



St. Paul's Hospital Millennium Medical College
School of Public Health

**Prevalence of Hypertensive disorders and associated factors among
pregnant women attending Antenatal care Clinic at St. Peter's
Specialized Hospital, Addis Ababa, Ethiopia, 2022: Cross sectional Study**

**A Research Thesis to be Submitted to St. Paul's Hospital Millennium,
Medical College School of Public Health in Partial Fulfillment for the
Requirements of Master of Public Health in Epidemiology**

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November, 2022
Addis Ababa, Ethiopia



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ACKNOLEGMENT

Above all I would like to express my gratitude to my Lord- Jesus Christ. To my advisors Dr. Takele Menna and Mr. Samson Zegeye I cannot find appropriate words to describe the dedication, diligence and discipline with which they guided me through this research thesis. Finally, I would like to give my deepest gratitude for every individual who support me to conduct this thesis.

Abstract

Background: Hypertensive disorder of pregnancy is a term used to describe pregnant women who are above 20 weeks of pregnancy having elevated blood pressure ($\geq 140/90$). Hypertensive disorders of pregnancy can also cause different maternal and fetal complications. According to WHO systemic analysis hypertensive disorders of pregnancy account for about 14% of maternal deaths globally. Preeclampsia is estimated to complicate 2-8% of pregnancies globally.

Objective: To assess the prevalence hypertensive disorders of pregnancy and its associated factors among women attending antenatal clinic follow up at St. Peter's Specialized Hospital.

Methods: Hospital based cross-sectional study was conducted from July 15, 2022 to August 15, 2022 at St. Peter's Specialized Hospital among selected pregnant women on follow up at the ANC clinic. The total sample was calculated to be 205. Systematic random sampling technique was used to select study participants from a total of 425 mothers that visited the ANC unit during the study period. Data collection process was conducted using a pre-tested and structured questionnaire through face-to-face interview. The data collectors were three trained midwife nurses who were supervised by experienced professional and the principal investigator. The filled questionnaires were checked for completeness daily. Double data entry and data cleaning were done before analysis. The data was entered in to EPI- INFO and was exported to and analyzed using SPSS version 25. Descriptive statistics such as frequency mean, percentage and analytic statistics such as odds ratio, simple and multivariable binary logistic regression models were employed to summarize the results. P-value < 0.05 was considered as statistically significant and findings were presented using texts, tables and graphs.

Results: Among the 205 pregnant mothers who participated in the study 27 (13.2) of them had Hypertensive disorders of pregnancy. Of which 13(6.34%) of them had gestational hypertension, and the remaining 6.82% of Hypertensive disorders of pregnancy had preeclampsia and preeclampsia superimposed on chronic hypertension each. Family history of hypertension ([AOR=2.838; 95% CI (1.114-7.288)]) was found to be factor associated with hypertensive disorders of pregnancy among the study participants.

Conclusion: This study identified that hypertensive disorders of pregnancy are more prevalent in the study area as compared to other studies. Additionally, family history of hypertension was observed as predictor of hypertensive disorders of pregnancy. Thus, early screening, diagnosis and providing better antenatal care for those mothers with family history of hypertension during their ANC follow up is mandatory to decrease the impact of this condition on pregnant mothers.

Key Words: Hypertensive disorders of Pregnancy, Gestational hypertension, Pregnancy, Antenatal care, Preeclampsia, St. Peter's specialized Hospital

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Acronym and abbreviations

ACOG.....	American College of Obstetrics and Gynecology
ANC.....	Antenatal Care
DM.....	Diabetes Mellitus
CDC.....	Central Disease Control
EDHS.....	Ethiopian demographic health survey
GHTN.....	Gestational Hypertension
HDP.....	..Hypertensive disorders of Pregnancy
HTN.....	Hypertension
IUFD.....	Intrauterine Fetal death
SDG.....	Sustainable Developmental Goals
SPHMMC.....	St. Paul’s Hospital Millennium Medical College
WHO.....	World Health Organization

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1. Introduction

1.1. Background.

Hypertensive disorders of pregnancy is a term used to describe pregnant women who are having elevated blood pressure ranging from mild elevation ($\geq 140/90$) to severe elevation of blood pressure ($\geq 160/90$) with or without various organ dysfunctions (1, 2).

Hypertensive disorders of pregnancy (HDP) cover a spectrum of medical conditions. The American College of Obstetrics and Gynecology (ACOG) classifies, HDP as a group of diseases and conditions that occur during pregnancy, including preeclampsia and eclampsia, gestational hypertension, chronic hypertension, and preeclampsia superimposed on chronic hypertension (3).

Hypertensive Disorders of pregnancy can also cause different maternal complications which include placenta abruption (placental separation from the uterus), seizure, hemolytic anemia, thrombocytopenia, platelet count $<100,000$), pulmonary edema, renal and hepatic injury. It can also lead to preterm delivery of the baby and may even cause both maternal and fetal death. (3, 4)

The UN inter-agency estimated the global maternal mortality ratio in 2017 to be 211 deaths per 100,000 live births (5). Sub-Saharan African countries contribute the largest number of maternal mortality ratio which is estimated to be 200,000 maternal deaths per year. Complications during pregnancy could happen without any warning during pregnancy or childbirth. Most pregnancy complications can be prevented through proper ANC, delivery and post delivery services (6).

Hypertensive Disorders of pregnancy is one of the commonest causes of maternal and perinatal mortality worldwide. According to WHO systemic analysis hypertensive disorders of pregnancy account for about 14% of maternal deaths globally and Preeclampsia is estimated to complicate 2-8% of pregnancies globally (7).

1.2. Statement of the problem

Hypertensive Disorders of pregnancy has become a major worldwide medical concern affecting both the mother's and fetal health condition (8). Among the hypertensive disorders that complicate pregnancy, pre-eclampsia and eclampsia are the major causes of maternal and perinatal mortality and morbidity(8, 9). Around 10% of still births worldwide are attributable to hypertension during pregnancy (10, 11). The majority of deaths due to pre-eclampsia and eclampsia are avoidable through the provision of timely and effective care to the women presenting with these complications(12).

The prevalence of HDP varies from country to country, and it is estimated that it affects between 2% -10% of pregnancies every year worldwide(7) . The magnitude of maternal mortality caused by HDP has shown improvement through early diagnosis at ANC Follow up and proper treatment. Despite the declines in hypertension-related mortality, growing numbers of women are experiencing hypertensive disorders of pregnancy due to factors including the rising obesity epidemic, delayed childbearing, along with behavioral factors like substance use and the use of assisted reproductive technologies (13).

