Application of Binomial Models on the Determinants of Hypertension Patients in Haramaya Woreda, Eastern Hararghe, Ethiopia

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Abstract

Introduction: Hypertension is along with a medical condition, in which the blood pressure in the arteries is high, which is a major health problem in the community. The main aim of the study was to assess the determinants associated with patients who experienced hypertension in Haramaya Woreda using a binomial model.

Methods: A cross-sectional study design was conducted to assess the associated factors of *hypertension patients' complications in the Haramaya Hospital, Eastern Hararghe zone from December 1st to 30th, 2020*. Data were statistically analyzed using the statistical package for social sciences (SPSS) version-23 (SPSS Inc., USA). A sample of 1417 respondents having hypertension chronic disease was included. Statistical tools such as descriptive statistics, chi-square test of association, and binomial regression were used to summarize and interpret the hypertension patients' dataset and a 5% level of significance was also used as a baseline comparison.

Results: Both chi-square test of association and binomial model revealed that age group, gender, residence, presence of diabetes mellitus and congestive heart failure were significantly associated with hypertension patients at a 5% level of significance. Multivariable binomial regression model indicated that an estimated odd ratio(OR) with 95% confidence interval were age group of 21-30year3.502(95%CI=1.310-9.361),31-40year6.108(95%CI=2.364-15.782),41-50year 11.070(95%CI=4.276-28.661), 51-60 year 12.530(95% CI=4.890-32.107) and greater than 60 years 12.713(95%CI=4.827-33.482), being male (OR=1.859; 95%CI=1.320-2.617), living in rural (OR=0.545. 95%CI=0.381-0.778).The presence of diabetes mellitus (OR=0.028, 95%CI=0.019-0.040), and congestive heart failure (OR=0.017, 95%CI=0.009-0.032) are associated risk factors of hypertension patients.

Conclusions: The main hypertension risk factors were age category, gender, residence, having diabetes mellitus, and congestive heart failure ($p=0.0001$). Those were significantly associated with hypertension in both the chi-square test of association and binomial model. To predict the participants being a hypertensive binomial model with logit link function best fit the dataset.

1. Introduction

Hypertension is a long-term medical condition in which the blood pressure in the arteries is high. Hypertension is a chronic health disorder characterized by higher blood pressure (BP) in the blood vessel and determined as raised systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg in adults aged 18 years and above(Animut, 2018 #4;Asresahegn, 2017 #2;Legese, 2020 #5) [1]–[4]. Long-term high blood pressure is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia. Blood pressure is expressed by two measurements such as systolic and diastolic pressures, which are the maximum and minimum pressures, respectively. High blood pressure is divided into primary hypertension or secondary hypertension. About 90 up to 95% of cases are primary, defined as high blood pressure due to nonspecific

lifestyle and genetic factors. On average, systolic and diastolic blood pressures were 125.3 mmHg and 78.5 mmHg, correspondingly [5]. The average systolic and diastolic blood pressure respectively were 117.0 mmHg and 75.5 mmHg [6].

Hypertension is the top leading cause of the global burden of disease [7]. Because of its associated risks of cardiovascular and kidney diseases such as myocardial infarctions, strokes, and renal failures as well as its frequent disease, hypertension disease is the main health challenge in the community[1]. Hypertension affects around 22% of people aged 18 years and above and it is responsible for an estimated 9.4 million deaths per year globally [8], [9].]. Hypertension is a worldwide public health problem and it is a risk factor for cardiovascular disease. An estimated 1.13 billion people worldwide have hypertension, most (two-thirds) living in low- and middle-income countries [10].

According to World Health Organization, African Region has the highest prevalence of hypertension (27%) while the American Region has the lowest prevalence of hypertension (18%) [10]. The increasing prevalence of hypertension in developing countries is a major concern. According to recent estimates from the World Health Organization, two-thirds of hypertensive people live in developing countries including Ethiopia [11]. Hypertension is the leading risk factor for cardiovascular disease and death in Africa. It is a public health problem and big economic impact in Africa. This is because a significant proportion of the productive population is affected by hypertension and its complications[12]. Almost three-quarters of people with hypertension live in developing countries where people have very low awareness of hypertension [13]. The prevalence of hypertension is increasing in Africa rising from 19.7% in 1990 to 30.8% in 2010 [14].

