Out of pocket expenditure on hypertension among patients attending At Tanta University Hospitals

ABSTRACT

Aims: Determine the level of out-of-pocket expenditure incurred by hypertensive patients at Tanta University Hospitals. Identify different determinants of out-of-pocket health expenditure among hypertensive patients in Tanta University Hospitals.

Study design: A cross sectional study.
Place and Duration of Study: The study was conducted from July 2020 up to July 2022, at Tanta University Hospitals, Cardiovascular medicine department.
Methodology: Collection of data was conducted by a questionnaire-based interview. The study included 195 hypertensive patients attending outpatient clinics. Their ages ranged from 36.0 to 75.0 years old. Males represented 57.4% while females' percentage was 42.6%. Expenditure was estimated over the last three months, then the monthly average was calculated.
Results: All included patients incurred out of pocket expenditure on medications. Their cost had a mean of 550.4±325.0 and ranged from 45 L.E up to 1215.0 L.E. As regards outpatient visits' cost, more two third of the patients (69.2%) incurred cost for physicians' visits with a mean of 98.1±80.6 and ranged from 50.0 L.E. Concerning investigations' cost, (61.0%) of the study patients incurred investigations' cost that ranged from 65.0 to 150.0 with a mean of 115.0±21.8 L.E. Overall direct OOP expenditure had a mean of 682.4±283.8 with a markedly wide range from 60.0 to 1550 L.E. Regarding the factors affecting the incidence of catastrophic health expenditure, those who were unemployed, or housewives represented had the highest level of CHE (70.3%) with a statistically significant differences in CHE regarding the employment status (p=.001). Patients without regular fixed income had higher CHE (58.9%) than patients with regular monthly salary (16.7%) with a statistically significant difference (p=.001).
Conclusion: Hypertensive patients incur substantial direct and indirect costs. High rates of catastrophic costs illustrate the urgency of improving financial risk protection of these patients and strengthening primary care to ensure affordability of hypertension care.

Keywords: Out-of-pocket expenditure, catastrophic health expenditure and Hypertension

1. INTRODUCTION

Arterial hypertension (HTN) is the most pivotal contributor to the global burden of disease (GBD) [(1)]. It is a risk factor for a number of serious diseases and adverse outcome [(2)]. Uncontrolled HTN is a key modifiable risk factor for cardiovascular diseases (CVDs), the major non-communicable disease (NCD), associated to more than 10 million preventable deaths annually [(3)].

More than 1.4 billion people around the globe have hypertension. It is defined as systolic and diastolic blood pressures higher than 140 and 90 mmHg, respectively. Disability caused by HTN and CVD has grave economic consequences at all levels: individual, household, economic agents, public institutions, government and the society as a whole. Not only is this burden expected to increase in the future but also low- and middle-income countries will incur an increasing share of this burden due to population growth, ageing and globalization [(4-6).]

In the majority of patients, hypertension is accompanied with multimorbidity, the simultaneous presence of two or more non-communicable diseases. Such multimorbidity represents a costly and complex challenge for health systems worldwide and forcing many patients especially in the developing countries to incur tremendous levels of out-of-pocket expenditure (OOPE) on medications and complications [7].

The high OOPE push patients to less compliance or even total discontinuation of anti-hypertensive medications, especially the more expensive ones. Moreover, many patients may sacrifice sticking to follow-up visits and recommended investigations. Such harmful patient-directed solutions may result in adverse consequences since the under-use of such essential medications aggravates the risk of avoidable morbidity and mortality [8].

The current research literature about the economic burden of hypertension and the actual volume of OOPE is still lacking, especially in developing countries [6]. Since high OOPEs can affect receiving healthcare services, this study aims at estimation of the level of OOPEs, its determinants, and lost services due to high OOPEs.

2. MATERIAL AND METHODS

2.1. Study design: The present study was cross sectional.

2.2. Study duration: It was conducted from the start of February 2020 through November 2022.

2.3. The study setting: This study was carried out at Cardiovascular Medicine department that represents the main referral facility in Mid-Delta region where secondary and tertiary medical services are provided.

