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Cost of Hypertension Illness and Associated Factors Among Patients Attending Hospitals in Southwest Shewa Zone, Oromia Regional State, Ethiopia

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Addisu Bogale Zawudie[1]
Teferi Daba Lemma[2]
Dawit Wolde Daka[2]

[1]Pathfinder International Ethiopia, Addis Ababa, Ethiopia; [2]Faculty of Public Health, Department of Health Policy and Management, Jimma University, Jimma, Ethiopia

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Background: Hypertension is a common vascular disease and the main risk factor for cardiovascular diseases. Since the incidence of hypertension is rising in Ethiopia, one may expect that the household's cost of healthcare services related to the disease will increase in the near future. Yet the cost associated with the disease is not known. We aimed to estimate the total cost of hypertension illness and identify associated factors among patients attending hospitals in Southwest Shewa zone, Oromia regional state, Ethiopia.

Patients and Methods: An institution-based cross-sectional study design was employed to conduct the study from 13 August to 2 September 2018. All hypertensive patients aged 18 years and older who were on follow-up were eligible for this study. The total cost of hypertension illness was estimated by summing the direct and indirect costs. Bivariate and multivariate linear regression analyses were performed to identify factors associated with hypertension costs of illnesses.

Results: A total of 349 patients participated in the study. The mean monthly total cost of hypertension illness was US$ 22.3 (95% CI, 21.3–23.3). Direct and indirect costs constitute 51% and 49% of the total cost, respectively. The mean direct cost of hypertension illness per patient per month was US$ 11.39 (95% CI, 10.6–12.1). Out of these, drugs comprised higher cost (31%), followed by food (25%). The mean indirect cost per patient per month was US$ 10.89 (95% CI, 10.4–11.4). In this study, the primary educational status, family size (4–6 and >6), distance from hospital (≥10 km), the presence of a companion and stage of hypertension (stage two) of patients were identified as the predictors of the cost of hypertension illnesses.

Conclusion: The cost of hypertension illness was very high when compared to the monthly income of households, exposing patients to catastrophic costs. Hence, the government should give due attention to protect patients from catastrophic health expenditures.

Keywords: cost of illness, direct cost, indirect cost, total cost, Ethiopia

Plain Language Summary

Hypertension is one of the main public health problems worldwide. It is a common vascular disease and risk factor for cardiovascular diseases. The prevalence of hypertension is on a high rise in Ethiopia and as a consequence the cost of hypertension illnesses is expected to increase. But no study has been made to estimate the direct and indirect costs of hypertension and factors that influence this cost among patients in Ethiopia. Therefore, this study aimed to estimate the cost of hypertension illness and to identify the predictors of cost of hypertension illness among patients attending hospitals in Southwest Shewa zone, Oromia region, Ethiopia. The study revealed that patients spent more than 10% of household income

Correspondence: Dawit Wolde Daka
Jimma University, P.O.Box=378, Jimma, Ethiopia
Tel +251-966763913
Email dave86520@gmail.com

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on hypertension illnesses and thus they were at risk of catastrophic health expenditure. Over half of the total costs were the direct expenses such as cost of medications, food and accommodations. However, the indirect cost (cost borne by lost workdays) also accounted for a significant share of the total cost of hypertension illness. The study findings may help policy makers, program designers and local healthcare managers to consider strategies that minimize the catastrophic costs associated with hypertension illnesses.

Introduction

Hypertension is the main public health problem of adults worldwide. It is a risk factor for cardiovascular disease (CVD) such as heart diseases and stroke.[1,2] Worldwide, 45% of heart disease-related deaths and 51% of deaths due to stroke were caused by hypertension.[3] In 2012 alone, 17.5 million people died due to CVDs; ie, every three in ten deaths are due to CVD.[4] Out of these deaths, over half (9.4 million deaths) were caused by complications of hypertension.[4,5] Hypertension is also a major cause of premature death worldwide.[6]

Over time, the prevalence of hypertension is on a high rise throughout the world[7] though it varies across the different regions and country income groups. Recent evidence indicated that an estimated 1.13 billion people have hypertension worldwide and out of these the majority (around two-thirds) were located in low and middle income countries. The prevalence of hypertension ranged from 27% in the World Health Organization (WHO) Africa region to 18% in the WHO Americas region. The increase in the prevalence of hypertension was attributed to risk factors such as physical inactivity, consumption of tobacco and alcohol, unhealthy diet, overweight and obesity in those population groups.[2,7]

In Ethiopia there is an increase in the prevalence and impact of non-communicable diseases (NCDs) including hypertension.[8] A meta-analysis and other surveys conducted in different parts of Ethiopia revealed that the prevalence of hypertension is not only high but also increasing. Studies showed that the prevalence of hypertension in Ethiopia ranged from 24.4% to 34.7%.[9–13] The data published by WHO showed that in 2017, 1.74% of the total deaths (or 11,050 deaths) in Ethiopia were caused by hypertension. As a result, hypertension was ranked 11th out of the top 20 causes of death in the country.[14] The increased impact of NCDs coupled with high prevalence of infectious diseases is a serious challenge to the Ethiopia health system that requires urgent actions.[15]

Cost of health services is an important determinant of acceptability and utilization of health services by society. The goal of the health system is improving the health conditions of citizens through protecting against financial catastrophes or hardships.[16,17] The management of hypertension is cost intensive and, hence, it may cause economic burden to citizens.[18–21] As a result, society may not afford the available services leading to ineffective hypertension management.[22] Cost of hypertension illness is determined by various factors such as the presence of comorbidity, stage of illness and distance to the health facility.[19,23] Therefore, it is vital to quantify the cost of hypertension illness and identify the factors that determine the cost of hypertension illness among patients in Ethiopia.

