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RISK FACTORS OF PREGNANCY RELATED HYPERTENSION AMONG WOMEN ATTENDING MATERNAL HEALTH CARE SERVICE IN SELECTED PUBLIC HOSPITALS OF TIGRAY, ETHIOPIA

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ABSTRACT

Introduction: Hypertensive disorder of pregnancy is the commonest medical complication of pregnancy. The incidence varies in different populations and is also affected by the definition used. Generally the problem is more common in the developing countries than it is in the developed countries. Several studies have shown that null parity, extreme ages, race (being black) and others as risk factors for this problem.

Objective: This thesis is to determine risk factors of pregnancy related hypertension among women attending Maternal Health Services in Tigray zonal Public Hospitals between July 2010 and June 2012.

Methods: This case-control study was done at the selected zonal Hospitals of Tigray Regional state between March 2013 and June 2013. All the 80 deliveries complicated with hypertension were compared and analyzed with 320 pregnancies that were not complicated with the disease. Data analysis was performed using SPSS. The differences were considered to be significant if the p-values were less than 0.05.

Results: Using bivariate analysis, several factors linked to hypertensive disorder in pregnancy were identified. They included early adolescence, illiteracy, and lack of occupation, null parity and family history of hypertension. At multivariate analysis, the risk of having hypertension during pregnancy remained greater for illiterate women (OR: 1.8; 95%CI: 1.0-3.1), early age pregnancy (OR: 2.6; 95%CI: 1.3- 5.1)

Conclusion and recommendation: In general early age pregnancy, housewives, women with histories of hypertension during pregnancy were significant in the bivariate analysis. However risk factors for hypertensive diseases in pregnancy in Tigray seem to include early teenage status and illiteracy, Quality antenatal care services with good obstetric and neonatal care at delivery are essential for early recognition and management of hypertensive disorders of pregnancy. The knowledge about the aforesaid factors seems to lay the tracks for its prevention in Tigray.

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INTRODUCTION

Hypertension is the most common medical disorder of pregnancy and is reported to complicate up to 1 in 10 gestations and affects an estimated 240,000 women in the United States every year. Although physicians for millennia have recognized preeclampsia, relatively little is known about its pathogenesis and prevention. The primary concern about elevated blood pressure relates to the potential harmful effects on both mother and fetus.

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These potential adverse effects range in severity from trivial to life threatening (Dutta, 2004). Hypertensive disorder in pregnancy is a condition in which the pregnant woman presents an elevated blood pressure during pregnancy or puerperium as defined in 1986 by the American College of Obstetricians and Gynecologists and adopted by the World Health Organization (Mohanty *et al.*, 2006). Previous reports defined hypertension in pregnancy as a condition presented with a diastolic blood pressure of at least 90 mmHg or a systolic blood pressure of at least 140 mmHg, or a rise in diastolic blood pressure of at least 15 mmHg or a rise of 30 mmHg in systolic blood pressure (Mohanty *et al.*, 2006; Roberts *et al.*, 2003). In the obstetric condition, the Working

Group recently defined hypertension in pregnancy as a condition in which, the diastolic blood pressure is at 90 mmHg or above, or a systolic blood pressure is at 140 mmHg or above. Moreover, World Health Organization considers only an elevated value of diastolic blood pressure as a criterion for defining the disorder. The disorder complicates 4-10% of pregnancies (American College of Obstetricians and Gynecologists, 1996). The American College of Obstetricians and Gynecologists and the United Nations Organization recognize four categories of hypertension in pregnancy. These include chronic hypertension, gestational hypertension, preeclampsia / eclampsia, and superimposed preeclampsia/eclampsia, a condition defined as chronic hypertension complicated by preeclampsia/eclampsia (American College of Obstetricians and Gynecologists, 1996; Sibai *et al.*, 2005). In a multicenter study, approximately 30% of hypertensive disorders of pregnancy were due to chronic hypertension while 70% of the cases were diagnosed as gestational hypertension/preeclampsia (Sattar *et al.*, 2002).

