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Determinants of Pre-Eclampsia Incidence among Pregnant Women in Antenatal Care at Fortportal Regional Referral Hospital

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ABSTRACT

Pre-eclampsia stands as a major contributor to maternal mortality, perinatal complications, preterm births, and restricted fetal growth. Globally, it ranks among the top three causes of maternal mortality and affects 6-8% of pregnancies, contributing to approximately nine percent of maternal deaths in Africa. This study aimed to identify factors linked to pre-eclampsia prevalence among pregnant women receiving antenatal care at Fortportal Regional Referral Hospital. Conducting a hospital-based cross-sectional study involving 60 pregnant women, data collection employed a structured questionnaire. Statistical analysis with SPSS version 25 determined Odds Ratios with 95% confidence intervals, marking significance at p values <0.05. Findings revealed several significant associations. Socio-demographic factors like lower maternal age, limited education, and reduced income were linked to pre-eclampsia, alongside obstetric factors including lower parity (≤ 4), overweight status, a history of gestational diabetes mellitus, shorter interpregnancy intervals (≤ 2 years), and previous diagnoses of gestational hypertension. The study underscores the critical need for urgent interventions in the district to address these identified risk factors and prevent and manage pre-eclampsia effectively among pregnant women attending Fortportal Regional Referral Hospital. Both socio-economic and obstetric factors significantly contribute to the occurrence of pre-eclampsia, necessitating targeted interventions for improved maternal and fetal health outcomes.

Keywords: prevalence, pre-eclampsia, pregnant women, antenatal care

INTRODUCTION

Pre-eclampsia is a major cause of maternal mortality (15-20% in developed countries) and morbidities, perinatal deaths, preterm birth, and intrauterine growth restriction [1-10]. By definition, preeclampsia is defined as high blood pressure (>140mmHg systolic and 90mmHg diastolic) with proteins in urine (300mg) within 24 hours that manifest after 20 weeks of pregnancy [11-21]. Furthermore, it is among the three leading causes of maternal mortality and morbidity worldwide, it occurs in 6-8% of all pregnancies, and is estimated to account for at least nine percent of maternal deaths in Africa [22-32].

Eight hundred women die every day from pregnancy or child birth related complications worldwide but ninety nine percent of these deaths occur in developing countries [33-39]. Approximately 10-20 million women will experience complications associated with child bearing each year while the differences in numbers of maternal deaths in parts of the world reflect inequities to access of health services and the gap between rich and poor. In developing countries, the maternal mortality ratio is 240 per 100,000 compared to 16 per 100,000 in developed countries [40-49].

Hypertension in pregnancy falls among the most important complications during pregnancy in addition to excessive bleeding and infection that account for

the increased maternal morbidity and mortality. It accounts for about 3.7% - 5% of all complications in pregnancies. In preeclampsia, high blood pressure is the basic pathology that appears during gestation. It may start to manifest at gestational age of 20 weeks where it is considered as early onset and the way it advances is different among patients [5-56].

Abnormal placentation has been suggested as an extrinsic cause leading to early onset of preeclampsia. It has also suggested that late onset preeclampsia (≥34 weeks' gestation) may be triggered by a distinct, intrinsic pathology involving microvillus overcrowding. This is thought to occur as placental growth reaches its limits at term, with diminishing villous pore size impeding perfusion and increasing oxidative stress. This theory extends to suggest that oxidative stress proteins modulate the maternal response to developing preeclampsia through regulation of various growth factors [57].

Preeclampsia is an assorted condition leading to multiple organ involvement. However, the signs and symptoms and how they present is highly variable and the sequel tends to be less alarming when the mild form of preeclampsia manifests after 9th month of pregnancy. The severity of the maternal and perinatal consequence greatly increases when the condition develops so early during the course of the pregnancy. This is worsened primarily if the mother already has an underlying problem such as chronic hypertension or diabetes in pregnancy [58].

METHODOLOGY

Study Design

The design of this study will utilize both qualitative and quantitative descriptive approaches.

Study Area

This study will be conducted at the Antenatal clinic of Fort portal Regional Referral Hospital.

