

## Magnitude and Associated Factors of Preeclampsia Among Pregnant Women who Attend Antenatal Care Service in Public Health Institutions in Arba Minch Town, Southern Ethiopia, 2016

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### Abstract

**Background:** Hypertensive disorders of Pregnancy are the major complications that cause about 60% to 80% of all maternal deaths. Preeclampsia is a major hypertensive disorder of pregnancy that had caused maternal mortalities and morbidities all round the world.

**Objective:** To assess the prevalence and factors associated to preeclampsia among pregnant women attending antenatal care service.

**Methods:** A cross-sectional study was conducted from January 10 to February 09, 2016 among pregnant women who followed anti natal care at public health institutions in Arba Minch town. The study included 422 pregnant women who were selected using systematic random sampling. Semi-structured questionnaire was employed to collect data. The data were entered into EpiData version 3.1 and analyzed using SPSS version 20.

**Result:** The prevalence of preeclampsia was 18.25%. The associated factors of preeclampsia were change of paternity: 4.08 (AOR=4.08; 95% CI: (1.17-14.266)), family history of hypertension: 3.52 (AOR=3.52; 95% CI: (1.31-9.45)) and alcohol use: 8.06 (AOR=8.06; 95% CI: (2.3-28.5)).

**Conclusion and recommendation:** The finding of this study showed that considerable proportion of women had preeclampsia (18.25%). The study showed that different factors affect the occurrence of hypertension during pregnancy. It is important to give health education in order to make the women develop health seeking behavior so that they would get a chance to be diagnosed of preeclampsia as early as possible.

**Keywords:** Preeclampsia; Associated factors; Antenatal care

**Abbreviations:** AMU: Arba Minch University; DM: Diabetes Mellitus; EDHS: Ethiopia Demography HealthSurvey; FP: Family Planning; HNP: Hypertension SNNPR: South Nation Nationality People Region

### Background

Hypertensive Disorders of Pregnancy (HDP) are one of the five major complications that cause about 60% to 80% of all maternal deaths [1]. Studies indicate that HDP is the main cause for maternal mortality and morbidity all round the world [2,3]. The latest classification system which is used for the classification of blood pressure among pregnant categorizes HDP into five classes: Preeclampsia, Eclampsia, Transient Hypertension of pregnancy, Chronic Hypertension and Preeclampsia superimposed on Chronic Hypertension [4]. Preeclampsia is a pregnancy induced hypertension that causes considerable rise in proteinuria [1].

Investigations revealed that preeclampsia is a predisposing factor for several potentially lethal complications. Placental abruption,

disseminated intravascular coagulation, intracranial hemorrhage, hepatic failure, acute renal failure and cardiovascular collapse, intrauterine fetal growth restriction, intrauterine fetal demise and prematurity appear to be the major lethal obstetric problems that result from preeclampsia [5-9]. Preeclampsia is one of the leading causes of maternal mortality and morbidity among pregnant women in the world. The incidence of the disease shows discrepancy among different populations of the world [10].

The American High Blood Pressure Education Program Working Group report indicates that about 30% of HDP in that country were due to chronic hypertension while 70% of the cases were preeclampsia [5]. Similarly, World Health Organization (WHO) estimate of 2010 indicated that death due to preeclampsia among mothers in Latin-American and Caribbean countries was 25.7%, where as it was 9.1% in Asian and African countries [10,11]. It is also expected that underdeveloped countries are more prone to the problem than developed countries.

Studies indicate that there are several risk factors for preeclampsia. Null-parity, extreme ages, race (being black) are some to mention [12-14]. Underdeveloped countries like Ethiopia face worse complications of the problem than the developed ones. Poor

pregnancy outcomes that are associated with lack of anti natal care (ANC) follow up and delayed recognition and intervention in the affected mothers aggravate the situation [15-18].

