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PREVALENCE AND FACTORS ASSOCIATED WITH PRE-ECLAMPSIA AMONG PREGNANT WOMEN ATTENDING MUHIMA DISTRICT HOSPITAL, RWANDA

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Abstract

Pre-eclampsia has a huge adverse impact on maternal and perinatal health especially in low- and middle-income countries. The magnitude of this problem in some places across the world is still somehow not fully known, especially in low and middle-income countries. This study aimed to assess the prevalence and factors associated with pre-eclampsia among pregnant women attending Muhima district hospital, Rwanda.

Study findings revealed that 21.7% were diagnosed with pre-eclampsia. Thus, the majority of respondents was married 86.0%, had mean age of 28.8 years [6.02 ± 28.8], and completed primary education 57.7%. worked in private or public sector 70.2%, protestants 43.2%, had got a diversified diet 42.8% and 66.4% were insured under RSSB. The present study revealed that most of pregnant women 63.1% had not had fetal complications, 55.7% of respondents were multigravidity while 53.6% had given at most one birth,45.2% were attending their first ANC, 79.8% had ever had a history of chronic disease especially pregnancy induced hypertension (PIH) 52.9% and 77.7% have not encountered maternal complications during their pregnancies 20.5% had had preterm births, 12.3% experienced still births while 4.1% experienced IUGR during their pregnancy. Less than a half 31.5% had had NICU admission during their post-delivery, 28.8% had known low APGAR sore, 8.2% had had early neonatal birth while 31.5% had no neonatal complications.

Introduction

Globally, Preeclampsia is among the leading causes of important cause of maternal mortality and severe maternal morbidity in the world (Ghlumiyyah,.et al, 2017). The major causes of maternal deaths are similar across low income countries, often obstetric in origin, and mainly severe preeclampsia, eclampsia, and infection (Alvarez, et al., 2019).

According to the World Health Organization (WHO), preeclampsia is recognized as an important cause of maternal, perinatal and neonatal morbidity and mortality. About 2–8% of complications related to pregnancies are attributed to the pre-eclampsia (WHO, 2018). In developing countries, preeclampsia incidence is almost seven times higher than in developed countries on average of 2.8% of live births versus 0.4% (Kartika, *et al.*, 2017).

In 2017, the WHO estimated that there were 295 000 maternal deaths; 35% lower than in 2000 when there were an estimated 451 000 maternal deaths globally. The global maternal mortality

rates (MMR) in 2017 was estimated at 211 maternal deaths per 100 000 live births, representing a 38% reduction since 2000, when it was estimated at 342 deaths (WHO, 2019). On the World Bank Report side, pregnancy induced hypertensions like pre-eclampsia is rated as one of the primary causes of death (World Bank Report, 2018).

Material and Method

This research was a hospital-based cross-sectional study conducted among pregnant women who attended Muhima district hospital, between March and June 2021. Muhima District Hospital is located within the city of Kigali. It serves as district hospital for Nyarugenge District but receives referrals from nearby district hospitals and health centers. Annually, Muhima hospital conducts 7,000 delivers with 30 babies per day. It receives daily expectant women coming to attend gyneco-obstetric service and as well provides comprehensive obstetric care (Ndayambaje,*et a*l., 2017).

Result and Discussion

This section presents the sociodemographic characteristics of pregnant women attended the gyneco-obstetric service at Muhima District Hopital during the period of the study. As indicated in Table 4.1, the majority (99.1%) of respondents were coming from urban areas: This may be explained by the fact that Muhima Hospital is located in the midtown and receiving patient transferred from health facilities in the catchment area. Most pregnant women (86.0%) were married, 57.4% were aged between 21-30 years (Mean age: 28.8 years, Stand. Dev.: 6.02, Minimum age: 17 years and Maximum age: 45 years), more than a half (57.7%) had primary education, 70.2% were working in private or public sector, 43.2% were protestants, 42.8% said they got a diversified diet and 66.4% were insured by RSSB.