Available investigations on the cost of hypertension illness in Ethiopia have focused on the direct cost of illness[23] and little was known about the indirect cost of hypertension illness. Hence, this study aimed to estimate the cost of hypertension illness among patients in four hospitals of Southwest Shewa zone, Oromia regional state, Ethiopia. We estimated the direct, indirect and total costs of hypertension illness. Moreover, we analyzed the potential predictors of the total cost of hypertension illness. Evidence generated from this study will be used by policy makers, program designers and managers, and will help to enhance the management of hypertension in Ethiopia.

Materials and Methods

Study Setting

The study was conducted in four hospitals of Southwest Shewa zone from August 13 to September 2, 2018. Southwest Shewa zone is one among the zonal administrations located in Oromia regional state. The zonal capital, Woliso, is 114 km from the capital city of Ethiopia, Addis Ababa. According to a report from the zonal health office in 2018, the total population of the zone was 1,101,129. Southwest Shewa zone comprises 3 government hospitals, 1 non-governmental organization (NGO) hospital, 54 health centers and 264 health posts.

Study Design and Participants

An institution-based cross-sectional study design was conducted and the perspective of patients was used to estimate the cost of hypertension illness. All hypertensive patients who were on follow-up care at the hospitals and aged older than 18 years were eligible for this study. Pregnant women

were excluded from this study to avoid gestational hypertension, as its effect may not last long.

The study sample size was determined using a single population mean formula.[24] A previous report from Ethiopian public hospitals indicated that the mean or median drug prescription cost of hypertension was 100 Ethiopian Birr (ETB) or US$ 3.6 (SD 41.19 or 1.5).[23] Based on the assumptions above, the estimated sample size at the 95% confidence interval and 4% of absolute allowable error (precision) yields 408 patients.

However, as the number of hypertension patients on follow-up care (source population) were fewer than 10,000 in the study area (N=1451), we corrected the sample size to the actual population size and this resulted in a sample size of 318 patients. By adding a 10% non-response rate, the final estimated sample size yields 354 patients.

The calculated sample size was proportionally allocated to each of the study hospitals based on the case load or hypertension patients per month. Accordingly, the number of patients per month and sample size allocated to each hospital were: hospital one n=152 (N=620), hospital two n=76 (N=315), hospital three n=59 (N=241) and hospital four n=67 (N=275), where N and n refer to the source population and sample size, respectively.

Each eligible patient who appeared at the study hospitals during the data collection period was approached and interviewed.

Measurement

A structured questionnaire was used to collect the data. The contents of the questionnaires were developed based on the WHO protocol for a survey to determine the costs of a TB treatment program[25] and other related literature.[23]

The questionnaire was developed in English but translated into local language (Afan Oromo and Amharic) by an experienced and professional translator and back-translated into English with an independent translator to check for consistency. Five data collectors with a qualification of diploma nurse and who had also received additional training on survey data collection and research ethics participated in data collection. The overall data collection processes were closely monitored and supervised by two health professionals who had a qualification of bachelor's degree.

Each eligible patient who visited the hospitals during the survey period was given an explanation about the research objectives. An interview was conducted only with those who gave consent for participation. The interview was conducted at the chronic care department after patients were exited from services. The first patient was selected randomly and the interview continued consecutively until the required sample size was obtained.

Techniques of Cost Estimation

The cost analysis of hypertension illnesses was conducted from the perspective of patients and a prevalence-based model was employed to estimate cost.[26] The main outcome variable was the total cost of hypertension illness. Costs of hypertension illness referred to the cost incurred by patients per month (for a 30-day period) as a consequence of hypertension illness. It includes both the direct and the indirect costs associated with hypertension illnesses. Valuations of these costs were based on a record review and patients' recall (Table 1).

Direct cost referred to the opportunity cost of resources used for treating hypertension patients such as direct medical cost and direct non-medical cost. The direct cost of hypertension illness was estimated using micro-costing and bottom-up approaches.[26] Subsequently, the healthcare consumptions were collected at individual patient level and the illness costs were also modeled at the same level.

Direct medical cost was the amount of money that was paid for registration, laboratory investigation and medication or drugs. The cost of registration was the cost spent for cards to get services at the health facilities. It was computed by multiplying the number of visits by the unit cost of cards per visits. The cost of laboratory investigation or test was calculated by multiplying the number of investigations carried out by cost of

Table 1 Cost Item, Data Source and Data Type for Cost of Hypertension Illness Estimation Among Patients in South West Shewa Zone Hospitals, Oromia Regional State, Ethiopia (August 2018)

Cost Category	Data Source	Method of Data Collection	Data Type
Direct medical cost	Patient/health facility	Patient interview/record review	Cost of registration, drugs, laboratory, admin cost, if any investigations
Direct non-medical cost	Patient	Patient interview	Cost of transport for patients/escort, lodging accommodation
Indirect medical cost	Patient	Patient interview	Income loss by patients and their families/relatives

each investigation (unit price) and the cost of drug was computed by multiplying the number of prescriptions by cost of each drug (unit cost). The routine laboratory tests included blood pressure, weight, urinalysis and echocardiogram.

Direct non-medical cost referred to the amount of money that was paid for transportation, food, and accommodation for both patients and their caregiver (companion) to visit the hospital. Transportation cost was estimated based on the number of visits made to hospitals (round trips) to seek care and lodging or accommodation cost was estimated based on the number of days of stay at hospitals. The cost of transportations equals the number of round trips from home to the care provider multiplied by the cost of a single trip, and the cost of lodging or accommodations implied the money spent on food and accommodations multiplied by the number of days patients and their companions were away from their home.

Indirect cost is the productivity loss due to a particular illness and was estimated in terms of the productive time lost by patients and their caregivers (companions). It is the value of time lost by patients and caregivers during travel and consultation with the healthcare provider. The human capital approach was used to value the productivity time losses.[26] First, the time forgone in seeking care and the productivity time lost were estimated. Then, the time forgone was converted into cost based on the daily wage rate.