A systematic review study conducted in 24 countries of Africa has shown that about 10% of women in Africa develop any form of HDP at some point during pregnancy or postpartum. The study also showed the highest number of pregnant women with HDP are in Sub-Saharan countries (14).

In Ethiopia Hypertensive disorders of pregnancy is also a common complication faced by pregnant women attending ANC follow up. HDP contributes to about 10.3% of maternal mortality in Ethiopia (15). According to a study done in Ethiopia regarding Pregnancy induced hypertension the pooled prevalence of HDP in Ethiopia was estimated to be 6.07% (16).

According to the Ethiopian demographic health survey (EDHS) report in 2016, pregnancy related maternal deaths were 412 from 100,000 live births (17) . Hypertensive disorders of pregnancy have become one of the major maternal causes for emergency caesarean section resulting in longer hospital stay postoperatively. A study conducted in Saint Paul's Hospital Millennium Medical College showed about 4.6% of emergency cesarean section are performed for the indication of severe preeclampsia (18).

Even though hypertensive disorders of pregnancy are one of the leading causes of maternal and perinatal mortality, information regarding the magnitude and factors related with HDP are limited in our country. Therefore, this study is hoped to add more insight to the topic and for possible better and timely intervention strategies in order to alleviate the impact and occurrences of hypertensive disorders of pregnancy among pregnant women in Ethiopia and abroad.

1.3. Significance of the Study

Hypertensive disorders of pregnancy are among significant public health problems with most of the affected patients found in low-income countries (19). One of the goals for SDG (Sustainable Developmental Goals) is to reduce the global maternal mortality ratio by less than 70 per 100,000 live births. In order to achieve this goal there is a need to act on the commonest causes of MMR one of them being Hypertensive disorders of pregnancy (20). HDP also has great impact on the perinatal outcome of the baby. Understanding more about the factors will enable in the prevention as well as treatment of affected pregnant women

According to a CDC report prevalence of hypertensive disorders of pregnancy among delivery hospitalizations increased from 13% to 16% from the year 2013 to 2019 (21). In our country Ethiopia, efforts have been made to assess the prevalence and the factors associated with hypertensive disorders of pregnancy; however, none of these studies were conducted in our study area.

Thus, this study aims at assessing the prevalence and associated factors of pregnancy related Hypertension in the study area (St. Peter's Specialized Hospital) and provide additional information and input for the Antenatal follow up program and interventions in the Hospital.

2. Literature Review

2.1. Magnitude of Hypertensive Disorders of Pregnancy

A retrospective population-based study done in Ireland on prevalence and risks of HDP has shown that around 5.9% of pregnant women were diagnosed with hypertensive disorders of pregnancy. Of these recorded HDP preeclampsia took the highest share (79%). Additionally, the study has shown that women with a diagnosis of HDP were twice as likely to develop placental abruption, almost twice as likely to deliver by cesarean section, 3.7 times more likely to develop preterm labor and delivery (22).

According to a population base study done on Epidemiological trends of maternal hypertensive disorders of pregnancy at the global, regional, and national levels the magnitude of HDP increased from 16.30 million to 18.08 million globally, with a total increase of 10.92 % from 1990 to 2019. The study has shown that highest prevalence of HDP in 2019 was detected in South Asia followed by sub-Saharan African countries mainly western and eastern sub-Saharan areas (23).

A systemic review and meta-analysis done on prevalence in sub-Saharan African countries has shown that the pooled prevalence of HDP was 8% (95% CI = [6, 10]). The subgroup analysis showed higher pooled prevalence in central Sub-Saharan Countries (6.7%; 95% CI = [3.1, 13.8] for preeclampsia). According to the study Preeclampsia and GHTN are the commonest specific types of HDP (24).

A meta-analysis conducted on Maternal and perinatal outcomes of hypertensive disorders of pregnancy in Ethiopia in 2019 has shown that 4% of women diagnosed with HDP ended up in maternal death (25).

2.2. Factors associated with socio-demographic and Behavioral Characteristics

A study done on factors associated with hypertension during pregnancy in Derashie Woreda, Ethiopia has shown that women whose age was ≥ 30 were 6.59 times more likely to develop hypertensive disorders of pregnancy than those who were younger (26).

Serial cross-sectional study conducted on the trends of the incidence of new onset hypertensive disorders of pregnancy among rural and urban areas in United States from 2007 to 2019 has shown that hypertensive disorders of pregnancy has doubled in each age group in both rural and

urban areas from the year 2007 to 2019 with the highest incidence being recorded from age 40-44. The study also showed that individuals living in rural area are 9% more likely to develop hypertensive disorders of pregnancy than those in urban areas with possible explanations of poverty and lack of access to antenatal care (27).

As the findings of another cross-sectional study done in public health institutions in Arba Minch town, SNNRPS showed those mothers who were drinking alcohol during the time of pregnancy were found to be 8 times more likely to develop preeclampsia than their counterparts. (28)

2.3. Reproductive and Obstetric Factors

An institutional based cross-sectional study done in Dessie town referral hospital showed nulliparous women had 11 times increased odds of developing hypertensive disorders of pregnancy compared to multiparous women (29).

A population-based cohort study done in Norway on risk factors for recurrence of Hypertensive Disorders of Pregnancy showed pregnant women having history of HDP during their first pregnancy had 20.7% recurrence of HDP in their second pregnancy. According to the study the recurrence of hypertensive disorder of pregnancy depends on the type of HDP in the previous pregnancy (30).

A population-based case-control study conducted in Washington State by using birth certificate and discharge records to assess the association of Gestational Hypertension and Gestational Diabetes reported a three times increased risk of preeclampsia among mothers with gestational diabetes compared with mothers without gestational diabetes (31).

In a study done in Ethiopia on prevalence and associated factors of preeclampsia among pregnant women attending ANC follow up at Metu Karl referral Hospital showed that women with current singleton pregnancy were less likely to be preeclamptic women than those women with current multiple pregnancy (32).

2.4. Factors associated with Family History of Chronic Illness

A study done in Ireland on the similar topic showed that pre-existing family history diabetes predisposes to HDP (22). In similar manner a cross-sectional study conducted in our country on Preeclampsia and associated factors In Dessie Town referral Hospital showed participants with

family history of Diabetes have two times odds of developing preeclampsia as compared with no family history (33).