Risk factors for pregnancy hypertension and pre-eclampsia have been well documented. Factors that increase risk include null parity, older maternal age, multiple births, diabetes, chronic hypertension, obesity, previous pre-eclampsia, family history of pre-eclampsia, a new partner and/or ≥ 10 years since last pregnancy, renal disease, and the presence of antiphospholipid antibodies. (Sattar *et al.*, 2002; Ramsay *et al.*, 2003; Wilson *et al.*, 2003) Decreased risk of pregnancy hypertension and pre-eclampsia has been associated with placenta praevia, smoking (although smoking may only be protective in the non-obese), summer births, low-dose aspirin and calcium supplementation in high-risk women, treatment of gestational diabetes and use of antihypertensive medications. (Roberts *et al.*, 2003; Yucesoy *et al.*, 2005) As the majority of cases of pregnancy hypertension and pre-eclampsia occur at term, increasing rates of early elective delivery may reduce their frequency. (Ramsay *et al.*, 2003) Trends in pregnancy hypertension and pre-eclampsia are the result of the effects of changes in all these factors.

According to the report of the National Center for Health Statistics hypertension complicates around 3.7% of pregnancies in the USA and 16% of pregnancy related deaths from 1991–1997 were from complications of pregnancy related hypertension. Black women were 3 times at increased risk to die from preeclampsia as white women (American College of Obstetricians and Gynecologists, 1996). Hypertensive disorder of pregnancy is the commonest medical complication of pregnancy. The incidence varies in different populations and is also affected by the definition used. Generally the problem is more common in the developing countries than it is in the developed countries. Several studies have shown that null parity, extreme ages, race (being black) and others as risk factors for this problem. There is a significant risk of both maternal and perinatal morbidity and mortality in pregnancies affected by the disorder. The complications are more common and worse in the underdeveloped countries; poor pregnancy outcomes are also associated with lack of Antenatal care follow up which is associated with delayed recognition and intervention in the affected mothers (American College of Obstetricians and Gynecologists, 1996; Cunningham *et al.*, 2005).

Studies have indicated that physical activity, diet may have a role in reducing the risk of hypertensive disorders of pregnancy, but such studies are sparse, have yielded inconsistent results, and have been conducted in predominantly white populations with little Latina representation (3, 6). Several studies have analyzed the risk factors for hypertensive disorders in pregnancy and the identified risk factors include obesity, a family history of hypertension, alcohol intake, heart failure, stroke and left ventricular hypertrophy and smoking (Yucesoy *et al.*, 2005; American College of Obstetricians and Gynecologists, 1996; Cunningham *et al.*, 2005) (Miller David, 2007). Hypertension during pregnancy, particularly pre-eclampsia, is one of the major obstetrical problems in less-developed countries and the causes of most cases remain unknown. Obstetricians are attempting to early recognize and diagnose this complication. However, biophysical and biochemical tests have been suggested to identify women who are at increased risk of developing of this complication in the future. Available literature indicates that there has been minimum attention on blood pressure control and identifying the risk factors of hypertension disorder during pregnancy among PIH patients locally, regionally and globally.