The daily wage rate of monthly paid patients and companions was estimated by dividing their net monthly salary by 30 days. The income losses to patients who had no permanent job and farmers were estimated using the local daily wage rate (Ethiopian birr per day) for unskilled labor and multiplied by number of working days per month. The local daily wage rate for unskilled labor was obtained from the response of patients and companions. The indirect costs of unemployed patients and those who were not in the labor force were not considered because the opportunity cost of the time according to human capital approach is nil.

All direct cost, indirect cost and productivity losses were initially collected in Ethiopian currency (birr) and then converted to US$ during the analysis. A currency exchange rate of 1 US$=27.471 Ethiopian Birr as of August 2018 was used in the analysis.

Data Analysis

Paper-based data were checked for completeness and consistency. Following this, data were entered into Epidata version 3.1 and exported to SPSS 20 for analysis.

The analysis was performed in such a way that, first, descriptive statistics were conducted to analyze information related to the characteristics of patients and the costs of hypertension illness. Next, the cost of illness data were checked for normality using plots (Q–Q plots and histograms) and the Kolmogorov–Smirnov test for normality ($P>0.05$). By doing so, the cost data were found to be right-skewed and log transformation was performed to approximately conform the skewed data to normality.

Multiple linear regression analysis was performed to identify the predictors of the total cost of hypertension illness in patients. In the regression model, independent variables with a probability value ($P<0.05$) have been entered and only statistically significant variables ($P<0.05$) were included into the final model and interpreted. The independent variables included in the analysis were demographic, socioeconomic and clinical characteristics of patients.

Additionally, we computed the catastrophic healthcare costs as a measure of financial risk protection. We have compared the total direct cost of hypertension illness incurred against the household income. Accordingly, catastrophic cost was defined as a total direct cost that exceeds 10% of the household income.[20]

Ethical Considerations

Appropriate research ethical clearance was obtained from the ethical review committee of Jimma University Institute of Health (reference number: IHRPGD/453/2018, July 2018) and Oromia Regional Health Bureau. The study permission letter was obtained from Oromia Regional Health Bureau and Southwest Shewa Zone Health Office. This study was conducted in accordance with the Declaration of Helsinki: each study participant was well informed about the aim of the study, benefits and risks; informed written consent was secured from study participants; study participants' confidentiality was maintained; no personal identifiers were used in the data collection questionnaire and codes were used in place of them; data were kept in a protected and safe location where paper-based data were kept in a locked cabinet and computer-based data were protected using passwords; the recorded data were not accessed by a third person, except the research team; and data sharing will be enacted based on the consent and permission of research participants and the ethical and legal rules of data sharing.

Results

Out of the total planned patients (n=354), 349 participated in the study with a response rate of 98.6%.

Characteristics of Patients

The mean age of patients was 51 years (SD 14). The youngest patient was 22 years old and the oldest one was 88 years old. A bit more than half (52%) of patients were male. The majority of the patients were married (80%), orthodox religion followers (58%), have no any formal education (44%), unemployed (59%) and from urban settings (60%). The average monthly income of patients and households was US$ 115.4 (SD 70.1) and US$ 136.8 (SD 105.9), respectively. Over four in ten of the patients (46%) were in stage one of hypertension (BP 140-159/90-99 mmHg) and over two-thirds (69%) of them have illness duration of less than 5 years. While the majority (66%) of the patients have received monotherapy antihypertensive medications, one-third (31%) of them have received two drug combinations (Table 2).

The most common monotherapy medications provided to patients were nifedipine, hydrochlorothiazide and enalapril. Likewise, the most common two antihypertensive drug combinations provided to patients were nifedipine/hydrochlorothiazide, enalapril/hydrochlorothiazide and enalapril/nifedipine. The three antihypertensive drug combination was nifedipine/enalapril/lasix. Atenolol/hydrochlorothiazide (mean cost US$ 5.7: 95% CI, 2.7, 8.7) was the most expensive combination of all prescribed antihypertensive medications, followed by atenolol/nifedipine (mean cost US$ 5.1: 95% CI, 3.8, 6.5), enalapril/nifedipine (mean cost US$ 4.6: 95% CI, 3.6, 5.5) and lasix/nifedipine (mean cost US$ 4.6: 95% CI, 2.9, 6.3) (Table 3).

Cost of Hypertension Illness by Patients

The mean direct cost of hypertension illness was US$ 8.8 (95% CI, 8.2–9.3). Most (60%) of the direct cost of hypertension illness was related to medical costs (mean monthly cost, US$ 5.2; 95% CI, 4.8–5.5). Slightly over two-thirds (69%) of total medical costs were contributed by the cost of drugs alone (mean monthly cost, US$ 3.6; 95% CI, 3.4–3.8). Whereas, the costs of laboratory tests and registration accounted for 13% (mean monthly cost, US$ 1.2; 95% CI, 1.1–1.4) and 7% (mean monthly cost, US$ 0.4; 95% CI, 0.37–0.39) of the total medical costs, respectively. On average, patients have visited hospitals

Table 2 Characteristics of Hypertensive Patients at Hospitals of Southwest Shewa Zone, Oromia Regional State, Ethiopia (13 August to 2 September 2018)