2.4. The study patients: The target patients of the study were hypertensive patients receiving healthcare services at outpatient clinics.

2.4.1 Inclusion criteria: Hypertensive patients older than 18 years attending at the Cardiovascular Medicine Department outpatients' clinics at the time of data collection and presented with hypertension, or hypertension with cardiac complications such as ischemic heart diseases or hypertensive heart failure.

2.4.2 Exclusion criteria:

- Patients with complications other than cardiac complications such as hypertensive renal insufficiency or stroke.
- Patients with diabetes and other comorbidities.
- Pregnant women to avoid gestational hypertension.

2.5. Sample Size and sampling techniques: The sample size was calculated using Epi-Info 7, software statistical package created by World Health organization and Center for Disease Control and Prevention, Atlanta, Georgia, USA, 2007. The criteria used for sample size calculation included: Confidence level of 95%, The expected prevalence of OPEs among hypertensive patients was anticipated to be 86% with a confidence limit of 5% .

- The minimal required sample size was found to be 185 patients.
- The study included 195 valid complete questionnaires out of 200 patients' interview. Patients were included through systematic random sampling; first patient was selected randomly and following patients were selected on fixed interval (every 5th patient) as every patient consumes 30-40 minutes during the interview, while physician spends about 10-15 minutes with each patient.

2.6. Data collection:

A pre-designed questionnaire-based interview was used to calculate the out-of-pocket expenditures. Data was collected via predesigned interview-based questionnaire.

The questionnaire was divided into the following sections: -

1. The socio-demographic data: age, sex, residence, marital status, employment status, income, level of education, family members numbers, number of dependents and smoking status.
2. Hypertension profile data: current diagnosis, disease duration, and complication.
3. Healthcare utilization: type of used health care facility either public or both public and private.
4. Out of pocket expenditure: Questions on assessment of OPEs were structured based on World Health Survey, Short Questionnaire, Rotation D (WHO Evidence and Information for Policy) [9]. These incurred costs included:
    - Total medications cost,
    - Total cost of visits to healthcare professionals,
    - Laboratory and imaging investigations,
    - Hospitalizations cost (such as admission cost),
    - Expenditure made for transportation related to hypertension management,
    - Information on any exemption, subsidies, and insurance types was included.

5. Lost services: That part included the indicated but lost (unmet) any healthcare services or medications related to hypertension management due to financial inaccessibility.

Cost estimation methods: Cost was estimated over the last three months, then the monthly average was calculated. The cost was calculated by the integrative approach through decomposition of spending into different components to be estimated individually through exhaustive enumerations of each item with the following considerations.

1. Production-side data was confirmed from the providers such as outpatient clinic fees and admission fees.
2. Outpatient services from private physicians or private laboratories: data was collected directly from the providers when that was available and accessible.
3. Pharmaceutical products: The price of medications was obtained from pharmacies as it was the most reliable and efficient method of estimating.
4. Any expenditures that can be potential reimbursed later on by insurance or subsidy through governmental funded treatment was included as out of pocket spending as it is initially paid by the patients.
5. All costs were calculated in Egyptian Pound (L.E), then converted to US dollar (USD) according to currency exchange rate for the purpose of comparison.

2.7. Operational definitions

According to the European Society guideline (the adopted guidelines at Cardiology department) [10]:

- **Hypertension** is defined as persistent (three readings or more) elevation of SBP> 140 mmHg or DBP>90 mmHg.
- **Uncontrolled hypertension** is defined as an average (two or three readings) of SBP greater than or equals 140 mmHg or an average DBP greater than or equals 90 mmHg among patients diagnosed with hypertension.
- **Controlled hypertension** is defined as an average (two or three readings) of SBP less than 140 mmHg or an average DBP less than 90 mmHg among patients diagnosed with hypertension.
- **Direct costs** are costs those associated with registration/ consultation, diagnostic work-up, medications and transportation.
- **Indirect costs** are costs associated with loss of working time of person who is ill and caregivers, loss of income of person who is ill and caregivers (due to absenteeism, missing business
- **Overall out-of-pocket expenditure (OOPE)** is all payments incurred by a patient for care and treatment of hypertension without compensations from a third party; example, included payments for doctor's consultation fees, medication, laboratory tests and hospital bills and household expenditure.
- **Annual income** was estimated from the average monthly income reported by the patient.
- **Catastrophic health expenditure** (according to World Bank definition) is out-of-pocket expenditure that exceed 10% of the household's total annual income.
- **Income quintiles:** Patients were arranged in an ascending order according to their monthly income then divided into five equal quintiles. The first quintile represented the lowest income, and the last quintile represented the highest income.

2.8. Statistical Analysis

- Sorting and analysis of data were performed by using Statistical Package for Social Sciences (SPSS) version 21.
- In this study the qualitative data were described using number and percent. Quantitative data were presented by median, mean ± standard deviation (SD) and range. For categorical variables, Chi-square test was used. Monte Carlo and Fisher exact test were used when Chi square was inappropriate.
- Multivariate analysis (binary logistic regression) was conducted, and all statistically significant exposures were included in the model to detect determinants of catastrophic health expenditure by calculating the adjusted odds ratios.
- Significance level was set at <0.05.

3. RESULTS AND DISCUSSION

Sociodemographic characteristics of the study patients

Table (1) describes the sociodemographic characteristics of the study participants. Regarding age, it ranged from 36.0 to 75.0 years old with a mean 55.4±9.8. Males represented 57.4%. As regards the marital status, married patients represented the highest percentage as 81.5% were married. Rural residences were higher 56.4% than urban residence. Regarding educational level among the study participants, secondary school or equivalent represented the highest percentage as it represents 63.6% from the study participants.

Table (1): The sociodemographic characteristics of the study patients.

Sociodemographic characteristics	(n=195)	
	n	%
Age		
30-	16	8.2
40-	45	23.1
50-	66	33.8
60-	53	27.2
≥70	15	7.7
Mean±SD	55.4±9.8	
Range	36.0-75.0	
Gender		
Male	112	57.4
Female	83	42.6
Marital status		
Single	8	4.1
Married	159	81.5
Widow	22	11.3
Divorced	6	3.1
Residence		
Urban	85	43.6
Rural	110	56.4
Education		
Illiterate	3	1.5
Read & write/ Primary school	32	16.4
Secondary school or equivalent	124	63.6
University	36	18.5

As regards the employment status, manual workers represented the highest percentage (33.8%), followed by those who were unemployed or housewives. Regarding the income characteristics described in ***table (2)***, higher percentage reported lack of regular monthly income than those with fixed monthly salary. Furthermore, 71.3% reported that their monthly income was insufficient for their basic needs (Food, rent, utilities, etc.)

Table (2): The employment characteristics and income details of the study participants.

Characteristics	(n=195)	
	n	%
Employment status		
Unemployed/ Housewife	64	32.8
Manual worker	66	33.8
Employee/professional	39	20.0
Retired	26	13.4
Monthly income type		
Fixed monthly salary	66	33.8
No Fixed monthly income	129	66.2

Income sufficiency		
Sufficient and can save	8	4.1
Just enough	48	24.6
Not sufficient (in debt)	139	71.3

Hypertension profile and risk factors among the study patients

As described in table (3), patients with controlled hypertension represented only 36.4%. Uncontrolled hypertension represented 63.6% As regards the disease duration, more than half of the participants (51.3.%) had disease duration less than 4 years. Concerning the risk factors distribution, one quarter (25.1%) of the study patients had neither obesity nor smoking. Obesity percentage was 62.1%. Smoking was present among 30.8% of the study participants.

Table (3): Hypertension profile and risk factors distribution among the study participants.

