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Factors associated with poor medication adherence during COVID-19 pandemic among hypertensive patients visiting public hospitals in Eastern Ethiopia: a cross-sectional study

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ABSTRACT

Objective This study aimed to assess factors associated with poor medication adherence during the COVID-19 pandemic among hypertensive patients visiting public hospitals in Eastern Ethiopia.

Setting Hospital-based cross-sectional study was conducted in Harari regional state and Dire Dawa Administration from 1 January to 30 February 2022. Both settings are found in Eastern Ethiopia.

Participants A total of 402 adult hypertensive patients who visited the chronic diseases clinic for follow-up were included in the study.

Main outcome measures The main outcome measure was poor medication adherence during the COVID-19 pandemic.

Results The level of poor antihypetensive medication adherence was 63% (95% CI 48.1 to 67.9). Patients who had no formal education (adjusted OR (AOR)=1.56, 95% CI 1.03 to 4.30), existing comorbid conditions (AOR=1.98, 95% CI 1.35 to 4.35), self-funded for medication cost (AOR=2.05, 95% CI 1.34 to 4.73), poor knowledge about hypertension (HTN) and its treatment (AOR=2.67, 95% CI 1.45 to 3.99), poor patient–physician relationship (AOR=1.22, 95% CI 1.02 to 4.34) and unavailability of medication (AOR=5.05, 95% CI 2.78 to 12.04) showed significant association with poor medication adherence during the pandemic of COVID-19.

Conclusion The level of poor antihypertensive medication adherence was high in this study. No formal education, comorbidity, self-funded medication cost, poor knowledge about HTN and its treatment, poor patient–physician relationship, and unavailability of medication during the COVID-19 pandemic were factors significantly associated with poor adherence to antihypertensive medication. All stakeholders should take into account and create strategies to reduce the impact of the COVID-19 pandemic on medication adherence of chronic diseases.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study used both primary and secondary data, which improve the accuracy of the data.
⇒ The study was a multicenter study that was conducted at four public hospitals in Eastern Ethiopia.
⇒ This study was the first study that showed the impact of the COVID-19 pandemic on medication adherence in Eastern Ethiopia.
⇒ The finding of this study showed the role of the patient–physician relationship in medication adherence.
⇒ Self-reporting could overestimate the level of medication adherence.

The burden of high blood pressure (BP) is significantly increasing in sub-Saharan Africa (SSA) over the past two to three decades.[2] In SSA, 80 million people were living with HTN in 2000, projected to be 150 million by 2025.[2] Even though, no countrywide study in Ethiopia the result of systematic review and meta-analysis showed that the prevalence of HTN was 19.6%.[3]

In a broader sense, HTN management requires a multifactorial approach which is classified into two main categories: pharmacological therapy and lifestyle modifications. Lifestyle modification includes a healthy diet, being physically active, non-smoking and weight management.[4] Antihypertensive medication adherence is another important component of HTN management which significantly decreases hospitalisations rates and lower medical care costs.[4 5]

Many studies have suggested that high adherence to antihypertensive medication improves clinical outcomes and reduces the risk of cardiovascular diseases.[6 7] However, the impact of COVID-19 on antihypertensive drug adherence in low-income and

INTRODUCTION

Hypertension (HTN) is affecting one billion people globally and causes around 10 million deaths and 2 million disabilities annually.[1]

middle-income countries doubled the burden of non-communicable diseases including HTN.[8] The health systems of all countries faced a huge challenge related to prevention, reducing and overcoming the effect of the spread of COVID-19, providing timely medical care and adequate medical therapy, and regulating the risk of unavailability of drugs.[9]

During this period, pharmaceutical companies are concentrated on battling COVID-19. Moreover, inadequate manufacturing capabilities and paying for the cost of the medication were the key problems.[10]

In Ethiopia, inadequate supply to meet the increased demand created by COVID-19 made many patients unable to afford the cost of their medications.[11] Even though antihypertensive drug adherence affects the HTN outcome,[12] accessibility and affordability of the medication have negatively affected medication adherence during the period of the pandemic.[8] Therefore, this study aimed to assess factors associated with poor medication adherence during the COVID-19 pandemic among hypertensive patients visiting public hospitals in Eastern Ethiopia.