Variables	Observations (n=349)	Mean/Proportion (95% CI)
Age (mean± SD)	51.2 (±13.9)	51.2 (50–53)
Gender		
Male	181	52% (47–57%)
Female	168	48% (43–53%)
Total		
Marital status		
Married	281	80% (76–84%)
Never married/single	27	8% (5–11%)
Widowed/divorced	41	12% (9–16%)
Religion		
Orthodox	202	58% (53–63%)
Muslim	78	22% (18–27%)
Protestant	69	20% (16–24%)
Highest education level		
No education	154	44% (39–49%)
Primary	57	16% (13–21%)
Secondary	68	20% (16–24%)
Higher	70	20% (16–25%)
Employment status		
Formal employment	144	41% (36–47%)
Informal/unemployed	205	59% (54–64%)
Family size		
1–3	49	14% (11–18%)
4–6	203	58% (53–63%)
>6	97	28% (23–33%)
Residence		
Urban	210	60% (55–65%)
Rural	139	40% (35–45%)
Average distance from hospital (km)		
<10	169	48% (43–54%)
11–20	57	16% (13–21%)
21–30	42	12% (9–16%)
31–40	36	11% (7–14%)
41–50	20	6% (4–9%)
50+	25	7% (5–10%)
Patient monthly income (mean± SD)	115.4 (±70.1)	115.4 (108–123)
Household monthly income (mean± SD)	136.8 (±105.9)	136.8 (126–148)
Illness duration		
1–5 years	242	69% (64–74%)
>5 years	107	31% (26–36%)

(*Continued*)

Table 2 (Continued).

Variables	Observations (n=349)	Mean/Proportion (95% CI)
Stage of hypertension		
Prehypertension[a]	113	32% (28–37%)
Stage I[b]	161	46% (41–51%)
Stage II[c]	75	22% (17–26%)
Type of hypertensive drugs		
Monotherapy	230	66% (61–71%)
Two-drug combination	109	31% (27–36%)
Three-drug combination	10	3% (2–5%)

Notes: [a]Blood pressure 120–139/80–89 mmHg. [b]Blood pressure 140–159/90–99 mmHg. [c]Blood pressure ≥160/≥100 mmHg.
Abbreviations: CI, confidence interval; km, kilometers; SD, standard deviation.

Table 3 Drug Costs

Drug Class	Observations	Mean US$ (95% CI)	Median US $ (IQR)
Nifedipine	135	3.3 (3.0, 3.6)	3.1 (1.8–4.4)
Hydrochlorothiazide	45	2.9 (2.4, 3.4)	2.6 (1.7–4.4)
Enalapril	28	3.4 (2.7, 3.9)	2.9 (1.9–4.5)
Atenolol	17	3.1 (2.4, 3.8)	2.6(1.8–4.7)
Nifedipine and hydrochlorothiazide	28	3.6 (2.8, 4.4)	2.9 (1.8–5.4)
Enalapril and nifedipine	20	4.6 (3.6, 5.5)	3.6 (2.9–5.7)
Enalapril and hydrochlorothiazide	28	4.4 (3.3, 5.5)	3.6 (2.6–5.1)
Atenolol and nifedipine	12	5.2 (3.8, 6.5)	5.1 (3.6–5.5)
Atenolol and hydrochlorothiazide	5	5.7 (2.7, 8.7)	5.8 (2.8–8.6)
Lasix and nifedipine	5	4.6 (2.9, 6.3)	4.7 (2.7–6.5)
Nifedipine/enalapril/lasix	10	3.8 (3.1, 4.5)	4.4 (2.5–4.7)
Other[a]	16	3.7 (2.6, 4.8)	3.3 (1.8–5.5)

Notes: [a]Lasix (n=2), methyldopa (n=1), metoclopramide (n=1), propranolol (n=1), atenolol and lasix (n=2), enalapril and atenolol (n=1), furosemide and nifedipine (n=2), furosemide and amlodipine (n=1), hydrochlorothiazide and amlodipine (n=1), hydrochlorothiazide and atorvastatin (n=1), hydropine and nifedipine (n=1), methyldopa and nifedipine (n=1), nifedipine and atrovestatinatorvastatin (n=1)
Abbreviations: US$, United States Dollar; CI, confidence interval; IQR, interquartile range.

once per month and half of the patients have used a bus as a means of transportation to visit hospitals. The mean working days lost by patients due to hypertension illness was one. On average, each patient spent US$ 6.7 (95% CI, 6.3–7.0) (Table 4).

Cost of Hypertension Illness by Companions

Most study participants (87%; 95% CI, 83–90) had family or friends that accompany them to the hospital. And half of the companions (52%; 95% CI, 46–57) have foregone some of their income due to hypertension illnesses. The mean direct cost of companions was US$ 3.1 (95% CI, 2.7–3.6) and the mean forgone earnings by companions as the result of hypertension illness was US$ 6.2 (95% CI, 5.9–6.5) (Table 4).

Total Cost of Hypertension Illness

The mean monthly total cost of hypertension illness per patient was US$ 22.3 (95% CI, 21.3–23.3). Out of these, direct costs accounted for 51% or US$ 3973.8. The mean monthly direct cost of hypertension illness per patient was US$ 11.4 (95% CI, 10.6–12.1).

The mean monthly indirect cost of hypertension illness per patient was US$ 10.9 (95% CI, 10.4–11.4). A total of 833 working days were lost by patients and companions with a median of 1.9 days in a one-month period. The time spent by patients and companions to visit hospital was 26,585 minutes with a median of 60 minutes (round trip) (Table 4).

For most (72%) of the patients (95% CI, 67.0–76.5) the hypertension illness cost is more than 10% of the monthly household income. Even worse is that about 42% (95% CI, 36.7–47.1) of the patients were at risk of catastrophic costs because they spent (as direct cost) more than 10% of the household monthly income.

A higher proportion of patients from rural settings incurred catastrophic costs compared to patients in the urban settings (62% vs 29%). Similarly, a higher proportion of patients with no formal education (62%) have catastrophic costs than patients in the primary (28%), secondary (34%) and tertiary (16%) levels of education, respectively. The proportion of patients with catastrophic costs with the age category of patients was 18–29 (50%), 30–39 (30%), 40–49 (31%), 50–59 (39%), 60–69 (58%), 70–79 (51%) and ≥80 years (50%).