Hypertension profile	**Group I (n=195)**	
	n	**%**
Diagnosis		
Controlled	71	36.4
Uncontrolled	124	63.6
Duration (in years)		
<2 years	29	14.9
2-	71	36.4
4-	64	32.8
6-	31	15.9
Risk factors		
None	49	25.1%
Obesity [a]	121	62.1%
Smoking	60	30.8%

a: (BMI ≥30)

Regarding health services utilization profile, the percentage of patients who used private health care services besides the governmental services was 13.8% during the last 3 months, while 86.2% of them used governmental services only. Regarding the presence of subsidy, it represented 38.5%. Patients who reported financial inaccessibility of indicated healthcare services were 33.8%.

Table (4): Health services utilization profile among the study participants during the last three months.

Health services utilization profile	**(n=195)**	
	n	**%**
Health service types		
Governmental only	168	86.2
Both governmental & Private	27	13.8
Presence of Subsidy a		
No	120	61.5
Yes	75	38.5
Unmet required health services [b]		
Yes	66	33.8
No	129	66.2

a: Subsidy was governmental funded treatment

b: patients didn't receive required healthcare service due to financial unaffordability

Table (5) describes the components of monthly out of pocket expenditure among patients attending outpatient clinics. All patients incurred out of pocket of expenditure on medications. Their cost had a mean of 550.4±325.0 with a wide range starting from 45

L.E among patients with controlled hypertension with one drug and increased with multiple medications up to 1215.0 L.E. As regards outpatient visits' cost, more two third of the patients (69.2%) incurred cost for physicians' visits which had a mean of 98.1±80.6 and ranged from 50.0 L.E which is the cost of one outpatient visit at Tanta University clinics up to 500 L.E for physicians consultation at private clinics.

Concerning investigations' cost, sixty one percent (61.0%) of the study patients had investigations in the form of laboratory investigations, Echocardiography, or both. The investigation cost ranged from 65.0-150.0 with a mean of 115.0±21.8 L.E. Most of the study patients (97.9%) reported incurring transportation cost as only 4 patients had residence near to the Tanta University Hospitals that allowed them to attend without using any means of transportation. The transportation cost ranged from 5.0-60.0 with a mean of 18.9±8.0 L.E. Overall direct OOP expenditure had a mean of 682.4±283.8 with a markedly wide range from 60.0 to 1550 L.E.

In the current study, the medication cost had an evidently wide range according to the disease presentations; the lowest cost was observed among patients with controlled hypertension with only one drug and increased significantly with multiple medications or presence of complications. That was similar to the findings of ***Adams et al. (2020)***, who reported that medications cost had a wide range based on severity of hypertension either controlled or uncontrolled besides the presence of risk factors and comorbidities [(5).]

In the present study, the investigations' cost represented the second share of overall direct OOP expenditure as most of investigations were available mainly through private sector exposing patients without reimbursement schemes to pay directly for the service provision. The investigations reported by the study patients were either laboratory investigations or imaging investigations such as echocardiography, or both. For imaging investigations, echocardiography was the most frequently requested investigation.

Concerning both laboratory and imaging investigations' cost, sixty one percent (61.0%) of the study patients incurred OOP on hypertension related investigations.

As regards outpatient visits' cost in the present study, it came at the third share of overall out of pocket expenditure. More than two third of the patients incurred cost for physicians' visits which had a wide range between service available at university hospitals and private physicians' visits. Most of the study patients reported incurring transportation cost. The estimated annual cost of overall direct out-of-pocket expenditure had a mean of US$ 409.4.

Table (5): OOPEs monthly average during the last three month among patients attending outpatients' clinics.