A study done in Gondar town, Ethiopia health institutions regarding Hypertensive Disorders of pregnancy among women attending ANC follow up pregnant women who have family history of hypertension were 7.8 times more likely to develop hypertensive disorder of pregnancy when compared to those pregnant women who do not have family history of hypertension (34). A similar study conducted in Mezan-Tepi also showed five times greater odds of developing HDP in those patients with family history of hypertension (35).

2.5 Factors Associated with Participants Chronic Illness History

A study assessing risk factors for hypertensive disorders of pregnancy in Southern Brazil showed that those women with pre-existing hypertension were 7.05 more likely to develop worsening of hypertension during their pregnancy(36) .

A hospital based cross-sectional study done among pregnant women whose ANC follow up were at Wachemo University, Southern Ethiopia showed that women who had pre-existing diabetes were 7 times more likely to develop hypertensive disorders of pregnancy than their counterparts(37).

Conceptual frame work

Different factors play determining role in contributing for the development of Hypertension during pregnancy. These factors may be interrelated in determining the occurrence of HDP. This study will center on the perceived conceptual framework of factors determining Hypertensive disorders of pregnancy (15) . These factors include Socio- demographic and Behavioral factors, Obstetric and reproductive factors, genetic predisposition (family history of Hypertension and diabetes)

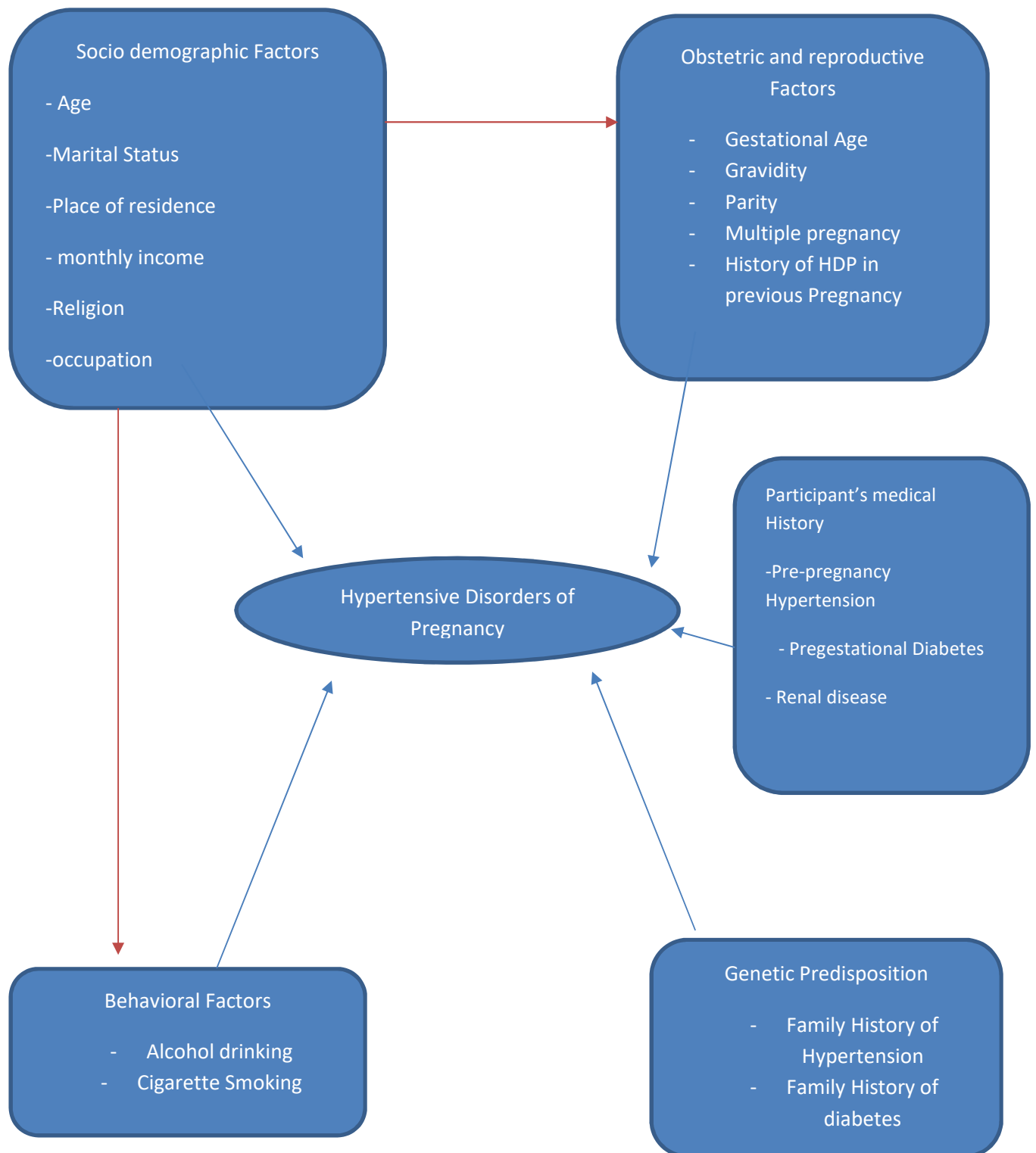


Figure 1. Conceptual Frame work for factors associated with HDP

3. Objectives

3.1. General objective

- To assess the prevalence of Hypertensive Disorders of pregnancy and its associated factors among pregnant women at ANC follow up at St. Peter's Specialized Hospital in Addis Ababa, Ethiopia.

3.2. Specific Objectives

- To assess the prevalence of Hypertensive disorders of Pregnancy among pregnant women at ANC follow up at St. Peter's Specialized Hospital in Addis Ababa.
- To identify factors associated with Hypertensive disorders of Pregnancy among pregnant women in the study area.