A review of current trends shows that the number of adults with hypertension increased from 594 million in 1975 to 1.13 billion in 2015, with the increase seen largely in low and middle-income countries. The lower-income countries include Ethiopia have been affected by double burden diseases. The WHO 2011 report showed that 34% of all deaths in Ethiopia were due to non-communicable diseases, from which cardiovascular disease contributes 15% [15]. Burial surveillance in Addis Ababa also revealed that 51% of all deaths were due to non-communicable diseases, of which cardiovascular disease was a main cause of death (24%), and hypertension was responsible for 12% of the cardiovascular disease deaths [16].

Some studies have been done on hypertension that swept the worldwide. According to the World Health Organization's recent update [9], hypertension is one of the top five continuing risk factors for cardiovascular deaths in the world. The World Health Organization (WHO) predicted deaths from non-communicable diseases (NCDs) would increase globally by 17% over the next ten years where the greatest increase will be in the African region (by 27% or 28 million deaths from NCDs)[17]. Raised blood pressure is the principal risk factor for worldwide mortality in which 9.4 million deaths and 7% of disease burden in 2010 were caused by elevated blood pressure. If blood pressure is left uncontrolled, hypertension causes stroke, myocardial infarction, cardiac failure, dementia, renal failure, and blindness [1]. Concerning the deviations in regional and residence adults with hypertensive were 40% in the world and 46% in Africa [18]–[20]. Regarding the problem with hypertension disease, the peoples are not

responsive to their health status to the timely and suitable intervention, the symptoms of the disease do not appear until complications of a heart attack happen, developed severe disabilities like heart failure, chest pain, and irregular heartbeat which leads to sudden death in many guys with elevated blood pressure[4].

According to World Health Organization, the method that discourses treatment decisions relied on individual risk factors is less cost-effective than the technique that addresses total cardiovascular risk [21], [22]. World Health Organization recommends a total risk tactic that enables assimilated control of hypertension, diabetes, and other cardiovascular risk factors in primary care and targets available resources at persons most likely to develop heart attacks, strokes, and diabetes complications [15], [23]

Diabetes contributes a huge burden of disease so that diabetic patients exhibit a very high prevalence of hypertension. People have a high prevalence of hypertension that is three times more affected than the general population[24]. According to the study done in sub-Saharan Africa, as a result of diabetes, the total disability-adjusted life years were increased by 126.4% between 1990 and 2017, thus, the decide largest change observed across all level 3 causes of NCD burden. Diabetes in sub-Saharan Africa has not only increased in terms of total disability-adjusted life years, but also in terms of crude and age-standardized disability-adjusted life year rates, as well as years of life lost and years of life lived with disability rates [25]. Diabetes status was a significant risk factor as evidenced by the prevalence of hypertension among 29.9%, 44.0%, and 53.3% for normoglycemic, prediabetes, and diabetic individuals, respectively [26]. The residence status of the patient was found to have a significant factor of hypertension among its prevalence that 33.5% for Atbara, 39.5% for Ed Damer, 30.4% for Shendi, and 41.0% for berber[26]. The study conducted by Huang et al., (2020) reported that compared with non-hypertensive patients, hypertensive patients were older (58–73 vs 40–68), had higher rates of diabetes (28.3% vs 8.1%), and had a higher mortality rate (24.8% vs 15.2%). Different studies in Ethiopia and others revealed that increased risk of hypertension was associated with older age (≥ 45 years), obesity[28], smoking [29] and chat chewing [29], [30].

In spite of the fact that several studies have been done on hypertension using a summary measure of statistics, meta-analysis to predict the effect of associated factors by ignoring the covariates are at the level of the study rather than the level of the subject, and the dependent variable is the effect size in the studies rather than subject scores. An up-to-date and comprehensive assessment of the evidence concerning hypertension in Ethiopia is lacking. Thus, this study assessed associated factors of Hypertension patients and the application of Binomial models in Haramaya Woreda, Eastern Hararghe, and Ethiopia.

2. Methods

2.1. Study Design, and Period

A cross-sectional study design was conducted to investigate the factors associated with hypertension patients' complications in Haramaya Hospital, Eastern Hararge Zone, Ethiopia. Haramaya hospital is one of the public hospitals in the East Hararge zone which is found in Ethiopia and was established in 2000. The admitted hypertension patients and related health complaints were deliberated as hospital admission due to high hypertension complications. All patients admitted to the medical ward of the hospital from January 1st, 2019 to December 30th, 2020 due to hypertension-related health conditions such as stroke, cardiovascular, renal, or peripheral vascular diseases, and hypertensive emergencies were included in this study. However, patients with those health conditions and additional comorbidities such as diabetes mellitus, and patients with $<140/90$ mmHg blood pressure at admission or with no documented antihypertensive medication history were excluded from this study.