OOPE in L.E	**(n=195)**	
Medications cost		
less than 300	63	32.3
300 -	35	17.9
600 -	69	35.4
900-	28	14.4
Range	45.0-1215.0	
Median	450.0	
Mean± S.D	550.4±325.0	
Outpatient visits' cost (135)		
< 60	91	67.4
≥60	44	32.6
Range	50.0-500.0	
Median	120.0	
Mean± S.D	85.1±45.6	
Investigations cost (n=118)		
< 120	55	46.6
≥120	63	53.4
Range	65.0-150.0	
Median	150.0	
Mean± S.D	115.0±21.8	
Transportation cost (n=191)		
< 25	92	48.2
≥25	99	51.8
Range	5.0-60.0	

Median	20.0	
Mean± S.D	18.9±8.0	
Overall direct OOPEs		
less than 300	48	24.6
300 -	42	21.5
600 -	48	24.6
900-	57	29.2
Range	60.0-1550	
Median	450.0	
Mean± S.D	682.4±283.8	

Table (6) and figure (1) demonstrate the incidence of catastrophic health expenditure among income quintiles. CHE progressively increased from the poorest quintile to the wealthier quintiles as the poorest quintile had the least capacity to pay for required health care services. As, it is obviously noticed that the poorest quintiles had a relatively low catastrophic health expenditure (33.3%) compared with wealthier quintiles (46.2%, 56.4%, and 59.0% in 2nd, 3rd and 4th quintile, respectively) expect for the richest quintile that had the lowest percentage (28.2%) with a statistically significant difference (p=.02).

Table (6): Incidence of catastrophic health expenditure (CHE) according to income quintiles among patients attending outpatient clinics.

	Income quintiles										□²	P
	1st		2nd		3rd		4th		5th			
	n	%	n	%	n	%	n	%	n	%		
CHE												
No	26	66.7	21	53.8	17	43.6	16	41.0	28	71.8	**11.746**	**.02***
Yes	13	33.3	18	46.2	22	56.4	23	59.0	11	28.2		

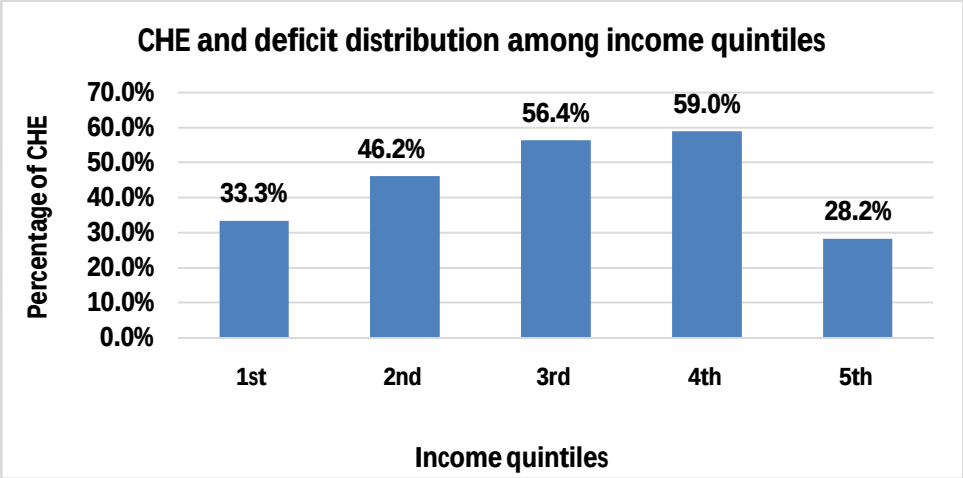

Figure (1): Percentage of CHE according to income quintiles among patients attending outpatients' clinics.

Table (7) describes the factors affecting the incidence of catastrophic health expenditure. Regarding the age, the highest percentage of CHE was observed among sexagenarians (69.0%) with a statistically significant difference in the distribution of CHE between age groups(p=0.001). For gender, females had a higher level of CHE (49.4%) than males (41.1%) without a statistically significant difference (p=.25). As regards marital status, widows had the highest level of CHE (63.6%) without statistically significant differences

(p=.19). Patients residing rural areas had higher percentage of CHE (47.3%) than those in urban areas (41.2%) without a statistically significant difference (p=.40). All illiterate patients (three patients) had CHE with p=.25 for educational level. Those who were unemployed, or housewives represented had the highest level of CHE (70.3%) with a statistically significant differences in CHE regarding the employment status (p=0.001). Patients without regular fixed income had higher CHE (58.9%) than patients with regular monthly salary (16.7%) with a statistically significant difference (p=.001). Regarding the sufficiency of monthly income, patients who reported insufficient income for their basic needs had the highest level of CHE (52.5%) with p=.001 for income sufficiency.