Variables		Frequency (n=336)	Percent (%)
Residence	Urban	333	99.1
	Rural	3	0.9
Marital status	Single	47	14.0
	Married	289	86.0
Age (years)	≤ 20 years	23	6.8
	21-30 years	193	57.4
	31-35 years	70	20.8
	>35 years	50	14.9
Education level	Primary	194	57.7
	Secondary	120	35.7
	University	22	6.5
Occupation	Housewife	26	7.8
	Merchant	74	22.0
	Private/Government	236	70.2
Religion	Catholic	128	38.1
	Protestant	145	43.2
	Muslim	59	17.5
	No religion	4	1.2
Lifestyle	Alcohol consumption	32	9.5
	Smoking	11	3.4
	Getting a diversified diet	144	42.8
	Psychological stress	82	24.4
	Physical exercise	67	19.9
Medical Insurance	RSSB	223	66.4

Private	78	23.1
None	35	10.5

Source: Primary data (2021)

As gravidity is defined as the number of times that a woman has been pregnant and the parity defined as the number of times that a woman has given birth to a fetus with a gestational age of 24 weeks or more regardless of whether the child was born alive or was stillborn. Results in Table 4.2 indicated that 55.7% of respondents were multigravidity while 53.6% had given at least one birth, 64.4% of respondents was in the preterm period (≤ 36 weeks) as gestational age (Mean: 31.57 weeks, Stand. Dev.: 6.48, Minimum: 20 weeks and Maximum: 40 weeks) and 45.2% were attending their first ANC, 79.8% had ever had a history of chronic disease especially pregnancy induced hypertension (PIH) (52.9%). A total of 77.7% have not encounterd maternal complications during their pregnancies.

Obstetric and clinical characteristics of pregnant women at Muhima DH

Variables		Frequency (n=336)	Percent (%)
Gravidity	Primigravida	149	44.3
	Multigravida	187	55.7
Gestational age (weeks)	≤36 weeks	47	64.4
	>37 weeks	26	35.6
Parity	1	180	53.6
	2-4	132	39.3
	≥5	24	7.1
ANC visits	1	152	45.2
	2-3	135	40.2
	≥4	49	14.6
Past medical history	Yes	68	20.2
	No	268	79.8
If "Yes", past medical history of: (n=68)	Chronic HTA	17	25.0
	PIH	36	52.9
	Diabetes	11	16.2
	Renal disease	4	5.9
Current obstetric complications	Preeclampsia	73	21.7
	Placental abruption	2	0.6
	No complication	261	77.7

Source: Primary data (2021)

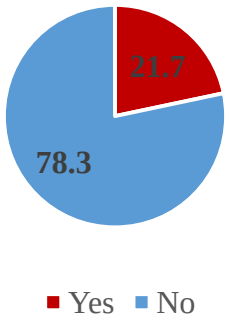
Presentation of findings

The presentation of findings and its interpretations were organized according to the research objectives and they are answered to the study research questions.

Prevalence of preeclampsia among the respondents

As the prevalence measures the proportion of individuals in a defined population that have a disease or other health outcomes of interest at a specified point in time or during a specified period of time, the researcher has put attention on investigating prevalence of preeclempsia among pregnant women attending Muhima Hospital. In a total of 336 pregnant women enrolled in the study, the results in Figure 4.1 revealed that the prevalence of pre-eclempsia was 73/336 (21.7%).

Prevalence of preeclampsia among pregnant women at Muhima DH



Source: Primary data (2021)

Factors associated with preeclampsia at Muhima District Hospital

The researcher sought to determine the factors associated with preeclempsia among pregnant women attending Muhima Hospital. Study findings are presented in the following tables. As indicated in Table 4.4, a multivariable analysis revealed that there was an association between preeclempsia and marital status (p=0.047) and pregnant women's lifestyle (p<0.001).

Maternal and perinatal outcomes of preeclampsia among pregnant women

The research tried to find out the maternal and perinatal outcomes of preeclampsia among pregnant women attending Muhima District Hospital. Findings in Table 4.2 revealed that most of pregnant women (63.1%) had not had fetal complications, 20.5% had had preterm births, 12.3% experienced still births while 4.1% experienced IUGR during their pregnancy. Less than a half (31.5%) had had NICU admission during their pregnancy, 28.8% had known low APGAR sore, 8.2% had had early neonatal birth while 31.5% had no neonatal complications.

