

Prevalence of hypertensive disorders in pregnant Nigerians and their related factors

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Abstract

Background: Pregnancies complicated with hypertensive disorders are regarded as high risk and contribute to increased maternal and perinatal morbidity and mortality.

Objective: To determine the prevalence of hypertensive disorders in pregnancy (HDP) and their related factors in defined areas of South West Nigeria.

Methods: The study is a prospective cohort study conducted in Antenatal Clinics of the departments of Obstetrics and Gynaecology of Ekiti State University Teaching Hospital, Ado-Ekiti, Federal Medical Centre, Ido-Ekiti, University College Hospital Ibadan and Adeoyo Maternity Hospital, Ibadan, Nigeria from June 2011 to October 2012. The data regarding demographic details, gestational age, obstetrics history, diagnosis, and blood pressure readings were obtained from each participant through a semi pretest questionnaire. Data entry and analysis was done using SPSS version 22 statistical package.

Result: A total of 521 pregnant women enrolled for the study and 34 (7.2%) were hypertensive among whom 55.9% were diagnosed as preeclampsia-eclampsia (19), 35.3% as gestational hypertension (12), 5.9% as chronic hypertension (1) and 2.9% as preeclampsia superimposed on chronic hypertension. HDP was more prevalent among women aged ≥ 31 years (64.7%), who had previous history of HDP (23.5%), the third trimester (70.6%) of pregnancy and in nulliparous women (67.6%).

Conclusion: Hypertensive disorders of pregnancy are among the most common medical complications worsening the outcome of pregnancy. Regular monitoring of the risk factors may help to mitigate the progression of the disorders.

Keywords: Preeclampsia, pregnancy, hypertensive, prevalence, disorders

Résumé

Contexte: Les grossesses compliquées avec troubles d'hypertension sont considérées comme haute-risque et contribuent à l'augmentation de la morbidité et de la mortalité maternelle et périnatale.

Objectif: Pour déterminer la prévalence des troubles hypertensifs pendant la grossesse (HDP) et leurs facteurs associés dans des zones définies du Sud-Ouest du Nigeria.

Méthodes: L'étude est une étude de cohorte prospective menée dans les cliniques prénatales des départements d'obstétrique et de gynécologie de l'Hôpital d'Enseignement Universitaire de l'État d'Ekiti, Ado-Ekiti, Centre Médical Fédéral, Ido-Ekiti, Collège Hospitalier Universitaire Ibadan et l'Hôpital de Maternité Adeoyo, Ibadan, Nigeria de Juin 2011 à Octobre 2012. Les données concernant les détails démographiques, l'âge gestationnel, l'histoire obstétrique, diagnostic, et des lectures de pression artérielle ont été obtenues de chaque participant par le biais d'un semi pré-test questionnaire. La saisie et l'analyse des données ont été effectuées à l'aide du logiciel statistique SPSS version 22.

Résultat: Au total, 521 femmes enceintes ont participé à l'étude et 34 (7,2%) étaient hypertendues, parmi lesquelles 55,9% avaient reçu un diagnostic de pré-éclampsie - éclampsie (19), 35,3% d'hypertension gestationnelle (12), 5,9% d'hypertension chronique (2) et 2,9% comme pré-éclampsie super imposée à l'hypertension chronique. HDP était plus fréquente chez les femmes âgées de ≥ 31 ans (64,7%), qui avaient des antécédents d'HDP (23,5%), le troisième trimestre (70,6%) de grossesse et chez les femmes nullipares (67,6%).

Conclusion : Les troubles hypertensifs de la grossesse sont parmi les complications médicales les plus fréquentes qui aggravent l'issue de la grossesse. Un suivi régulier des facteurs de risque peut aider à atténuer la progression des troubles.

Mots-clés: Pré-éclampsie, grossesse, hypertension, prévalence, troubles

Introduction

Pregnancy is a normal physiological event but in some circumstances pregnancy specific or other

medical conditions can cause maternal as well as foetal morbidities and even mortalities. Among pregnancy specific disorders, hypertensive disorders of pregnancy (HDP) are one of the major leading causes of maternal and foetal morbidity and mortality in different communities [1].