Predictors of Cost of Hypertension Illness

In the bivariate linear regression analysis, variables such as gender, marital status, educational status, family size, place of residence, distance from hospital, presence of a companion and stage of hypertension were associated with the total cost of hypertension illness. After adjusting for other independent variables, educational status, family

Table 4 Total Cost, Direct Cost and Indirect Cost of Hypertension Illness at Hospitals of Southwest Shewa Zone, Oromia Region, Ethiopia (13 August to 2 September 2018 (US$))

Cost Item	Observations	Sum	Mean±SD (Median)	95% CI for Mean
Direct medical cost by patients	349	1804.230	5.2±3.3 (4.7)	(4.8–5.5)
Cost of prescribed drugs	349	1247.752	3.6±1.9 (3.3)	(3.4–3.8)
Cost of different laboratory tests	186	231.371	1.2±0.9 (0.9)	(1.1–1.4)
Cost of registration	349	133.413	0.38±0.1 (0.4)	(0.37–0.39)
Cost of non-prescribed drugs	52	191.693	3.7±4.4 (2.6)	(2.5–4.9)
Direct non-medical cost by patients	339	1228.022	3.6±3.2 (2.9)	(3.3–3.9)
Cost of food during visit	278	505.078	1.8±1.5 (1.5)	(1.6–1.9)
Cost of transport	302	369.335	1.2±1.2 (0.7)	(1.1–1.4)
Cost of sport (gym) per month	87	353.609	4.1±4.2 (3.6)	(2.8–4.5)
Direct cost by patients	349	3032.252	8.8±4.9 (7.6)	(8.2–9.3)
Direct cost by companions	302	941.5	3.1±4 (2.2)	(2.7–3.6)
Payment for food	247	493.2	1.9±3.8 (1.1)	(1.5–2.5)
Transportation fee	302	369.3	1.2±1.2 (0.7)	(1.1–1.4)
Cost for other expenses	33	78.9	2.4±1.9 (2.4)	(1.7–3.1)
Indirect cost by patients (income lost)	290	1927.89	6.7±3.4	(6.3–7.0)
Number of outpatient visits	349	396	1.0±1.0	(0.9–1.1)
Days absent from work	349	459	1.3±1.3	(1.2–1.5)
Travel time to the hospital (minutes)	349	14,145	40.5±34.5	(36.9–44.1)
Waiting time in the hospital (minutes)	349	10,715	30.7±14.7	(29.2–32.2)
Indirect cost by companions (income lost by companions)	302	1871.8	6.2±2.3 (5.5)	(5.9–6.5)
Travel time by caregivers in minutes/month	302	12,440	41.2±34.9 (30.0)	(37.3–45.1)
Days absent from work to accompany/month	302	376	1.0±1.0 (1.0)	(0.9–1.1)
Total direct cost of patients and companions	349	3973.75	11.4±7.1 (10.0)	(10.6–12.1)
Total indirect cost of patients and companions	349	3799.72	10.9±5.0 (10.9)	(10.4–11.4)
Total cost of hypertension illness	349	7773.47	22.3±9.4 (20.8)	(21.3–23.3)

Abbreviations: US$, United States Dollar; SD, standard deviation; CI, confidence interval.

size, distance from hospital, presence of a companion and stage of hypertension were statistically associated with the total cost of hypertension illness. Twenty-three percent of the variability in the total cost of hypertension illness was explained by these variables.

Patients with no formal education have a higher total cost of hypertension illness compared to patients with a primary educational level (β-coefficient=−0.07; 95% CI, −0.124, –0.020). The cost of hypertension illness increased with an increase in family size, where the cost was higher in patients with family size of 4–6 (β-coefficient=0.107; 95% CI, 0.044, 0.171) and >6 (β-coefficient=0.115; 95% CI, 0.044, 0.186) compared to patients with family size of 1–3.

The total cost of hypertension illness increased with the increase in distance to hospital. With a unit increase in distance to hospital, the total cost of hypertension illness increased by about US$ 0.003 (95% CI, 0.002, 0.004), keeping the other variables constant. Moreover, the total cost of hypertension illness was associated with the presence of a companion and the stage of hypertension. The total cost of hypertension was higher among patients who have companions compared to those who did not have companions (β-coefficient=0.096; 95% CI, 0.057, 0.135). Additionally, the total cost of hypertension illness was higher among patients in hypertension stage two compared to patients in the prehypertension stage (β-coefficient=0.070; 95% CI, 0.023, 0.118) (Table 5).

Discussion

Cost of illness analysis is useful to understand the burden of a particular disease in society.[26–28] In this study we estimated the cost of hypertension illness among patients for the year 2018 for a one-month recall period. The mean monthly cost of hypertension illness per patient was US$ 22.3; out of this, direct cost accounted for 51%. In the current study, variables such as educational status, family size, distance from hospital, the presence of a companion and stage of hypertension of patients were the predictors of the total cost of hypertension illness.

Table 5 Predictors of the Total Cost of Hypertension Illness Among Patients at Hospitals of Southwest Shewa Zone, Oromia Regional State, Ethiopia (13 August to 2 September 2018 (US$))