2.2. Data Sources and Collection Procedures

Hypertension was defined as admission blood pressure of ≥ 140 mmHg systolic and/or ≥ 90 mmHg diastolic or previously on anti-hypertension medication. Blood pressure was measured by the physician or nurse at the emergency department using a standard mercury sphygmomanometer. Patients were allowed to sit for 5 minutes before measurement then at least two blood pressure measurements; spaced 1–2 minutes apart were taken. This was repeated every 30 minutes until the patient gets stable per the national guideline [31]. We took the average of the first two consecutive records as the patient's blood pressure at admission. We considered the type of hypertension complication recorded on the patient discharge notes as the final diagnosis of hypertension complication.

Data were collected through reviewing medical records; admission logbooks and patient folders by the investigation team using a data extraction sheet. First, we reviewed medical admission logbooks to count the sex and admission outs of all medically admitted patients and to identify and prepare the list of Unique Medical Record Number (UMRN) of 1417 patients admitted due to hypertension complications. Then, using patients' UMRN those patient folders were drawn from the medical record room and reviewed for data collection. Data retrieved from patient and tuberculosis screening results.

2.3. Variables of the study

Dependent Variables of the study: The dependent variable is hypertension complication that coded as 1 for the presence of hypertension complication and 0 for the absence of hypertension complication.

Independent variables of the study: The independent variables were age group sex, residence, diabetes mellitus, congestive heart failure, and tuberculosis screening results.

2.4. Operational Definition of the terms

Hypertension is a higher blood pressure that determined as raised systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg [1], [3], [4].

Diabetes mellitus is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period This high blood sugar produces the symptoms of frequent urination, increased thirst,

and increased hunger [32].

Heart failure is a chronic, progressive condition in which the heart muscle is unable to pump enough blood to meet the body's needs for blood [33] .

Congestive heart failure is a type of heart failure that requires seeking timely medical attention, although sometimes the two terms are used interchangeably.

Tuberculosis screening results is defined as the identification of people with suspected active TB, in a predetermined target group, using tests, examinations or other procedures that can be applied rapidly [34].

2.5. Methods of Data Collection and Data Analysis

The collected data were checked for completeness and consistency daily by principal investigators. The data was entered into SPSS version 23 statistical software for analysis.

2.6. Specification of Binomial regression model

This model describes the relationship between a dichotomous response variable and a set of continuous or discrete explanatory variables [35]. The logistic regression model has become the statistical model of choice [36]. First, it considers the case where the response variable y_i is binary, assuming only two values that are coded as one or zero.

$$y_i = \begin{cases} 1, & \text{if the } i^{\text{th}} \text{ patients with hypertension} \\ 0, & \text{if the } i^{\text{th}} \text{ patients without hypertension} \end{cases} \quad (1)$$

We view y_i as a realization of a random variable Y_i (hypertension complication) that can take the values one and zero with probabilities π_i and $1 - \pi_i$, respectively.

The Binomial Regression model is the family of **Generalized Linear Models**. GLMs are used to model the relationship between the expected value of a response variable y and a linear combination of the explanatory variables vector X using link function such as logit and probit.

Odds ratio of binary logistic regression: The logistic regression function can be expressed in terms of odds ratio.

$$\frac{\pi_i}{1 - \pi_i} = \exp\{x_i' \beta\} \quad (2)$$

This expression defines a multiplicative model for the odds. For instance, if we were to change the j^{th} predictor by one unit while holding all other variables constant, we would multiply the odds by $\exp\{\beta_j\}$. Following some algebraic manipulation, the following intrinsically linear function is produced.

$$\ln \left[\frac{\pi_i}{1-\pi_i} \right] = x_i' \beta = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik} \quad (3)$$

2.7. Parameter Estimation and Model Diagnosis

Logistic regression uses a maximum likelihood estimation technique to estimate parameters in the model. Maximum likelihood function yields the best solution for the binary logistic model and log likelihood function are given in Equations (4) and (5), respectively (Anthony et al, 2014).

$$L(\beta) = \prod_{i=1}^n (\pi_i)^{y_i} (1 - \pi_i)^{1-y_i} \quad (4)$$

$$\ln L(\beta) = \sum y_i \ln(\pi_i) + (1 - y_i) \ln(1 - \pi_i) \quad (5)$$

The well fitted models show non-significance on the Hosmer and Lemeshow goodness-of fit test. This desirable outcome of non-significance indicates that the model prediction does not significantly differ from the observed [38]. To test the capability of all predictors in the model jointly to predict the response variable. A finding of significance of Omnibus test corresponds to concluding that there is adequate fit of the data to the model [38].