Hypertension in pregnancy can exist before pregnancy, be induced by the pregnancy, develop during delivery or all occurring and its clinical presentation is characterized by hypertension, proteinuria and edema [2, 3]. HDP can also trigger some severe forms of maternal complications, such as cardiovascular and cerebrovascular diseases, liver and kidney failure, placental abruption, disseminated intravascular coagulation (DIC) and HELLP syndrome. Under these circumstances, the placenta dysfunction may occur, leading to foetal growth restriction, foetal distress, preterm birth, intrauterine foetal demise, stillbirth and neonatal asphyxia [4, 5].

Hypertensive disorders during pregnancy are classified into 4 categories, as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy: 1) chronic hypertension, 2) preeclampsia-eclampsia, 3) preeclampsia superimposed on chronic hypertension, and 4) gestational hypertension [4].

Though HDP has been described as a maternal complication over the last several decades, its true aetiology and pathophysiology remain unknown; HDP-related complications are still threatening maternal and foetal life and health. The prognosis of HDP is associated with the severity of disease process and in general, the more severe the disease is, the poorer the prognosis [5, 6]. However, how pregnancy incites or aggravates hypertension remains unsolved despite decades of intensive research. Indeed, HDP remain among the most significant and intriguing unsolved medical problems complicating pregnancy [6, 7].

The incidence of hypertensive disorders of pregnancy varies widely ranging from 1-35% among different populations, probably due to variations in the definitions, classification and target population studied [3]. In a population-based study, Ye *et al.* [6] examined HDP in 112,386 pregnant women with prevalence of 5.22%. Another study conducted in Latur, Maharashtra, India on 1566 deliveries, the prevalence was found to be 6% [8]. Studies in Zambia and Pune also reported prevalence rates of 17.7% [9] and 7.8 % [4] respectively. The variations can be attributed to racial differences, ethnic background, socioeconomic status, age distribution and some other parameters like parity and gravidity [4, 6].

In Nigeria, it is estimated that 10% of pregnancies are complicated by HDP and it results in more admissions in the antenatal period than any other disorder [3, 10]. Salako *et al.* [11] reported a prevalence rate of hypertension at antenatal booking as 9.8% rising to 26.2% at delivery among pregnant patients at the University College Hospital, Ibadan, Nigeria while Singh *et al.* [3] reported a value as high as 17% prevalence rate of HDP in a teaching hospital in Northern part of Nigeria. Kooffreh *et al.* [12] also reported a prevalence rate of preeclampsia (1.2%), one of the types of HDP in University of Calabar Teaching Hospital, a South-South area in Nigeria. There is dearth of information on the prevalence of HDP in South West of Nigeria. This present study is therefore aimed at determining the prevalence of HDP and some related factors in South Western part of Nigeria.

Materials and methods

A total of 521 participants were enrolled into this prospective cohort study. The participants were pregnant women attending the clinics for antenatal care in four different tertiary health facilities, namely: Ekiti State University Teaching Hospital, Ado-Ekiti, Federal Medical Centre, Ido-Ekiti, University College Hospital and Adeoyo Maternity Hospital, Ibadan, Nigeria respectively. Participants were recruited from June 2011 to October 2012.

Inclusion criteria were women first seen at first or second trimester (< 20 weeks at booking) with systolic blood pressure below 140mm/Hg and diastolic blood pressure below 90mm/Hg and participants that gave consent. Exclusion criteria included pregnant women first seen at ≥ 20 weeks of pregnancy, women who were already hypertensive at entry into the study or had proteinuria by the dipstick measurement greater than 300mg/L (1+). The ethical approval for the study was obtained from the University of Ibadan/University College Hospital (UI/UCH) Joint Ethics Committee Ibadan, Oyo State, Nigeria.