MATERIALS AND METHODS
Study area, period and design
A hospital-based cross-sectional study was conducted from January 1 to February 30, 2022 at public hospitals found in Harari regional state and Dire Dawa Administration, Eastern Ethiopia. Harari regional state is one of the eleven regional states in Ethiopia. Harar is the capital city of the Harari region, and it is found 526 km away from Addis Ababa in the Eastern direction. The total population of the town was projected to be 263 455 of which 132 294 are women in 2022. Harari region has two public hospitals: Hiwot Fana Compressive Specialised University Hospital (HCFSUH) and Jugal General Hospital (JH). Dire Dawa Administration is one of the administration of the Federal Democratic Republic of Ethiopia. Dire Dawa adiministartion is found 515 km away from Addis Ababa in the Eastern direction. The estimated total population of the Dire Dawa Administration was 629 855, of whom 316 861 are women in 2022. Dire Dawa Administration has two public hospitals, namely, Dilchora Referral Hospital (DRH) and Sabian General Hospital (SGH).

Patient and public involvement
There was no patient or public involvement in this research.

Study participants and eligibility criteria
The first COVID-19 case was confirmed on 13 March 2020 in Ethiopia. Until 1 February 2022, there were 439 832 COVID-19 cases. During the study period (January–February 2022), there were 48 332 COVID-19 new cases reported in Ethiopia. All adult (≥ 18 years old) hypertensive patients on follow-up clinic and who were on antihypertensive treatment for at least months before the data

collectiion period were included in this study. However, patients with severe illnesses who could not respond to the interview and those who had cognitive problem were exluded.

Sampling and sampling procedure
A single population proportion formula was used to calculate the sample size. The assumptions considered were 95% confidence level, 5% margin of error and 40% prevalence of poor medication adherence.[13]

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 P\ (1-P)}{d^2}$$

$$n = \frac{(1.96)^2\ 0.4\ (1-0.4)}{0.05^2} = 369$$

By adding 10% non-response rate, the final sample size became 406. This research was conducted at four public hospitals in the Harari regional state and Dire Dawa Administration in Eastern Ethiopia. The expected number of patients coming to the hypertensive follow-up clinic was approximated from the previous quarterly report. Then the total number of hypertensive patients approximated for the 2-month (data collection) period was 1868. Then, the calculated sample size was proportionally allocated to each hospital based on the respective number of patients. The study participants were then selected using systematic random sampling (k=1868/406=4.6≈4). The first study participant was selected by using the lottery method.

Study variables and measurements
Dependent variable
The dependent variable was poor medication adherence.

Independent variable
Sociodemographic related factors were sex, age, marital status, religion, educational status, occupation and place of residence. Clinical and patient-related factors were BP control status, presence of comorbidity, medication cost coverage, duration of treatment, number of medication, medication side effect and patient–physician relationship, social support, knowledge about HTN and its treatment, and effect of the COVID-19 pandemic (unavailability of medication and unaffordability or increased price).

Data collection tool and procedure
Data were collected through face-to-face interviews and record reviews using pretested and structured questionnaires. Medication adherence was measured by a modified version of the Medication Adherence Rating Scale (MARS),[14] and its Cronbach's alpha was 0.91. Hypertension Knowledge-Level Scale (HK-LS)[15] with a Cronbach's alpha of 0.93 was used to measure respondents' knowledge about HTN and its treatment. The patient–physician relationship was assessed by the patient–physician Relationship Questionnaire[16] and had a Cronbach alpha of 0.94. Duke Social Support and Stress Scale with 12 items was used to assess support gained from family and non-family[17] and its Cronbach's alpha was 0.88. All

the aforementioned standard measurement scales had an acceptable level of internal consistency. The questionnaire was originally developed in English and translated into the local language (Afaan Oromo, Amharic and Af-Somali) for data collection based on the patient's language preference (online supplemental file 1).

Operational definition

BP control status

BP control status of patients was classified into two categories based on the average of the three consecutive BP measurements. Uncontrolled BP referred to the BP measurement of ≥140/90 and ≥130/80 mm Hg for hypertensive patients with diabetic mellitus and chronic kidney diseases otherwise it was controlled BP.

Comorbidity

Existance of one or more chronic disease or conditions other than HTN.

Good knowledge

Knowledge of HTN and its treatment was categorized as good and poor based on median value. Patients scored above or equal to the median of the HK-LS was considered to have good knowledge.