The 2011 Ethiopia Demographic and Health Survey report estimated that pregnancy and related causes are the cause for 676 mothers' death per 100,000 live births [19]. A study conducted in Addis Ababa indicated that the prevalence of HDP among diagnosed pregnant women were around 5% [15], of which the majorities were due to severe preeclampsia [16]. According to Ethiopian National Emergency Obstetric and Newborn Care report, the complications of about 5% of all pregnancies and 1% of all deliveries result from preeclampsia [16]. The purpose of the current study is to assess the prevalence and factors associated to preeclampsia among pregnant women who are in ANC follow up at public health institutions in Arba Minch town.

## Methods

### Study setting, design and sampling

An institution-based cross-sectional study was conducted among pregnant women who were in ANC follow up at public health institutions in Arba Minch town. Data were collected from January 1 to February 30, 2016. The town is an administrative centre for Gamo Gofa zone, Southern Ethiopia. It had a total population of 108,956 during data collection time among whom 53,388 were males and 55,568 were females. There are three public health institutions in the town which provide public health services for the people in the town and nearby rural kebeles.

The study included pregnant women with a gestational age of 20 weeks or greater. Gestational age of the woman was measured based on women recall of the last menstrual period (LMP). When the women failed to recall the gestational period, Ultrasound estimation was used to measure it. When the gestational age estimation was not possible in both cases, pregnant women were excluded from the study to prevent misclassification.

Sample size was determined using sample size determination formula for single population proportion and 51.9% preeclampsia prevalence taken from a study which was conducted in a relatively similar setting [20]. Ninety five percent CI, 5% margin of error and a 10% of non-response rate were also considered to determine the sample size. Based on these, a total of 422 pregnant women were taken into the study. Systematic random sampling procedure was applied to select the study subjects from all the pregnant women in ANC follow up at the public health facilities. We first determined monthly plan K interval of the facility. Then, the first mother was randomly selected based on her arrival at the facility and every Kth woman was taken into the study until the required number of study participants was reached.

### Operational definitions

The scholars' definition of preeclampsia is a rise in gestational blood pressure beyond the normal (systolic blood pressure (SBP)  $\geq$  140 mmHg and/or diastolic blood pressure (DBP)  $\geq$  90 mmHg) after 20 weeks of gestation and the presence of greater than normal value of proteins in urine (Proteinuria). A protein level in the urine which is stated as 1+ is classified as proteinuria. We assessed the proteinuria using urine dipstick method.

### Data collection, data quality control and statistical analysis

Data were collected by using structured questionnaire which was prepared in English. The questionnaire was translated to Amharic (local language) and retranslated back to English to ensure its consistency. Training was given for four clinical nurses before the data were collected and they were finally involved in data collection. Interview based questionnaires were deployed to gather data on demographic characteristic, obstetrics and reproductive history, and behavioral and family history of the study population. Medical records of the women were also reviewed. The completeness, consistency and clarity of the collected data were continuously supervised by the supervisors. When mistakes and errors were found, they were corrected immediately.

Blood pressure measurement was carried out after the women were allowed to take rest for about ten minutes. Mercury sphygmomanometer apparatus was used to take blood pressure readings while the women were sat in upright position. The measurement was taken from participant's right hand. Systolic blood pressure (SBP) was taken up on hearing the first sound, and diastolic blood pressure (DBP) was taken up on 4th (muffled) Korotkoff sound.

Independent predictors of preeclampsia among the explanatory variables were assessed using multivariate logistic regression. Stepwise backward regression procedure was applied by including variables with significant or marginally significant association (p-value  $<$ 0.25) during the bivariate analyses. All statistical tests were considered significant at alpha less than 0.05.

### Ethical consideration

The Ethics Review Board of AMU approved the study protocol. Data were collected after written informed consent was taken from the women.