4. Methods and Materials

4.1. Study Area

The study was conducted at St Peter Specialized hospital. St. Peter Specialized hospital is one of the largest tertiary level public hospitals and few TB centers in Ethiopia. It was established in June, 1953. It is a public hospital under MOH. The hospital provides various services along with specialty in MDR-TB diagnosis and treatment. It serves as a referral TB hospital in AA, Ethiopia with a vision to become center of excellence in East Africa for the diagnosis and treatment of TB.(38)

The Hospital is one of the largest among the health training institutions in the country gives service of MDR TB, toxicology, cardiac center, chronic follow up, internal medicine, surgery, gynecology and obstetrics, pediatrics, neurosurgery and urology. St. Peter specialized Hospital offers diagnosis and treatment for approximately 110,000- 150,000 patients a year. (38)

The gynecology and obstetrics department of St. Peter's specialized Hospital provides a holistic maternal (Obstetric Care). The service provided incorporates Antenatal care, delivery including operative procedures and post-partal care as well. The ANC clinic provides service for both normal antenatal follow up as well as high risk pregnancy antenatal follow-up. The high-risk ANC follow-up is assigned for mothers having medical conditions that might complicate the wellbeing of the mother as well as the fetus during the period of pregnancy. Some of these conditions include Hypertensive disorders of pregnancy, gestational Diabetes, multiple pregnancy, thyroid hormone abnormalities

Based on HMIS registry logbook at St. Peter's it is estimated that every month an average of 400 pregnant women attend the ANC clinic at Hospital. The Hospital has a daily flow of about 25-40 pregnant women visiting the ANC Clinic (39, 40). Normal ANC follow-up includes 4 visits with inter visit gap ranging from 4 to 8weeks depending on the gestational age and maternal condition. Whereas for high-risk pregnant women the follow-up visit could be more frequent ranging between 2weeks to 4weeks depending on the maternal condition.

4.2. Study Period

The study was conducted from July 15, 2022 to August 15, 2022.

4.3. Study Design

A hospital based cross-sectional study was conducted at St. Peter's specialized Hospital

4.4. Source and Study Population

Source Population

All pregnant women attending ANC follow up clinic at St. Peter's specialized Hospital were considered as the source population of the study.

Study Population

Pregnant women who were attending ANC clinic at St. Peter's specialized Hospital and fulfill the inclusion criteria were taken as the study population

4.5. Eligibility criteria: Inclusion and Exclusion Criteria

Inclusion Criteria

- All Pregnant women who were attending ANC follow up at St. Peter's Specialized Hospital.

Exclusion Criteria

- Pregnant Women who were unable to provide the necessary information due to severe illness.

4.6. Sample Size

Sample size was determined using single population proportion formula:

$$\frac{n=(P)(1-p)(Z\alpha/2)^2}{d^2}$$

Where n_0 = Total number of pregnant women on ANC follow up who participated in the study

P = The pooled prevalence of hypertensive disorders of pregnancy from a systematic review and meta-analysis study conducted on prevalence of Hypertensive disorders of pregnancy in Ethiopia was 6.07% (16)

Z = at 95% confidence interval is 1.96

d= margin of error which was taken as 2.5%

The sample size from the above formula became **350**.

Since our source population is below 10,000, we used correction formula for finite population:

$$n = \frac{n_o}{\left(1 + \frac{n_o}{N}\right)}$$

$$= \frac{350}{1 + 350/400} = 187$$

By adding 10% non-response rate, the final total calculated sample size was **205**.

The table below shows sample size calculated for associated factors using STATCALC for selected potential variables. The data were derived from a study that was done in Dessie town on prevalence and associated factors of preeclampsia among pregnant women attending ANC service in public Dessie Referral Hospital.(33)

Table 1: Summary of sample size calculation for associated factors of Hypertensive disorders of pregnancy

Variables as exposure	Assumptions						Sample size	Total sample size with 10% non-response
	OR	P of exposed	P of Unexposed	ratio	power	CI		
Age> 35	4.97	23.25 %	5.74 %	1;1	80%	95%	150	165
Family History of DM	4.77	24.13 %	6.25 %	1:1	80%	95%	146	161
Family history of HTN	4.87	28.01 %	3.99 %	1:1	80%	95%	88	97

OR: odds ratio; P: percentage; CI: confidence interval

Since the largest of all the calculated sample sizes is **205**, it was used as the final sample size.

4.7. Sampling Procedure

Systematic random sampling procedure was used in order to select study participants. The total number of pregnant women visiting the ANC Clinic per month was estimated to be 400.

The skip interval $k = N/n$

$$= 400/205 = 1.95 \text{ rounded to } 2$$

Numbers were assigned from 1 to 400 for the study population, The first subject was selected randomly by lottery method and the subsequent participants were chosen by adding 2 (every K^{th} interval) until the required sample size is reached.

4.8. Operational Definition

The following operational definitions are based on the International Society for the Study of Hypertension in Pregnancy (ISSHP) Classification (41) and American College of Obstetrics and Gynecologist (3).

Hypertensive Disorders of Pregnancy (HDP): It is elevated blood pressure $\geq 140/90$ during pregnancy. It's spectrum of medical conditions that occur during pregnancy, including preeclampsia and eclampsia, gestational hypertension, chronic hypertension, and preeclampsia superimposed on chronic hypertension.

Gestational Hypertension: is a rise in gestational blood pressure beyond the normal (systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg) on two separate occasions at least 4 hours apart after 20 weeks of gestation in a woman with previous normal blood pressure without the development of significant proteinuria (< 0.3 g/l) during pregnancy, labor and/or within 48 h of delivery. **OR**

Blood pressure $\geq 160/110$ can be confirmed within short time interval (minutes) to facilitate timely treatment.

Pre-eclampsia: Development of significant proteinuria $+1$ in dipstick or (> 0.3 g/l) after 20 weeks of gestation or during labor and/or within 48 h of delivery in a woman having elevated blood pressure ($\geq 140/90$).

Eclampsia: preeclamptic pregnant women having generalized tonic clonic seizure or new onset seizures 48-72 hours postpartum.

Preeclampsia Superimposed on Chronic Hypertension: A woman with Chronic hypertension developing new onset proteinuria or increase in amount of proteinuria if she already had one.

Chronic Hypertension: is Hypertension that occurred before pregnancy or that has been diagnosed before 20 weeks of gestation, or persists beyond 12 weeks postpartum.

Proteinuria: Development of significant proteinuria (> 0.3 g/l in 24 hours) or +1 and above urine dipstick after 20 weeks of gestation or during labor and/or within 48 h of delivery.