Level of social support

Patients' social support was assessed by Duke's social support and stress scale based on mean value. The level of social support were considered as good social support if the patient scored above or equal to the mean value of the scale, otherwise it was poor social support.[17]

Medication adherence

Medication adherence was assessed by a validated self-report questionnaire (a modified version of the MARS) originally developed by Thompson et al.[14] The MARS contains 10 items with 'Yes' or 'No' responses. Then 'No' was coded as 1, and 'Yes' was coded as 0. Patients who correctly answered 8 out of the 10 questions were good adherents unless and otherwise they were poor adherents.

Patient–physician relationship

The patient–physician relationship was assessed by nine items of the PDRQ with 'Yes' or 'No' responses. When patients responded to ≥7 of questions, it was considered a good patient–physician relationship unless and otherwise, it was considered as a poor patient–physician relationship.[16]

Data collection procedure and quality control

The questionnaire was first prepared in English and then translated to the local languages by languages experts (Afaan Oromo, Amharic and Af-Somali) and then translated back into English to ensure consistency. The data collectors and supervisors were trained on data collection tools and procedures for 2 days before actual data collection. Moreover, the pretest was conducted among 5% (20) of the total sample at Bisidimo General Hospital.

During the pretest, the applicability of the instruments was checked and feedback was incorporated into the final tool to improve the quality. Continuous follow-up and supervision were done by the supervisor and the principal investigator throughout the data collection period.

Data processing and analysis

For statistical analysis, the data were entered into EpiData V.3.1 and exported to SPSS V.25. There were both descriptive and analytical procedures were used. The results of the study were reported in the form of a mean, median, standard deviation, and presented in table, and figure. Researchers used logistic regression models to assess the factors associated with poor medication adherence. For the multivariable logistic regression analysis, variables with a p-value of less than 0.25 in bivriable logistic regression analysis were included. The Hosmer-Lemeshow goodness-of-fit test was performed to assess model adequacy, and adjusted odds ratio (AOR) with 95 percent confidence level were determined. A statistical significance was declared at a p-value of <0.05. There was no collinearity and multicollinearity among the variables.

RESULTS

Sociodemographic characteristics of the study participants

Among hypertensive patients who visit the outpatient department for HTN follow-up, 402 patients participated in the study, making a response rate of 99%. The data were collected from two public hospitals in Harari region (HCFSUH and JH) and two public hospitals in Dire Dawa Administration (DRH and SGH).

The mean age of the participants was 49.5±11.8 years. More than half of the respondents, 220 (53%) were female and 174 (41.9%) were Muslim religious followers. Concerning educational level, almost half, 200 (48.2%) had college and above educational level. Two-hundred eighty-four (68.4%) were urban residents and 161 (38.8%) were civil servants followed by merchant, 116 (28.9%) (table 1).

Clinical and medication-related characteristics of the study participants

Out of the total participants, 226 (56.2%) had controlled BP and 141 (35.1%) had comorbidity. Among the participants, 261 (64.9%) used health insurance for the medication cost coverage; 156 (38.8%) were taking two drugs per day; and 181 (45%) experienced an antihypertensive medication side effects (table 2).

Social support of hypertensive patients

The overall mean score for social support was 47.38±14.55, and 220 (54.7%) respondents scored above the mean value. Among those who had good social support, 202 (91.8%) received social support from their family, while 18 (8.2%) received it from non-family members.

Knowledge about HTN and its treatment

HTN knowledge was measured by HK-LS. The total sum of the scores of the knowledge items gives a score ranging

Table 1 Sociodemographic characteristics of hypertensive patients visiting public health hospitals in Eastern Ethiopia during the COVID-19 pandemic, 2022 (n=402)

Variable	Frequency	Per cent (%)
Sex		
Male	210	52.2
Female	192	47.8
Age (years)		
<60	284	70.6
≥60	118	29.4
Marital status		
Single	22	5.5
Married	230	57.2
Divorced	94	23.4
Widowed	56	13.9
Religion		
Muslim	154	38.3
Orthodox	139	34.6
Protestant	90	22.4
Others*	19	4.7
Educational Level		
No formal education	90	22.4
Primary education	87	21.6
Secondary education	155	38.6
College and above	70	17.4
Occupation		
Farmer	80	19.9
Civil servant	136	33.8
Merchant	116	28.9
Housewife	52	12.9
Other†	18	4.5
Place of residence		
Urban	237	59
Rural	165	41

*Others: Catholic, Waqefata.
†Daily labour, retired, student and self-employed.