Maternal and perinatal outcomes of pregnant women with preeclampsia

Variables		Frequency (n=73)	Percent (%)
Fetal complications	Preterm birth	15	20.5
	Still birth	9	12.3
	IUGR	3	4.1
	No complication	46	63.1
Neonatal complications	NICU admissions	23	31.5
	Low APGAR score	21	28.8
	Early neonatal birth	6	8.2
	No complication	23	31.5

Source: Primary data (2021)

Sociodemographic factors associated with preeclampsia among women attending Muhima district hospital

Variables		Preeclampsia		Chi-square	P-value
		Yes n(%)	No n(%)		
Residence	Urban	73(21.9)	260(78.1)	0.840	0.359
	Rural	0(0.0)	3(100.0)		
Marital status	Single	5(10.6)	42(89.4)	3.95	**0.047**
	Married	68(23.5)	221(76.5)		
Age (years)	≤ 20 years	6(26.1)	17(73.9)	5.545	0.136
	21-30 years	48(24.9)	145(75.1)		
	31-35 years	14(20.0)	56(80.0)		
	>35 years	5(10.0)	45(90.0)		
Education level	Primary	45(23.2)	149(76.8)	1.149	0.563
	Secondary	25(20.8)	95(79.2)		
	University	3(13.6)	19(86.4)		

Occupation	Housewife	5(19.2)	21(80.8)	0.262	0.877
	Merchant	15(20.3)	59(79.7)		
	Private/Government	53(22.5)	183(77.5)		
Religion	Catholic	37(28.9)	91(71.1)	7.571	0.056
	Protestant	22(15.2)	123(84.8)		
	Muslim	13(22.0)	46(78.0)		
	No religion	1(25.0)	3(75.0)		
Lifestyle	Alcohol consumption	8(25.0)	21(75.0)	192.29	**<0.001**
	Smoking	11(78.6)	3(21.4)		
	Psychological stress	36(56.2)	28(43.8)		
	Diversified diet	6(4.0)	144(96.0)		
	Physical exercise	12(15.2)	67(84.8)		
Medical Insurance	RSSB	72(32.3)	151(67.7)	3.108	0.468
	Private	0(0.0)	78(100.0)		
	None	1(5.0)	19(95.0)		

Source: Primary data (2021)

Findings in Table 4.5 showed that there was an association between preeclempsia and the parity (p = 0.001) and history of chronic disease (p<0.001). The gravidity, ANC attendace, have not found to be associated with preeclempsia in the bivariate analysis (p value > 0.005).

Obstetric and clinical outcomes associated with preeclampsia

Variables		**Preeclampsia**		**Chi-square**	**P-value**
		Yes n(%)	**No n(%)**		
Parity	1	39(24.2)	122(75.8)	8.959	**0.011**
	2-4	26(23.6)	84(76.4)		
	≥5	2(9.1)	20(90.9)		
Gestational age (in weeks)	≤ 36 weeks	11(23.4)	36(76.6)	0.001	0.975
	> 37 weeks	6(23.1)	20(76.9)		
Gravidity	Primigravida	35(23.5)	114(76.5)	0.490	0.484
	Multigravida	38(20.3)	149(79.7)		
ANC visits	1	31(22.3)	108(77.7)	2.572	0.276
	2-3	21(17.8)	97(82.2)		
	≥4	15(41.7)	21(58.3)		
Past medical history	Yes	13(19.1)	55(80.9)	32.17	**<0.001**
	No	60(22.4)	208(77.6)		
If "Yes", past medical history of: (n=68)	Chronic HTA	0(0.0)	17(100.0)	0.902	0.825
	PIH	1(2.8)	35(97.2)		
	Diabetes	0(0.0)	11(100.0)		
	Renal disease	0(0.0)	4(100.0)		

Source: Primary data (2021)

According to the results presented in Table 4.6, the researcher concluded that fetal complications (p<0.001) and neonatal complications (p<0.001) were statistically significantly associated with preeclampsia among pregnant women attended Muhima hospital. No association has been found between gestational age and preeclampsia (p>0.05).

Maternal and perinatal outcomes associated with preeclampsia

Variables		**Preeclampsia**		**Chi-square**	**P-value**
		Yes n(%)	**Yes n(%)**		
Fetal complications	Preterm birth	13(86.7)	2(13.3)	58.877	**<0.001**
	Still birth	7(77.8)	2(22.2)		
	IUGR	1(33.3)	2(66.7)		
	None	6(13.0)	40(87.0)		

Neonatal complications	NICU admission	19(82.6)	4(17.4)	24.220	**<0.001**
	Low APGAR score	5(23.8)	16(76.2)		
	Early neonatal birth	3(50.0)	3(30.0)		
	None	4(17.4)	19(82.6)		

Source: Primary data (2021)

Independent variables which had a statistically significant association with preeclampsia in the bivariate analysis were submitted to the multivariable analysis to determine to which extent they were associated with the dependent variable. Six factors were predictive of preeclampsia in bivariate analysis: marital status, lifestyle, parity, fetal and neonatal complications ($p<0.05$). However, adjusted odds ratios (AOR) were somewhat compared to the crude odds ratios (COR) calculated at 95% confidence interval.