Variables	Observations	Unadjusted β-Coefficient (95% CI)	Adjusted β-Coefficient (95% CI)
Age in years (mean ± SD)	51.2 (±13.9)	0.0001 (−0.001, 0.002)	
Gender			
Male	181	Ref	Ref
Female	168	−0.070 (−0.113, −0.027)*	−0.037 (−0.077, −0.004)
Educational status			
No education	154	Ref	Ref
Primary	57	−0.068 (−0.126, −0.009)*	−0.072 (−0.124, −0.020)*
Secondary	68	0.007 (−0.047, 0.062)	−0.021 (−0.080, 0.038)
Tertiary	70	0.002 (−0.052, 0.056)	−0.030 (−0.088, 0.029)
Marital status			
Married	281	Ref	Ref
Single	27	0.030 (−0.051, 0.112)	0.037 (−0.043, 0.118)
Divorced/widowed	41	−0.091 (−0.157, −0.024)*	−0.057 (−0.121, 0.006)
Family size			
1–3	49	Ref	Ref
4–6	203	0.106 (0.044, 0.169)*	0.107 (0.044, 0.171)*
>6	97	0.122 (0.050, 0.195)*	0.115 (0.044, 0.186)*
Residence			
Urban	210	Ref	Ref
Rural	139	0.062 (0.018, 0.106)*	0.020 (−0.021, 0.060)
Distance from hospital (km)	21.6±23.7	0.003 (0.002, 0.004)*	0.003 (0.002, 0.004)*
Presence of a companion			
Yes	153	0.106 (0.064–0.149)*	0.096 (0.057, 0.135)*
No	196	Ref	Ref
Stage of hypertension			
Prehypertension[a]	113	Ref	Ref
Stage I[b]	161	−0.007 (−0.051, 0.036)	0.029 (−0.020, 0.077)
Stage II[c]	75	0.074 (0.021, 0.126)*	0.070 (0.023, 0.118)*
Duration of hypertension illness			
1–5 years	242	Ref	
>5 years	107	−0.027 (−0.074, 0.020)	
Presence of comorbidity			
Yes	227	Ref	
No	122	0.012 (−0.034, 0.057)	

Notes: *$P<0.05$. [a]Blood pressure 120–139/80–89 mmHg. [b]Blood pressure 140–159/90–99 mmHg. [c]Blood pressure ≥160/≥100 mmHg.
Abbreviations: US$, United States dollar; SD, standard deviation; CI, confidence interval.

The cost of hypertension illness varies from country to country; the cost we computed was lower than the study conducted in Kenya[20] and higher when compared to a report from India.[29] It was found even higher than the one conducted in Addis Ababa.[23] This difference might be due to variation in settings, period and methods of cost estimation employed.

In the current study, a bit over four in ten patients spent more than 10% of household income on hypertension illness and hence they were at risk of catastrophic costs. This finding was comparable to a study done in Kenya[20] though higher than a report from Malawi (21.3%).[30] The variation in the study findings might be partly related to difference in settings and the scope of cost estimation. The earlier

study was done only on hypertension illness and the later study considered other non-communicable illnesses in addition to hypertension. The income difference among the study population also contributed to the difference.

The current finding on catastrophic health expenditure was also higher than a study done in the general and cardiac hospitals of Addis Ababa, which reported that about 27% of the households experienced catastrophic health expenditure. The variation in rates of catastrophic costs might be related to the difference in scope, settings and period of estimation. In contrast to our study, the study conducted in Addis Ababa included both public and private health facilities and considered other CVDs. Though the private hospitals are expensive, those who attend treatment at these hospitals are super rich and hence reduce the percentage of patients who fall in catastrophic costs. However, similar to our study it indicated that households with low socioeconomic status and households located in rural settings were more affected by the financial burden.[31]

The incidence of catastrophic healthcare expenditure was increased to 72%, when the indirect cost (cost related to the lost workdays) was included. Catastrophic health expenditures might cause poor treatment outcomes in patients. A study conducted in 12 low and middle income sub-Saharan Africa countries revealed that over a quarter of patients admitted to hypertensive treatments stopped treatment due to financial reasons and poor adherence to treatments was more likely in patients with the lowest wealth quintile.[32]

Direct medical and non-medical costs accounted for over half of the total costs. Costs of drug, accommodation and transportation account for the largest share of direct cost. A comparable result was also reported by other studies elsewhere in that much of the direct cost of hypertension illness was comprised of the cost of medicines.[18–20,23,29,33] Monotherapies were the most frequently prescribed drugs and the common prescribed antihypertensive medications were nifedipine, hydrochlorothiazide and enalapril. This finding was similar to a study done in other parts of Ethiopia.[34–37] The economic burden and cost implications of antihypertensive drugs were also evident from studies done in other settings. The cost of antihypertensive medications is a barrier to effective treatment. It influences the prescribing patterns among physicians and compliance to treatment by patients.[38]

The indirect cost of hypertension illness was also equally important as the direct cost. The average cost borne from lost workdays per patients was US$ 10.9. This finding was lower than a report from Kenya,[20] however the amount of cost spent revealed a significant impact on patients and the society at large. A study on the cost of illness among outpatients also showed that the non-medical and indirect costs of illness were significantly higher in Ethiopia.[39]

The indirect cost of hypertensive illness was attributed to the travel time to the hospital and being absent from work. In this study, over half of patients were more than 10 km from the treatment centers and this indicates a lower access to services. This finding was supported by the national report in that the coverage of non-communicable diseases management services was low though increasing steadily in Ethiopia.[40] This condition requires further efforts toward expanding hypertension management centers and enhancing the control of hypertension at the community level.

In the current study, the educational status of patients, family size, distance from treatment center, the presence of a companion and the stage of hypertension were statistically associated with the cost of hypertension. This findings are comparable to other reports elsewhere.[18,29,41] The total cost of hypertension illness was lower in patients with a primary level of education than patients with no education. A similar finding was reported by a study in Malawi in that literacy was positively associated with out of pocket expenditure.[41] The cost of hypertension illness increased with the increased family size and distance to treatment center, and the presence of a companion. This is due to the fact that the companion consumptions (food and transport) and the transportation costs of patients may increase the total cost of hypertension illness. Similarly, patients who were in stage two of hypertension have a higher cost of illness (US$ 0.070) than those in the prehypertension stage. This of course may be due to the fact that stage two hypertension and related complications require intensive diagnostic procedures and management. The complications of hypertension are asignificant contributor to increased costs of illness and this warrants the early diagnosis and management of hypertension. A comparable finding was reported by a study done on breast cancer services in that the stage of breast cancer was associated with the cost of illness among breast cancer patients on chemotherapy.[39]

To sum up, we estimated the total cost of illness by considering the two major categories of costs: direct and indirect costs. Both service records and patients were used as the sources of information for estimating the costs. However, the cost of illness analysis was limited to the patients' perspective and does not incorporate other costs of the health system. Intangible costs (cost of pain, suffering,

stigma and discrimination) associated with hypertension illness were not also estimated in the current study.