3. Results

3.1. Distributions and summary measures of categorical variables in the study

The outline measures of socio-economic factors were displayed in Table 1. The whole tests of 1417 hypertension patients conceded to Haramaya Clinic were utilized to recognize the potential factors and utilized binomial models. Out of the whole, 58.0%(822) of male patients were conceded to the healing center for hypertension screening though 42.0%(595) were female patients. More of the patients were living in rustic ranges 65.8%(932) of Haramaya woreda. The respondents have categorized age dispersions of 14%(198) for 21-30, 21.4%(303) for 31-40, 20.2%(286) for 41-50, 21.5%(305) for 51-60, and 14.0%(199) for more than 60 a long time though the remaining 8.9% have less than twenty years old. Patients who experienced diabetes mellitus within the clinic were around 55.5% of the entire affirmation and 44.5% did not have diabetes.

Inlined with this tall rate of diabetes patients the chi-square test of affiliation appeared that there's a measurable affiliation between those persistent maladies of hypertension and diabetes (p-value=0.00001). Most of the patients with hypertension were not experienced congestive heart disappointment 81.5%(1155) and had negative Tuberculosis screening comes about 94.3%(1336). Be

that as it may, around 18.5% (262) of the patients had congestive heart disappointment unremitting illnesses which have a solid affiliation with hypertension.

The comes about of the chi-square test of affiliation shown in Table 1 uncovered that Age group, sex, Home, nearness of diabetes mellitus, and congestive heart disappointment were altogether related to the hypertension patients at a five percent level of noteworthiness. This suggests the nearness of those components deciding the presentation hazard of the encompassing community for the unremitting hypertension illness in Haramaya Woreda. In expansion, the age dispersion of respondents appeared that more of the patients were in Age category of 41-50 and 51-60 a long time as shown in Figure1. But Tuberculosis has no such impact on the hypertension patients of the clinic conceded within the current study.

Table 1
Distributions and summery measures of determinants associated with Hypertension patients'

Variables	Category	Frequency	Percentage	Statistic	Df	p-value
Age group	<=20	126	8.9	45.419	5	0.00001
	21-30	198	14.0			
	31-40	303	21.4			
	41-50	286	20.2			
	51-60	305	21.5			
	>60	199	14.0			
Gender	Male	822	58.0	43.309	1	0.00001
	Female	595	42.0			
Residence	Urban	485	34.2	14.258	1	0.00001
	Rural	932	65.8			
Presence of DM	Non-diabetic	631	44.5	262.396	1	0.00001
	Diabetic	786	55.5			
Congestive heart failure	No	1155	81.5	77.981	1	0.00001
	Yes	262	18.5			
TB screening result	Negative	1336	94.3	0.204	1	0.6520
	Positive	81	5.7			

Most of the hypertensive patients were found in Age bunch of 51-60 a long time while youthful age bunches of less than 20 a long time were less uncovered to be hypertensive as demonstrated in Figure 1.

3.2. Classification of Hypertension patients' data

A classification Table 2 was used to summarize the predictive power of a binary logistic model. In this case, the Table cross-classifies the binary response with a prediction of whether respondents were not experienced hypertension ($y = 0$) or had experienced hypertension ($y = 1$). Therefore, the predictive power of the binary logistic regression model for hypertension patients being correct classification was 88.0% based on the cutoff value of 0.5.

Table 2

Classification of hypertension patients.

Observed			Predicted		
			Hypertension		Percentage Correct
			No	Yes	
Step 1	Hypertension	No	972	73	93.0
		Yes	97	275	73.9
	Overall Percentage				88.0
a. The cut value is .500					

3.3. Link function for Model Comparison and Model Summary

Model selection was done using Akaike information criteria and comparisons have been made between the link function of logit, probit, and identity. Based on the result of the generalized linear model with the respective link function, binary logistic with logit link function has the smallest Akaike information criteria (AIC=267.102) and Bayesian information criteria (BIC=324.932) among the candidate model which implies that model with logit link function best fit of the hypertension dataset. In addition, log-likelihood and deviance statistics are also inlined with the logit link function of binary logistic regression as observed in Table 3.