Smoking (AOR=6.1; 95% CI: [3.03–35.7]; $p < 0.001$) and having psychological stress during pregnancy (AOR=5.2; 95% CI: [1.97-13.89]; $p<0.001$) were more likely associated with developing preeclampsia compared to those were practicing physical exercise. The risk of developing preeclampsia was 2.1 times (AOR=2.1; 95% CI: [1.05–3.42]; p=0.036) higher among women with 2-4 births compared to women who had given at least one birth. Pregnant women with a history of chronic disease has found with 1.5 times of developing preeclampsia compared to pregnant women with no history of chronic disease (AOR=1.5; 95%CI: [1.18–3.81]; p=0.024). Pregnant women with stillbirth as fetal complication were 2.7 times more likely to develop preeclampsia compared to pregnant women without fetal complications during pregnancy (AOR=2.7; 95% CI: [1.42–7.46]; p=0.015) and pregnant women with NICU admission as neonatal complication were 3.1 times more likely to develop preeclampsia compared to pregnant women without neonatal complications (AOR=3.1; 95% CI: [1.65–9.76]; p=0.020).

Predictors of preeclampsia among pregnant women at Muhima hospital

Characteristics		**Crude OR (95%CI)**	**P-value**	**Adjusted OR (95%CI)**	**P-value**
Marital status	Single	Ref.		Ref.	
	Married	2.5(0.98-6.79)	0.054	1.7(0.42-4.78)	0.064
Lifestyle	Physical exercise	Ref.		Ref.	
	Smoking	5.3(3.28–22.7)	<0.001	6.1(3.03–35.7)	**<0.001**
	Psychological stress	4.8(2.30-14.5)	<0.001	5.2(1.97-13.8)	**<0.001**
	Diversified diet	0.5(0.41–1.97)	0.060	0.8(0.57–2.65)	0.077
	Alcohol consumption	0.9(0.04–1.69)	0.074	0.8(0.63–1.32)	0.081
Parity	1	Ref.		Ref.	
	2-4	1.9(1.54-3.71)	0.029	2.1(1.05–3.42)	**0.036**
	≥5	0.3(0.07-1.39)	0.764	0.7(0.25–3.60)	0.613
Past medical history	Yes	1.2(1.01–2.57)	0.0186	1.5(1.18–3.81)	**0.024**
	No	Ref.		Ref.	
Fetal complications	Preterm birth	1.4(0.56-3.52)	0.459	1.2(0.71–2.24)	0.312
	Still birth	2.3(1.33-13.9)	0.001	2.7(1.42–7.46)	**0.015**
	IUGR	3.3(0.26-42.6)	0.355	2.6(0.92–37.1)	0.290
	None	Ref.		Ref.	
Neonatal complications	NICU admission	2.7(1.91-10.3)	<0.001	3.1(1.65–9.76)	**0.020**
	Low APGAR score	1.4(0.34-6.47)	0.599	1.5(0.49–3.15)	0.897
	Early neonatal birth	4.7(0.69-32.7)	0.114	2.6(0.42–22.1)	0.294
	None	Ref.		Ref.	

Source: Primary data (2021)

Discussion of key findings

The overall prevalence of preeclampsia in our study was 21.7% which was different with what found in a study conducted in 2 teaching hospitals in Kigali where the prevalence was 2.3% (2.0% preeclempsia; 0.3% eclampsia) (Mutabazi, et al., 2020). Our finding was also inconsistent to WHO statistics which estimate the prevalence of preeclampsia in developing countries to be 2.8% (WHO, 2011). The prevalence of preeclampsia varies worldwide and in African countries varies from 1.8% to 7.1 % (WHO, 2011). Variation between countries likely reflects variation in socioeconomic status, access to care and timeliness of diagnosis as well as background prevalence of hypertension and preeclampsia.

The study finding was found to be high compared with the results of other studies conducted in different areas where the prevalence was found to be 3% in Norway (Klungsøyr, *et al.*, 2012), 2.31% in German (Schneider, et al., 2014), 9.5% in Mustafa hospital of Ilam in the west of Iran (Khosravi,*et al.*, , 2016) and 0.17% in Shiraz Southern Iran (Zibaeenezhad, *et al*., 2017) and 4.8% in Brazzaville teaching hospital in the Repulic of Congo (Kimbally, *et al*., 2017).

