Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

https://doi.org/10.34104/ejmhs.024.013019

European Journal of Medical and Health Sciences

Journal homepage: www.universepg.com/journal/ejmhs

Socio-demographic Characteristics of a Cross-section of Pre-eclamptic Women in Yenagoa, Nigeria

Tokoni Gloria Ogbede[1]*, Jackson Bobobuebi Okutu[1], Gborienemi Simeon George[1], and Ezeiruaku Ferdinand Chukwuma[1]

[1]Department of Medical Laboratory Science, Faculty of Basic Medical Sciences, College of Health Sciences, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria.

*Correspondence: tokonigloria16@gmail.com (Ogbede Tokoni Gloria, Department of Medical Laboratory Science, Faculty of Basic Medical Sciences, College of Health Sciences, Niger Delta University, Bayelsa State, Nigeria).

ABSTRACT

Pre-eclampsia (PE) is a multifactorial disorder that ultimately manifests as hypertension in the pregnant woman. This study was aimed at determining socio-demographic characteristics of PE among pregnant women attending tertiary Hospitals in Yenagoa, Bayelsa State, Nigeria. A total of 182 pregnant women, consisting of 91 women with PE (gestation > 20 weeks, blood pressure ≥ 140/90 mmHg) and 91 normotensive pregnant women at gestation > 20 weeks were enrolled in the study by consent. These respondents filled structured questionnaires that obtained data on sociodemographic variables (which are maternal age, parity, body mass index [BMI], systolic and diastolic blood pressure [SBP and DBP], educational level, family history of PE, occupation, severity of PE, primipaternity, and gestational age of PE. Data was grouped into PE cases and control. Chi-square was used to determine associations between PE and sociodemographic variables for categorical data, whereas the independent T-test was used to determine differences between groups for parametric data. Data was considered significant at $p < .05$. Results showed that BMI ($X^2 = 21.01$, $p = .00$), SBP ($T = 27.06$, $p = 0.00$), DBP ($T = 29.75$, $p = 0.00$), educational level ($X^2 = 14.15$, $p = .00$), family history of pre-eclampsia ($X^2 = 33.09$, $p = .00$), and primipaternity ($X^2 = 21.01$, $p = .00$) showed significant associations with pre-eclampsia ($p < .05$). It is recommended that healthy weight management, blood pressure monitoring, adequate antenatal care, and family history counselling be promoted in health facilities in our setting.

Keywords: Primipaternity, Body mass index, Pre-eclampsia, Gestational age, BMI, and Blood pressure.

INTRODUCTION:

Pre-eclampsia is defined as a sudden onset of hypertension after twenty (20) weeks gestation with one or more of the following symptoms: Proteinuria, maternal organ dysfunction which includes hepatic, renal, haematological or neurological complications or the foetal growth restriction (Dimitriadis *et al*., 2023; American College of Obstetricians and Gynaecologists [ACOG], 2019). According to the National High Blood Pressure Education Program, a blood pressure of at least 140/90mm Hg in women who were normotensive constitutes a pre-eclamptic pregnancy. The onset of pre-eclampsia can be classified as early-onset; if it occurs before 34 weeks of pregnancy and as late-onset if it occurs at 34 weeks of pregnancy or later (Dimitriadis *et al*., 2023). Pre-eclampsia may also occur postpartum which is defined as new-onset hypertension and proteinuria within 6 weeks after delivery (O'Gorman *et al*., 2017). Pre-eclampsia affect about 2-8% of pregnant women worldwide and is said to be a major cause of infant and maternal mortality (Dimitriadis *et al*., 2023). With a prevalence of 5.69% in Yenagoa, South-South, Nigeria, the disease burden is alarming

(Adokiye *et al*., 2015). The exact aetiology of pre-eclampsia is not clear which is because of its heterogenous origin. According to a study by Redman and Sargent, (2010) pre-eclampsia is thought to be associated with aberrations in placental development and function, which can lead to decreased blood flow and oxygen to the developing foetus. Similarly, a review by Ahmed and Ahmed, (2019) suggests that the placenta plays a central role in the development of pre-eclampsia, as placental determinants are responsible for initiating the cascade of events leading to the clinical manifestations of the disease. Another study by Staff *et al.* (2019) investigated the immune system's response to the developing foetus in pre-eclampsia and revealed that alterations in placental development and function may initiate an immune response that contributes to the development of pre-eclampsia (Elhassan *et al*., 2023).