Table 2 Clinical and medication-related factors of hypertensive patients visiting public health hospitals in Eastern Ethiopia during the COVID-19 pandemic, 2022 (n=402)

Variables	Frequency	Per cent (%)
Blood pressure control status		
Controlled	226	56.2
Uncontrolled	176	43.8
Presence of comorbidity		
Yes	141	35.1
No	261	64.9
Medication cost coverage		
Health insurance	261	64.9
Self-funded	94	23.4
Free of charge	47	11.7
Duration of treatment (years)		
<5	201	50
5–10	140	34.8
>10	61	15.2
Number of medications		
Monotherapy	154	38.3
Dual therapy	156	38.8
Triple therapy & +	92	22.9
Medication side effect		
Yes	181	45
No	221	55
Patient–physician relationship		
Good	350	87.1
Poor	52	12.9

reported that the COVID-19 pandemic disturbed HTN follow-up visits (figure 1).

Level of medication adherence of study participants
In this study, the level of poor antihypertensive medication adherence was 63% (95% CI 58.1% to 67.9%) (figure 2).
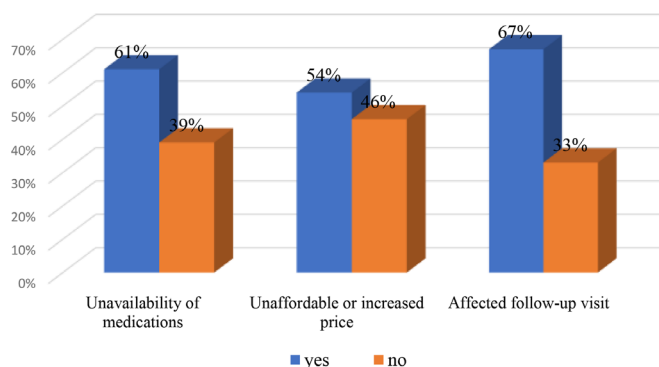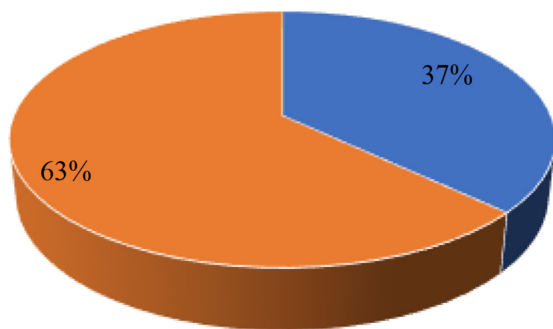

Figure 1 Effect of COVID-19 pandemic on hypertensive patients visiting public health hospitals in Eastern Ethiopia during the COVID-19 pandemic, 2022 (n=402).

from 0 to 22. We used the mean score (13±2.34) as the cut-off point. Of the study participants, 225 (56%) had good knowledge about HTN and its treatment, whereas 177 (44%) had poor knowledge.

Effect of the COVID-19 pandemic on hypertensive patients
Among study participants, 245 (61%) reported that the COVID-19 pandemic posed a negative effect on the availability of medications, and 217 (54%) of the study participants reported that antihypertensive medication price was increased or unaffordable due to the COVID-19 pandemic. Out of 402 study participants, 269 (67%)

Figure 2 Level of medication adherence among hypertensive patients visiting public health hospitals in Eastern Ethiopia during the COVID-19 pandemic, 2022 (n=402).

Factors associated with poor medication adherence among patients with HTN

The association of dependent and independent variables was investigated using a logistic regression model. From the final multivariable binary logistic regression model educational level, comorbidity, medication cost coverage, knowledge about HTN and treatment, patient–doctor relationship and unavailability of medication due to the COVID-19 pandemic were found to be statistically significant predictors of poor medication adherence.