Classification into the different subtypes of hypertensive disorders in pregnancy (by the National High blood pressure Education Program) was as follows:

1. Preeclampsia-eclampsia: elevated blood pressure of ≥ 140 mm/Hg systolic and ≥ 90 mm/Hg (hypertension) appearing ≥ 20 weeks of gestation, accompanied with proteinuria ≥ 300 mg/24hr (or urinary dipstick proteinuria of $\geq 1+$).
2. Gestational hypertension (Pregnancy Induced hypertension): elevated blood pressure of ≥ 140 mm/Hg systolic and ≥ 90 mm/Hg (hypertension) for the first time appearing

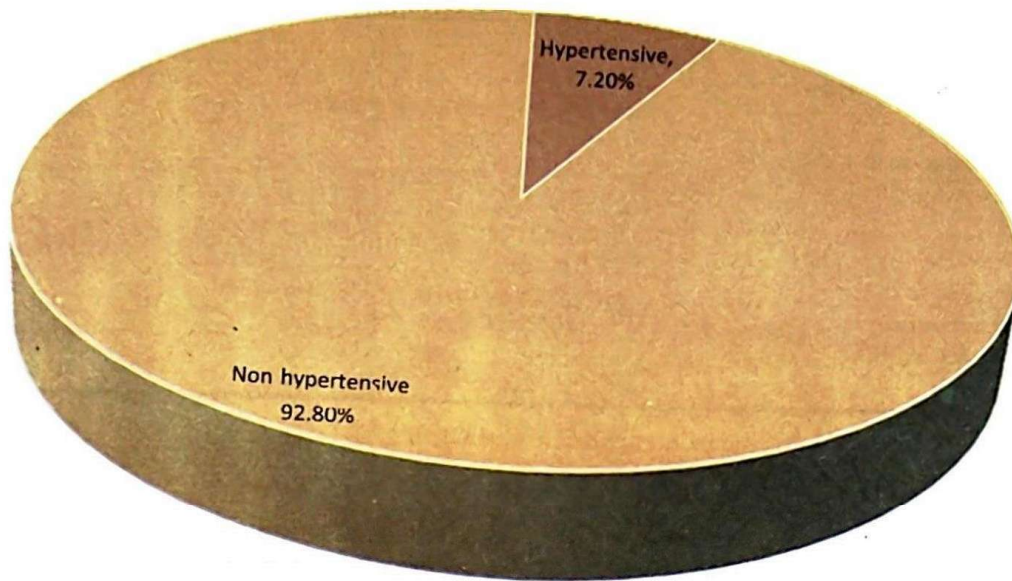


Fig.1: Prevalence of HDP in the study participants.

- ≥ 20 weeks of gestation, no proteinuria, blood pressure returns to normal postpartum.
3. Chronic hypertension: elevated blood pressure of ≥ 140 mm/Hg systolic and ≥ 90 mm/Hg (hypertension) appearing > 20 weeks of gestation without a known cause (or known to exist prior to pregnancy), hypertension persistent for more than 12 weeks after pregnancy.
 4. Preeclampsia superimposed on chronic hypertension: elevated blood pressure of ≥ 140 mm/Hg systolic and ≥ 90 mm/Hg (hypertension) appearing ≥ 20 weeks of gestation, accompanied with new onset of proteinuria or resistant hypertension

Age, educational status, parity, occupation, ethnic group, gestational age, maternal smoking, and previous history of hypertension were obtained from each participant through a semi pretest questionnaire. Urinalysis for protein and glucose was done at booking and at subsequent visits. The diastolic and systolic blood pressure readings were measured in a sitting position with sphygmomanometer after at least 10 minutes of rest at booking and at subsequent visits. All pregnant women were followed-up to delivery and information on the gestational age, mode of delivery and foetal outcome were recorded. Data collected were entered into a spread sheet and analysed using SPSS version 22 statistical package.