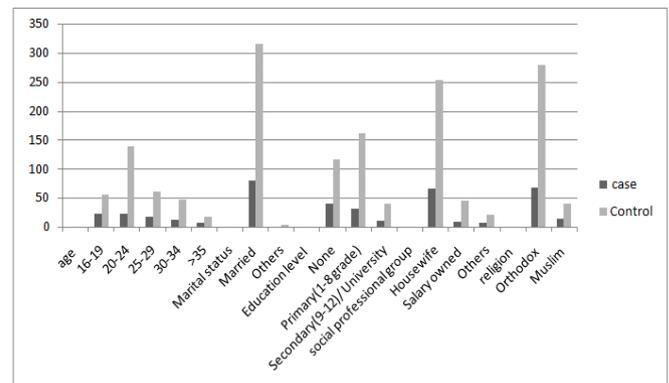


Figure 1. Socio-demographic and reproductive Characteristics of participants

This study therefore aimed at closing this gap in literature by highlighting the level of blood pressure control among PIH pregnant women and to assess the Effectiveness of Planned Teaching Program on Knowledge Of Antenatal mothers regarding prevention of pregnancy induced hypertension in selected public Hospitals of Tigray. This study aimed to identify the possible risk factors for hypertensive disorders in pregnancy, in order to propose specific preventive measures for the far North Ethiopian. A retrospective study on global impact of pre-eclampsia and eclampsia was done in the Centre for Epidemiology and Biostatistics, University of Leeds, Bradford, UK. Study described that over half a million women die each year from pregnancy related causes, 99% in low and middle income countries. In many low income countries, complications of pregnancy and childbirth are the leading cause of death amongst women of reproductive years. The Millennium Development Goals Number four have placed maternal health at the core of the struggle against poverty and inequality, as a matter of human rights. Ten percent of women have high blood pressure during pregnancy, and preeclampsia complicates 2% to 8% of pregnancies. Preeclampsia can lead to problems in

the liver, kidneys, brain and the clotting system. Risks for the baby include poor growth and prematurity. Although outcome is often good, preeclampsia can be devastating and life threatening. Overall, 10% to 15% of direct maternal deaths are associated with preeclampsia and eclampsia. Where maternal mortality is high, most of deaths are attributable to eclampsia, rather than preeclampsia. Perinatal mortality is high following preeclampsia, and even higher following eclampsia.

METHODS

Study settings

This study was conducted in four zonal and one Referral Public Hospitals of Tigray Regional state of Northern Ethiopia from March 2013 to June 2013. Under the four facility tiers of the Ethiopian national health care system (referral hospital, zonal/district hospital, health center, and health post) the Tigray Health Bureau maintains 1 referral hospital, 12 zonal/district hospitals, 38 health centers, and 600 health posts. In Tigray region which reports an annual crude birth rate of 30.9/1000; an annual all cause mortality rate of 9/1000; and an annual mortality rate for women of reproductive age of 6.3/1000. The most recent maternal mortality ratio for Ethiopia (2008), estimated by the WHO is 450/100,000 live births. 85% of the population lives in rural areas.

Study design, participants and sampling procedure

Hospital based unmatched case control study was conducted.

Cases: all the mothers who had pregnancy related hypertension during pregnancy, labor & delivery and up to 42 days after delivery in Tigray public hospitals from 1st of July 2010 to 30th of June 2012.

Controls: All the mothers who gave birth in selected Tigray Public Hospitals from 1st of July 2010 to 30th of June 2012 and surviving and do not have pregnancy related hypertension disorder.

Sample size was calculated using Epi info 5.2.1 and the required sample size was 400 (80 cases 320 controls). The assumption used for sample size calculation is: 95% CI, and 80% power, 4.5 odds ratio and case to control ratio of 4:1 and the prevalence of exposure among controls is 5% based on similar study done in Ethiopia. There are 7 zonal and one specialized hospitals in Tigray regional state. The study was conducted in 4 zonal Hospitals and one specialized hospital. According to the two year annual report, between 1st July 2010 and 30th June 2012 from the four zonal hospitals and one specialized hospital, charts of 400 clients was selected. Based on this reports five hospitals of Tigray that have a pregnancy related hypertension record during the study period (Ayder Referral Hospital=16, Mekelle Hospital=16, Adi-grat Hospital=16, St. Merry Hospital=16 and Lemlem Carl Hospital=16) included in the study. Cases were proportionally allocated to each hospital based on the pregnancy related hypertension records. These hospitals are selected by using simple random sampling technique lottery method from all

hospitals. Four controls were included for one case from the selected hospitals by Sample Random Sampling method. Homogeneity of control with cases was considered during selection as much as possible to ensure representativeness of the population from which they drawn. The mothers who was selected as controls was those in the same season who had pregnancy or closest in time to the mother who had pregnancy induced hypertension.