The results of the current study shows that hypertensive patients who had no formal education were 1.56 times more likely to be poorly adherent to antihypertensive medication than those who had formal education (AOR=1.56, 95% CI 1.03 to 4.30). Hypertensive patients with comorbid conditions were 1.98 times more likely to be poorly adherent to antihypertensive medication as compared with patients without comorbidity (AOR=1.98, 95% CI 1.35 to 4.35). The odds of having poor adherence were two times higher among patients who could afford the cost of medications by self-sponsorship than those who could afford the cost of medications by health insurance or free of charge (AOR=2.05, 95% CI 1.34 to 4.73). Patients with poor knowledge about HTN and its treatment were 2.67 times more likely to be poorly adherent to antihypertensive medication than those who had good knowledge about HTN and treatment (AOR=2.67, 95% CI 1.45 to 3.99). Patients who had a poor patient–physician relationship were 1.22 times more likely to have poor adherence to antihypertensive medication than those who had a good patient– physician relationship (AOR=1.22, 95% CI 1.02 to 4.34). Patients who faced the unavailability of medication during the COVID-19 pandemic were five times more likely to be poorly adherent to antihypertensive medication than those not faced with unavailability of medication (AOR=5.05, 95% CI 2.78 to 12.04) (table 3).

DISCUSSION

This study assessed factors associated with poor medication adherence during the COVID-19 pandemic among hypertensive patients visiting public hospitals in Eastern Ethiopia. The results of this study revealed that 63% of the patients on follow-up had poor medication adherence, indicating the existence of serious problems that affect both the patients and the healthcare system service delivery. A variety of factors were likely to affect medication adherence. Educational status, comorbidity, self-funded medication cost coverage, poor knowledge about HTN and treatment, poor patient–physician relationship and unavailability of medication during the COVID-19 pandemic were significantly associated with poor adherence to antihypertensive medication. This finding was consistent with a study conducted in Kenya (66.7%).[18] The finding of this study was higher than those of studies conducted in Egypt (53.88%),[19] Lima, Peru (57.4%)[20]; Hong Kong (55.9%)[21]; Dessie, Northeastern Ethiopia (48.1%)[22]; Jimma, Southwest Ethiopia (38.2%)[23]; Northwest Ethiopia (32.8%)[24]; Addis Ababa, Ethiopia (33.2%)[25]; Asella, Ethiopia (16.5%)[26]; Mizan-Teferi, Ethiopia (47.06%)[27]; and Shashemene, Ethiopia (36.5%).[28] On the contrary, this finding was relatively lower than those of studies conducted in China (72.54%)[29]; Addis Ababa, Ethiopia (72%)[11]; and Nedjo, West Ethiopia (68.6%).[30]

In this study, poor adherence to antihypertensive medication was higher among patients who had no formal education, which was in line with other studies conducted in Nedjo, West Ethiopia,[30] Jimma town and southwest Ethiopia.[31] This might be because patients who had formal education should have better knowledge about HTN and its treatment. This increases antihypertensive medication adherence.[32] To improve antihypertensive medication, adherence among patients who had no formal education supplementing oral health education and advice on prescribed drugs is a fundamental component.[33]

Comorbidity showed association with poor medication adherence. This finding also agrees with studies done in Ethiopia and Hong Kong that showed comorbidity conditions as a factor in tackling adherence.[11 23 24 34 35] The possible reason could be patients with comorbidity commonly suffered from higher pill burden, drug-drug interaction and medication side effects. All of this might cause the patient to miss antihypertensive drugs.

Self-sponsorship or funding for medication cost was a predictor of poor medication adherence. This finding was consistent with other studies conducted in Shanghai[36] and Northwest Ethiopia.[24] This might be due to those self-sponsored/funded patients do not consistently afford to buy thier medication while its cost increases. This imply that the need for government and other stakeholders' commitment towards increasing the awarness acceptance about community-based health insurance.

Poor knowledge about HTN and its treatment showed association with poor adherence to antihypertensive medication. This finding was supported by some studies done

Table 3 Factors associated with poor medication adherence among hypertensive patients visiting public health hospitals in Eastern Ethiopia during the COVID-19 pandemic, 2022 (n=402)