## Results

### Socio-demographic characteristics

A total of 422 pregnant women were incorporated into the study. This made the response rate 100%. About 229 (54.26%) of them were aged below 24 years and there were 11 (2.6%) pregnant women whose age was  $\geq$  35 years. Orthodox and protestant were the major religions practiced among the participants each accounting 186 (44.02%) and 157 (37.2%), respectively. Among the total respondents, 388 (91.94%) were married and the rest 3 (0.71%) were single.

Concerning their level of education, about one hundred forty one (33.41%) of them attended tertiary level of education. Majority of them (57.1%) were Gamo in ethnicity and one hundred sixty three (38.62%) were housewives. The findings of the sociodemographic variables are indicated in (Table 1).

Variable	Frequency	Percent %
<b>Occupation</b>		
Government and private employee	134	31.75
House wife	163	38.62
Merchant	80	18.96
Other	45	10.66

Total	422	100
<b>Religion</b>		
Orthodox	186	44.02
Muslim	42	9.9
Protestant	157	37.2
Other	37	8.8
Total	422	100
<b>Ethnicity</b>		
Amara	67	15.9
Gamo	241	57.1
Wolyta	157	14.2
Other	54	12.8
Total	422	100
<b>Educational Level</b>		
Unable to read and write	33	7.8
Able to read and write	69	16.3
Primary education	73	17.3
Secondary education	106	25.12
Territory education	141	33.41
Total	422	100
<b>Marital Status</b>		
Single	3	0.71
Marred	388	91.94
Windowed	14	3.32
Divorced	17	4.03
Total	422	100
<b>Monthly Income</b>		
<570	59	14
570-1140	145	34.36
>1140	218	51.65
Total	422	100

**Table 1:** Characteristics of pregnant women in public health facilities in Arba Minch town Gamo Gofa Zone SNNPR, Ethiopia 2016.

### Characteristics related to reproductive, obstetric, behavioral and family history of the women

Of the total women included into the study, about 325 (77%) were menarche at their age of 13-15 years and 43 (10.2%) of them started before their thirteenth birth day. About 418 (99.05%) of them became pregnant at the age less than 35 years and 4 (0.95%) were pregnant at

the age greater than or equal to thirty five years. About 270 (65.98%) of the women were primigravida (got pregnant for the first time) and 152 (36.02%) of them were at their second or more pregnancy. Of the total participants, 26 (9.76%) had changed paternity from the previous pregnancy and 60 (14.22%) of the women had conceived twins. Regarding infertility, about 21 (5%) of them had history of infertility. History of chronic diseases in the previous pregnancy was seen in 37 (13.7%) of the informants while 77 (18.25%) of them developed preeclampsia with the current pregnancy (Table 2).

From the total women of the study, 5 (1.18%) were tobacco smokers and the rest had no habit of smoking. About 51 (12%) of the informants were drinking alcohol, while the rest 371 (87.91%) didn't. There was family history of hypertension in 108 (25.6%) of them. Diabetes mellitus (DM) was seen in the families of 45 (10.7%) informants and seventy four (17.5%) of them had stress full condition in their life. The prevalence of preeclampsia in the current study was 18.25%

Variable	Frequency	Percent %
<b>Age at first menstruation (in years)</b>		
<12	43	10.2
13-15	325	77
>16	54	12.8
Total	422	100
<b>Age at first pregnancy (in years)</b>		
<35	418	99.05
>35	4	0.95
Total	422	100
<b>Gravidity</b>		
One	152	36.02
>2	270	63.98
Total	422	100
<b>Waited time b/n pregnancy (in years)</b>		
One	85	31.5
>2	185	68.5
Total	270	100
<b>Change paternity after previous pregnancy</b>		
Yes	26	9.73
No	241	90.26
Total	267	100
<b>ANC follow-up during the first pregnancy</b>		
Yes	246	92.13
No	21	7.87
Total	267	100
<b>Chronic disease in previous pregnancy</b>		

