

## Prevalence and Associated Factors of Adherence to Antihypertensive Drugs Among Patients with Hypertension at Arba Minch General Hospital, Gamo Gofa Zone, South West Ethiopia, Cross Sectional Study

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### Abstract

#### Background

Hypertension is an overwhelming global challenge with high morbidity and mortality rate. Analysis of the global burden of hypertension revealed that over 25% of the world's adult population had hypertension in 2000, and the proportion is expected to increase to 29% by 2025. The prevention and control of high blood pressure has not received due attention in many developing countries. Adherence to therapies is a primary determinant of treatment success. Poor adherence attenuates optimum clinical benefits and therefore reduces the overall effectiveness of health systems.

## Objective

To determine prevalence and associated factors of adherence to antihypertensive drugs among hypertensive patients at Arbaminch general Hospital, Ethiopia, 2017 GC.

## Method

Institutional based cross-sectional study was conducted among 160 hypertensive patients in chronic follow up clinic at Arbaminch general Hospital from September-December 2017 GC. A structured questionnaire was used as data collection tool. Mo risky medication adherence scale was used for labeling patients as adhered and non-adhered for antihypertensive drugs. Data cleaning, coding, categorizing, merging and analysis carried out by STATA version 12. Descriptive statistics was done and presented accordingly. Bivariate binary logistic regression analysis was done to select potential candidates for the full model at P-value cutoff point  $\leq 0.25$  and multivariable binary logistic regression analysis was made to estimate the independent effect of predictors on adherence. Model diagnostic tests were done, final model fitness was checked using Hosmer and Lemeshow chi square test. Finally, statistical significance was tested at P-value  $<0.05$ .

## Result

More than half (64.6%) of the study participants were found to be adherent to their treatment. Distance from the hospital (AOR=3.786, 95%CI =1.77, 8.09) and co morbidity (AOR=5.664, 95%CI=1.93, 6.65) were found significantly associated factors with treatment adherence.

## Conclusion and Recommendation

Only 64.6% of the study subjects were found to be adherent to their treatment. Factors such as distance from the hospital and number of co morbidities were associated with adherence behavior of patients. Early diagnosis and management of co morbidities, adherence counseling and patient education about the disease and its treatment are important to improve adherence status of patient.

## List of Abbreviations

AMGH:	Arbaminch General Hospital
BP:	Blood Pressure
HTN:	Hypertension
ROC:	Receiver Observed Characteristics
SNNPRS:	Southern Nations nationality and People Regional State
WHO:	World Health Organization

## Introduction

### Back ground

Hypertension (HTN) or high blood pressure (systolic blood pressure  $\geq 140$ mmHg and diastolic blood pressure  $\geq 90$ mmHg) is an overwhelming global challenge with high morbidity and mortality rate [1]. Analysis of the global burden of hypertension revealed that over 25% of the world's adult Population had hypertension in 2000, and the proportion is expected to increase to 29% by 2025. The prevention and control of high blood pressure has not received due attention in many developing countries. Adherence to therapies is a primary determinant of treatment success. Poor adherence attenuates Optimum clinical benefits and therefore reduces the overall effectiveness of health systems [2-4].

Low adherence is a key factor in explaining impaired effectiveness and efficiency in the pharmacological treatment of hypertension. However, little is known about which factors determine low adherence in actual practice. Although there is shortage of extensive data, 10.5% of the Ethiopian population has been estimated to have HTN. Approximately 30% of adults in Addis Ababa have BP above 140/90mmHg or reported use of antihypertensive medications [4]. Poor adherence to antihypertensive medications is an obstacle in the management of hypertension resulting in high rate of hospitalization and death [5,6].

WHO report estimates that adherence to antihypertensive medications ranges from 52% to 74%. It also identified non adherence to medical treatment as a major public health concern, especially in patients with chronic conditions, e.g. hypertension. It is now evident from WHO data that coronary heart disease and cerebro vascular disease are increasing so rapidly that they will rank Number one and five respectively as causes of global burden by the year 2020 [7]. In Africa, 15% of the population has hypertension [8].