Analysis of variance (ANOVA) and Student's t-test were used for comparison of continuous variables while Chi-square test was used for association between categorical variables. Survival analysis (time to event analysis) was employed using Cox proportional hazard regression model as the technique to measure the survival and hazard function. $P < .05$ is considered significant.

Results

Of the 521 pregnant women that were recruited at booking during the antenatal period and longitudinally followed-up till delivery, 50 were lost for follow-up. Out of the remaining 471 whose outcomes of pregnancy were known, 34 developed HDP giving a prevalence of 7.2% while 437 (92.8%) were normotensive. (Fig. 1).

Table 1 shows the different subtypes of HDP made up of 55.9% preeclampsia-eclampsia, 35.3% gestational hypertension, 5.9% chronic hypertension and 2.9% preeclampsia superimposed on chronic hypertension respectively. The calculated percentages for preeclampsia-eclampsia, gestational hypertension, chronic hypertension and preeclampsia superimposed on chronic hypertension in the study population were 4.0, 2.6, 0.4 and 0.2 respectively.

Table 2 shows the maternal age distribution of HDP and normotensive pregnant women. In both groups majority of the pregnant women were aged

Table 1: Distribution based on type of HDP developed in the study participants.

Type	Number (n)	Percentage (% within study group)	Percentage (% within HDP group: n=34)
Preeclampsia-Eclampsia	19	4.0	55.9
Gestational hypertension	12	2.6	35.3
Chronic hypertension	2	0.4	5.9
Preeclampsia superimposed on chronic hypertension	1	0.2	2.9
Normal	437	92.8	
Total	471	100	100
Those who developed in the second trimester only	10	2.1	29.4
Those who developed in the third trimester only	24	5.1	70.6

HDP= Hypertensive disorders in pregnancy, n= number of participants

Table 2: Comparison of the maternal age of normotensive women and HDP patients.

Variable	HDP	Normotensive	X ²	t-value	p-value
Age group (years)	n=34	n=483			
17-22	2 (5.9%)	15 (3.1%)	17.158		0.002*
23-28	4 (11.8%)	145 (30.0%)			
29-34	18 (52.9%)	231 (47.8%)			
35-40	7 (20.6%)	87 (18.0%)			
41-46	3 (8.8%)	5 (1.0%)			
Mean maternal age (yrs)	32.4±5.0	30.5±4.4		-2.392	0.017*
Gestational age group (weeks)	n=34	n=437			
<27	0	37 (8.5%)	41.280		0.000*
27-36	18 (52.9%)	54 (12.4%)			
37-42	16 (47.1%)	340 (77.8%)			
>42	0	6 (1.4%)			
Mean value	35.5±3.5	36.5±6.5		0.826	0.409

HDP= Hypertensive disorders in pregnancy, n= number of participants, Values are in number of participants with percentage in each group in parenthesis, X² = Chi-Square, t= Student t-test, p = significant level, * =significant at p<0.05, Values are in mean ± standard deviation.

between 20-40 years with 8.8% of the HDP group aged above 40 years while only 1.0% of the normotensive group were older than 40 years. More of the hypertensive women were aged between 29 and 46 years while the normotensive women were aged between 17 and 34 years. The mean maternal age for hypertensive women was 32.4 ± 5.0 years while that of normotensive was 30.5 ± 4.4 years (p<0.02). There is a significant difference in the mean gestational age between the HDP and normotensive women (p<0.001).

As indicated in table 3, 23.5% of HDP group had previous history of hypertension, while the respective value for the normotensive group was 1.8%. In the HDP group only 11.8% had term

(47.1%) or preterm (52.9%) delivery by vaginal route, while the others had their babies by either EMCS (47.1%) or ELSCS (38.2%) respectively. On the other hand, as high as 59.7% of the normotensive group had term (78.3%), preterm (20.4%) or postterm (1.4%) delivery by vaginal route, while the others had their babies either by EMCS (24.9%) or ELSCS (10.8%) respectively (p<0.001). The incidence of HDP peaked in the nulliparous (67.6%) when compared with the normotensive women (60.4%) respectively.