Target Population

The study will target pregnant women attending antenatal clinic at FRRH

Study Population

The study population will consist of all pregnant mothers diagnosed with pre-eclampsia at Antenatal clinic in FRRH, Department of Obstetrics and Gynecology between January 2022 and October 2022

Sample Size Determination

Using Kish Leslie (1965) formula

$$n = \frac{z^2(p)(1-P)}{e^2}$$

Where;

z= standard normal deviation set at 95% confidence interval (1.96)

n = Estimated minimum sample size required

p= Proportion of a characteristic in a sample (96.0%)

e=margin of error set at 5%

Therefore,

$$n = \frac{(1.96)^2 0.96(1-0.96)}{(0.05)^2} = 60.24$$

$$\approx 60\ participants$$

Sampling Procedures

The sampling procedures for this study was purposive sampling and simple random sampling. The researcher will utilize purposive sampling to select newly diagnosed preeclampsia mothers based on their blood pressure and urinalysis results on examination. Those receiving routine specialized ANC for their high-risk pregnancy due to their already known preeclampsia status will be subjected to simple random sampling.

Inclusion Criteria

The study included mothers who had been diagnosed with pre-eclampsia and at least 20 weeks pregnant and had consented to participate in the study. Inclusive of mothers with a diastolic BP of 90-109 mmHg and/ or systolic BP of 140-159 mmHg with ≥1+ proteinuria. And also, mothers with acute severe hypertension (160/110 mmHg) and ≥1+ proteinuria OR any degree of hypertension.

Exclusion Criteria

Non-pregnant mothers

Mothers who were less than twenty weeks pregnant but had no signs and symptoms of pre-eclampsia.

Mothers who met the inclusion criteria but had not consented to participate in the study.

Data Analysis

Data collected was analyzed using SPSS (v20) where they were responses coded

and data entered into the SPSS (Statistical Program for Social Scientists). Cross tabulation was the main method used for data analysis. After analysis, data was summarized and presented in form of frequency tables, percentages, and proportions. Multivariable analyses were conducted to assess the association between the prevalence of pre-eclampsia and the socio-demographic, maternal, obstetric factors.

Ethical Consideration

The following were the ethical considerations during the study:

a) The study was conducted in accordance with the rules and regulations of the institutional research ethics committee (IREC) at Kampala International University.
b) Approval and permission for the study was sought from the FRRH administration through the university research committee.
c) Care was taken to ensure that all those who agree to participate in the study and do so voluntarily, and give their written informed consent.
d) To obtain informed consent, the researcher explained the aims and objectives of the study to all those that participated and they were given an opportunity to ask questions for any clarification
e) The collected information was kept confidential and no names appeared on research documents.
f) A participant was free to opt out of the study at any stage.
g) No benefits in form of money, gifts or any materials were given to research participants to be involved in the study.
h) The participants' privacy was highly preserved.
i) The researcher did not alter any prescription, advice or information given to the patient by staff at hospital.

RESULTS

A total of 60 pregnant mothers with preeclampsia who had attended ANC at FRRH were sampled, most of them 30 (50%) were between age group 18 to 26 years, most 30(50%) attained primary level of education as highest level of education, most 49(81.7%) of them were of middle-income class.

TABLE 1: AGE OF THE RESPONDENTS

		Frequency	Percent	Cumulative Percent
Valid	Below 17 years	1	1.7	1.7
	18-26 Years	30	50.0	51.7
	27-34 Years	22	36.7	88.3
	Above 35 years	7	11.7	100.0
	Total	60	100.0	

Half of the mothers were between 18-26 years (50%) followed by those between 27-34 years. 88.3% of the mothers were below 35 years.

TABLE 2: HIGHEST LEVEL OF EDUCATION

		Frequency	Percent	Cumulative Percent
Valid	None	16	26.7	26.7
	Primary	30	50.0	76.7
	Secondary	11	18.3	95.0
	Tertiary	3	5.0	100.0
	Total	60	100.0	

Majority of the mothers (76.7%) were of either none or primary education level compared to 23.3% of mothers who had attained secondary level and above.