Yes	37	13.7
No	233	86.3
Total	270	100
<b>History of infertility</b>		
Yes	21	5
No	401	95
Total	422	100
<b>Parity</b>		
Nulliparous	137	32.5
One delivery	132	31.3
>2	153	36.25
Total	422	100
<b>Multiplicity of pregnancy</b>		
Singleton	362	85.78
Twin	60	14.22
Total	422	100
<b>BMI</b>		
<18.5	5	1.2
18.5-24.5	367	86.96
24.6-29.9	35	8.3
>30%	15	3.5
<b>Preeclampsia</b>		
Yes	77	18.25
No	345	81.7
Total	422	100

**Table 2:** Reproductive and obstetric characteristics of pregnant women at public health facilities in Arba Minch town Gamo Gofa Zone SNNPR, Ethiopia 2016.

### Factors associated with preeclampsia

Logistic regression was done to identify factors that have significant association with preeclampsia. Maternal age, family history of hypertension, marital status, family history of diabetes mellitus, income, parity, obesity, multiple gestation, age at menstruation, age at first pregnancy, gravidity, history of infertility, multiplicity of pregnancy, stress, tobacco use, alcohol use were some of the factors assessed.

In bivariate analysis; maternal age, occupation, education, age at first pregnancy, paternity, parity, twin pregnancy, family history of hypertension & DM, alcohol use and stress showed association with preeclampsia at p value <0.25. However, marital status, income, age at menarche, gravidity, history of infertility, waiting time between pregnancy, ANC visit and chronic disease showed no association in bivariate analysis at that p-value. All the variables that showed

association at p<0.25 were further assessed in multivariable logistic regression (Table 3).

Variable	Preeclampsia		OR (95% CI)		AOR (95%)
	Yes	No	COR (95%)		
<b>Age (in year)</b>					
≤ 24	31	198	17.03 67.69)	(4.29,	0.47 (0.017, 0.29)
25-29	23	121	14.03 56.87)	(3.46,	0.090 (0.017, 0.47)
30-34	15	23	4.09 17.92)	(0.933,	0.018 (0.011, 0.024)
≥ 35	8	3	1		1
<b>Multiplicity</b>					
Twin	7	53	1		1
Singleton	70	292	0.551 1.264)	(0.240,	0.307 (0.053, 0.079)
<b>Chronic HTN</b>					
No	67	295			
Yes	10	50	5.2 (2.8-15.6)		3.3 (2.33-12.9)
<b>Family history of HTN</b>					
No	44	270	1		1
Yes	33	75	5.370 0.622)	(0.220,	3.52 (1.31, 9.45)
<b>Family history of DM</b>					
No	64	313	1		1
Yes	13	32	1.503 1.512)	(1.250,	2.300 (1.13, 4.78)
<b>Alcohol use</b>					
No	60	311	1		1
Yes	17	34	3.38 0.735)	(0.203,	8.060 (2.28, 18.51)

**Table 3:** Bivariate and multivariate logistic regression analysis of factors associated with preeclampsia among pregnant women in Arba Minch town public health institutions, Arba Minch, SNNPR, Ethiopia, 2016.

The odds of age of respondents less than 24 had 40% less likely to develop preeclampsia when compare to age ≥ 35 (AOR=0.47; 95% CI: (1.017, 0.296)). The odds of single pregnancy were 30.7% (AOR=0.307; 95% CI: (0.053-1.79)) less likely to develop preeclampsia compare to twin pregnancy.

A women who had family history of hypertension were 3.52 (AOR=3.52; 95% CI: (1.31-9.45)) times more likely to develop preeclampsia as compare to those who didn't have family history of hypertension. In the similar manner, women who had family history of diabetic mellitus were 2.3 times more likely to develop preeclampsia as compared to those who didn't have family history of diabetic mellitus.

Alcohol users developed preeclampsia about eight times more likely (AOR=8.06; 95% CI: (2.3, 18.5)) compare to non-users.

Educational status, waiting time between pregnancies, occupation, level of education, and change of paternity didn't show significant association in multi variable logistic regression analysis.