Data management and analysis

Data were collected from Card Room through check list guided by the registration book from the Gynecology and Obstetrics department. Basic demographic information was gathered from the chart before reading the history of the women. The responsibilities of the data collectors were filling the questionnaire after through orientation and training. The supervisors were provided with all items necessary for data collection on each day, checked questionnaires for completeness and addressed problems being raised during data collection. On each data collection day some percent of the collected data were reviewed by the principal investigator, any problem faced during data collection was discussed and immediate solution was made. Sources of information of the study subject were obtained from reviewing charts in delivery ward, operating theatre and health management information system registers. Data that were collected from quaternary were then entered, cleaned, coded and analyzed by SPSS version 20. Frequencies and sorting of each variable were used to check for missed variables, outliers and errors. An error found during data cleaning was corrected based on the hard copy. The presence of significant association between dependent and independent variables was checked using bivariate analysis. Independent variables that associate with the dependent variables were included in the model for multivariate analysis using logistic regression. Graphical presentation such as tables, line graphs and pie charts was used to present the result findings of the study.

Ethical Considerations

Ethical clearance to conduct the study was obtained from Mekelle University College of Health Sciences Ethical Review Committee a permission to conduct the study was obtained from MU-CHS. Written and Verbal consent was obtained from the study subjects and the right of the respondents to withdraw or not to participate was respected. Additionally, names of participants were not used in the study and information obtained from patients was held with confidentiality.

RESULTS

Socio-demographic and reproductive characteristics

For a period of two years at the selected five Tigray Public Hospitals, (July 2010 to Jun 2012), there were 16,985 deliveries among which 400 charts are selected for the study of which 80 were cases (mothers having pregnancy induced hypertension) and the remaining 320 were controls (mothers do not have hypertension).

Table 1. Socio-demographic and reproductive characteristics of participants

Socio-demographic and reproductive	Preeclampsia/eclampsia N = 80 , N (%)	No hypertension N = 320, N (%)	Total N = 400, N (%)	P-value characteristics
Age: Mean (SD)	18 (4.01)	24.8 (11.39)		
16-19 years	23 (28.8)	4 (16.9)	77 (19.3)	
20-24 years	22 (27.5)	139 (43.4)	161 (40.3)	
25-29 years	17 (21.3)	61 (19.1)	78 (19.5)	0.005
30-34 years	12 (15.0)	47 (14.7)	57 (14.3)	
>35 years/ others	6 (7.5)	18 (5.6)	24 (6.0)	
Religion				
Orthodox	67 (83.8)	280 (87.5)	347 (99.3)	
Muslim	13 (16.3)	40 (12.5)	53 (13.3)	0.628
Marital status				
Married	80 (100)	317 (99.1)	397 (99.3)	
Others	0 (0)	3 (0.9)	3 (0.75)	0.83
Education level				
None	39 (48.8)	117 (36.7)	156 (39)	
Primary	31 (38.8)	162 (50.6)	193 (40.3)	0.026
Secondary/ University	10 (12.5)	41 (12.8)	51 (13)	
Socio-professional group				
Housewife	66 (82.5)	253 (79.4)	320 (80)	0.489
Salary owned/ others	14 (17.5)	67 (20.9)	81 (20.3)	
History of ectopic pregnancy				
Yes	0 (0)	1 (0.3)	1 (0.25)	1.000
No	80 (100)	319 (99.7)	399 (99.75)	
History of abortion				
Yes	5 (22.4)	21 (6.7)	26 (6.5)	0.963
No	75 (93.8)	299 (93.4)	374 (93.5)	
Number of deliveries				
0	37 (46.3)	130 (40.6)	167 (41.8)	
1	26 (13.8)	109 (34.1)	135 (33.8)	0.461
≥ 2	17 (32.5)	81 (25.3)	98 (24.5)	
History of premature delivery				
Yes	3 (3.8)	6 (98.3)	9 (98.2)	0.200
No	77 (96.3)	314 (98.1)	391 (97.8)	

The mean age of the study participant of case were 18, 4.01 standard deviation and the mean age of the study participants of the controls were 24.8, 11.39 standard deviation. Eighty (100%) of the case sample were married. Three hundred ninety seven (99.1%) of the control were married. Sixty seven (83.8%) were Orthodox, thirteen (16.3%) were Muslim in religion among the case and two hundred eighty (87.5%) were Orthodox, forty (12.5%) were Muslim in religion among the control studies. In terms of level of education among the cases 39 (48.8%) illiterate, 10(12.5%) attained secondary level of education. A considerable percentage, 31(38.8%) attained the minimum level of education which was the primary level and among the controls 117 (36.6%) were illiterate, 41(12.8%) attained secondary level of education. A considerable percentage, 162(50.6%) attained the minimum level of education which was the primary level. It was also noted that the majority, 66 (82.5%) were unemployed housewife among cases and 254 (79.4%) were housewife among controls. A total of 14 (17.5 %) were salary owned from case studies and 66 (20.6%) were from