TABLE 3: ECONOMIC STATUS OF THE RESPONDENTS

		Frequency	Percent	Cumulative Percent
Valid	Poor	4	6.7	6.7
	Middle Income (Low, Middle, High)	49	81.7	88.3
	Rich/Very Rich	7	11.7	100.0
	Total	60	100.0	

Majority of mothers (81.7%) were in middle income status compared to the other extremes i.e., poor and very rich.

Table 3: Pearson Chi-square results for Sociodemographic factors influencing prevalence of pre-eclampsia among pregnant women attending ANC

	Pre-eclamptic				
	Yes	No			
Sociodemographic factors	**N (%)**	**N (%)**	**χ^2**	**df**	**P-Value**
Age in years					
≤ 26	8(25.0)	23(75.0)	0.017	1	**0.041***
27 and above	8**(26.0**)	21(74.0)			
Education level					
At most Primary	18(35.5)	34(64.5)	33.767	1	**0.000****
Post Primary	1(8.1)	13(91.9)			
Economic status					
Poor and middle income	8(16.0)	45(84.0)	5.963	1	**0.015****
Rich/very rich	2(29.2)	5(70.8)			

***significant at 5%*

Results presented in table 3 above, shows that being pre-eclamptic is highest among pregnant women aged 27 years old and above (26.0%) and lowest in those 26 years old and below (25.0%). This difference in the proportion of pregnant women that were pre-eclamptic was statistically significant (χ^2 =0.017, df =1, p=0.041 < 0.05). Therefore, maternal age is a significant predictor of pre-eclampsia in pregnant mothers. Results presented in table 3 above shows that being pre-eclamptic is highest among pregnant mothers who had attended up to at most Primary level (35.5%) and lowest among pregnant mothers who had attended up to Post Primary level (8.1%). This difference in the proportion of pregnant mothers

that were pre-eclamptic was statistically significant (χ^2 =33.767, df=1, p=0.000 < 0.05). Therefore, Education level is a significant predictor of pre-eclampsia in pregnant mothers. Finally results in table above show that being pre-eclamptic is highest among pregnant mothers who are poor/middle income status (29.2%) and lowest among pregnant mothers who were rich/ very rich (16. 0%). This disparity in the proportion of pregnant mothers that were pre-eclamptic was statistically significant (χ^2 = 5.963 df = 1, p= 0.015 < 0.05). Therefore, economic status is a significant predictor of pre-eclampsia in pregnant mothers.

Table 4: BMI of mothers

Maternal factors		Frequency	Percent	Cumulative Percent
Valid	Normal weight	23	38.3	38.3
	Overweight	17	28.3	66.7
	Obesity Class I	13	21.7	88.3
	Obesity Class II	5	8.3	96.7
	Obesity Cass III	2	3.3	100.0
	Total	60	100.0	

Majority of the mothers 37(61.7%) were overweight or obese compared to those of normal weight.

Table 5: Previous diagnosis of hypertension

		Frequency	Percent	Cumulative Percent
Valid	Yes	34	56.7	56.7
	No	26	43.3	100.0
	Total	60	100.0	

More mothers (56.7%) had a history of hypertension prior to current pregnancy compared to those who didn't have hypertension. Most mothers (76.7%) did not have diabetes prior to current pregnancy.