This Intrauterine growth restriction (IUGR), which is a condition of impeded foetal growth can be caused by problems with the placenta, such as decreased blood flow and oxygen delivery, leading to a decrease in the supply of nutrients to the developing foetus (Figueras and Gratacós, 2014). Additionally, pre-eclampsia can cause the blood vessels in the placenta to narrow, leading to further decreases in blood flow and oxygen delivery. These changes can affect the foetal growth, leading to IUGR (Khalil *et al*., 2013).

Some risk factors have been reported to be associated with the occurrence of pre-eclmapsia. Multiparity is one of such; although, the relationship between multiparity and pre-eclampsia is complex and not fully understood. Wu *et al*. (2019) found that multiparity was significantly associated with an increased risk of pre-eclampsia. This study was aimed at determining socio-demographic characteristics of pre-eclampsia among pregnant women attending tertiary Hospitals in Yenagoa, Bayelsa State, Nigeria.

MATERIALS AND METHODS:

Respondents, Design, and Setting

The sample size for this study was 182 pregnant women, consisting of 91 women with pre-eclampsia (gestation > 20 weeks, the blood pressure ≥ 140/90 mmHg) and 91 normotensive pregnant women at gestation > 20 weeks. All respondents were aged 18 years and above.

Instrument for Data Collection

The instrument for categorical data collection was a well-structured questionnaire. This consisted of two sections: A and B. Sectional A was used to obtain demographic data such as maternal age & gestational age at pre-eclampsia, while section B was used to obtain socio-demographic data (Abubakari *et al*., 2023) such as educational level, parity, family history of pre-eclampsia, occupation, severity of preeclampsia, and primipaternity. Parametric data on the other hand were obtained with the required devices. Blood pressures (diastolic and systolic) were measured with a standardized clinical sphygmomanometer at least thrice with the average reading recorded. Body mass index was derived from weight/(height)^2 after obtaining multiple readings of patient's weight and height, using clinic standard bathroom scale and meter rule (Bickley and Szilagyi, 2017).

Validation and Reliability of Instrument

A draft copy of the research instrument was presented to research experts for the assessment of face validity. Reviews from such experts ensured that the questions successfully captured the research topic, & common misleading errors were deleted, producing a superior draft for reliability testing. The draft copy of the questionnaire which consisted of two different indices for section A & B of direct and reverse coded questions was presented to a subset of the targeted respondents (20%). Internal consistency was reviewed using standard Cronbach's Alpha (CA) statistical analysis and it yielded the reliability coefficient of at least .86 (Nunnally and Bernstein, 1994; Tavakol and Dennick, 2011).

Method of Data Collection

Written consent was obtained from the Ethical boards of the respective tertiary hospitals in the State. This was followed by obtaining informed consent from the participants, prior to data collection. All questionnaires were filled and retrieved immediately.

Statistical Analysis

SPSS windows version 26 (IBM Corporation, 2019) was used for all the statistical analyses. Data was grouped into pre-eclampsia cases and control. The Kolmogorov Smirnov Test was used for normality testing. Chi-square was used to determine association between sociodemographic variables & pre-eclampsia. The independent T-test was used to determine differences between the groups. Data was considered significant at $p < .05$.

RESULTS:

A total of 182 subjects were enrolled in this study comprising a balanced sample size of 91 pre-eclampsia (PE) cases and 91 normal pregnancy mothers as control. Subjects were aged 20 to 44 years, with most of them falling between the 30 to 34 age group for both cases (55.30%) and control (44.70%). There was no significant association between age and pre-eclampsia ($p > 0.05, X^2 = 6.64$). But significant association was observed between body mass index (BMI) and PE ($p = 0.00, X^2 = 21.01$), between PE and each of systolic blood pressure (SBP) (p = 0.00, T= 27.06), diastolic blood pressure (DBP) (p = 0.00, T= 29.75), between educational level and PE (p = 0.00, X^2=14.15), between Family History of PE and the occurrence of PE ($p = 0.00, X^2 = 33.09$), and between primipaternity and the PE ($p = 0.00, X^2 = 6.13$). Other details are listed in **Table 1** and **Table 2**, respectively.

Table 1: Demographic Characteristics among Subject Studied.