Variable	Medication adherence		COR (95% CI)	AOR (95% CI)
	Poor (%)	Good (%)		
Sex				
Male	154 (73.3)	56 (26.7)	2.58 (1.27 to 5.12)	1.46 (0.97 to 3.57)
Female	99 (51.6)	93 (48.4)	1	1
Age				
<60	196 (69)	88 (31)	2.38 (1.23 to 4.02)	1.24 (0.86 to 2.68)
≥60	57 (48.3)	61 (51.7)	1	1
Educational level				
No formal education	66 (73.3)	24 (26.7)	1.84 (1.54 to 4.62)*	**1.56 (1.03 to 4.30)***
Formal education	187 (60)	125 (40)	1	1
Residence				
Rural	120 (72.7)	45 (27.3)	2.09 (1.55 to 5.50)	1.86 (0.98 to 3.53)
Urban	133 (56.1)	104 (43.9)	1	1
Comorbidity				
Yes	108 (76.6)	33 (23.4)	2.62 (1.64 to 6.67)**	**1.98 (1.35 to 4.35)****
No	145(55.6)	116(44.4)	1	1
Medication cost coverage				
Self-funded	77 (81.9)	17 (18.1)	3.4 (2.04 to 6.62)	**2.05 (1.34 to 4.73)**
Health insurance/free of charge	176 (57.1)	132 (42.9)	1	1
Number of medication				
≥Triple therapy	70 (76.1)	22 (23.9)	3.18 (1.82 to 8.69)	2.34 (0.95 to 5.56)
Dual therapy	106 (67.9)	50 (32.1)	2.12 (1.56 to 7.56)	1.27 (0.79 to 4.03
Monotherapy	77 (50)	77 (50)	1	1
Knowledge of hypertension and its treatment				
Poor	137 (77.4)	40 (22.6)	3.22 (1.67 to 4.95)**	**2.67 (1.45 to 3.99)***
Good	116 (51.6)	109 (48.4)	1	
Patient–physician relationship				
Poor	38 (73.1)	14 (26.9)	1.56 (1.24 to 6.56)	**1.22 (1.02 to 4.34)**
Good	222 (63.4)	128 (36.6)	1	1
Unavailability of medication during the COVID-19 pandemic				
Yes	196 (80)	49 (20)	7.02 (3.04 to 14.78)**	**5.05 (2.78 to 12.04)****
No	57 (36.3)	100 (63.7)	1	1
Disturbed follow-up visits during the COVID-19 pandemic				
Yes	187 (69.5)	82 (30.5)	1.93 (1.13 to 4.71)	1.32 (0.6 to 3.45)
No	72 (54.1)	61 (45.9)	1	1

*P<0.05, **P<0.001; 1=Reference.
AOR, adjusted OR; COR, crude OR.

in Nigeria,[36] Congo,[37] Hawassa, South Ethiopia,[34] Debre Tabor, Northern Ethiopia[38] and Addis Ababa, Ethiopia.[25] Lack of good knowledge about the nature of the disease and importance its treatment might affect the patients' motivation. Less motivation influence adherence to health care professional instaction and might leads to miss the doses of thier medication.

The poor patient–physician relationship was associated with poor medication adherence. This finding was similar to studies conducted in Shanghai,[36] Southwest Nigeria[39]

and Northwest Ethiopia.[24] This could be due to a positive patient–physician interaction, would foster a pleasant therapeutic environment in which patients would have faith in healthcare professionals that enhance medication adherence.

Unavailability of antihypertensive medication during the COVID-19 pandemic showed correlation with poor antihypertensive medication adherence. This was congruent with previous studies conducted in the Democratic Republic of Congo[37] and Ghozzi in Tunis.[40] This might be because patients who could not acess antihypertensive medication easily in healthcare facilities or pharmacies, the risk of poor adherence would be apparent.

Strengths and limitations of the study

This study had several strengths. Firstly, the study used both primary and secondary data, which improves the accuracy of the data. Secondly, this study was a multicenter study, which increases the generalisability of its findings. Thirdly, this study was the first study that showed the impact of the COVID-19 pandemic on antihypertensive medication adherence in Eastern Ethiopia. Lastly, this finding showed the role of the patient–physician relationship in medication adherence. The possible limitation of this study was overestimation of the level of medication adherence since the data was collected by self-reporting.

CONCLUSION

The level of poor adherence to antihypertensive medication was high in this study. No formal education, comorbidity, self-sponsored medication cost coverage, poor knowledge about HTN and its treatment, poor patient–physician relationship and unavailability of medication during the COVID-19 pandemic were significantly associated with poor adherence to antihypertensive medication. All stakeholders should have strategies that reduce the impact of the COVID-19 or other pandemic on chronic diseases.

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