In table 4, it was observed that none of the women developed HDP in the first trimester of pregnancy (<14weeks), only 10 (29.4%) had the disease in the second trimester (15-28weeks), more

Table 3: Obstetric characteristics of the participants.

Obstetric characteristics	HDP	Normotensive	Total	X ²	p-value
<i>Gestation</i>	n=34	n=437	n=471	19.242	0.000*
Term	16 (47.1%)	342 (78.3%)	358		
Preterm	18 (52.9%)	89 (20.4%)	107		
Postterm	0	6 (1.4%)	6		
<i>Mode of delivery</i>	n=34	n=437	n=471	37.600	0.000*
Vaginal	4 (11.8%)	261(59.7%)	265		
EMCS	16 (47.1%)	109 (24.9%)	125		
ELSCS	13 (38.2%)	47 (10.8%)	60		
Evacuation	1 (2.9%)	20 (4.6%)	21		
<i>Outcome of pregnancy</i>	n=34	n=437	n=471		
Live birth	30 (88.2%)	399 (91.3%)	429	4.276	0.233
Stillbirth	3 (8.8%)	15 (3.4%)	18		
Misabortion	1 (2.9%)	6 (1.4%)	7		
Miscarriage	0 (0.0%)	17 (3.9%)	17		
<i>Previous history of HTX</i>	n=34	n=487	n=521	46.666	0.000*
NO	26 (76.5%)	478 (98.2%)	504		
Yes	8 (23.5%)	9 (1.8%)	17		
<i>Parity</i>	n=34	n=487	n=521	2.497	0.476
Nulliparous	23 (67.6%)	294 (60.4%)	317		
Primiparous	4 (11.8%)	111 (22.8%)	115		
Multiparous (2-4)	7 (20.6%)	80 (16.4%)	84		
Grand multiparous (5-6)	0 (0%)	2 (0.4%)	2		

HDP= Hypertensive disorders in pregnancy, n= number of participants, HTX= hypertension, Values are in number of participants with percentage in each group in parenthesis, X² = Chi-Square, p = significant level, * =significant at p<0.05

than half of the women 24 (70.6%) had the disease in the third trimester of pregnancy.

Table 4: Gestation week of HDP women at the point of diagnosis of hypertension.

Gestational age (weeks)	Number (n=34)	Percentage (%)
17-28	10	29.4
29-36	18	52.9
37-39	6	17.6

HDP= Hypertensive disorders in pregnancy, n= number of participants

Table 5 shows adjusted Cox regression of maternal age, parity and previous history of hypertension in women with hypertensive disorders of pregnancy. After controlling or adjusting for maternal age, parity and previous history of hypertension, it was observed that pregnant women who are within the age of 23-28years were at lower risk of developing hypertension when compared with those within 17-22 years. The hazard was lower in pregnant women of age range 23-28 years compared to

17-22 years (HR= 0.10, 955CI = 0.01- 0.81). The data further showed that primiparous pregnant women had lower risk of developing hypertension when compared with nulliparous pregnant women. The hazard was less pronounced in primiparous women than nulliparous (HR = 0.16, 95% CI = 0.03 -0.82).

On the other hand, development of hypertension in pregnancy was 9.2 times higher in women who had previous history of hypertension. The hazard was more pronounced in pregnant women with previous history of hypertension (HR = 9.20, 95% CI = 3.78-22.44).

Table 6 shows un-adjusted Cox regression of maternal age, parity and previous history of hypertension in women with hypertensive disorders of pregnancy. After individual analysis, significant differences were observed in maternal age and previous history of hypertension (p= 0.02 and 0.000). An increase in maternal age of 1year will be associated with 1.1 fold increase in risk of development of hypertension in pregnancy (HR =1.10, 95% CI = 1.01-1.19). Previous history of hypertension was associated with greater risk of development of HDP and therefore shorter survival (HR =10.44, 95% CI= 4.72-23.08).