Item	Characteristics	Frequency (%)		X^2	*P*	OR.
		Cases	Control			
Total number	Frequency (%)	91	91			
Age (yrs)						
	20 – 24	7 (7.70)	4 (4.40)			
	25 – 29	19 (20.90)	22 (24.20)			
	30 – 34	42 (46.20)	34 (37.40	6.64	0.16	nil
	35 – 39	15 (16.40)	27 (29.70)			
	40 – 44	8 (8.80)	4 (4.40)			
Parity						
	1-2	84 (92.30)	77 (84.60)	2.64	0.10	0.46
	≥ 3	7 (7.70)	14 (15.40)			
BMI (Kg/m^2)						
	18.5 – 24.9	5 (5.50)	20 (22.00)			
	25.0 – 29.9	24 (26.40)	38 (41.80)	21.01	0.00**	nil
	≥ 30	62 (68.10)	33 (36.30)			
BP (mmHg)	Mean ± SD			*T*	*p*	95%CI
	SBP	157.69 ± 16.55	105.27 ± 8.21	27.06	0.00**	48.59
	DBP	99.86 ± 8.43	66.04 ± 6.81	29.75	0.00**	31.57
Educational level	Frequency (%)			X^2	*p*	OR.
	Primary	4 (4.40)	0 (0.00)			
	Secondary	43 (47.30)	24 (26.40)	14.15	0.00**	nil
	Tertiary	44 (48.40)	67 (73.60)			

Key: ** = Significant *p*< .01, * = Significant *p*< .05 *T* = T-test Statistic, $\boldsymbol{X^2}$ = Chi-square statistic, OR. = odds ratio.

Table 2: Demographic Characteristics among Subject Studied.

Item	Characteristics	Frequency (%)		X^2	*P*	OR.
		Cases	Control			
Family history of PE						
	Yes	28 (30.80)	0 (0.00)	33.09	0.00**	.41
	No	63 (69.20)	91 (100.00)			
Occupation						
	Employed	44 (48.40)	48 (52.70)			
	Self-employed	5 (5.50)	0 (0.00)	5.19	0.08	nil
	Unemployed	42 (46.20)	43 (47.30)			
Severity of PE						
	Mild	55 (60.44)				
	Severe	36 (39.56)				
Primipaternity						
	Yes	58 (63.70)	73 (80.20)	6.13	0.01*	2.31
	No	33 (36.30)	18 (19.80)			

Gestational Age at PE (Wks)						
	< 30	59 (64.84)				
	≥ 30	32 (35.16)				

Key: ** = Significant p< .01, * = Significant p< .05 T = T-test Statistic, $\boldsymbol{X^2}$ = Chi-square statistic, OR. = odds ratio.

DISCUSSION:

Although the enrolled subjects in this study were aged between 20 to 44 years, the predominant age group for both cases and control were between 30 - 34 years. Of the various demographic features of pre-eclampsia considered in this study, only body mass index (BMI), blood pressure (BP), educational level, family history of pre-eclampsia, and primipaternity showed significant association with pre-eclampsia ($p < 0.05$). 95.50% of the pre-eclampsia cases had BMI at booking ≥ 25kg/m^2 ($X^2 = 21.10, p = 0.00$). This is similar to the study done by Musa *et al*. (2018) in Jos, Nigeria. In their study, they emphasized that BMI at booking ≥ 25 kg/m^2 was a significant risk factor for pre-eclampsia in a large cohort of pregnant women. The association between pre-eclampsia and overweight (BMI ≥ 25 kg/m^2) was also buttressed by a study which was done in Tanzania among pregnant women with 17, 738 singleton births (Mrema *et al*., 2018). Also, the meta-analysis carried out by Poorolajal and Jenabi, (2016) provided copious evidence that pre-eclampsia was significantly associated with overweight and obesity among 1 298 references that included 23 studies. Although the underlying mechanism behind the association between pre-eclampsia and overweight is not well understood, it is thought that obesity is a protagonist variable for endothelial dysfunction and inflammation: both of which are characteristic features of pre-eclampsia. Obesity also correlates well with dyslipidemia and insulin resistance which can impede placental function, thereby increasing the risk of pre-eclampsia (Belo *et al*., 2017: Nassis *et al*., 2018).