control studies. Among the selected overall 80 deliveries of case studies, 4 had hypertension complicated by seizures (5%) but 76 did not (95%). 67 Women (83.8%) had elevated blood pressure (gestational HPT) during pregnancy when compared with women with known have hypertension. the mothers with hypertension presented with history of maternal hypertension were three (3.8%), history of paternal hypertension were five (6.3%) and have history of chronic hypertension were five (6.3%). Five women (6.3%) had history of abortion when compared with out hypertension 21(6.6%), history of premature delivery (3.8% vs. 1.9%). Meanwhile, women with hypertensive disorder in pregnancy were at early teenage years (28.8% vs. 17.2%) compared to control women. The illiteracy rate was also higher among the women with hypertension disorder (48.8% vs. 36.6 %). (Table1).

Maternal related factors

The number of patients with hypertensive disease in pregnancy was significantly greater in pregnancy when taking into account a personal history of maternal hypertension in

Table 2. Frequency distribution of patients according to the personal and family history of hypertension

History of hypertensive disease	Preeclampsia/eclampsia N = 80, N (%)	No hypertension N = 320, N (%)	Total N = 400, N (%)	P-value
History of maternal hypertension				
Yes	3 (3.8)	0 (0)	3 (0.8)	0.999
No	77 (96.2)	320 (100)	397 (99.2)	
History of paternal hypertension				
Yes	5 (6.3)	0 (0)	5 (1.3)	0.999
No	75 (93.8)	320 (100)	395 (98.7)	
History of hypertension in pregnancy				
Yes	1 (1.3)	0 (0)	1 (0.25)	1.000
No	79 (98.8)	320 (100)	399 (99.8)	
History of chronic hypertension				
Yes	5 (6.3)	0 (0)	5 (1.3)	0.999
No	75 (93.8)	320 (100)	395 (98.6)	

Table 3. Risk factors for developing hypertensive disorders in pregnancy

History of hypertensive disease	Preeclampsia/eclampsia N = 80, N (%)	No hypertension N = 320, N (%)	Total N = 400, N (%)	P-value
Age				
16-19 years	23 (28.8)	54 (16.9)	77 (19.3)	
20-24 years	22 (27.5)	139 (43.4)	161 (40.3)	
25-29 years	17 (21.3)	61 (19.1)	78 (19.5)	0.005
30-34 years	12 (15.0)	47 (14.7)	57 (14.3)	
>35 years/ others	6 (7.5)	18 (5.6)	24 (6.0)	
Number of deliveries				
0	37 (46.3)	130 (40.6)	167 (41.8)	
1	26 (32.5)	109 (34.1)	135 (33.8)	0.461
≥ 2	17 (21.3)	81 (25.3)	98 (24.5)	
Education level				
None	39 (48.8)	117 (36.7)	156 (39)	
Primary	31 (38.8)	162 (50.6)	193 (48.3)	0.026
Secondary/ University	10 (12.5)	41 (12.8)	51 (12.7)	

Table 4. Adjusted OR risk factors for developing hypertensive disorders in pregnancy

History of hypertensive disease	Preeclampsia/eclampsia N = 80, N (%)	No hypertension N = 320, N (%)	Total N = 400, N (%)	P-value
16-19 years	23 (28.8)	54 (16.9)	77 (19.3)	
20-24 years	22 (27.5)	139 (43.4)	161 (40.3)	
25-29 years	17 (21.3)	61 (19.1)	78 (19.5)	0.005
30-34 years	12 (15.0)	47 (14.7)	57 (14.3)	
>35 years/ others	6 (7.5)	18 (5.6)	24 (6.0)	
Marital status				
Married	80 (100)	317 (99.1)	397 (99.3)	
Others	0 (0)	3 (0.9)	3 (0.75)	0.83
Education level				
None	39 (48.8)	117 (36.7)	156 (39)	
Primary	31 (38.8)	162 (50.6)	193 (48.3)	0.026
Secondary/ University	10 (12.5)	41 (12.8)	51 (12.7)	
Number of deliveries				
0	37 (46.3)	130 (40.6)	167 (41.8)	
1	26 (32.5)	109 (34.1)	135 (33.8)	0.461
≥ 2	17 (21.3)	81 (25.3)	98 (24.5)	

