOR = 3.564, 95% CI = 1.609–7.894) compared those who utilized the care. Earlier gestational age at admission for HDP (AOR = 18.272, 95% CI = 6.330–52.742) and lesser proteinuria level (AOR = 0.213, 95% CI = 0.062–0.733) determined unfavorable neonatal outcome (Table 3).

DISCUSSION

This study sought to determine the prevalence and outcomes of hypertensive disorders in pregnancy and to identify determinants of adverse pregnancy outcomes

Table 2: Predictors of maternal outcomes among mothers diagnosed with HDP at Woliso St. Luke Hospital, South West Showa, Ethiopia, 2020.

Variables		Maternal outcomes		Odds Ratio, 95% CI		p value
		Normal n = 160(%)	Adverse n = 37 (%)	Crude (COR)	Adjusted (AOR)	
ANC visit	No	65(40.6)	22(59.6)	2.144(1.035-4.440)	2.541(1.054-6.123)	0.002**
	Yes	95(59.4)	15(40.4)	1	1	
BP at admission	$< 139/90$	22(13.8)	5(13.5)	0.628(0.211-1.870)	0.270(0.060-1.208)	0.031*
	140/90-159/109	80(50)	11(29.7)	0.380(0.170-0.849)	0.365(0.143-0.935)	
	$\geq 160/110$	58(36.3)	21(56.8)	1	1	
Proteinuria	Negative	25(15.6)	3(8.1)	0.353(0.094-1.318)	0.484(0.095-2.464)	0.061
	+1	32(20)	2(5.4)	0.184(0.040-0.850)	0.173(0.031-0.956)*	
	+2	53(33.1)	15(40.5)	0.832(0.376-1.843)	0.876(0.300-2.555)	
	+3	50(31.3)	17(45.9)	1	1	
Labor onset	Spontaneous	139(86.9)	25(67.6)	0.315(0.138-0.720)	0.301(0.102-0.889)*	0.02*
	Induced	21(13.1)	12(32.4)	1	1	
Delivery mode	SVD	115(71.9)	18(48.6)	0.304(0.141-0.655)	0.320(0.104-0.981*	0.024*
	Instrumental	12(7.5)	2(5.4)	0.324(0.065-1.614)	0.875(0.119-6.410)	
	CS	33(20.6)	17(45.9)	1	1	
Serum Creatinine level	≤ 1.2 gm/dl	157(98.1)	34(91.9)	0.217(0.042-1.119)	0.336(0.055-2.061)	0.52
	> 1.2 gm/dl	3(1.9)	3(8.9)	1	1	

Notes: AOR: Adjusted Odds Ratio; COR: Crude Odd Ratio; SVD: Spontaneous Vaginal Delivery; ANC: Antenatal Care; CS: Cesarean Section; *p-value < 0.05 , **p-value < 0.01 , ***p-value < 0.001 and 1 = reference, CI = Confidence Interval.

Table 3: Predictors of neonatal outcomes among mothers diagnosed with HDP at Woliso St. Luke Hospital, South West Showa, Ethiopia, 2020.

Variables		Neonatal outcomes		Odds Ratio, 95% CI		p value
		Normal n = 95(%)	Adverse n = 102(%)	(COR)	(AOR)	
ANC visit	No	32(33.7)	55(53.9)	2.304(1.294-4.101)	3.564(1.609-7.894)	0.001**
	Yes	63(66.3)	47(46.1)	1	1	
Proteinuria	Negative	17(17.9)	11(10.8)	0.316(0.127-0.789)	0.476(0.149-1.526)	
	+1	21(22.1)	13(12.7)	0.303(0.128-0.715)	0.213(0.062-0.733)	0.0013**
	+2	35(36.8)	33(32.4)	0.461(0.230-0.926)	0.457(0.183-1.145)	
	+3	22(23.2)	45(44.1)	1	1	
Labor onset	Spontaneous	80(84.2)	84(82.4)	0.875(0.413-1.853)	0.986(0.359-2.704)	0.055
	Induced	15(15.8)	18(17.6)	1	1	
Delivery mode	SVD	73(76.8)	60(58.8)	0.387(0.195-0.768)	0.375(0.125-1.125)	0.72
	Instrumental	6(6.3)	8(7.8)	0.627(0.186-2.112)	1.100(0.239-5.073)	0.064
	CS	16(16.8)	34(33.3)	1	1	
Gestational age (n = 196)	Preterm	8(8.5)	50(49)	10.337(4.544-3.514)	18.272(6.33052.742)	0.00***
	Term	86(91.5)	52(51)	1	1	

Note: AOR: Adjusted Odds Ratio; COR: Crude Odd Ratio; SVD: Spontaneous Vaginal Delivery; ANC: Antenatal Care; CS: Cesarean Section; *p-value < 0.05, **p-value < 0.01, ***p-value < 0.001 and 1 = reference, CI = Confidence Interval.

among mothers diagnosed with HDP at Woliso St. Luke Hospital in Ethiopia.