It is no surprise that blood pressure (systolic and diastolic) was significantly associated with the pre-eclampsia ($p < 0.01$) in this study. Pre-eclampsia is an established hypertensive disorder in pregnancy. According to Roberts *et al*. (2020), the disease has pathophysiologic features of impediment in trophoblastic invasion and aberrant placentation, resulting in placental ischemia and release of anti-angiogenic factors such as soluble fms-like tyrosine kinase-1 (sFlt-1) and soluble endoglin (sEng). Worthy of note, however, is the association between family history of pre-eclampsia and the disease state itself. Singh *et al*. (2014) showed in their study in Sokoto, Nigeria, that previous history of pre-eclampsia was a significant risk factor for the development of hypertensive disorders in pregnancy. This was also observed in the study by Musa *et al.* (2018), in Jos, Nigeria. Moses *et al*. (2018) reported that a genetic risk score based on 19 common genetic variants was associated with an increased risk of pre-eclampsia. Jido and Yakasai, (2013) highlighted genetics as one of the most frequent risk factors for pre-eclampsia, among others like immunology, and socio-economic class; such as educational level. In this study, educational level had a significant association with pre-eclampsia ($X^2 = 14.14, p = 0.00$). 73 % of the control subjects had tertiary education, compared with just 48% of the pre-eclampsia cases. Low socio-economic status was shown as a predictor of severe pre-eclampsia among 143 women with pre-eclampsia in Kampala, Uganda (Wandabwa *et al*., 2010). A population-based study carried out in Australia by *Hsieh et al.* (2021) revealed that women with lower educational attainment were more predisposed to pre-eclampsia than those with higher educational attainment. In the same vein, a study by Ezebialu *et al*. (2020) found that women in manual labour occupations had a higher risk of developing the disease than those in non-manual labour occupations.

The mechanisms behind the relationship between pre-eclampsia and socio-economic variables are not fully understood. But several factors have been implicated, including limited access to antenatal care, poor nutrition or dieting, & chronic stress. Anderson *et al*. (2019) showed in their study, that women of low socio-economic status were less likely to receive timely prenatal care, which may contribute to the development of pre-eclampsia.

Similar to educational level, primipaternity, a term coined by Robillard *et al.* (2011) which means a change in new partner, was significantly associated with the pre-eclampsia ($X^2 = 6.13, p = 0.01$). This finding is in agreement with several studies reviewed by Breborowicz and Klatsky, (2014). They showed that pre-eclampsia cases in multiparous women with an interval partner change were attributable to the

primipaternity, although the risk of pre-eclampsia remained lower in these women when compared to nulliparae. A possible reason for this could be that short duration of exposure to sperm is more common in pre-eclamptic women than the non-pre-eclamptic counterparts (Kho *et al*., 2009; Sadat *et al*., 2012).

A family history of pre-eclampsia was significantly associated with the occurrence of the disease in this study ($X^2 = 33.09, p < 0.01$). Several studies have reported an elevated risk of pre-eclampsia among women with a family history of the condition (Esplin *et al*., 2018; Wilson *et al*., 2018). Wang *et al*. (2020) showed that a positive family history of pre-eclampsia increased the risk of pre-eclampsia in pregnant women by threefold. Another study by Wang *et al*. (2019) found that a family history of pre-eclampsia was associated with a 1.6-fold increased risk of the disease. The underlying mechanisms linking a family history of pre-eclampsia to the development of the condition are not well understood. But it has been suggested that genetic factors may play a role (Musa *et al*., 2018).

CONCLUSION:

Based on the findings of this study, the following conclusion ensued among pregnant women that attended tertiary hospitals in Bayelsa State, at the time of the study: body mass index (BMI), blood pressure (BP), educational level, family history of the pre-eclampsia, and primipaternity showed significant associations with pre-eclampsia. Thus, the outcome of this study makes several significant contributions to the knowledge of the disease: provides valuable epidemiological insights into pre-eclampsia in a specific region of Nigeria, emphasizes the role of body mass index (BMI) as a significant risk factor for pre-eclampsia, confirming the well-established association between blood pressure and pre-eclampsia with brief explanation of the underlying pathophysiological features, underlines the relevance of family history in the development of pre-eclampsia which is consistent with findings from other studies in Nigeria, and highlights the impact of socioeconomic status on the condition. This information is crucial for addressing health disparities & developing interventions that target vulnerable populations.

ACKNOWLEDGEMENT:

The authors hereby seize the opportunity to thank Dr. Oboma Yibala for his emphatic support and suggestions in the Statistical aspects of the work. Also, not forgetting, the key role that Prof. F. C. Ezeiruaku played in the overall framework of the documentation. Dr. G. S. George was very instrumental in the build up and edits of the discussion.

CONFLICTS OF INTEREST:

Authors declare that they do not have any conflict of interest.