pregnancy 3.8%, a personal history of chronic hypertension 6.3%, a history of paternal hypertension 6.3% (Table 2). No statistically significant differences were found between the two groups concerning the history of maternal health condition and maternal behavior (Table 2).

Risk Factors associated with Pregnancy related Hypertension among women

A greater risk of having hypertension during pregnancy for the age group 16-19 years (OR: 2.6; 95%CI: 1.3- 5.2), women without any school education (OR: 1.8; 95%CI: 1.0-3.1) and have some risk of having hypertension during pregnancy were lack of occupation, null parity and maternal history of hypertension (Table 3). After adjustment for different factors linked to the occurrence of hypertension, the risk of having hypertension during pregnancy remained greater for women without any school education (OR: 2.6; 95%CI: 1.3- 5.2), age group 16-19 years (OR: 2.6; 95%CI: 1.3- 5.2)(Table 4)

DISCUSSION

The risk factors for hypertensive diseases in pregnancy in Tigray region; in the bivariate Analysis early adolescence, illiteracy, lack of occupation, null parity and maternal history of hypertension were found to be the predictors of pregnancy related hypertension. But in the multivariate analysis, the risk of having hypertension during pregnancy remained greater for illiterate women (OR: 0.53; 95%CI: 1.0-3.1), early age pregnancy (OR: 2.6; 95%CI: 1.3- 5.1). The extreme ages of reproductive years are well known risk factors for hypertension during pregnancy with high incidence rates in teenagers (Cunningham, 2005; Federal Democratic Republic of Ethiopia Ministry of health, 2008). Many authors have identified young age as a risk factor for hypertension during pregnancy, as is the case in the present study (Sibai, 1996; ACOG, 2002). Adeyinka *et al.* found the prevalence of eclampsia and preeclampsia among adolescents to be 20% in comparison to only 3.33% among the controls (Sibai, 1996). In another study, a 2.9% vs. 0.6% preeclampsia prevalence was reported in teenagers compared to women aged 25-34 years (ACOG, 2002). In the present study the result shows the number of early teenagers among patients with hypertension was 28.8% compared to 16.9% among the controls. We found that early teenage status (16-19 years) was associated with an increased risk for hypertensive disorders in pregnancy (OR: 2.6; 95%CI: 1.3- 5.2; $p=0.0006$).

Similar findings were reported by Saftlas *et al.* (1990) who revealed that black teenagers aged 15-18 years had 2.6-fold risk for preeclampsia compared to women aged 24-34 years. Studies have reported that a higher age is also an important risk factor for hypertension in pregnancy, especially in developed countries (Saftlas *et al.*, 1990; Adeyinka *et al.*, 2010). Assis *et al.* (2003) found that age above 30 years was associated with a risk for preeclampsia superimposed on chronic hypertension (OR: 5.218; 95% CI: 1.873 to 14.536) (Adeyinka *et al.*, 2010). A similar result was reported by Suzuki *et al.* (1990) who found that, in singleton pregnancies, the developing preeclampsia was associated with maternal age 35 years or above.

Both studies reported the association of infertility treatment with an increased risk for hypertensive disorders in pregnancy as this was also recently reported by Poon *et al.* (2000), but Tigray is a semi-urban area and few women are likely to be under ovulation treatment, low economic states and low in daily diet requirement. In the present study, the percentage of women aged above 35 years old was not similar in the two study populations revealing that, this age group was not associated with an increased risk of hypertensive disorders in pregnancy.