According to the WHO, more than 80% of deaths from hypertension and associated cardiovascular diseases now occur in low and middle-income countries and this is particularly common among people of low socio-economic status [9].

Poor adherence is associated with bad outcome of the disease and wastage of healthcare resources [2,10]. Clearly, interventions to improve adherence with antihypertensive agents are needed, if such interventions are to be successfully designed, targeted, & cost effective, it is critical to understand the complex reasons for non-adherence and to identify those that are modifiable [1]. In Ethiopia, particularly in the study area, nothing is known about the adherence status and associated factors. Considering that HTN is a difficult disease for adherence to treatment due to the required change in lifestyle habits and active participation of the individual in antihypertensive medication therapy [11].

Generally, antihypertensive therapy should be maintained indefinitely [10]. However, findings in clinical practice have raised concerns about under treatment and non-adherence to antihypertensive treatment hampering the effectiveness of these medications [12].

Poor adherence has been attributed to unnecessary over-prescription of drugs, substantial worsening of diseases, avoidable increases in hospital admission rates, longer hospital stays, leading to a significant medical burden [13,14]. It also compromises the efforts of the health care system, policy makers and health care

professionals in improving the health of populations. As a result, substantial numbers of patients do not get the maximum benefit of medical treatment resulting in poor health outcomes, lower quality of life increased health care costs and erodes public confidence in health systems.

Therefore, poor adherence to anti-hypertensive therapy is usually associated with bad outcome of the disease and wastage of limited health care resources in our setup. Therefore, the aim of this study is to assess the prevalence and factors contributing to medication adherence among adult patients with hypertension on follow up in Arbaminch general hospital (AMGH), Southern Ethiopia.

## Methods

This cross sectional study was conducted at Arbaminch general hospital from April 2016 to October 2017 G.C. Arbaminch hospital was located at Arbaminch town, the capital city of Gamo Gofa zone, which is 505km from Addis Ababa (capital city of Ethiopia) and 280Km from Hawasa, center of southern nation's nationality and people regional state (SNNPRS). Arbaminch has two sub cities, Secha and Sikela. The hospital is located at Secha which is the administrative center of Arbaminch town. Though Arbaminch hospital is technically a regional hospital, it is acting as a referral hospital and provides preventive, curative and rehabilitative care for 100,000-200,000 people per year and of them more than 400 patients were hypertensive.

### Source Population

All cases of hypertension that were on follow up at AMGH who started taking antihypertensive drug treatment at least for three months.

### Study Population

All cases of hypertensive patients who come during study period and who fulfill inclusion criteria.

### Inclusion Criteria

Hypertensive patients of age 18 years and above receiving antihypertensive treatment as outpatients at the hypertensive illness follow-up care unit in AMGH during study period.

### Exclusion Criteria

Those patients who were not capable of hearing and speaking and had known mental disorders or serious illness.

### Sample Size Determination

Sample size determination formula for single population proportion was used, that is

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

Where:

n- The required sample size

p- The proportion of the study subjects who were found to be adherent to their treatment in Gondar (64.6%).

z- A standard score corresponding to 95% confidence

d- The margin of error and is 5%

$\alpha$ = level of significance

Sample size will be:

$$n_i = z^2pq = (1.96)^2(0.646)(0.354) = 351$$

$$d^2 = (0.05)^2.$$

Using the above formula, the initial sample size was 351, Which is less than 10,000 so that considering the finite population proportion (FPP) designed as “nf”

Sample size determination formula for single population proportion was used, that is

$$nf = n_i / (1 + (n_i / N)) = 351 / (1 + 351 / 255) = 146$$

Taking the non-response rate to be 10% the final sample size is 160.

### Sampling Technique and Procedure

Systematic random sampling method was used to select the respondents by every interval of two until the total sample size fulfilled.