Conclusion

This study has revealed that the total cost of hypertension illness was high in the study area and significant proportions of patients were at risk of catastrophic health expenditure. The increased rise of hypertension in Ethiopia combined with the low coverage and high cost of hypertension management may expose individuals to financial hardships and consequently might lead to poor treatment outcomes. Unless urgent action is taken, the problem may get even worse than it is currently. This calls for the attention of the government in preventing further catastrophic costs caused by hypertension illness. A comprehensive package of hypertension prevention and control strategies should be expanded to the primary healthcare level. This, however, requires further investigations and analysis of the cost-effectiveness of available strategies.

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Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

References

1. American College of Cardiology. Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. Report No.: 23976; 2017. Available from: https://www.acc.org/~/media/Non-Clinical/Files-PDFs-Excel-MS-Word-etc/Guidelines/2017/Guidelines_Made_Simple_2017_HBP.pdf. Accessed March 25, 2020.
2. World Health Organization. Hypertension: key facts; 2019. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension. Accessed March 25, 2020.
3. World Health Organization. A global brief on hypertension: silent killer, global public health crisis. world health day 2013; 2013. Available from: https://ish-world.com/downloads/pdf/global_brief_hypertension.pdf. Accessed March 25, 2020.
4. Campbell N, Lackland D, Niebylski M. High blood pressure: why prevention and control are urgent and important. a 2014 fact sheet from the world hypertension league and the international society of hypertension. increased blood pressure is the leading risk factor for death and for disability. *Int Soc Hypertens*. 2014;1:5.
5. IFPMA. Hypertension: putting the pressure on the silent killer. May; 2016:21. Available from: https://www.ifpma.org/resource-centre/hypertension-putting-the-pressure-on-the-silent-killer/. Accessed March 25, 2020.
6. World Health Organization. Hypertension: key facts. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension. Accessed March 25, 2020.
7. Salem H, Hasan DM, Eameash A, El-Mageed HA, Hasan S, Ali R. Worldwide prevalence of hypertension: a pooled meta-analysis of 1670 studies in 71 countries with 29.5 million participants. *J Am Coll Cardiol*. 2018;71(11):A1819. doi:10.1016/S0735-1097(18)32360-X.
8. Misganaw A, Mariam DH, Ali A, Araya T. Epidemiology of major non-communicable diseases in Ethiopia: a systematic review. *J Health Popul Nutr*. 2014;32(1):1–13.
9. Roba HS, Beyene AS, Mengesha MM, Ayele BH. Prevalence of hypertension and associated factors in Dire Dawa city, Eastern Ethiopia: a community-based cross-sectional study. *Hindawi Intl J Hypertension*. 2019;2019:1–9. doi:10.1155/2019/9878437
10. Belachew A, Tewabe T, Miskir Y, et al. Prevalence and associated factors of hypertension among adult patients in Felege-hiwot comprehensive referral hospitals, Northwest, Ethiopia: a cross-sectional study. *BMC Res Notes*. 2018;11(1):876. doi:10.1186/s13104-018-3986-1.
11. Abebe S, Yallew WW. Prevalence of hypertension among adult outpatient clients in hospitals and its associated factors in Addis Ababa, Ethiopia: a hospital based cross - sectional study. *BMC Res Notes*. 2019(12):87. doi:10.1186/s13104-019-4127-1.
12. Abebe SM, Berhane Y, Worku A, Getachew A. Prevalence and associated factors of hypertension: a crossectional community based study in Northwest Ethiopia. *PLoS One*. 2015;10(4):1–11. doi:10.1371/journal.pone.0125210
13. Kibret KT, Mesfin YM. Prevalence of hypertension in Ethiopia: a systematic meta-analysis. *Public Health Rev*. 2015;36(1):14. doi:10.1186/s40985-015-0014-z.
14. World Health Organization. Age adjusted death rate estimate. the health profile of Ethiopia; 2017. Accessed from: https://www.worldlifeexpectancy.com/country-health-profile/ethiopia. Accessed March 25, 2020.
15. Misganaw A, Haregu TN, Deribe K, Tessema GA, Deribew A. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990 – 2015: findings from the global burden of disease study 2015. *Popul Health Metr*. 2017;15(1):29. doi:10.1186/s12963-017-0145-1.
16. GAVI CSO Project fact sheet. What are the health system building blocks ? 2013. Available from: https://hssfactsheets.weebly.com/uploads/4/8/1/1/48110245/gavi_cso_fact_sheet_no_5_building_blocks.pdf. Accessed March 26, 2020.
17. Murray C, Frenk J A WHO framework for health system performance assessment. Evidence and Information for policy. World Health Organization. Available from: https://www.researchgate.net/publication/12402824_A_WHO_Framework_for_Health_System_Performance_Assessment. Accessed March 25, 2020.
18. Nguyen TB, Nguyen TT, Le HH. Direct costs of hypertensive patients admitted to hospital in Vietnam – a bottom-up micro-costing analysis. *BMC Health Serv Res*. 2014;14(1):514. doi:10.1186/s12913-014-0514-4
19. Alefan Q, Ibrahim MIM, Razak TA, Ayub A. Cost of treating hypertension in Malaysia. *Asian J Pharm Clin Res*. 2009;2(1):1–5.
20. Njoroge M, Nguhiu P, Oyando R, et al. Patient costs of hypertension care in public health care facilities in Kenya. *Int J Health Plann Manag*. 2019;34:e1166–e1178.
21. Wagner AK, Valera M, Graves AJ, Laviña S, Ross-degnan D. Costs of hospital care for hypertension in an insured population without an outpatient medicines benefit: an observational study in the Philippines. *BMC Health Serv Res*. 2008;8(1):161. doi:10.1186/1472-6963-8-161