Gravidity: the total number of pregnancies, including abortion, ectopic pregnancy and any other pregnancies documented on the chart

Parity: the number of deliveries after 28 weeks of gestation including IUFD (Intrauterine fetal death) and still birth

4.9. Study Variables

Dependent Variable

Hypertensive disorders of Pregnancy

Independent Variable

- Socio-Demographic variables which include: Age, Marital Status, economic status, education, occupation, residency and religion
- Obstetric and reproductive variables: Parity, gravidity, multiple pregnancy, previous history of Hypertension in previous pregnancy
- Behavioral Variables: which include alcohol drinking and cigarette smoking.
- Family History of Hypertension, Diabetes
- Participants medical history of chronic illness: pre-pregnancy Hypertension, pregestational diabetes, renal diseases

4.10. Data Collection tool and procedure

Data were collected using interviewer administered structured questionnaire which was developed from different literatures done in similar study topic to fit into this research study

from July 15, 2022 to August 15, 2022 (15, 34, 42) . The questionnaire was first prepared in English and translated in to the local language Amharic and back to English to ensure consistency. It contained different sections that asses for demographics, reproductive and obstetric factors, family history of chronic illness and behavioral factors. It was pretested in 5% of the sample size one week prior to the actual data collection time and check for its clarity and reliability at Gandi Memorial Referral Hospital. Additionally, medical records were reviewed for determining gestational age and clinical laboratory results like proteinuria from urine analysis result. The medical registration numbers of the participants who were involved in the study was recorded on a separate sheet to avoid repeated recruitment of the study participants who came for the next visit. During study period we encountered repeated visit from 7 of our participants who were identified from the data record sheet and their secondary visit was not recorded in the data collection process.

The data was collected via interview by 3 trained midwife nurses and one supervisor who were recruited from the hospital. The data was collected during the ANC visit after the mothers have finished their medical evaluation. Blood pressure measurement was taken once the selected participants were allowed to take rest for 5 minutes then readings were taken while the woman was in sitting and upright position with her legs uncrossed with her arm resting at the level of the heart by using the appropriate size mercury sphygmomanometer by covering the lower 2/3rd of the left upper arm. The measurement was taken two times at least 4 hours apart in a similar manner using the same arm. For those pregnant mothers with blood pressure value $\geq 160/90$ only one measurement was taken as diagnostic for HDP. (1) For those mothers whose blood pressure remained $\geq 140/90$ the second(last) blood pressure measurement was taken in to this study for analysis.

Gestational age of the women was estimated from the participants last menstrual cycle or by using obstetric ultrasound from the chart review for those who didn't remember their last menstrual cycle. Presence of multiple pregnancy was also confirmed from participants obstetric ultrasound. Proteinuria was observed from the laboratory medical records as every hypertensive pregnant woman gave urine analysis as routine laboratory investigation.

4.11. Data Quality Assurance

Data was collected using a pretested interviewer administered questionnaire after training was provided to the data collectors. Three midwives and one supervisor participated in the data collection process. The data collectors were given two days training on the objectives of the study and different sections of the questionnaire, and interviewing techniques by the researcher. Blood pressure measurement was taken by calibrated mercury Sphygmomanometer.

Questionnaire filled was checked for its completeness and consistency daily by the assigned supervisor. The investigator was responsible for monitoring the overall data collection process and providing supportive supervision on the spot.

The data collected was carefully double entered and cleaned before analysis.

4.12. Data processing and analysis

The collected data was double entered using Epi-info version 7, cleaned and then was exported to SPSS version 25 for the required analysis. Mismatches found between the two datasets were corrected before undergoing analysis. Frequencies and percentages were calculated to all the variables that were related to the objectives. Descriptive statistics using cross tabulations, simple and multivariable binary logistic regression were employed. Variables with p values <0.25 in binary analysis were entered to multivariable logistic model regression for analysis to control for confounders. The magnitude of the association between independent variables and dependent was measured using odds ratios with 95% Confidence Interval (CI). The P values below 0.05 were considered as statistically significant. The data will be presented using tables and narrative forms.

4.13. Ethical Consideration

An Ethical clearance was obtained before data collection from the institutional review board (IRB) of SPHMMC and submitted to St Peter's specialized hospital research affairs office. The objective of the study was clearly explained to the study participants and their right to refuse was maintained. Data were collected after obtaining informed consent from each participant. The personal information of study participants was kept entirely anonymous, and confidentiality was assured throughout the study period. The name and address of the patient was omitted from the questionnaire. The data collected were used only for the intended purpose of the study. Those

participants whose blood pressure was found to be elevated were immediately linked to medical staff for their medical evaluation.

4.14. Dissemination of results

After being completed, the research paper will be submitted to SPHMMC School of public health. The findings of this study will be distributed to SPHMMC, St Peter's specialized hospital. If possible, the findings will be presented in different seminars, meetings and workshops and will be also published in peer reviewed journals.

5. Results

5.1 Socio-demographic characteristics of study participants

A total of 205 pregnant women whose ANC follow up was St. Peter's Specialized Hospital participated in this study. Most of the mothers who participated in the study 114 (55.5%) were in the age group below 29 years with mean age being 29.2 years. Among the total respondent's majority or 179(87.3%) were married. Most of the participants had completed secondary school 111(54.1%). Orthodox Christian, Protestant and Muslim religions were mainly followed by the respondents each containing 128(62.4%), 35 (17.1%), 34 (16.6) respectively. Concerning their occupational status 163(79.5%) of the respondents were self-employed and 42% of the participants' family income ranged between 1000-3999 ETB (Table 2).

Table 2 Socio-demographic characteristics of pregnant women at ANC follow up in St. Peter's Specialized Hospital

Variable		Frequency(N)	Percent (%)
Age in years	≤29	114	55.5
	≥30	91	44.4
Marital Status	Married	179	87.3
	Un Married	26	12.7
Education	No Schooling and Primary schooling	53	25.9
	Secondary	111	54.1
	Diploma and above	41	20.0
Occupation	Employed	163	79.5
	Housewife	42	20.5
Religion	Orthodox Christian	128	62.4
	Muslim	34	16.6
	Protestant	35	17.1
	Others	8	3.9
Income	1000-3999	86	42.0
	4000-6999	65	31.7
	7000-9999	43	21.0
	≥10000	11	5.4
Residence	Rural	7	3.4
	Urban	198	96.6

5.2 Reproductive and Obstetric Characteristics

The study showed that 118 (57.6%) of the respondents were in their 3rd trimester of pregnancy during the study period. Among the total participants 76(37.1%) of the participants had one

child whereas 70(34.1%) of the respondents were primigravid (were carrying their first child). Only 4 (2%) participants had multiple pregnancy. Among the study participants 11 (8.3%) of them had previous history of hypertensive disorders of pregnancy (Table 3).