In comparison with the other studies conducted in different areas of the world, it was also found to be high as compared with the studies conducted in different parts of Ethiopia, where 8.4% in Dessie referral hospital (Tessema, *et al.*, 2015) and 2.23% in Dilla (Vata, *et al*., 2015). In Zanzibar, a study revealed a high prevalence (26.3%) of severe pre-eclampsia among postpartum women in Zanzibar (Mwashamba, *et al.*,2020). This discrepancy might be due to the fact that there is a difference in study setting, socio-economic factors, methodological aspect and a difference in study duration. Moreover, the variation of prevalence of preeclampsia might be to the different distribution of maternal risk factors, availability/accessibility of health services and diagnostic capacities (Bilano, *et al.*, 2014), (Khader, e*t al.*, 2018). In addition, in low income countries, the quality of data might be impacted by a lack of funds and therefore of manpower for routine and systematic registration of data.

Multiparity was found to be significantly associated with the risk of developing preeclampsia among pregnant women. This study finding was inconsistent with the studies conducted in Egypt (El-Moselhy, *et al*., 2017), and in Ireland (Kenny, *et al.*, 2015) where no association was been found between parity and preeclampsia. This was somehow strange as studies have confirmed that change of partner raises the risk for preeclampsia in subsequent pregnancies. Immune maladaptation on the fetal maternal interface could be an underlying mechanism (Tubbergen, *et al.*, 2014).

Pregnant women with history of a chronic disease like diabetes were 1.5 times more likely to be pre-eclamptic than those without a history of chronic diseases. This finding is in line with the studies conducted in Sweden (Haglund, *et al*.,2015), in Ireland (Kenny, *et al*., 2015) and in Germany (Schneider, *et al.,* 2016). This might be explained by that diabetes is a disease in which the blood glucose, or blood sugar, levels are too high which will cause narrowing of blood vessels and interfere with the normal physiological response during pregnancy.

Our findings revealed that stillbirth was a significant adverse perinatal outcome of pregnant women with preeclempsia. This is because newborns were with no signs of life at or after 28 completed weeks of pregnancy. This finding was consistent with what found in a study conducted in Iraq (Yusra, *et al.*, 2018). Some hospital based prospective and retrospective studies from Nepal and Ethiopia showed that respective proportions of 13% and 30.2 % of babies were delivered premature (Tesfaye, *at al*., 2019). These are in line with our findings, though reported proportions of prematurity were comparatively low (20.5%). This discrepancy resides in the methods and enrolled pregnant women into research studies.

Likewise, Backes *et al*. acknowledged that adverse neonatal outcomes of preeclampsia is not limited to prematurity only, it is also inclusive low birth weight, early and late neonatal complications as the most prevalent early neonatal complication of pre-eclampsia (Backes, *et al*., 2014). According to Yusra (2018), the prematurity is also a significant adverse perinatal outcome of preeclampsia. Those findings were in contrast with our study findings because the gestational age has not found to be associated with pre-eclampsia in the multivariable analysis.

In our study, hypertension disorders were mainly chronic HTA, PIH and Diabetes. This has also been the reason for the high proportion in neonatal outcomes as compared to other studies conducted in Southwest, Ethiopia (Tesfaye, *at al.*, 2019) and (Doddamani, et al., 2018). Yusra (2018) found that the NICU admission was significantly higher for neonates of pre-eclamptic women. Although this finding was related with preterm infants in Yusra's study, and coincided with results of Mansoura et al.' study in Greece (Masoura, *et al.*, 2016).

Also, lower Apgar score was not found to be statistically significant associated with pre-eclampsia. This finding was inconsistent with what found by Yusra in Iraq (2018) where the Apgar scores at 1 and 5 minutes were significantly lower among neonates of preeclamptic women than controls. These findings were consistent with results of Dodd Amani study in India (Doddamani, *et al.*, 2018).

Conclusion

The prevalence of preeclampsia in this study was 21.7%. Predictor variables like the psychological stress, multiparity, having a history of chronic disease, stillbirth, and NICU admission were factors associated with preeclampsia. Thus, antenatal care sessions should emphasize on obstetric and neonatal danger signs, health seeking behavior towards pregnant women should be encouraged, which provide a chance to diagnose preeclampsia as early as possible and to prevent the coming complication towards preeclampsia.

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