22. Baker-goering MM, Roy K, Howard DH. Relationship between adherence to antihypertensive medication regimen and out- of-pocket costs among people aged 35 to 64 with employer-sponsored health insurance. *Public Health Res Pract Policy*. 2019;16:180381.
23. Bedane SN. Out of pocket expenditures among hypertensive patients and their households who visit public hospitals in Addis Ababa, Ethiopia, 2016. *Health Econ Outcome Res Open Access*. 2018;4 (1):1–7.
24. Dhar M, Binu V, Mayya S. Some basic aspects of statistical methods and sample size determination in health science research. *Int Q J Res Ayurveda*. 2014;35(2):119–123. doi:10.4103/0974-8520.146202.
25. World Health Organization Global TB Programme. Protocol for survey to determine direct and indirect costs due to TB and to estimate proportion of TB-affected households experiencing catastrophic costs due to TB; November, 2015. Available from: http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/tf6_background_5a_patient_cost_surveys_protocol.pdf?ua=1. Accessed March 26, 2020.
26. Jo C. Cost-of-illness studies: concepts, scopes, and methods. *Clin Mol Hepatol*. 2014;20(4):327–337. doi:10.3350/cmh.2014.20.4.327.
27. Segel JE. Cost-of-illness studies: a primer.RTI international. RTI-UNC center of excellence in health promotion economics; 2006:1–39. Available from: https://pdfs.semanticscholar.org/3bbf/0a03079715556ad816a25ae9bf232b45f2e6.pdf. Accessed March 25, 2020.
28. Byford S, Torgerson DJ, Raftery J. Cost of illness studies. *BMJ*. 2000;320(7245):1335. doi:10.1136/bmj.320.7245.1335.
29. Kar SS, Kalidoss VK, Vasudevan V, Goenka S. Cost of care for hypertension in a selected health center of urban Puducherry: an exploratory cost-of-illness study. *Int J Non-Commun Dis*. 2018;3 (3):98–103. doi:10.4103/jncd.jncd_49_17.
30. Wang Q, Brenner S, Kalmus O, Banda HT, De Allegri M. The economic burden of chronic non-communicable diseases in rural Malawi: an observational study. *BMC Health Serv Res*. 2016;16:457.
31. Tolla MT, Norheim OF, Verguet S, et al. Out-of-pocket expenditures for prevention and treatment of cardiovascular disease in general and specialised cardiac hospitals in Addis Ababa, Ethiopia: a cross-sectional cohort study. *BMJ Glob Heal*. 2017;2(2):e000280. doi:10.1136/bmjgh-2016-000280
32. Terline DMD, Kane A, Kramoh KE, et al. Factors associated with poor adherence to medication among hypertensive patients in twelve low and middle income Sub-Saharan countries. *PLoS One*. 2019;14 (7):e0219266. doi:10.1371/journal.pone.0219266
33. Zhang D, Wang G, Zhang P, Fang J, Ayala C. Medical expenditures associated with hypertension in the U.S., 2000–2013. *Am J Prev Med*. 2017;53(6):S164–S171. doi:10.1016/j.amepre.2017.05.014
34. Mulatu HA, Bayisa T, Berhe T, Woldeyes E. Pattern of antihypertensive treatment and blood pressure control among diabetic outpatients in Addis Ababa, Ethiopia. *J Diabetes Metab*. 2017;08:4. doi:10.4172/2155-6156.1000738
35. Mengesha HG, Welegerima AH, Hadgu A, et al. Comparative effectiveness of antihypertensive drugs prescribed in Ethiopian healthcare practice: a pilot prospective, randomized, open label study. *PLoS One*. 2018;13(9):e0203166. doi:10.1371/journal.pone.0203166
36. Abegaz T, Tefera Y, Abebe T. Antihypertensive drug prescription patterns and their impact on outcome of blood pressure in Ethiopia: a hospital-based observational study. *Integr Pharm Res Pract*. 2017;6:29–35. doi:10.2147/IPRP.S124047
37. Horsa BA, Tadesse Y, Engidawork E. Assessment of hypertension control and factors associated with the control among hypertensive patients attending at Zewditu memorial hospital: a cross sectional study. *BMC Res Notes*. 2019;12(1):152. doi:10.1186/s13104-019-4173-8.
38. Jarari N, Rao N, Peela JR, et al. A review on prescribing patterns of antihypertensive drugs. *Clin Hypertens*. 2016;22:7. doi:10.1186/s40885-016-0042-0.
39. Mamo G, Worku A, Lemma S, Demas T. Cost of illness of breast cancer patients on chemotherapy in Addis Ababa Public Hospitals, the case of Tikur Anbessa specialized teaching hospital-cross-sectional types of study. *Health Econ Outcome Res Open Access*. 2017;03:4.
40. Ethiopian Public Health Institute. Services Availability and Readiness Assessment (SARA); 2018. Available from: https://www.ephi.gov.et/images/pictures/download_2011/Ethiopia-Service-Availability-and-Rediness-Assessment-SARA-report-2018.pdf. Accessed March 26, 2020.
41. Wang Q, Fu AZ, Brenner S, Kalmus O, Banda HT, De Allegri M. Out-of-pocket expenditure on chronic non-communicable diseases in Sub-Saharan Africa: the case of rural Malawi. *PLoS One*. 2015;10 (1):1–15.

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