Accordingly, the prevalence of HDP among mothers diagnosed with HDP was determined to be 1.3%. This was lower compared to previous study reports that showed 8.5% in Jimma, Ethiopia [16], Zimbabwe 26% [10], India 6.9% [19], Iran 9.8% [20], Haiti 5.8% [21] and 2.4% in Saudi Arabia [22]. This difference might be due to the socio-demographic and economic characteristics of pregnant mothers as well as level of health facilities to provide the care. In addition, this study used single hospital data located in urban area, difference of study period, only three years retrospective data and is among the best hospitals in the country.

The study estimated the overall prevalence of maternal adverse outcome was 18.8% which was higher than the study report in Saudi Arabia 9.4% [17], but lower than study report in Northern Ethiopia 67.7% [23]. The overall perinatal adverse outcome was estimated to be 51.8%, which was higher than the study report in Ethiopia 40.9% [24]. Nearly half of the birth weights (43.1%) were LBW which was higher than the pooled prevalence of LBW neonate in a woman with HDP is 37% in Ethiopia [25] and 31.6% in India [19].

The current study depicting maternal death from HDP as 2.5% is consistent with the meta-analysis study report in Ethiopia estimated as 2-6% [25] and 2.2% in Ghana [25]. However, it is higher than report from Saudi Arabia of 1.3% maternal death from HDP [22].

The study also revealed that the neonatal death rate was 16.2% and is lower compared to other study in northern Ethiopia, which reported 25% [25]. Mothers diagnosed with HDP lacking antenatal follow-up were three and four

times more likely developed adverse maternal and perinatal outcomes respectively compared those who had ANC care.

This finding supports the study report conducted at Nekemte referral hospital in Ethiopia which showed that women who had ANC visit were three times more likely developed unfavorable outcomes [15].

Another study reports in Ethiopia revealed that hypertensive pregnant mothers who utilized ANC were 84% less likely to develop unfavorable neonatal outcomes [26] and mothers who attended ANC were 83% less likely to have adverse pregnancy outcomes [27]. This might be due the fact that ANC visits give opportunity to early diagnosis and management of complications that could result from HDP.

The study also revealed that the gestational age significantly contributed to adverse neonatal outcomes. Preterm mothers diagnosed with HDP were eighteen times more likely developed unfavorable perinatal outcomes compared to term gestational age. This is consistent with the previous study report in Ethiopia which showed that the risk of neonatal mortality in every preterm baby was almost eight fold higher than term babies, and very preterm gestational age mothers diagnosed with HDP were 6.5 times more likely to develop adverse outcomes [12] and 2.6 times more likely to develop adverse perinatal outcomes [24]. Similarly, another study in Taiwan revealed that gestational age was significantly associated with unfavorable neonatal outcomes [28].

Additionally, the study revealed that level of proteinuria had significantly affected the neonatal outcomes, which showed that mothers whose proteinuria level was + 1 were 79% less likely to develop unfavorable maternal and neonatal

outcomes compared to those mothers who diagnosed with proteinuria + 3. Similarly, the level of proteinuria identifies women who are at increased risk of adverse outcomes for mothers and their babies [7,29].

In general, the discrepancies between this study results and previous study reports could be due to different levels of health care systems in different countries that have different capacities to support the care of sick mothers diagnosed with HDP and outcomes based on levels of staffing, health care providers available, infrastructure and the availability of equipment, medications, and laboratory tests. Despite the study identified the major factors that contribute to adverse maternal and perinatal outcomes among mothers diagnosed with HDP, the sample of the study was derived from a single hospital and the finding may differ in other hospitals of the country.

CONCLUSION

The overall prevalence of HDP was lower at Woliso St. Lukas hospital compared to other study reports. However, the magnitude of unfavorable maternal and perinatal outcomes due to HDP were higher which were significantly associated with level of blood pressure, level of proteinuria and ANC visits were responsible for adverse maternal outcomes whereas ANC visits, level of proteinuria and preterm gestational age were the major predictors of unfavorable perinatal outcomes among mothers diagnosed with HDP.

We strongly recommend the health care providers should provide adequate and quality of ANC care and create awareness for the utilization of the care. Additionally, health care providers should assess and manage the factors that contribute to adverse maternal and perinatal outcomes during ANC visits, labor and delivery at all levels of health facilities. Finally, we recommend further study in future using prospective study design to identify preconception risk factors, presence of specific underlying disorders and pregnancy related risk factors.

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Ethical Approval

Ethical clearance was obtained from Institutional review board of Oromia regional health bureau Letter of cooperation to access the file were obtained from respective zonal health bureau.

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