K value were calculated by

$K = N/n = 400/160 \approx 3$ . Every other 3 patients were interviewed when they come for follow up at the chronic care clinic

### Study Variables

**Dependent:** Adherence to antihypertensive drugs

**Independent:** Age, sex, gender, marital status, ethnicity, occupation, religion, monthly income, educational status, distance from hospital, numbers of pills, side effect of drug, drug cost, patient health care provider relationship, blood pressure, knowledge toward hypertension and treatment.

### Operational Definitions of Terms

**Controlled Hypertension:** Average blood pressure (BP) reading less than 140/90mmHg at the time of data collection irrespective of measurements at other times.

**Knowledgeable:** Respondents who scored above mean for the knowledge questions.

**Good Patient-Provider Relationship:** Participants who scored mean and above for questions prepared on patient provider relationship in the treatment and care of HTN patients otherwise not.

**Adherent:** Those who scored Mo risky Medication Adherence Scale of  $\geq 3$ .

**Non-Adherent:** Those who scored Mo risky Medication Adherence Scale of  $\geq 3$

**Favorable Attitude:** Respondents who scored points at mean and above ( $\geq 3$ ) for the attitude questions prepared on HTN and its treatment.

**Co-morbidity:** Average Those who scored Mo risky Medication Adherence Scale of  $\geq 3$

### Data Collection Tools and Procedure

A structured questionnaire was adopted from different study. The English version of the questionnaire was adapted in such a way that it includes all the relevant variables to meet the objectives of the study and then translated in to Amharic version. The Amharic version was again translated back to English to check for consistency of meaning. The data was collected by BSc nurses who are working in the respective hospital.

### Data Quality Assurance

A questionnaire was tested by 5% volunteer hypertensive patients before data collection. Investigators were closely followed the data collection process at the spot. Data cleaning was performed to check for completeness, consistency, extreme and missed values.

### Data Processing and Analysis

The data was entered to Microsoft excel software package and transferred to STATA version 12 for analysis. Descriptive statistics was done and summarized using frequency, graph and percentage. Binary logistic regression analysis was applied; Bivariate logistic regression analysis was done to select potential candidates and explanatory variables with preset p-value  $\leq 0.25$  were included in the multivariable logistic regression analysis to estimate the independent effect of predictors on adherence status. Step wise back ward elimination model building procedure was done and model was compared by likely hood ratio test. Interaction and cofounder were tested and cutoff point was beta change greater than 20%.

After fitting the final full model, multi collinearity was checked by variance inflation factor and cutoff point is mean VIF  $> 10$  to have significant collinearity among predictors. The prediction performance of final fitted model was checked by receiver observed characteristics (ROC) curve and 70% will be acceptable discriminatory range. Overall model fitness was checked by Hosmer and Leme show chi-square test. Associations between adherence to anti-hypertensive drugs and predictors were summarized by using odds ratio and statistical significances were tested by Wald chi-square test at 95% CI.

**Ethical Consideration**

Ethical approval was taken from Arbaminch University, College of Medicine and Health Science, School of medicine. Permission to undertake the study in follow-up unit was obtained from the medical director’s office of the hospital. Each study participant was adequately informed about the purpose, method, anticipated benefit and risk of the study by the data collectors. Verbal consent was obtained from study participants and anonymity was maintained to ensure confidentiality.

**Results**

**Socio Demographic Characteristics of Study Subjects**

A total of 160 study participants were interviewed making the response rate 100%. As it is depicted below table 1), males comprising 81(50.6%) of the population which is almost equal to female counter parts 79 (49.4%). Regarding to age of the respondents, 84(52.5%) were in the age group between 41-60yrs. Whereas 35.6%, and 11.9% of the respondents were in age group above 60 and 18-40years respectively. Out of 160 respondents, 62(38.8%) of the respondents have attended their education up to grade 7-12 and the 18.8% were attended grade 1-6.