Surprisingly, patients with uncontrolled hypertension had lower CHE (34.7%) than patients with controlled hypertension (62.0%) with a statistically significant difference. Uncontrolled HTN can be attributed to lower utilization of both healthcare services and medications as 87.9% of uncontrolled patients reported deficit due to financially inaccessibility compared to 28.2% among patients with controlled hypertension**.**

The least incidence of CHE (20.7%) was observed among patients with the least hypertension duration (less than 2 years) with a statistically significant difference regarding the duration (p=.001). The use of private healthcare services beside the public sector increased the CHE from 41.1% to 66.7% with a statistically significant in CHE regarding the type of service used (p=.001).

The presence of subsidy schemes decreased the CHE percentage from 46.7% to 41.3% with a statistically significant difference in CHE regarding to the presence of subsidy schemes.

Unmet required health care services decreased the incidence of CHE as a result of low health expenditure due to financial unaffordability as CHE dropped from 60.7% to 37.3% among patients who reported deficit in healthcare services utilization with a statistically significant difference (p=.001).

Table (7): Factors affecting presence of CHE among the study patients.

Variables	No CHE (n=108)		CHE (n=87)		□2	P
	n	%	n	%		
Age						
30-	14	87.5	2	12.5		
40-	31	68.9	14	31.1		
50-	38	57.6	28	42.4	**23.873**	**.001***
60-	16	30.2	37	69.8		
≥70	9	60.0	6	40.0		
Gender						
Male	66	58.9	46	41.1	**1.337**	**.25**
Female	42	50.6	41	49.4		
Marital status						
Single	6	75.0	2	25.0		
Married	91	57.2	68	42.8	**MC**	**.19**
Widow	8	36.4	14	63.6		
Divorced	3	50.0	3	50.0		
Residence						
Urban	50	58.8	35	41.2	**0.721**	**.40**
Rural	58	52.7	52	47.3		
Education						
Illiterate	0	0.0	3	100.0		
Read &write/ Primary	19	59.4	13	40.6	**MC**	**.25**
Secondary/ equivalent	68	54.8	56	45.2		
University	21	58.3	15	41.7		
Employment status						
Unemployed/ Housewife	19	29.7	45	70.3		
Manual worker	37	56.1	29	43.9	**35.088**	**.001***
Employee	34	87.2	5	12.8		
Retired	18	69.2	8	30.8		

Monthly income type						
Fixed monthly salary	55	83.3	11	16.7	**31.538**	**.001***
No Fixed income	53	41.1	76	58.9		
Income sufficiency						
Sufficient and can save	8	100.0	0	0.0		
Just enough	34	70.8	14	29.2	**MC**	**.001***
Not sufficient (in debt)	66	47.5	73	52.5		
Diagnosis						
Controlled hypertension	27	38.0	44	62.0	**19.610**	**.001***
Uncontrolled hypertension	81	65.3	43	34.7		
Hypertension duration (in years)						
<2 years	23	79.3	6	20.7		
2-	35	49.3	36	50.7	**30.524**	**.001***
4-	34	53.1	30	46.9		
6-	16	51.6	15	48.4		
Risk factors						
None	38	77.6	11	22.4	**6.163**	**.046***
Obesity	58	47.9	63	52.1	**6.619**	**.01***
Smoking	24	40.0	36	60.0	**4.818**	**.001***
Health service types						
Governmental	99	58.9	69	41.1	**7.230**	**.001***
Both private & governmental	9	33.3	18	66.7		
Presence of Subsidy						
No	64	53.3	56	46.7	**12.685**	**0.005***
Yes	44	58.7	31	41.3		
Unmet required health care services (deficit)						
No	24	39.3	37	60.7	**12.685**	**0.005***
Yes	84	62.7	50	37.3		