Table 5: Adjusted Cox Regression of Maternal age, Parity and Previous History of Hypertension in Women with Hypertensive Disorders of Pregnancy

Index	B	Exp (β)	95% CI Lower	For Exp (β) Upper	p- value
Maternal age					
17-22					
23-28	-2.262	0.104	0.013	0.814	0.031*
29-34	-2.322	0.098	0.006	1.526	0.097
35-40	-3.054	0.047	0.001	2.649	0.137
41-46	-2.314	0.099	0.001	14.305	0.362
Parity group					
Nulliparous					
Primiparous	-1.864	0.155	0.029	0.817	0.028*
Multiparous (2-4)	-2.413	0.090	0.004	2.248	0.142
Grand multiparous (5-6)	-15.425	0.000	0.000		0.971
Previous history of HTX	2.220	9.204	3.776	22.437	0.000*
Maternal age	0.170	1.185	0.933	1.505	0.165
Parity	0.640	1.896	0.595	6.045	0.279

95% CI = 95 percentage confidence interval

Table 6: Un-adjusted Cox regression of maternal age, parity and previous history of hypertension in women with hypertensive disorders of pregnancy

Index	B	Exp (β)	95% CI Lower	For Exp (β) Upper	p- value
Maternal age	0.091	1.096	1.014	1.185	0.022*
Parity	-0.012	.988	.695	1.405	0.947
Previous history of HTX	2.346	10.440	4.723	23.077	0.000*
<i>Maternal age</i>					
17-22					
23-28	-1.483	0.227	0.042	1.239	0.087
29-34	-0.629	0.533	0.124	2.298	0.399
35-40	-0.543	0.581	0.121	2.799	0.499
41-46	1.324	3.760	0.625	22.613	0.148
<i>Parity group</i>					
Nulliparous					
Primiparous	-0.827	0.437	0.151	1.265	0.127
Multiparous (2-4)	0.054	1.056	0.453	2.461	0.900
Grand multiparous (5-6)	-10.175	0.000	0.000		0.980

95% CI = 95 percentage confidence interval

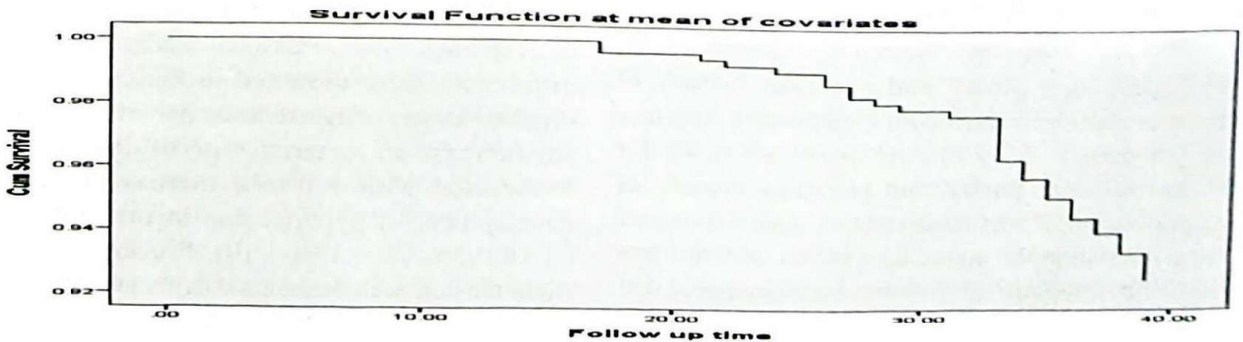


Fig. 2: Survival function for adjusted maternal age, parity and previous history of hypertension

Figures 2-4 show the survival function for the adjusted and un-adjusted maternal age, parity and previous history of hypertension in women with hypertensive disorders of pregnancy. In figures 2-4, the women survived up to around 15th week of gestation. The hazard began around the 17th week of gestation (second trimester) and continued till around 38th week (third trimester).