Majority of respondent in the study area 118(73.8%) earn a monthly income above 1000 Ethiopian birr and 29(18.1%) of the participants earn a monthly income between 501-1000 ETB and the rest 13 respondents have a monthly income below 500 birr. Regarding about employment status, 53(33.1%) of the respondents were merchants and 34(21.3%) were government employee. Whereas, students compromise 1% of the population, house wife women were found to account for 9.4% of the participants. Orthodox Christians and the Gamo ethnic group accounted for 84(52.5%) and 100 (62.5%) of the respondents respectively.

Majority, 136 (85%) of the respondents were urban by resident. One hundred forty-one (88.1%) reported to be married and 3.1% are reported to be single. Pertaining to distance of respondents from hospital, 105 (65.6%) were live less than half an hour on single trip to reach to the hospital (Table 1).

**Table 1:** Socio-demographic characteristics of hypertensive patients at AMGH, Southern Ethiopia in 2017G.C, (n=160)

Variables		Number	Percent
Sex	Male	81	56.6
	Female	79	49.4
Age	18-40	19	11.9
	41-60	84	52.5
	>= 60	57	35.6
Ethnicity	Gamo	100	62.5
	Wolaita	5	3.1
	Amhara	30	18.8
	Others	25	15.6

Marital status	Single	5	3.1
	Married	141	88.1
	Divorced	6	3.8
	Widowed	8	5
Religion	Orthodox	84	52.5
	protestant	56	35
	Muslim	20	12.5
Residence	Urban	136	85
	Rural	24	15
Employment status	Government	34	21.3
	Merchant	53	33.1
	Students	1	0.6
	House wife	15	9.4
	Farmers	25	15.6
	Retired	25	15.6
	Others	7	4.4
Educational status	Cannot read and write	32	20
	Grade 1-6	30	18.8
	Grade 7-12	62	38.8
	Diploma and above	36	22.5
Monthly income in birr	<500 ETB	13	8.1
	501-1000	29	18.1
	>= 1000ETB	118	73.8
Distance from Hospital	<0.5hrs	105	65.6
	>0.5hrs	55	34.4

### Clinical Condition of Participants

In the current study, among 160 participants, 112(70%) had controlled blood pressure. Regarding the treatment, about 75(46.9%), were on treatment for 2-4 years, 92(57.5%) were on mono-therapy, 73(45.6%) were took one pill per day and 20(12.5%) took three and above pills per day. More than two- third of the participants, 116(72.5%), had no co-morbidity like diabetes, heart and kidney diseases. Out of 160 patients, 91(56.8%) take medicine once daily the remaining 15(9.4%) take medicine three times and above. Out of the total 160 patients, 118(73.8%) had no fear of drug toxicity and the remaining 42(26.3) are feared of drug toxicity.

Majority of the respondents, 147 (91.9%), were knowledgeable towards hypertension (HTN) and its treatment. Almost all, one hundred fifty-eight (98.8%) participants had good patient-provider relationship. Out of 160 patients majority 151(94.4%) are favorable attitude towards HTN and the remaining 9(5.6%) are not favorable (Table 2).

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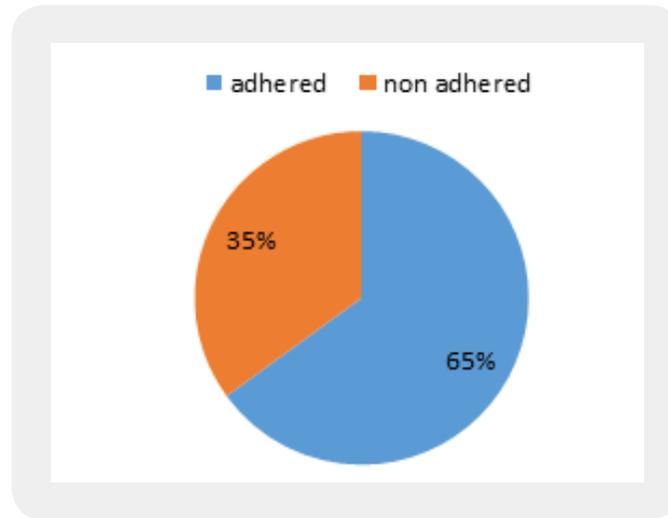
Biruk Wogayehu, *et al.* (2019). Prevalence and Associated Factors of Adherence to Antihypertensive Drugs Among Patients with Hypertension at Arba Minch General Hospital, Gamo Gofa Zone, South West Ethiopia, Cross Sectional Study. *CPQ Medicine*, 7(6), 01-16.

