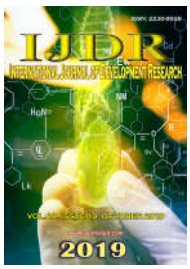
ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 09, Issue, 10, pp. 30341-30344, October, 2019



RESEARCH ARTICLE OPEN ACCESS

RISK FACTORS FOR HYPERTENSION AMONG PREGNANT WOMEN AGED 15-49 YEARS SEEKING ANTENATAL CARE SERVICESAT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, WESTERN KENYA

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ARTICLE INFO

Article History:
Received 25th July, 2019
Received in revised form
10th August, 2019
Accepted 03rd September, 2019
Published online 16th October, 2019

Key Words:

Hypertension, risk factors,
Programmatic interventions,
ANC Services.

ABSTRACT

Understanding the host and behavioral risk factors is important for the prevention and control of hypertension among pregnant women in a particular setting. However, in sub-Saharan Africa very few studies have been carried out on these risk factors to inform the interventions. Consequently, there are limited evidence-based interventions. A case and control study design was carried out on women aged 15-49 years seeking ANC at Jaramogi Oginga Odinga Teaching and Referral hospital. There were 48 cases and 100 controls in the study and body weight, height and blood pressure were measured using standard procedures. Other information was obtained by interviewing the study participants. The associations between the independent and dependable outcome was determined by Chi-square test, bivariate and multivariate regression analyses. The findings of the study show that the host factors such BMI, gestation period, maternal age and family at risks had the significant associations with hypertension ($p < 0.05$). On the behavioral factors, only high cholesterol was associated with hypertension ($p < 0.05$). Age and level of education had effect on the observed associations except for gestation period. This study found BMI, high cholesterol level, age at first birth and family history as risks to hypertension. There is a need to focus on these risk factors for an intervention in this setting. Furthermore, there should be more rigorous study using a biologic marker to detect more associations.

Citation: Omollo, R.O., Ayodo, G., Amimo, F. and Onguru, D. 2019. "Risk factors for hypertension among pregnant women aged 15-49 years seeking antenatal care servicesat jaramogi oginga odinga teaching and referral hospital, Western Kenya", *International Journal of Development Research*, 09, (10), 30341-30344.

INTRODUCTION

The most common pregnancy-associated disorder is hypertension and it complicates 5-10% of pregnancies globally (Dolea, 2000). Hypertensionis associated with the pregnancy outcomes such as induced abortions and premature deliveries that results into both neonatal and maternal mortalities in developing countries (Mosca *et al.,* 2011). In Kenya, the prevalence is estimated as 6.4% (KDHS, 2015) and this appears as an underestimation of the real prevalence due to inaccuracy of the available data. In order to prevent and control hypertension, several epidemiological studies have identified risk factors, which are collectively classified as host and behavioralrisk factors (Sun *et al.,* 2010). The host factors include: -age, parity, birth interval, BMI, family at risk, gestation period etc.

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whereas the behavioral factors are: - smoking, physical inactivity, obesity, stress, excessive alcohol intake, high salt intake, diet high in saturated fatsetc (Sun *et al.,* 2010). Understanding these host and behavioral risk factors is important for the prevention and control of hypertension in, a particular health setting. Indeed, a number of epidemiological studies have demonstrated that the risks from hypertension can be partly reversed by effective interventions that include: weight loss, reduced sodium intake, moderate alcohol consumption, adequate potassium supplementation, increased physical activity and consume a diet rich in fruits, vegetables, and low-fat dairy products and reduced in saturated and total fat (Kjeldsen *et al.,* 2002). It therefore important to know risk factors in a particular setting so at deploy relevant interventions. This study therefore attempted to identify these risk factors in urban setting in western Kenya.

MATERIALS AND METHODS

Study site: The study site was at Jaramogi Oginga Odinga Teaching and Referral hospital in Kisumu County, western

Kenya. It has an average annual out-patient visits of 197, 200 patients and in-patient admission of about 21, 000 patients. The hospital serves predominantly Luo ethnic community, largely of a low social-economic status and are subsistence-farmers or small-scale fishermen with limited access to health facilities (Wycliffe, 2009).