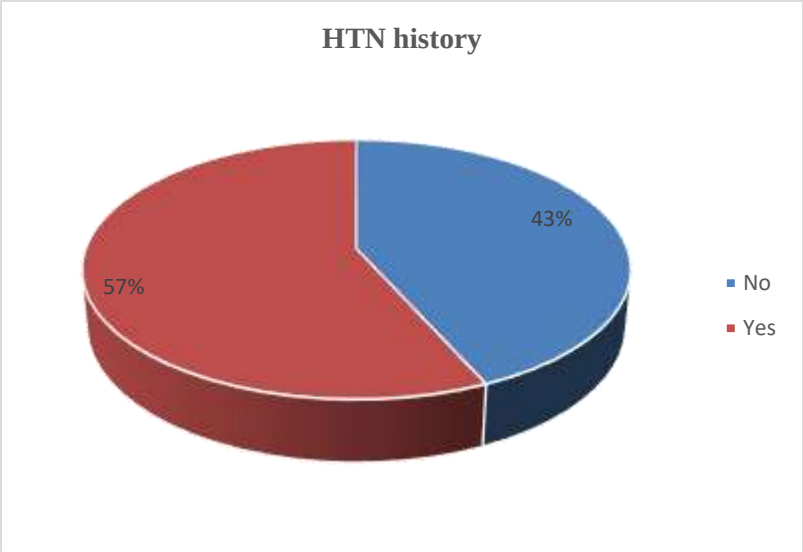

FIGURE 1: HYPERTENSION HISTORY

A slightly higher number of mothers (51.7%) had urinary tract conditions; a number not far from those who didn't have.

Obstetric factors

TABLE 6: PREVIOUS DIAGNOSIS OF DIABETES

		Frequency	Percent	Cumulative Percent
Valid	Yes	14	23.3	23.3
	No	46	76.7	100.0
	Total	60	100.0	

TABLE 7: ANTEPARTUM ILLNESSES

		Frequency	Percent	Cumulative Percent
Valid	Presence of a Strange Vaginal Discharge	8	13.3	13.3
	Vaginal discharge & dysuria	2	3.3	16.7
	Vaginal discharge, dysuria and foul-smelling urine	4	6.7	23.3
	Vaginal discharge and foul-smelling urine	3	5.0	28.3
	Pain on Urination	6	10.0	38.3

	Dysuria & foul-smelling urine	5	8.3	46.7
	Passage of Foul-Smelling Urine	3	5.0	51.7
	None	29	48.3	100.0
	Total	60	100.0	

TABLE 8: INTERPREGNANCY INTERVAL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Don't know	12	20.0	20.0	20.0
	Less than a year	1	1.7	1.7	21.7
	1-2 Years	22	36.7	36.7	58.3
	3-5 Years	14	23.3	23.3	81.7
	5-10 Years	7	11.7	11.7	93.3
	More than 10 years	2	3.3	3.3	96.7
	PG	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

More mothers (36.7%) had a shorter Inter-pregnancy interval of 1-2 years

TABLE 9: PARITY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	25.0	25.0	25.0
	2-4	29	48.3	48.3	73.3
	5-8	15	25.0	25.0	98.3
	More than 10	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

A parity of 2-4 was the commonest among mothers in this study group.

TABLE 10:PREVIOUS GESTATIONAL HYPERTENSION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	8.3	8.3	8.3
	Yes	33	55.0	55.0	63.3
	No	22	36.7	36.7	100.0
	Total	**60**	**100.0**	**100.0**	

More mothers responded showing to have been diagnosed with hypertension on previous pregnancies.

Factors which were associated with pre-eclampsia at binary regression analysis were further analyzed using a multiple logistic regression analysis and results are summarized in table below. Variables which were found significant were; parity, interpregnancy interval, previous diagnosis of gestational diabetes mellitus of hypertension and BMI. Pregnant mothers of parity ≤ 4 were 6.6 times more likely to develop pre-eclampsia as compared to pregnant mothers with parity ≥ 5 (AOR=6.6; 95%CI=2.160, 20.169; p=0.001). Pregnant mothers whose BMI were within normal were less likely to have pre-eclampsia compared to those who were overweight (AOR=0.03; 95%CI=0.005,0.134; p<0.001). Pregnant mothers with previous diagnosis of gestational diabetes mellitus were 7 times more likely to develop pre-eclampsia as

compared to their counterparts. (AOR=7.0 95%CI=2.333, 21.004; p=0.001). Pregnant mothers with interpregnancy interval less than or equaling to a period of 2 years were 7 times more likely to get pre-eclampsia than pregnant mothers with interpregnancy interval more than or equaling to a period of 3 years (AOR=7.0;95%CI =2.333, 21.004; p=0.001).Pregnant mothers who had a previous diagnosis of gestational hypertension were 7.9 times at more risk of developing pre-eclampsia as compared to pregnant mothers with no previous diagnosis of gestational hypertension(AOR=7.9;95%CI=2.580, 24.122; p<0.001).