**Table 2:** Clinical conditions, knowledge and attitude towards HTN and its treatment and patient provider relationships of respondents, AMGH, South Ethiopia, 2017G.C, n=160

Variables		Number	Percent
Numbers of co morbidity	None	116	72.5
	One	25	15.6
	Two and above	19	11.9
Blood pressure	Controlled	112	70
	Not controlled	48	30
Types of drugs	One	92	57.5
	Two	52	32.5
	Three and above	16	10
Drug dosage frequency	Once daily	91	56.9
	BID	54	33.8
	TID and Above	15	9.4
Numbers of pills per day	One pill	73	45.6
	Two pills	67	41.9
	Three and above	20	12.5
Duration of treatment in years	0.25-1years	31	19.4
	2-4 years	75	46.9
	5-7 years	37	23.1
	8-10 years	16	10
	>=11years	1	0.6
Attitude	Favorable	151	94.4
	Not favorable	9	5.6
Patient provider relationship	Good	158	98.8
	Poor	2	1.2
Patient providers relationship	Good	158	98.8
	Poor	2	1.3
Knowledge towards hypertension and it's treatment	Knowledgeable	147	91.9
	Not knowledgeable	13	8.1
Drug cost	Yes	42	26.3
	No	118	73.8
Fear of side effect of drug	Yes	42	26.3
	No	118	73.8

### Respondents’ Level of Adherence to Antihypertensive Medications

In this study, the overall prevalence of good drug adherence to antihypertensive medications was 65%. (Figure 1)



**Figure 1:** Adherence status of antihypertensive drugs among study subjects at AMGH, 2017 G.C, n=160

### Factors Associated with Antihypertensive Treatment Adherence

The association of selected socio-demographic, clinical and other characteristics on adherence status was investigated using both the bivariate and multivariable logistic regression technique. Accordingly, variables considered in the bivariate analysis were: age, sex, residence, marital status, religion, educational status, income, employment status, number of co-morbidities, BP level, distance, dosage frequency, duration of treatment, number of medications, coverage of drug cost, knowledge about HTN and Patient provider relationship. Explanatory variables with p value up to 0.25 were included in the multiple logistic regressions (see on table 3).

**Table 3:** Effect of selected socio-demographic, clinical and other characteristics on adherence to antihypertensive treatment, AMGH, SNNP, 2017G.C, n=160.

Variables		Adherent status		COR(95%CI)	AOR(95%CI)
		Adherent	Non adherent		
SEX	Male	30	26	1	
	Female	51	53	1.199(0.63,2.29)*	
AGE	18-40yrs	13	6	1.693(0.56,5.08)*	
	41-60yrs	59	25	1.844(0.94,3.72)*	
	>=60yrs	32	34	1	