developed were 19 (55.9%) preeclampsia-eclampsia, 12 (35.3%) pregnancy induced/gestational hypertension, 2 (5.9%) chronic hypertension and 1 (2.9%) preeclampsia superimposed on chronic hypertension respectively. The prevalence among the study participants were preeclampsia-eclampsia 4.0%, gestational hypertension 2.6%, chronic hypertension 0.4% and preeclampsia superimposed

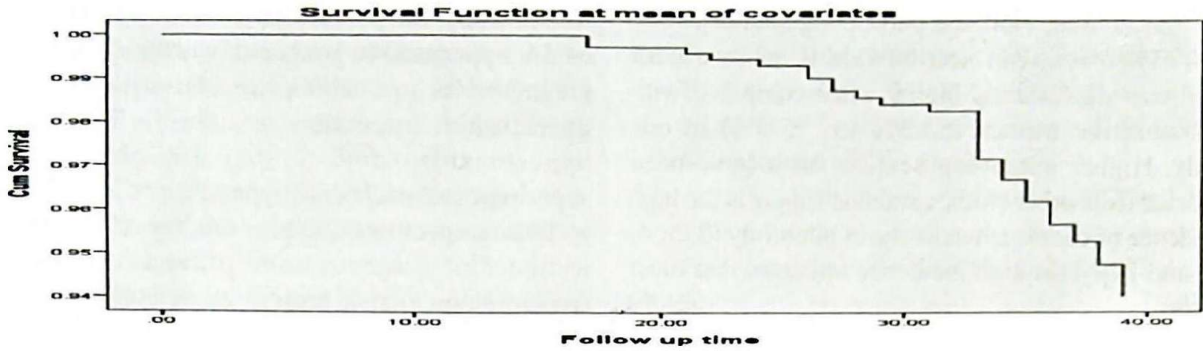


Fig.3: Survival function for un-adjusted maternal age

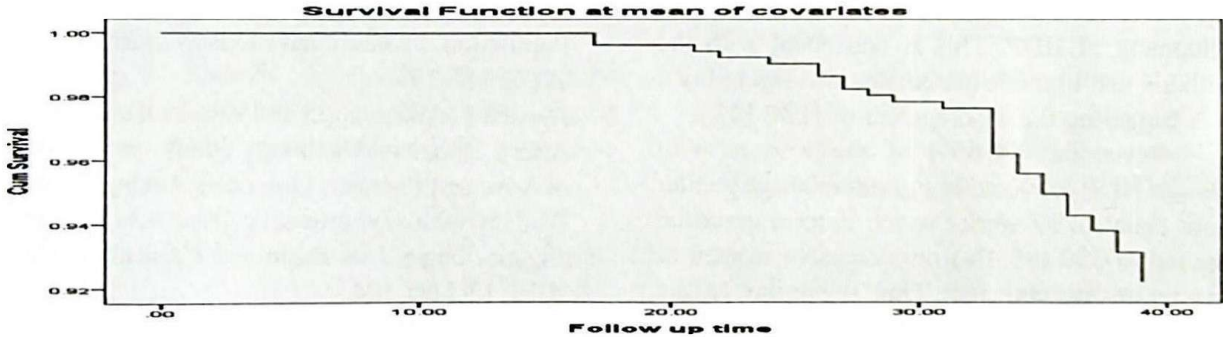


Fig.4: Survival function for un-adjusted previous history of hypertension

Discussion

In this study, 34 pregnant women developed different types of HDP out of the 487 pregnant women whose pregnancy outcomes were known with a prevalence of 7.2%. Ten of these women with a prevalence of 2.1% developed the HDP in the second trimester of pregnancy while 24 with a prevalence of 5.1% were in the third trimester of pregnancy. This observation is in line with the report of Khong *et al.*, [13] that early onset of HDP occurs less frequently (between 0.4-1%) than late-onset of HDP.