Table 3 Obstetric and Reproductive Characteristics of pregnant women in ANC follow up at St. Peter's Specialized Hospital

	Variable	Frequency (N)	Percent
Trimester	1st Trimester	16	7.8
	2nd Trimester	71	34.6
	3rd Trimester	118	57.6
Parity	Nulliparous	70	34.1
	One child	76	37.1
	Two and above	59	28.8
Gravidity	One	70	34.1
	Two and more	135	65.9
Multiple Pregnancy	No	201	98.0
	Yes	4	2.0
History of Abortion	No	171	83.4
	Yes	34	16.6
Previous History of HDP (N=134)	No	123	91.7
	Yes	11	8.3
Previous History of Gestational DM(N=134)	No	131	97.7
	Yes	3	2.2

5.3 Behavioral Characteristics of participants

Only 5 (2.2%) of the respondents reported to have used alcohol during their current pregnancy. None of the mothers reported use of cigarette or other substance use.

5.4 Family and Participant history of chronic illness

From the total number of participants 12(5.9%) of them had history chronic hypertension (were hypertensive before pregnancy). History of pregestational DM was seen in 10(4.9%) of the

informants. There was family history of hypertension in 31(15.1%) of the respondents. About 16 (7.8%) of the participants also reported family history of diabetes (Table 4).

Table 4 Family and Study participant history of chronic illness

Variable		Frequency	Percent
Prepregnancy HTN	No	193	94.1
	Yes	12	5.9
Pregestational DM	No	195	95.1
	Yes	10	4.9
Family History of HTN	No	174	84.9
	Yes	31	15.1
Family History of DM	No	189	92.2
	Yes	16	7.8

5.5 Prevalence of Hypertensive disorders of Pregnancy among pregnant women attending ANC follow up at St. Peter's specialized hospital

In this study 27 (13.2%) of the mothers were found to have Hypertensive disorders of pregnancy during their current pregnancy. Among those who were hypertensive majority of them had gestational hypertension 13 (6%) followed by preeclampsia (4%). Figure 2 below shows the forms of hypertensive disorders the participants had in this study.

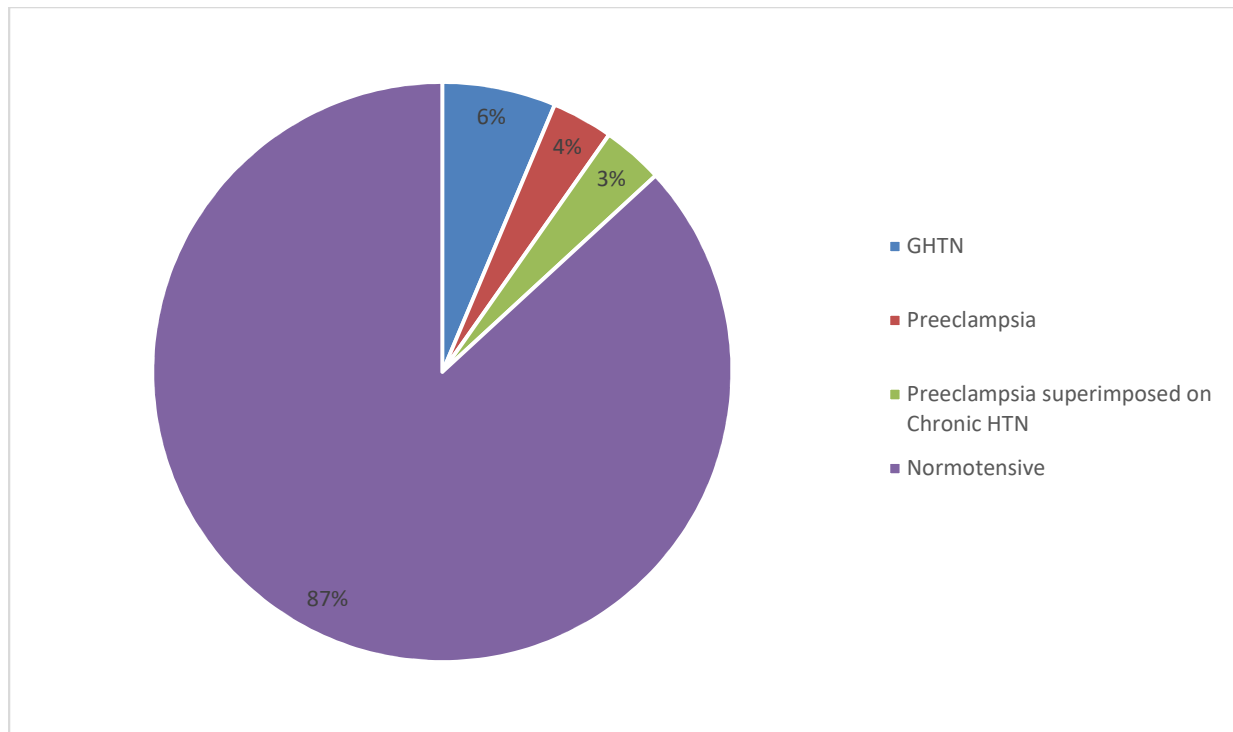


Figure 2: Prevalence of Hypertensive disorders of pregnancy among pregnant women at St. Peter's Specialized Hospital ANC unit

5.6 Factors associated with hypertensive disorders of pregnancy

Among the independent variables that were analyzed using bivariate analysis only family history of hypertension showed significant association with our dependent variable hypertensive disorders of pregnancy. Those with family history of hypertension were almost 3 times more likely to develop HDP than those with no family history of hypertension (**AOR=2.838; 95% CI (1.114-7.288)**).

Table 5: Bivariate and Multivariable logistic regression analysis of factors associated with Hypertensive Disorders of Pregnancy among pregnant women attending ANC follow up at St. Peter's Specialized Hospital

Variable		Hypertension Disorders of pregnancy (HDP)		COR (95% CI)	P-Value	AOR (95% CI)	P-value
		Yes	No				
Age	≤29 years	12	102	1			
	≥30 years	15	76	1.678(0.742,3.791)	0.213		
Occupation	Employed	22	141	1			
	Housewife	5	37	0.866(0.307,2.441)	0.786		
Gravidity	Primigravid	7	64	0.623(0.250,1.554)	0.311		
	Two or more	20	114	1			
Parity	Nulliparous	7	63	0.544(0.193,1.533)	0.250		
	One child	10	66	0.742(0.287,1.922)	0.539		
	Two or more	10	49	1			
History of Abortion	Yes	6	28	0.653(0.242,1.763)	0.401		
	No	21	150	1			
Family History of HTN	Yes	8	23	2.838(1.114,7.288) *	0.029		
	No	19	155	1			

Key: *statistically significant variable at 95% CI with P value<0.05, COR: Crude odds ratio, AOR adjusted odds ratio, CI: confidence interval