## Discussion

Preeclampsia is a disorder of pregnancy characterized by high blood pressure and a significant amount of protein in the urine. It is one of the major causes of maternal mortality worldwide. This study attempted to examine the prevalence and factors associated to preeclampsia based on a sample of 422 pregnant women who had ANC follow up at Arba Minch town public health facilities. The finding of this study showed that 77 (18.25%) of pregnant women had preeclampsia on their current pregnancy. This prevalence is lower than the prevalence reported from a study done in Jimma university referral hospital [21-25] and the study done in Black Lion Hospital [20]. The difference might be due to place of residence, time gap, referral hospital reviving patients out of the catchment area. The two studies; the study conducted in Jimma university referral hospital and the one which was conducted in Black Lion Hospital; took their study participants from urban areas. But in our case, some of the participants were rural dwellers.

According to the finding of the current study, the odds of developing preeclampsia are higher in older women than in younger women. A similar finding was reported from a study done in Dessie, Ethiopia [26-29]. This might be because of the increase in age increases the risk of developing cardiovascular disease [5]. A recent finding also claimed that as woman gets older, the haemodynamic adaptation during pregnancy become more difficult [28].

This study identified that multiple pregnancy is one factor for preeclampsia. Women with a single pregnancy were 30.7% less likely to develop preeclampsia compare to women with twin pregnancy. A Similar finding was reported by other studies [18,23] which argued that multiple pregnancies had significant effect on the incidence of preeclampsia. This might be due to a circulating antiangiogenic molecule of placental origin (which is called fms-like tyrosine kinase 1 (sFlt1)) that plays a central role in the development of preeclampsia by antagonizing placental growth factor (PlGF) and vascular endothelial growth factor signaling in the maternal vasculature [29]. And also it might be due to the psychological and physiological stress that develops in the women because of the multiple pregnancy [28].

Our study found that there is significant association between preexisting hypertension (chronic hypertension) and preeclampsia. The finding was in line with many studies' findings [18,29,30], which showed that women who had preexisting hypertension (chronic hypertension) were more likely to have preeclampsia as compared to women who had no preexisting hypertension. This might be related to the effect of the previous hypertension which might contribute to the development of coronary heart disease, stroke, heart failure and kidney disease.

Similarly, in our study, it was found that women who had family history of hypertension were more likely to develop preeclampsia than those who didn't have family history of hypertension. The finding is consistent with the reports of other studies [25,26]. The reason might be the association of some cardiovascular disorders with genetic inheritance.

According to WHO, DM is disposing factors for incidence of hypertension. A similar condition is seen among our study participants. Preeclampsia was more common among women with DM than without. A finding from Thailand also supports the same finding [28].

Several studies reported that alcohol consumption is a disposing factor for preeclampsia [18,25,26]. The same finding was also seen among our study participants. The reason might be because of alcohol use may have effect on renal function and systemic blood vessels that may expose the person to secondary hypertension and the secondary hypertension ultimately leads to preeclampsia.

## Conclusion

Preeclampsia was less prevalent in this study than other similar studies. Some of the factors associated with preeclampsia were multiplicity, older maternal age, alcohol consumption, personal or family history of hypertension, and family history of DM. It is important to encourage the women in order to make them develop health seeking behavior so that they would get a chance to be diagnosed of preeclampsia as early as possible.

## Availability of Data and Materials

Further reports and supporting materials can be found at [www.amu.edu.et](http://www.amu.edu.et).

## Competing Interests

The authors declare that they have no competing interests.

## Authors' Contributions

Iyasu Taye, Erkihun Gemedo, Tigist Gezahegn and Gezahegn Urmale wrote the proposal, participated in data collection, analyzed the data and drafted the paper.

We approved the proposal with some revisions, participated in data analysis. MS and WE drafted the manuscript. All authors read and approved the final manuscript.

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