Table 5: Multivariate logistic regressions analysis of maternal factors associated with pre-eclampsia

Variables	Pre-eclampsia		AOR (95%CI)	P value
	No	**Yes**		
Parity				
≤ 4	15	9	6.6 (2.160; 20.169)	**0.001**
≥ 5	33	3	1	
BMI				
Normal	47	6	0.03 (0.005; 0.134)	**<0.001**
Overweight or obese	1	6	1	
Previous diagnosis of gestational hypertension mellitus				
Yes	6	6	7.0 (2.333; 21.004)	**0.001**
No	42	6	1	
Interpregnancy interval				
≤ 2 years	6	6	7.0 (2.333; 21.004)	**0.001**
≥ 3 years	42	6	1	
Previous diagnosis of gestational hypertension				
Yes	6	7	7.9 (2.580; 24.122)	**<0.001**
No	42	5	1	
Antepartum illness				
Yes	47	10	0.1 (0.007; 0.682)	0.022
No	1	2	1	

DISCUSSION

The findings show that pre-eclampsia has significant association with younger age (88.3%, p < 0.001) years.

76.6% of mothers had no or had attained primary level education. Whereas fewer mothers (13.4%) with higher education had preeclampsia with significant association between lower levels of education and preeclampsia (p <0.001).

These results are in agreement with a study done in 2007 by Magnussen et al in Norway who found that higher education levels were associated with low prevalence of Preeclampsia whereas lower education level or no education level was linked with higher preeclampsia prevalence.

Furthermore, the results are in agreement with a Dutch case control study done by Silva et al in 2008 and another case-control study done by Kiondo et al in [59] at Mulago National Referral Hospital in Kampala who found that higher educational were associated with fewer cases of preeclampsia unlike their uneducated counterparts.

The suggested rationale for lower education levels to high preeclampsia prevalence is limited knowledge base hence delay to recognize the danger signs and symptoms, and further delay to seek treatment. Most mothers first get to know about preeclampsia on antenatal visits.

Poor or middle-income level was a significant predictor of preeclampsia (p <0.001) as Majority of the mothers (81.7%) were poor or of low-income status compared to the minority high income earners.

Results are in agreement with a North Korean study done by Lee et al in [60] who stated that low social economic status was associated with poor obstetric outcomes including Preeclampsia.

Silva et al in 2008 also found a strong relationship between Preeclampsia and low social economic status.

Overweight mothers were especially at more risk of having preeclampsia (p < 0.01) as compared their counterparts with normal weight. Study findings showed that more mothers (61.7%) were either overweight or obese asserting a close association of pre-eclampsia with obesity.

In another population based prospective Norwegian study done by Mansussen et al [61], it found the risk of preeclampsia in mothers with familial history of hypertension to triple compared to that in which such history was absent.

Another case-control study done in Bangkok at Chulalongkon Memorial Hospital; it was found that there was an increased risk of developing preeclampsia among mothers who had first degree relatives with familial history of Hypertension.

In 2014, Valdes et al found that both Type one and Type two diabetes contributed to developing preeclampsia in mothers who had. They found it to be more prevalent especially in those with Type One Diabetes.

A population-based study in Washington Dc by Lisonkov and Joseph in 2013 found an OR of 1.87 for early onset of preeclampsia if mothers had pregestational diabetes and an increased OR of 2.46 for late onset of preeclampsia. This further emphasizes a strong association of preeclampsia with pregestational diabetes.

CONCLUSION

The results of this study indicate that pre-eclampsia in Fortportal regional referral hospital is multifaceted and requires multi-sectoral, multidisciplinary and multi-level action to alleviate it. This study has discovered that there are basic, underlying and immediate causes that act at various levels of society and which contribute to the occurrence of pre-eclampsia among pregnant women attending Fortportal regional referral hospital. Among the factors that were investigated, socio-economic factors (namely maternal age, educational level, and socioeconomic status) and obstetric factors (namely interpregnancy interval, previous diagnosis of gestational diabetes mellitus or hypertension, parity and BMI)

were found to be significantly associated with pre-eclampsia. There is a need for urgent interventions to prevent and mitigate pre-eclampsia in the district by addressing all the identified risk factors.

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