Table 3

Model comparison for hypertension dataset.

Link function	Df	AIC	BIC	Log Likelihood	Deviance
Identity	10	813.625	876.701	-394.812	144.846
Logit	10	267.102	324.922	-122.551	112.253
Probit	10	269.885	327.704	-123.942	115.036

3.4. Result of Final binomial regression model and Interpretations of Parameter

Parameter estimates and their corresponding confidence interval of 95% for odds ratio were presented in Table 4. The binomial logistic regression with logit link function results indicated that age, gender, living place(residence), presence of diabetes mellitus, and congestive heart failure were significantly associated with being hypertensive of patients in the Haramaya woreda community whereas the Tuberculosis screening result was insignificant at 5% level of significance. The odds of hypertensive patients being female was 1.859 times more likely to be exposed to chronic hypertension disease as compared to male respondents of the hospital admitted patients. This implies about 85.9% of female respondents in the haramaya woreda were experienced hypertension complication's than males (OR=1.859; 95%CI=1.320-2.617). The Wald-test results for Age group of hypertension patients showed at least one coefficient different from zero which reflected that Age group had a significant effect on hypertension patients' of the community. Being older Age in years increased the risk of having hypertension complications. An estimated odd of hypertensive patients among Age group of 21-30, 31-40, 41-50, 51-60 and greater than 60 years were 3.502 (95%CI=1.310-9.361), 6.108(95%CI=2.364-15.782), 11.070(95%CI=4.276-28.661), 12.530(95% CI=4.890-32.107) and 12.713(95%CI=4.827-33.482) respectively. As a result, the risk of being hypertensive was more than three-fold for 21-30 years, six-fold for 31-40 years, eleven-fold for 41-50 years, and more than 12 fold for greater than 50 years higher as compared to their counterparts.

Another important factor was the Residence of respondents which is potentially affecting the hypertension patients in the surrounding. An estimated odds of living in rural area was 45.5% times less likely to develop hemoglobin complications' than being resident in urban (OR=0.545. 95%CI=0.381-0.778). In addition, respondents having diabetes mellitus (OR=0.028, 95%CI=0.019-0.040) and congestive heart failure (OR=0.017, 95%CI=0.009-0.032) were less developed hypertension chronic disease than those who haven't Diabetes and heart failure Respectively as indicated in Table 4. The goodness model has been checked using the Hosmer and Lemeshow test which suggested that the binomial model of logit link function was an appropriate model to predict and analyze the hypertensive patients' data set (chi-sq=11.00, P-value=0.202).

Table 4

Results of final binomial model with logit link function parameter estimation.

Factors	Levels	β	SE	Wald	Df	p-value	AOR	95%CI.for AOR
Age group (≤ 20)	21-30	1.253	0.502	6.242	1	0.0120	3.502	[1.310-9.361]
	31-40	1.810	0.484	13.960	1	0.00001	6.108	[2.364-15.782]
	41-50	2.404	0.485	24.536	1	0.00001	11.070	[4.276-28.661]
	51-60	2.528	0.480	27.734	1	0.00001	12.530	[4.890-32.107]
	>60	2.543	0.494	26.486	1	0.00001	12.713	[4.827-33.482]
Gender (male)	Female	0.620	0.175	12.606	1	0.00001	1.859	[1.320-2.617]
Residence(urban)	Rural	-0.608	0.182	11.154	1	0.0010	0.545	[0.381-0.778]
Diabetes mellitus(no)	Yes	-3.591	0.192	349.306	1	0.00001	0.028	[0.019-0.040]
CHF(No)	Yes	-4.098	0.329	154.746	1	0.00001	0.017	[0.009-0.032]
TB screening (No)	Yes	0.013	0.366	0.001	1	0.9720	1.013	[0.494-2.076]
Intercept		-0.743	0.477	2.425		0.119	0.476	
• Goodness of fit chi-square=11.000, p-value=0.202, CHF=congestive heart failure								