Study design: This was a case–control study with 48 clinical hypertension cases and 100 matched controls. Clinical hypertension cases were recruited at the hospital during their ANC visits. A hypertension case was defined as patient with systolic blood pressure (SBP) ≥140 mmHg and diastolic blood pressure (DBP) ≥90 mmHg. The control, however were patients with systolic blood pressure (SBP) ≤140.1 mmHg and diastolic blood pressure (DBP) ≤ 90.1 mmHg

Data collection: Recruitment was done in consultation with the health officer in-charge of the patients at the maternity section. The eligible individuals were invited to participate in face-to-face interviews by trained interviewers after written consent was obtained. Data sources included patient's medical files. A checklist was used to retrieve data from the patient's files and quantitative data was collected using structured questionnaire. Patient's medical files were reviewed with the help of research assistants and the inclusion criteria were pregnant women of reproductive aged (15-49) years seeking ANC at JOOTRH. And exclusion were pregnant women who were attending ANC at JOOTRH and are not within the reproductive aged (15-49) years. Also, pregnant women who were consenting to the study or too sick to participate in the study.

Data analyses: The data collected was then transferred into STATA version 12 for analyses. Bivariate analyses (Pearson $\chi 2$ test) was used to determine the associations between risk factors (host and behavioral) and hypertension.

Table 1. Socio-Demographic characteristics

Variables	Group	Hypertension		P-Value
		Cases (n=48) N (%)	Controls (n=100) N (%)	
Education	None	1(0.7)	1(0.7)	Ref
	Primary	12(8.1)	33(22.3)	0.342
	Secondary	18(12.2)	47(31.8)	0.041
	College/University	17(11.5)	19(12.8)	0.034
Marital Status	Widowed	0(0.0)	3(2.0)	Ref
	Separated	3(2.0)	4(2.7)	0.198
	Single	11(7.4)	33(22.3)	0.724
	Married	34(23.0)	60(40.5)	0.193
Occupation	Casual Job	6(4.1)	21(14.2)	Ref
	Salaried Job	12(8.1)	16(10.8)	0.529
	Self-Employed	14(9.5)	24(16.2)	0.209
	Unemployed	16(10.8)	39(26.4)	0.425
Religion	Other	1(0.7)	2(1.4)	Ref
	Catholic	24(16.2)	39(26.4)	0.869
	Muslim	9(6.1)	18(12.2)	1.000
	Protestant	14(9.5)	41(27.7)	0.763
Age	15-19	3(2.0)	16(10.8)	Ref
	20-24	6(4.1)	15(10.1)	0.339
	25-29	9(6.1)	26(17.6)	0.406
	30-34	10(6.8)	22(14.9)	0.225
	35-39	16(10.8)	12(8.1)	0.005
	40-44	4(2.7)	7(4.7)	0.206
	45-49	0(0.0)	2(1.4)	0.553
Residence	Rural	13(9.0)	19(13.1)	Ref
	Urban	35(24.1)	78(53.8)	0.307

Legend: Ref= Reference Category

Table 1. Host factors associated with hypertension

Host Factors		Cases (n=48)	Controls (n=100)	OR (95% CI)	p-value
		N (%)	N (%)		
BMI					
	Normal	15(11)	7(5)	Ref	Ref
	Overweight	10(7)	64(46)	40.035(7.10-225.54)	0.001
	Obese	18(13)	26(18)	14.828 (2.73-80.51)	0.002
Gestation Period					
	>28wks	2014)	58(39)	Ref	Ref
	<28wks	28(19)	42(28)	4.093 (1.14-14.59)	0.03
Family risk history					
	No	41(28)	72(48)	Ref	Ref
	Yes	7(5)	28(19)	11.661 (3.40-39.98)	0.001
Parity					
	Multigravida	34(23)	68(47)	Ref	Ref
	Primigravida	12(8)	32(22)	0.735 (0.08-6.52)	0.782
Age at first Birth					
	>24	4(3)	2(2)	Ref	Ref
	<24	35(32)	69(63)	6.606 (0.95-45.92)	0.05

Legend: Ref=Reference Category, BMI= Body Mass Index

Further multivariate regression analyses were carried on the risk factors associated with hypertension by adjusting for age and level of education. The P value < 0.05 was considered statistically significant.