Preeclampsia is the most common type of hypertensive disorder of pregnancy followed by pregnancy induced/gestational hypertension [8]. In this present study, the different types of HDP

on chronic 0.2%. Other studies also reported highest prevalence of HDP in preeclampsia and gestational/pregnancy induced hypertension than chronic and preeclampsia superimposed on chronic hypertension (56%; 31.4%, 78.8%; 19.2%, 60.5%; 18% and 63%; 21.1%) [4-6, 8].

Maternal age has an important influence on the incidence of hypertensive disorders of pregnancy [4]. In the present study, the highest incidence of HDP occurred among those aged 29 to 40 years. This is statistically significant when compared with normotensive pregnant women ($p < 0.02$). The age distribution in this study is similar to other reports in and outside Nigeria. Peter *et al.* [14], South East Nigeria, reported higher age with high blood pressure

in pregnant women. Ebeigbe and Aziken [15] also reported highest incidence of HDP in the age group of 30-34 years in Benin City, Nigeria. Other studies reported risk of developing hypertension in pregnancy to be more amongst women older than 30 years and same is indicated in our study [4, 8]. In contrast, Singh *et al.*, [3] in Northern part of Nigeria reported highest incidence of HDP in the age range of 25-29 years. This might be due to early marriage and high low level of girls' education (high illiteracy) which is prevalent in the Northern part of Nigeria [16].

The caesarean section rate in women with HDP was significantly higher when compared with normotensive women (85.3% vs. 35.7%) in our study. Higher caesarean section rates have been reported from other studies and this supports the high incidence of caesarean delivery in our study [3, 5, 6, 12, and 14]. This high incidence indicates that most of the hypertension cases were severe or rapidly progressive necessitating immediate delivery [12].

Meanwhile, previous medical history of hypertension was found to be a significant risk factor for developing HDP in this study ($p < 0.001$) which is in accordance to the findings of other studies [3, 17]. Gongora and Wenger, [17], Karakilic and Karakilic [19] in their studies described previous history of HDP as a principal risk factor in the development of HDP. This is consistent with the hypothesis that immune maladaptation might play a role in triggering the development of HDP [3].

Seventeen (4.6%) of the women who developed HDP delivered at a gestational age greater than or equal to 37 weeks which is term gestation compared to 350 (95.4%) normotensive women at the same gestational age. This is similar to the findings of an earlier study in a University Teaching Hospital, South-South area of Nigeria [12].

Only few women developed HDP at an early gestational age (17-26 weeks). Highest number of hypertension was between 32-36 weeks (50.0%) and just 6 of the women (17.6%) had the disease in the term gestation. Our finding is in accordance with findings of Borade *et al.*, [8] and Singh *et al.*, [3]. It is noteworthy that two third of the women who developed HDP in this study were nulliparous (67.6%) with lowest percentage in the primiparous (11.8%). Risk of developing hypertension during pregnancy in nullipara is extreme because pregnancy in these women is maternal first exposure to chorionic villi- specifically to trophoblast of fetal origin, to which the body respond with strong immunological reaction in the form of hypertension during pregnancy [8]. The etiology of HDP is diverse. It is believed that immune maladaptation of the

primigravida is responsible for the higher incidence of preeclampsia in this group. This mal adaptation is lost in subsequent pregnancies, hence the decreasing incidence of preeclampsia in the multipara [12]. Our findings agree with previous studies [3, 4, 12 and 20]. Our findings agree with previous studies that reported insulin levels as significant predictors of hypertensive disorders in pregnancy

Conclusion

In this study, the prevalence of HDP was 7.2%. Out of 34 hypertensive pregnant women 55.9% were diagnosed as pre-eclampsia-eclampsia, 35.3% as gestational hypertension, 5.9% as chronic hypertension and 2.9% as preeclampsia superimposed on chronic hypertension. Maternal age ≥ 31 years, previous history of hypertension, 3rd trimester of pregnancy and primigravida are few epidemiological risk factors associated with HDP. Early diagnosis and treatment through regular antenatal checkup is a key factor to prevent HDP and its complications.

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