4. Discussion

This study was aimed to identify and describe factors associated with hypertension patients' using the binomial model in Haramaya Woreda of East hararghe zone, Ethiopia. The results of the study implied that out of the sample 1417 of hypertensive patients admitted at Haramaya hospital from January 1st, 2019 to December 30th, 2020, 26.3% were experienced hypertension while 73.7% were not hypertensive. The study revealed that Age of patients', gender, Residence, presence of diabetes mellitus, and congestive heart failure had a significant effect on being hypertensive of respondents who live in Haramaya woreda that admitted to Haramaya Hospital at a 5% level of significance. The binomial model was employed with logit, probit, and identity link function, and the model with logit link function was an appropriate model based on Akaike information criteria which had the smallest (AIC=267.102) value as compared to

candidates' models. Hosmer and Lemeshow test also indicated that the binomial model with logit link function was a good fit for the hypertensive dataset. The prevalence for hypertension patients was 26.3%.

Both chi-square test of association and binomial model showed age group of patients\ had a significant effect on being hypertensive. The risk of respondents experiencing hypertension was increased as the Age of patients increased. As a result, the risk of being hypertensive was more than three-fold for 21-30 years, six-fold for 31-40 years, eleven-fold for 41-50 years and more than 12 fold for greater than 50 years higher as compared to younger age. This study consistent with study done by [39]–[41]. As the age increased for the patients the incidence risk of disease also increased which is in-lined with [13], [42], [43]. Another important factor associated with hypertensive was Gender of respondents which had significant effect on hypertension patients at 5% level of significance. The parameter estimation of binomial model indicated that the odds of female gender associated to being hypertensive was increased 1.859 times more as compared to counterpart. This implies females were more vulnerable part of society with hypertension disease in Haramaya Woreda and there was positive association between gender and being hypertensive. This study confirmed with study done in Nepal [13], [44]. Also study done in Debre Markos Town supported that being female was associated with hypertensive [20].

Living place of patients had effect to experience chronic hypertension based on the dataset of haramaya hospital. As a result of binomial model, the estimated risk of rural residence was 0.545 with confidence interval of 95% [0.381-0.778]. The risk of living in rural was 0.545 less likely to develop hypertension as compared living in urban area. This may be as a reason of most rural resident exercise more due to working on agricultural practice and used iron lacked food. The result linked with study conducted in Addis Ababa, Ethiopia, which indicated that Rural residents had a 3.5% lesser risk of death than urban patients [45].

Other important factors were presence of chronic disease diabetes mellitus and congestive heart failure which is significantly associated with being hypertensive. The odd of having diabetes mellitus was 2.8% less likely to develop hypertension than non-diabetes patients in the Haramaya woreda residents. This implies being admitted for diabetes mellitus treatment at hospital deceased the risk of developing chronic disease hypertension or non-diabetes people had more probability of exposed to hypertension disease in the community. The reason may be the health complication of diabetes was treated in the way that it decreases the risk of hypertensive person. Congestive heart failure also has significant effect on the respondents being hypertensive.

5. Conclusions

The prevalence of chronic hypertension was 26.3% among the study participants. Age category of respondents, gender, residence, having diabetes mellitus and congestive heart failure were independent predictors of hypertension. To predict and estimate the parameters of participants being hypertensive binomial model with logit link function was an appropriate model as the result of Hosmer and lemeshow statistic indicated ($\chi^2 = 11.00$, p-value=0.202). The healthcare providers are recommended to give due

attention for older age, women, urban resident and serious care for participants having diabetes mellitus and congestive heart failure in order to minimize the occurrence of hypertensive. On the top of this, future planning should be turn face to trainee the health services professional.

Declarations

Ethics approval and consent to participate

Letter of ethical clearance was obtained from Haramaya University, Department of Statistics and submitted to Haramaya Hospital to get permission to conduct this research. This study was developed in accordance with established legislation and complies with the norms of good clinical practice, and informed consent was being not necessary as personal identifying information was kept separate from this research data. Finally, the study protocol was approved by the ethics committee or medical directors of the Hospital.

Consent for publication

Not Applicable

Availability of data and materials

The raw data used in this study can be accessed from Haramaya Hospital.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

KK,MM and MW was involved in the conception and design of the study, drafting the manuscript, review of protocol development, interpretation of the data and review of the manuscript. All authors read and approved the final manuscript.

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Figures

Figure 1

Age conveyance of respondents conceded at Haramaya Healing center for the hypertensive case

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