REFERENCES:

1) Abubakari A, Asumah MN, and Abdulai NZ. (2023). Effect of maternal dietary habits and gestational weight gain on birth weight: an analytical cross-sectional study among pregnant women in the Tamale Metropolis. *Pan. Afr. Med. J*., **44**(19), 1-19. https://doi.org/10.11604/PAMJ.2023.44.19.38036
2) Adokiye EA, Isreal J, and Obaabo Levi W. (2015). Factors influencing the prevalence of Preeclampsia-eclampsia in booked and unbooked patients: 3 years retrospective study in NDUTH, Okolobiri. *World J. Med. Med. Sci.,* **3**(1), 1-14.
3) Ahmed R, Ahmed S. (2019). Pathogenesis and management of pre-eclampsia: An update. *Int. J. Women's Health Reprod. Sci.*, **7**(3), 292-299.
4) American College of Obstetricians & Gynaecologists (ACOG). (2019). Practice Bulletin No. 202: Gestational hypertension & preeclampsia. *Obstet. Gynecol*., **133**(1), e1-e25.
5) Anderson CJ, Bohren MA, and Say L. (2019). Predisposing factors for severe maternal morbidity and mortality: a systematic review and meta-analysis. *PLoS One*, **14**(2), e0210739.
6) Belo L, Santos-Silva A, and Rocha-Pereira P. (2017). Obesity and inflammation in pregnancy. *Acta Med. Port*., **30**(10), 727-733.
7) Bickley LS, and Szilagyi PG. (2017). Bates' Guide to Physical Examination and History Taking. 13th ed. *UK: Wolters Kluwer*.
8) Breborowicz GH, and Klatsky PC. (2014). Paternity in multiparae & risk of pre-eclampsia. *Obstet. Gynecol*., **124**(4, 718-724. https://doi.org/10.1097/00001648-199605000-00004
9) Dimitriadis E, Nicolaides K, and Menkhorst E. (2023). Pre-eclampsia. *Nat. Rev. Dis. Primers*, **9**(1), 1-22.
10) Elhassan S, Salah SE, Miskeen E, Ahmed H, Mandar O, Khalifa H, Mohamed H, Darazon W, and Osman A. (2023). Enhancing women's

health: advancing gynecological laparoscopy in resource-limited Eastern Sudan, *Eur. J. Med. Health Sci*., **5**(5), 118-127. https://doi.org/10.34104/ejmhs.023.01180127