**: statistically significant* MC: Montecarlo test

In order to better understand the percentage of CHE, adjustment was conducted by regression analysis *(table 8)* and revealed that factors that significantly increased the presence of CHE even after adjustment were being retired (OR: 6.799& p=.03), no fixed monthly income (OR: 5.293 & p=.049), uncontrolled HTN (OR: 5.110 & p=.04), the utilization of both governmental and private healthcare services (OR: 5.814 & p=.03). At contrast, the presence of unmet required health care services had adjusted OR of 0.227 with p =0.02.

Table (8): Multivariate logistic regression analysis for factors determining catastrophic health expenditure among hypertensive patients attending outpatient clinics.

Variables	B	S.E.	Wald	Sig.	OR	95% CI	
						LL	UL
Age							
30-®	–	–	–	–	–	–	–
40-	0.903	1.074	0.707	.40	2.466	0.301	20.227
50-	0.737	1.098	0.450	.50	2.090	0.243	17.990
60-	1.385	1.153	1.441	.23	3.994	0.416	38.296

≥70	0.403	1.302	0.096	.75	1.496	0.116	19.212
Employment status							
Unemployed	1.486	0.806	3.395	.07	4.419	0.910	21.470
Manual worker	0.514	0.754	0.465	.49	1.673	0.382	7.334
Retired	1.917	0.853	5.047	**.03***	6.799	1.277	36.195
Employee/professional®	–	–	–	–	–	–	–
Income type							
Fixed monthly salary®	–	–	–	–	–	–	–
No Fixed income	1.666	0.851	3.834	**.049***	5.293	1.998	28.059
Income sufficiency							
Sufficient and save®	–	–	–	–	–	–	–
Just enough	0.737	1.098	0.450	.50	2.090	0.243	17.990
Not sufficient (in debt)	-0.718	0.465	2.381	.12	0.488	0.196	1.214
Duration							
<2 years®	–	–	–	–	–	–	–
2-	1.195	0.652	3.353	.07	3.302	0.919	11.859
4-	1.302	0.725	3.227	.07	3.678	0.888	15.235
6-	1.091	0.821	1.766	.18	2.979	0.596	14.894
Diagnosis							
Controlled®	–	–	–	–	–	–	–
Uncontrolled	1.195	0.652	3.353	**.04***	5.110	1.090	23.958
Risk factors							
None®	–	–	–	–	–	–	–
Smoking	0.936	0.571	2.690	.10	2.550	0.833	7.803
Obesity (BMI ≥30)	0.331	0.646	0.263	.61	1.392	0.393	4.935
Health service types							
Governmental®	–	–	–	–	–	–	–
Both governmental and private	1.538	0.433	5.814	**0.03***	5.110	1.090	23.958
Deficit in health services							
No®	–	–	–	–	–	–	–
Yes	1.285	0.533	5.814	**0.02***	0.277	0.097	0.786

B: Un standardized Coefficients OR: Odds ratio CI: Confidence interval LL: Lower limit UL: Upper Limit
**: Statistically significant at $p \leq 0.05$ ®: reference category*

4.DISCUSSION

The medications' cost had an annual mean of 330.0 USD. That was evidently higher than medication costs reported by ***Agudelo et al., (2020***) in Colombia who reported 67.66 USD for annual medications expenditure and those reported by ***Adams et al., (2020)*** as medications cost was 181.0 USD [3, 5].

The present study annual medications cost was also higher than the results of ***Oyando et al., (2019)*** who reported that medications had a mean annual cost of USD 268.9. This can be explained by the fact that more than half of the patients participating in ***Oyando et al., (2019)*** study reported obtaining their routine medicines from a public hospital [12].

The investigation cost had an annual average of USD 69.0. That was higher than the annual investigation cost reported by ***Agudelo et al., (2020***) in Colombia who reported 21.3 USD. and ***Oyando et al., (2019)*** in Kenya who reported a mean annual direct cost of USD 31.8 for seeking imaging or laboratory test services [3, 12].