Marital status	Single	4	1	1	
	Married	94	47	6.667(0.49,91.3)*	
	Divorced	3	3	3.333(0.76,14.55)*	
	Widowed	3	5	1.667(0.195,14.3)*	
Religion	Orthodox	56	28	1	
	Protestant	31	25	0.62(0.309,1.243)*	
	Muslim	17	3	2.833(0.766,10.49)*	
Educational status	Cannot read and write	18	14	1	
	Grade 1-6	20	10	1.556(0.56,4.36)*	
	Grade 7-12	38	24	1.231(0.52,2.93)*	
	Diploma and above	28	8	2.722(0.5,7.79)*	
Income level	<=500ETB	13	16	1	
	500-1000ETB	83	35	0.675(0.21,2.21)*	
	>=1000 ETB	104	13	0.343(0.15,0.79)*	
Employment status	Government workers	21	13	0.646(0.11,3.80)*	
	Merchants	41	12	1.377(0.24,7.96)*	
	Students	1	0		
	House wife	6	9	0.267(0.04,1.85)*	
	Farmers	15	10	0.600(0.10,3.72)*	
	Retired	15	10	0.60(0.10,3.72)*	
	Others	5	2	1	
Numbers of co morbidity	None	88	28	5.388(1.93,15.01)	5.664(1.93,16.65)**
	One	9	16	0.964(0.28,3.33)	0.642(0.23,3.07)
	Two and above	7	12	1	1
Blood pressure	Not controlled	27	21	1	
	Controlled	77	35	1.711(0.85,3.43)*	
Distance from hospital	<=0.5hrs	78	27	3.222(1.62,6.40)	3.786(1.77,8.09)**
	>0.5 hrs.	26	29	1	1
Dose frequency	Once daily	60	48	2.212(0.73,6.67)*	
	BID	37	48	2.487(0.78,7.98)*	
	TID and Above	7	8	1	

Knowledge toward to HTN and its treatment	Not knowledgeable	6	7	1	
	Knowledgeable	98	49	2.3(.74-7.318)*	
Attitude	Not favourable	3	6	1	
	Favourable	101	50	0.248(0.06,1.03)*	

Note: - \*\* statistically significant \* variables with p value of greater than 0.25 in crude analysis omitted from entering in to the model.

Finally distance which is less than 0.5 hr from the hospital and having no co-morbidity remained to be significantly associated with adherence to treatment of HTN. The multivariable logistic regression showed that as the distance from the hospital decreased, the adherence to treatment of HTN got improved. The odds of adherence to antihypertensive drugs is more than three times higher when we compare patients with distance from the hospital less than 0.5hr with their counter parts. (AOR = 3.78, 95% CI = 1.77, 8.09). The odds of adherence among study participants with no co-morbidities was 5.66 times higher than those who had two co-morbidities (adjusted OR= 5.66, 95%CI 1.96, 16.65) (Table 3).

## Discussion

In many developing countries, maintaining good adherence to antihypertensive medications remained the most important challenge. Adherence to antihypertensive medications contributes for controlled blood pressure and the prevention of complications. Only 65% of the study subjects were found to be adherent to their treatment. It is comparable with what has been reported from Gondar university referral hospital (64.6%) [2]. the adherence to antihypertensive treatment found in the current study was also higher than that of 57% found in the study done in Pakistan [15]. This difference is due to majority of respondents having controlled BP in our study. Longer distance was a big barrier for adherence to treatment. Distance from the hospital was found to be significantly and independently associated with the adherence status of the respondents. Those patients from distant areas were less likely to be adherent as compared to study subjects who are closer. This finding is supported by the study done in Gondar and India [2,14]. Patients who take long to come to the clinic have certain characteristics that promote non-adherence, which also delayed them from coming for review and possibly collecting drugs from the hospital when they refill the antihypertensive.

The current study revealed that the numbers of co morbidities among HTN patients had significant associations on adherence behavior. This finding is supported by studies conducted in Gondar University Hospital [2], Addis Ababa Black lion hospital [16]. Co-morbidities can worsen the conditions of the patient and make them unable to adhere to their antihypertensive medications. Patients with no co morbidities were more likely to adhere to their treatment than those with two and above co morbidities. The possible reason could be if there is co -morbidity, they would have pill burden and if drugs are taken orally, they may cause gastrointestinal upset. All these might cause to miss antihypertensive medications. Additionally, when patients have additional health problem, their attention might be diverted towards the newly developed disease. Patients with more number of co morbidities could suffer from serious complications and complex treatment regimens which were favorable conditions not to adhere to their medications.

## Limitation of the Study

This study has the following limitations: self-reporting was used as the only method of measuring adherence. This method has the disadvantages of recall bias and eliciting only socially acceptable responses and hence, may overestimate the level of adherence. In addition, it did not consider HTN patients who did not visit the hospital during the time of the study. Hence, the extent of generalizability is limited only to those similar patients who are on chronic illness follow up care. Since it is cross-sectional study, unable to detect causal inference.