6. Discussion

Hypertensive disorders of pregnancy are one of the top medical conditions that complicate pregnancy. In this study the prevalence of hypertensive disorders of pregnancy was found to be 13.2% which is similar to a study done in Benin in 2015 (13.3%) (43). On the other hand, a study done in France and a study done in Ethiopia in Dessie town showed 7.4% and 8.8% of pregnancies affected by hypertensive disorders of pregnancy, which is lower than the report in our study (14, 29). Whereas studies done in Nigerian Teaching Hospital (17%) and Zimbabwe (19.4%) showed higher estimates than this study (44, 45). The difference in the magnitude of HDP could be due to difference in life style and genetics of the study participants

This study also determined the forms of hypertensive disorders of pregnancy. Gestational hypertension (6%) being the highest form of hypertensive disorders of pregnancy represented in our study followed by preeclampsia (4%). This result is consistent with studies done in Benin and health facilities located in Cameroon (46, 47).

The key associated factor with hypertensive disorders of pregnancy in our study was identified to be family history of hypertension. Family history of hypertension is another predictor variable that has shown significant association in this study with hypertensive disorders of pregnancy. Those mother with family history of hypertension are almost 3 times more likely to develop hypertensive disorders of pregnancy. Many other studies done in different areas go in line with the above result. This might indicate that genetic predisposition could actually contribute for the development of hypertensive disorders of pregnancy. (46, 48-50).

We couldn't find any association between age and Hypertensive disorders of pregnancy in this study, although older age seemed to be related in other studies with increased risk of developing hypertensive disorders of pregnancy (45, 48). Similarly, unlike other studies that showed association between nulliparity and hypertensive disorders of pregnancies, this study couldn't identify any association between parity and HDP (37, 51).

7. Strength and Limitations of the study

7.1 Strength of the study

- The study addressed topical issue that has huge public health importance.

7.2 Limitations of the study

- It's a cross sectional study, thus it's difficult to establish cause and effect relation ship
- Since the study was institutional based, it couldn't be generalizable to the general population

8. Conclusion and Recommendation

8.1 Conclusion

Hypertensive disorders of pregnancy are highly prevalent complications of pregnancy that could have impact on the wellbeing of both the mother and the baby. The first aim of this study was to determine the prevalence of Hypertensive disorders of pregnancy among pregnant women at ANC follow up. The finding showed that Hypertensive disorders of pregnancy are more prevalent as compared to similar studies.

Upon exploring for factors associated with Hypertensive disorders of pregnancy at St. Peter specialized Referral Hospital only family history of hypertension was identified factor that showed significant association.

8.2 Recommendation

As discussed above results Hypertensive disorders of pregnancy tend to affect the health of pregnant mothers as well as their babies. Therefore, this study has some suggestions for responsible bodies at different levels.

For Policymakers

The study suggests that policies that strengthen the ANC care and service provided by health institutions should be made. Moreover, awareness creating programs for the mothers aimed at preventing risks for HDP should be put in action.

For Health care providers

Health service providers should give due attention in screening those mothers with family history of chronic illness. They should also be able to make early diagnosis and follow up mothers coming to ANC with elevated blood pressure. Proper counseling regarding the factors that could predispose them to hypertensive disorders of pregnancy should be provided. Additionally, they ought to be able to give focused Antenatal care once the mothers are diagnosed with HDP.

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APPENDIX

INFORMATION SHEET AND INFORMED CONSENT

Dear respondent:

Hello, my name is I am collecting data on research entitled Hypertensive Disorders of Pregnancy and associated factors among pregnant women on ANC follow up at St. Peter's Specialized Hospital by Dr. Yordanos Girma for MPH in Epidemiology from St. Paul Hospital Millennium Medical college. The information interviewed will be very useful in the realization of this study, and it will be kept confidential. The Name and Address of the participant will not be recorded. You have the right not to answer for any questions which might be inconvenient for you. However, your honest response is very important for the study and is appreciated. And we would like to confirm to you that all your data are confidential and used for research purpose only.

Consent Form

Good morning/afternoon I am healthcare professional. I am collecting data regarding Hypertensive Disorders of pregnancy and associated factors among pregnant women attending ANC follow up at St Peter's Specialized Hospitals, using structured questionnaires and will be collected by the principal investigator. It will take 10 to 15 minutes of your time. Your honest response is very important to produce quality data in the organization there by to plan appropriate measures that could be taken. Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. You can ask for elaborations on questions you think you do not properly understand. There are no foreseeable (or expected) risks to you for participating in this study. There will be no direct benefit to you for your participation in this study. However, we hope that the information obtained from this study may be of valuable to mothers and newborns in general. This study is anonymous. We will not be collecting or retaining any information about your identity. The records of this study will be kept strictly confidential.

CONSENTI have read and I understand the provided information and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, without

giving a reason and without cost. I do also understand that there is no risk in participating in the study, so I voluntarily agree to take part in this study.

Participant's signature _____ Date _____

Data collector's Name and signature _____ Date _____

Thank you for spending your precious and valuable time

Questionnaire tool

ID/Code of Participant:

Code of Data Collector:

Supervisor:

Date of data collection _____

Section 1: Sociodemographic question	
1.1.Age (in years)	
1.2.Marital status	1. Single 2. Married 3. Divorced 4. Separated 5. Widow
1.3.Educational level	1. Never went 2. Primary 3. Secondary 4. Higher Education
1.4.Occupation	1. Government employed 2. Self employed 3. Unemployed 4. House wife
1.5.Religion	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. Other
1.6.Monthly House hold income	_____Birr

1.7.Place of residence	1. Rural 2. Urban
Section 2: Reproductive and obstetric factors.	
2.1. Gestational age estimated in weeks	
2.2. Parity (including still birth and IUFD)	1. Nulliparous 2. One delivery 3. Two and above
2.3. Gravidity (total number of pregnancies so far)	1. One 2. Two and more
<i>Go to Question No 2.8 If the answer to Question No 2.3 is option no. 1</i>	
2.4. Age at first pregnancy (<i>Ask only if this is not the first pregnancy</i>)	_____years
2.5.History of Hypertension in previous pregnancy	1. Yes 2. No
2.6.History of Diabetes in previous pregnancy	1. Yes 2. No
2.7.Pregnancy interval Between the current pregnancy and immediate previous delivery (<i>Ask only if there was previous Pregnancy</i>)	----- years
2.8.Presence of multiple pregnancy in the current pregnancy	1. Yes 2. No
2.9.History of abortion	1. Yes 2. No