Ethical approval: The study protocol was approved by the Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) Ethics and Research committee in Kisumu county, Kenya. Written consent was obtained from all eligible study participants.

RESULTS

There were 48 cases and 100 controls in this study as shown in Table 1. On comparing the variables on the cases and controls, age (P value < 0.005) and education level (P value 0.034) had statistically significant differences.

Table 2. Behavioral factors associated with hypertension

Behavioral Factors	Case (n=48)	Control (n=100)	O R (95% CI)	p-value
	N (%)	N (%)		
High Cholesterol				
No	10(7)	70(47)	Ref	Ref
Yes	38(26)	30(20)	11.998 (4.43-32,43)	0.001
Alcohol Consumption				
No	32(22)	77(53)	Ref	Ref
Yes	16(11)	21(14)	2.014 (0.65-6.20)	0.222
Smoking				
No	43(29)	91(63)	Ref	Ref
Yes	5(3)	8(5)	1.661 (0.27-10.08)	0.581
Physical Activity				
No	26(18)	59(40)	Ref	Ref
Yes	22(15)	40(27)	1.079 (0.44-2.62)	0.866
Salt Intake				
Without Salt	1(0.5)	1(0.5)	Ref	Ref
Moderate salt	29(20)	94(64)	4.352 (0.14-133.13)	0.339
Very salty	18(12)	5(3)	0.315 (0.01-11.17)	0.526

Legend: Ref=Reference Category

Table 4. The associationsof BMI, high cholesterol level, family at risk, gestation period, age at birth with hypertension (adjusting for age and level of education)

Predictors	Group	COR (95% CI)	*p-value*	AOR (95% CI)	*p-value*
BMI	Normal	Ref	Ref	Ref	Ref
	Overweight	1.585 (0.26-0.65)	0.001	1.518(0.19-0.64)	0.001
	Obese	1.458 (0.17-0.58)	0.001	1.438(0.13-0.59)	0.002
High Cholesterol	No	Ref	Ref	Ref	Ref
	Yes	1.406 (0.19-0.48)	0.001	1.335(0.13-0.44)	0.001
Age at first Birth	>24	Ref	Ref	Ref	Ref
	<24	1.375 (0.02-0.60)	0.032	1.317(-0.04-0.59)	0.025
Gestation Period	>28wks	Ref	Ref	Ref	Ref
	<28wks	1.105 (-0.03-0.23)	0.157	1.094(-0.06-0.24)	0.154
Family risk history	No	Ref	Ref	Ref	Ref
	Yes	1.415 (0.18-0,50)	0.001	1.387(0.15-0.49)	0.001

Legend: Ref=Reference Category

Table 2 shows that the risk of hypertension increased with BMI (p<0.05), in particular, overweight individuals (BMI ≥ 27.0 kg/m2) have odds of 40.04 times to have hypertension than individuals with a normal BMI. Others factors such as gestation period, family at risk and age at first birth were also associated with hypertension (P value < 0.05). Table 3 illustrates that the risk of hypertension among those who have high cholesterol level is twelve times more than those without high cholesterol level. Alcohol consumption, smoking, physical activities and salt intake were associated with hypertension. Table 4 shows that despite that adjustment of age and level of education on the model, BMI (P value < 0.001) high cholesterol (P value < 0.001), age of birth (P value < 0.025) and family risk (P value < 001) remained statistically significant.

DISCUSSION

The study shows that potential risks of hypertension among pregnant women are overweight or obese, gestation period, family risk history, age at first birth and high cholesterol level. In this study a significant association between overweight and hypertension was observed (p<0.05). In addition, this study also found out that overweight women were likely to be at risk of developing hypertension while those who were obese were several times likely to be hypertensive in the bivariate analysis. In a case control study conducted in Ethiopia, it was found that women with maternal body mass index >30 kg/m^2 to be 9.9 times more were likely developed pregnancy induced hypertension as compared to their counter parts (Ayele *et al.,* 2016). However, the inaccuracy of the interview-based data on BMI might have led to inaccurate measurements resulting to high odds ratios.