## Conclusions

In conclusion, more than half of the study participants were found to be adherent to their treatment. Factors such as distance from the hospital and number of co-morbidities were associated with adherence behavior of patients. Early diagnosis and management of co morbidities, adherence counseling and patient education about the disease and its treatment are important to improve adherence status of patients.

## Recommendations

- Administrative body of AMGH should increase health facility giving emphasis to health education towards hypertension.
- To health professional, especially nurses should emphasis on the awareness creation related to hypertensive complications and the benefit of adherence behavior of the patients. Also to increase organized continuous health education concerning hypertension might be the increase for adherence among these patients.
- To municipality of Arba Minch town to conduct mass health education and offering health education (information) for the public on hypertension and adherence of drugs increase the awareness of the community and attitude to comply with their medic.

## Declarations Section

### Ethics Approval and Consent to Participate

#### *Information Sheet*

**Title of the Research Project** prevalence and associated factors of adherence to antihypertensive drugs among patients with hypertension at Arba minch general hospital, Gamo Gofa zone, south west Ethiopia, Cross sectional study.

**Name of the Organization:** Arba Minch University

**Name of the Sponsor:** Arba Minch University

**Introduction:** This information sheet is prepared for Hypertensive patients at chronic care follow up in Arbaminch General hospital, Gamo Gofa zone. The aim of the form is to make the above concerned patients

clear about the purpose of the research work, data collection procedure and get permission to undertake the research.

**Purpose of the Research Project:** To assess the magnitude of adherence to anti hypertensive agents and associated factors among hypertensive patients who are on follow up at Arbaminch General Hospital, Gamo Gofa zone, Southern Ethiopia.

**Procedures:** In order to achieve the aforementioned objective, the randomly selected patients from chronic care follow up will be interviewed based on the questionnaire prepared for this purpose. I would like to assure you that everything you are about to tell remains strictly confidential and anonymous using coding system whereby no one will have access to your response.

**Risk and Discomfort:** By participating in this research project, there is no risk that comes to the selected health workers & the health facility in general. But the only cost incurred by the participants will be approximately 30 minutes of their time. If fatigue occurs, (or for any other reason) the participant may terminate the interview at any time to rest or re-schedule it, or may choose to not continue in the study.

**Benefit:** If you participate in this research project, you may not get direct benefit but your participation is likely to help us to determine the status of adherence to antihypertensive drugs and associated factors among diabetic patients who are on follow up at Arbaminch General Hospital, Gamo Gofa zone, Southern Ethiopia.

**Confidentiality:** To keep the confidentiality the name of client will not be mentioned rather code number will be used and no unauthorized access to the information is allowed.

**Right to Refusal or Withdraw:** your participation in the study is voluntary and you have the right to: (a) not answer a question, (b) terminate the interview, or (c) withdraw from the study at any time in the process. Your participation or nonparticipation or refusal to answer questions will have no effect on your personal life. However your answers have their own values and contribution to the improvement of adherence among hypertensive patients who are on follow up at Arbaminch General Hospital, Gamo Gofa zone, Southern Ethiopia.

### **Competing Interest**

We declare that we do not have competing interests.

### **Acknowledgement**

First of all, we would like to thank Arbaminch University College of health sciences for providing an ethical approval and fund to conduct this study. Next, we would also like to give our heartfelt for officials and professionals of Gamo Gofa zone health department and Arbaminch general Hospital for permission to undertake the research and for welcomed face. Finally, we would like to gratitude data collectors, friends and all individuals who helped directly or indirectly for the success of this study.

## Authors' Contributions

Y.C.D, is main author, conceived, designed and coordinated the study. M.S, T.T, S.S T.F and B.W participated in formal analysis and interpretation of the data.

Y.C prepared original draft of the manuscript coordinated the data collection process, funding acquisition and supervision of data collectors.

T.F and S.S review and editing of the manuscript; all authors read and approved the final manuscript.

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