11) Esplin MS, Quinney SK, and Grobman WA. (2018). The MFMU Cesarean Registry: Impact of time of day on cesarean complications. *Am. J. Obstet. Gynecol*., **219**(6), 605.e1-605.e7.
12) Ezebialu IU, Eke AC, and Ezebialu CU. (2020). Influence of maternal occupation on hypertensive disorders in pregnancy in Nnewi, Nigeria. *J. Obstet. Gynaecol*., **40**(1), 100-105.
13) Figueras F, and Gratacós E. (2014). Update on the diagnosis and classification of fetal growth restriction & proposal of a stage-based management protocol. *Fetal. Diagn. Ther*., **36**(2), 86-98.
14) Hsieh WC, Lee AH, and Binns CW. (2021). Education and pre-eclampsia risk: A study of 290,116 pregnant women in Western Australia, 1986-2019. *Eur. J. Public Health*, **31**(1), 118-122.
15) IBM Corporation. (2019). IBM SPSS Statistics 26 Brief Guide. Available from: https://public.dhe.ibm.com/software/analytics/spss/documentation/statistics/26.0/en/client/Manuals/IBM_SPSS_Statistics_Brief_Guide.pdf
16) Jido TA, and Yakasai IA. (2013). Preeclampsia: A review of the evidence. *Ann. Afr. Med*., **12**(2), 75-85.
17) Khalil A, Syngelaki A, and Nicolaides KH. (2013). Maternal and fetal characteristics associated with intrauterine growth restriction in pre-eclampsia. *J. Perinat. Med.*, **41**(6), 641-647.
18) Kho EM, McCowan LM, and Chan EH. (2009). Duration of sexual relationship and its effect on preeclampsia & small for gestational age perinatal outcome. *J. Reprod. Immunol*., **82**(1), 66-73. https://doi.org/10.1016/j.jri.2009.04.011
19) Moses EK, Cade TJ, and Wallace EM. (2018). Genetic studies in pre-eclampsia: A systematic review and reappraisal of meta-analyses. *Hum. Reprod. Update*, **24**(1), 97-110.
20) Mrema J, Urassa D, and Swai A. (2018). The association between maternal body mass index & pregnancy outcomes in Tanzania & Uganda: A prospective cohort study. *BMC Pregnancy Childbirth*, **18**(1), 1-9.
21) Musa J, Mohammed C, and Ocheke A. (2018). Role of booking body mass index as a predictor of pre-eclampsia among pregnant women in Jos, Nigeria. *Ann. Med. Health. Sci. Res*., **8**(2), 67-71.
22) Nas FS, Yahaya A, Muazu L, Halliru SN, and Ali M. (2020). Prevalence of Trichomonas vaginalis among pregnant women attending antenatal care in Kano, Nigeria. *Eur. J. Med. Health Sci*., **2**(2), 39-45. https://doi.org/10.34104/ejmhs.020.39045
23) Nassis GP, Geladas ND, and Mavrogiannis VS. (2018). Obesity, physical activity and exercise in pregnancy: a narrative review. *J. Sports Med. Phys. Fitness.,* **58**(1-2), 1-9.
24) Nunnally JC, and Bernstein IH. (1994). Psychometric Theory. 3rd ed. *New York: McGraw-Hill*.
25) O'Gorman N, Plasencia W, and Nicolaides KH. (2017). Multicenter screening for pre-eclampsia by maternal factors and biomarkers at 11-13 weeks' gestation: comparison with NICE guidelines and ACOG recommendations. Ultrasound *Obstet. Gynecol*., **49**(6),756-760.
26) Poorolajal J, Jenabi E. (2016). The association between body mass index and preeclampsia: A meta-analysis. *J. Matern. Fetal. Neonatal Med*., **29**(22), 3670-3676.
27) Redman CW, and Sargent IL. (2010). Placental stress & pre-eclampsia: A revised view. *Placenta*; **31**(5), 365-372.
28) Roberts JM, Escudero C, and Theilmann A. (2020). The placenta in preeclampsia. *Pregnancy Hypertens*., **21**,156-162.
29) Robillard PY, Dekker G, and Saftlas A. (2011). Epidemiological studies on primipaternity and immunology in preeclampsia--a statement after twelve years of workshops. *Journal Reprod. Immunol*., **89**(2),104-117.
30) Sadat Z, Kafaei A, and Taheri S. (2012). Duration of sexual exposure in primiparous women with and without preeclampsia in Isfahan, Iran. *J. Res. Med. Sci*., **17**(10), 918-923.
31) Singh S, Ahmed EB, and Ikechukwu NE. (2014). Hypertensive disorders in pregnancy among pregnant women in a Nigerian Teaching Hospital. *Niger. Med. J*., **55**(5), 384-388. https://doi.org/10.4103/0300-1652.140377
32) Staff AC, Johnsen GM, and Redman CW. (2019). Review: Preeclampsia, acute atherosis of the spiral arteries and future cardiovascular disease: Two new hypotheses. *Placenta*, **79**, 57-60.

33) Tavakol M, Dennick R. (2011). Making sense of Cronbach's alpha. *Int. J. Med. Educ*., **2**, 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd
34) Wandabwa J, Doyle P, and Kiondo P. (2010). Socio-economic status and severity of maternal anaemia among antenatal attendees at two hospitals in Kampala, Uganda. *Trans. R. Soc. Trop. Med. Hyg*., **104**(2), 123-129.
35) Wang X, Chen Y, and Zhang H. (2019). Family history of pre-eclampsia and maternal risk of pre-eclampsia: A systematic review and meta-analysis. *Pregnancy Hypertens*., **15**,146-153.
36) Wang X, Chen Y, and Zhang H. (2020). Association of family history of pre-eclampsia with the risk of pre-eclampsia: A systematic review & meta-analysis. *Pregnancy Hypertens*., **19**,11-18. https://doi.org/10.1016/j.ijchy.2021.100084
37) Wilson ML, Goodwin TM, and Gallaher MJ. (2001). A case-control study of risk factors for preeclampsia in California nulliparous women. *Am. J. Obstet. Gynecol*., **184**(5), 1620-1624.
38) Wu P, van den Berg C, and Khan KS. (2019). Early risk assessment tools for pre-eclampsia in pregnancy: A systematic review. *Br. J. Gynaecol*., **126**(8), 915-927.

Citation: Ogbede TG, Okutu JB, George GS, and Ezeiruaku FC. (2024). Socio-demographic characteristics of a cross-section of pre-eclamptic women in Yenagoa, Nigeria, *Eur. J. Med. Health Sci.*, **6**(1), 13-19. https://doi.org/10.34104/ejmhs.024.013019