Some studies are necessary to understand better why there is lack of effect of the age progress on the occurrence of hypertensive disorders in pregnancy. The absence of previous deliveries is widely reported as a risk factor for hypertensive disorders in pregnancy (Saftlas *et al.*, 1990; Matthys *et al.*, 2004; Duley, 2003). Assis *et al.* (2010) identified primiparity as a risk factor for gestational hypertension (OR: 5.435; 95% CI: 1.9-15.4). In the present study, we found that nulliparity was not associated with a nearly risk for hypertensive disorders in pregnancy (OR: 1.2; 95% CI: 0.6 -2.1). Our findings are in conformity with the aforementioned literature reports. In the present study, women with at least two previous deliveries represented 21.3% vs. 25.3% respectively when comparing hypertensive to non hypertensive women. Previous studies did find multiparity as a risk factor for hypertension in pregnancy, however, they reported an increased risk the nulliparous women had a different partner (21, 22). We found that illiteracy was associated with about 2-fold risk for presenting hypertensive disorder in pregnancy (OR: 1.7; 95% CI: 1.1-2.4). The absence of school education, identified as an independent risk factor for hypertensive disorder in pregnancies, is well-documented in the literature (23, 24). Among the risk factors for preeclampsia Mittendorf *et al.* (25) identified less than a high school education (OR: 2.0, 95% CI: 1.1-3.6). The illiteracy rate in our population could influence the occurrence of hypertension in pregnancy by the simple reason that the low school level is associated indirectly to the precocious marriage and to limited access to health care, including family planning. Even though some authors have not found any difference in pregnancy outcomes between housewives and employed women (Jansen *et al.*, 2010), most publications state that workers have adverse outcomes (El-Gilany *et al.*, 2008; Bao *et al.*, 1999; Hjartardottir *et al.*, 2004). In the present study, housewives had a risk for hypertensive disorder in pregnancy (OR: 1.3; 95% CI: 0.6 -3.1). However, housewives, respectively, represent 82.5% and 79.1% in hypertensive and non-hypertensive study populations and could randomly influence the pregnancy risks. Hypertension during pregnancy is also known to be an important risk factor for developing hypertension in pregnancy (20). Previous preeclampsia as an independent risk for superimposed preeclampsia was reported to be associated with about 5-fold increase for the risk (OR: 4.757; 95% CI: 1.261-17.938). A higher risk of hypertensive disorder in pregnancy was reported among women with previous hypertension in pregnancy (OR: 7.6; 95% CI: 3.4-16.9) (Adeyinka *et al.*, 2010). Personal history of chronic hypertension is one of the reported risk factors for hypertensive diseases in pregnancy (National High Blood Pressure Education Program Working Group, 2000; Craici *et al.*, 2008).

Family history of hypertension was identified as a risk factor for hypertension in Ethiopia (Cunningham *et al.*, 2005). However, little is known separately about histories of paternal, sibling or maternal hypertension, although we were able to illustrate that the last one is not a risk factor for hypertensive disease in pregnancy. Some studies have reported body mass index and birth spacing as risk factors for hypertension in pregnancy, but those variables were not analyzed in the present study (Luealon and Phupong, 2010; Hjartardottir *et al.*, 2004).

Conclusion

Risk factors for hypertensive diseases in pregnancy in Tigray, Region included early teenage status, illiteracy, housewife status, nulliparity, and family and personal histories of hypertension. Knowledge of risk factors for hypertensive disorders in pregnancy may give tracks for prevention in the population of Tigray region and beyond. Pregnant women with pregnancy induced hypertension should be encouraged to adhere to reduction of dietary sodium intake and continuous teaching needs to be provided on PIH self-care knowledge to pregnant women with pregnancy induced hypertension and user friendly on PIH self care knowledge and hypertension control which will assist clients to adapt and maintain their health pertaining to diet, reduction in alcohol consumption reduction in tobacco consumption, physical activity and adherence to medication. Frequent in-service training for the staff members would also be essential in reducing the burden.

ACRONYMS

CHS: - College of health Sciences,
MU- Mekelle University,
PIH: - pregnancy induced hypertension,
WHO; - World Health Organization

Competing interests

The authors declare that they have no competing interests

Authors' contribution

YT wrote the proposal, participated in data collection, analyzed the data and drafted the paper. SB and AA approved the proposal with great revision, participated in data analysis and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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