In a Bezerra *et al.,* (2010) maternal women with a family history of hypertension were eleven times likely to have hypertension. It also suggests that family history of hypertension has been recognized as among the strongest predictors for developing hypertension (Bezerra *et al.,* 2010). Similarly, in this study women with family history of hypertension were eleven times likely to be hypertensive during pregnancy in bivariate analysis. Likewise, in a multivariate analysis the associate between family history as predictor of hypertension was confirmed were 1.4. Other studies have also confirmed that pregnant mothers who have pervious history of pregnancy induced hypertension AOR 2.8 more likely develop PIH as compared their counter parts (Ayele *et al.,* 2016). These finding underscores the importance of screening family members for hypertension when an index case is found. In addition, identification of women at risk for hypertension allows early intervention through diet and lifestyle changes. Thus, future incidence of hypertension may be reduced as well. In a bivariate analysis, the study has found out that high cholesterol level is potential risk factor and is

associated with increased risk of being hypertension during pregnancy OR11.9. Similarly, in a multivariate analysis, the significant relationship was also confirmed AOR 1.3 after adjusting for age and educational level. The results are consistent to the findings by Org *et al.,* (2007) that showed that elevated levels of plasma lipids particularly cholesterol and triglycerides have been found to be closely related to the development of hypertension. In addition, measurement of blood cholesterol level was not performed with biological marks so there might be inaccuracy associating high cholesterol level as risk factor hypertension. The association between age at first birth with hypertension during pregnancy was found to be associated with hypertension OR 6.6. However, in a multivariate analysis the effect of association reduces AOR 1.3. This was consistent with previous study which associated early teenage status (13-16 years) with an increased risk for hypertensive disorders in pregnancy OR: 2.6 (Tebeu *et al.,* 2011).

In our study, women with gestation period of above twenty-four weeks had higher odds of having hypertension OR 4.1as compared to gestation period of below twenty-four weeks in the bivariate analysis, which was later proven to be insignificant AOR 1.1 in the multivariate analysis. This could be attributed to a larger proportion of controls in the sample (67%) which may not have had significant effect to cause of hypertension. After adjustment was made, it appears that effect of gestation period on hypertension is not significant. The association between smoking and hypertension were expected to be positive in this study; however, a statistical significance was not found AOR1.6. The result was consistent to the findings by Loh *et al.,* (2013) where they found out that smokers had lower odds of having hypertension OR 0.7 as compared to non-smokers in the univariate analysis.

This was later proven to be insignificant OR 0.8 in the multivariate analysis. The Finding could be attributed to a small proportion of smokers in the study (8%) which may not have had significant effect to cause of hypertension. Salt intake and hypertension were also not found to be statistically significant. Although, previous study by Mishra and Kumar (2011) found the odds ratio for hypertension to be significantly high for salt consumption > 5g/day OR 7.6. Existing evidence also suggests that a high dietary intake of salt may contribute to the rise in blood pressure and can promote the development of hypertension, or aggravate hypertension already present (Onuzulike, 2006). High alcohol consumption was not associated with an increased risk of hypertension in this study. However, previous studies suggested that risk of hypertension has been increasing among heavy alcohol drinkers (Onuzulike, 2006). The different may be attributed to a small proportion of women who take alcohol in the study (25%) which may not have had significant effect to cause hypertension.

Risk factors for hypertensive diseases in pregnancy at JOOTHR, Western Kenya included BMI, high cholesterol level, age at first birth and family history of hypertension. Knowledge of risk factors of hypertension and age of women during pregnancy may give tracks for prevention of hypertension cases among expectant mothers. Some more extended studies using biological marks are necessary to confirm our findings.

The confirmation of these findings should help towards the development of the national strategies of hypertension in pregnancy prevention. Prevention should include campaigns and education from the medical and paramedical staff.

Acknowledgments

I would like to thank my supervisors especially Dr George Ayodo, Prof Fred Amimo and Dr Daniel Onguru for reviewing this paper. I would also like to extend a warm thank to the JOOTRH Ethic Review Committee, and Medical Officers of Health at JOOTRH. Finally, grateful to 148 study participants.

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