Section 3. Behavioral Factors	
3.1. History of Alcohol Consumption on current pregnancy	1. Yes 2. No

3.2. History of Cigarette Smoking on current pregnancy	1. Yes 2. No
3.3. History of Other Substance use on current pregnancy	1. Yes 2. No

Section 4. Family chronic illness history	
4.1 Family history of hypertension	1. YES 2. NO
4.2 Family history of Diabetes	1. YES 2. NO
Section 5. Self-history of chronic illness	
5.1 History of Hypertension before the current pregnancy (prepregnancy Hypertension)	1. Yes 2. No
5.2 History of diabetes before the current pregnancy (pregestational Diabetes)	1. Yes 2. No
5.3 History of other known comorbidities	1. None 2. Cardiac illness 3. renal disease 4. Others <i>Specify</i> _____
Section 6. Blood pressure Measurement at the time of current visit	
Systolic BP _____ Diastolic BP _____	
Section 8. Urine proteinuria value _____	

የመረጃ ቅፅ እና የተሳታፊዎች ፈቃደኝነት ማረጋገጫ

ጤና ይስጥልኝ, ...እባላለሁ። በእርግዝና ወቅት ስለሚከሰት የግፊት መጨመር እና ተያያዥነት ስላላቸው ምክንያቶች መረጃ በመስጠት ላይ ነኝ። እርሶም በዚህ ጥናት ለመሳተፍ ከተስማሙ ከላይ በተጠቀሰው ርዕስ ላይ መሰረታዊ የሆኑ ጥያቄዎችን ይጠየቃሉ። መጠይቁም ከ 10 እስከ 15 ደቂቃ ብቻ የሚፈጅ ሲሆን የእርሶ ትክክለኛ ምላሽ ለጥናቱ ትልቅ አስተዋጽኦ እንዳለው እናሳውቃለን። በዚህ ጥናት ላይ የተሳታፊው ማንነት የማይገለፅ ሲሆን የሚሰጠው መረጃም ምስጢርነቱ የተጠበቀ ነው።

ከላይ በተጠቀሰው ርዕስ ዙሪያ ለሚደረግሎት ቃለ መጠይቅ ፈቃደኛ ከሆኑ ከታች በተቀመጠው ክፍት ቦታ ፊርማዎን ያስቀምጡ

የተሳታፊው ፊርማ _____

ስለተሳትፎ እናመሰግናለን።

መጠይቅ

<u>ክፍል አንድ</u>	
1.8. እድሜ	
1.9. የጋብቻ ሁኔታ	ሀ. ያላገባች ለ. ያገባች ሐ. የተፋታች መ. በሞት የተለየ
1.10. የትምህርት ደረጃ	ሀ. መደበኛ ትምህርት ያልወሰደች ለ. አንደኛ ደረጃ ሐ. ሁለተኛ ደረጃ መ. ኮሌጅና ከዛ በላይ
1.11. የስራ ሁኔታ	ሀ. የመንግስት ሰራተኛ ለ. የግልስራ ሐ. . የቤት እመቤት
1.12. የወር ገቢ	-----ብር
1.13. የመኖሪያ አድራሻ	ሀ. ገጠር ለ. ከተማ
<u>ክፍል ሁለት</u>	
2.1. ስንተኛ የእርግዝና ወ ር ላይ ኖት? (	

በሳምንት)	
2.2. የበፊት እርግዝና ጨምሮ አሁን ስንተኛ እርግዝና ነው	ሀ. የመጀመሪያ ለ. ሁለት እና ከዛ በላይ
2.3. ከዚህ በፊት ስንት ልጆች ወልድዋል	ሀ. ምንም ለ. 1 አለኝ ሐ. 2ና ከዛ በላይ
2.4. የመጀመሪያ ልጅዎን ሲወልዱ ዕድሜዎት ስንት ነበር	
2.5. የአሁኑ እርግዝና መንታ እርግዝና ነው	ሀ. አው ለ. አይደለም
2.6. ከዚህ በፊት የነበሩት እርግዝናዎች ላይ የደም ግፊት መጨመር ተከስቶ ያቃል	ሀ. አዎ ያውቃል ለ. አይ አያውቅም
2.7. ከዚህ በፊት የነበሩ እርግዝናዎ ላይ የስኳር መጨመር ተከስቶ ያውቃል	ሀ. አዎ ያውቃል ለ. አይ አያውቅም
2.8. በአሁኑ እርግዝና እና ከዚህ በፊት በነበረው እርግዝናዎ መሀል የስንት አመት ልዩነት አለ	-----
2.9. ከዚህ በፊት ፅንሰ አቀዋርጠው ያቃሉ	ሀ. አዎ አውቃለሁ ለ. አይ አላቅም

ክፍል ሶስት	
3.1. ሱስ አለብዎት ?	ሀ. ምንም ለ. የመጠጥ ሐ. የሲጋራ መ. ሌላ

ክፍል አራት	
4.1. ከፍተኛ የደም ግፊት ያለበት የቤተሰብ አባል አለ	ሀ. አለ ለ. የለም
4.2. የስኳር ህመም ያለበት የቤተሰብ አባል አለ	ሀ. አለ ለ. የለም

ክፍል አምስት:	
5.1 ከእርግዝናዎት በፊት የደም ግፊት አለብዎት	ሀ. አለ ለ. የለም
5.2 ከእርግዝናዎት በፊት የስኳር ህመም አለብዎት	ሀ. አለ ለ. የለም
5.3 ሌሎች ተጓዳኝ ህመሞች አለብዎት	ሀ. የደም ማነስ ለ. የልብ ሐ. የኩላሊት መ. ሌሎች
ክፍል ስድስት: የደም ግፊት ልኬት በአሁኑ የእርግዝና ክትትል -----	
ክፍል ሰባት: የሽንት ላይ ፕሮቲን መጠን-----	

APPROVAL SHEET

St. Paul's Hospital Millennium Medical College

School of Public Health

I hereby, certify that I have read and evaluated this topic entitled Hypertensive Disorders and associated factors among pregnant women attending Antenatal care Clinic at St. Peter Hospital, Addis Ababa, Ethiopia which was prepared under my guidance. I recommend it to be submitted as fulfilling the thesis requirement.

Submitted by

_____ /__ /__

Primary Advisor

_____ /__ /__

Full name

Signature

Date

Co-advisor

_____ /__ /__

Full name

Signature

Date