The differences between the findings in the current study and the previously mentioned studies can be explained by differences in the healthcare systems. In Kenya, most of these investigations were checked for free at public health care facilities, in contrast to the present study, all the laboratory services were available at private sector with exception for admitted patients who can receive most of the laboratory investigations free of charge during the whole period of hospital admission [12].

The annual cost for physicians' visits had a mean of 60.0 USD, that was higher than results of both ***Agudelo et al., (2020*) *and Oyando et al., (2019)*** who reported annual outpatients cost of 14.89 and 35.2 USD, respectively [3, 12]. On the contrary **Adams et al. (2020)** reported outpatient consultation costs of USD 158.6 [5].

Most of the study patients reported incurring transportation cost. The transportation cost represented the least share of overall out of pocket expenditure. However, ***Agudelo et al., (2020***) reported that transportation related to hypertension consultation represented the highest share of the total OOPE [3].

The estimated annual cost of overall direct out-of-pocket expenditure had a mean of US$ 409.4. That was nearly similar to the results of ***Adams et al., 2020*** who calculated total annual out-of-pocket expenditure for hypertension-related health care as 461.8 USD [5]. However, that was contradictory with ***Agudelo et al., (2020***) who reported higher average direct annual costs for hypertension care (326.4 USD) [3]. The present findings were also higher than the overall average direct annual costs (US$ 304.8) reported by ***Zhang et al., (2020)*** [11]**.**

The high OOPE for HTN found in this study is in line with Egyptian's overall OOPE for health that represents a 60% of the country's total health expenditure in 2020. Nevertheless, low OOPE is not always an indication of equitable access since it may be due to lack of utilization of health services [13]. The average per capita annual health expenditure among Egyptians was (USD) 167.8 in 2018, thus the presence of hypertension increased the expenditure by 2.5 times the average expenditure [13].

CHE progressively increased from the poorest quintile to the wealthier quintiles. The relatively low CHE among the poorest quintile can be attributed to the diminished capacity to pay for required health care services. This is in line with results of ***Zhang et al., (2020***) in China who observed inverse association between CHE and the income quintiles [11]. On the contrary, according to ***Oyando et al., (2019)*** in Kenya, the poorest group of patients incurred higher direct costs as they had fewer resources to pay for hypertension treatment from their existing income sources and they had to rely on savings, borrowing from family and friends or sale of assets [12].

Uncontrolled HTN can be attributed to lower utilization of both healthcare services and medications as 87.9% of uncontrolled patients reported deficit due to financially inaccessibility compared to 28.2% among patients with controlled hypertension**.** That was contradictory with the results of ***Zhang et al., (2020)*** in China that reported higher percentage of CHE among patients with uncontrolled hypertension as these patients experienced more complications that required frequent hospital admission [11].

Significant factors affecting the presence of CHE were being retired, no fixed monthly, uncontrolled HTN, the utilization of both governmental and private healthcare services While the significant factors by regression reported by ***Zang et al., (2020)*** were number of complications, education level, duration of disease, inpatient service, and living arrangement [11].

CONCLUSION

Hypertensive patients are highly vulnerable to incur higher OOPE as the health service utilization posed a high direct economic burden on the patients and their households that may result in financial hardships, catastrophic health expenditure or even inability to pay for required healthcare services. The current health subsidy scheme has minimal effect on the prevention of catastrophic health expenditure.

CONSENT

An informed written consent was obtained from the patients.

ETHICAL APPROVAL

The study was done after approval from the Ethical Committee of Tanta University Hospitals.

REFERENCES

1. Brouwers S, Sudano I, Kokubo Y, and Sulaica M. Arterial hypertension. *The Lancet.* 2021;398(10296):249-61.

2. Nakagawa N, and Hasebe N. Potential common pathophysiological pathway of hypertension-mediated organ damage in hypertensive emergency. *Hypertension Research.* 2021;44(1):124-5.

3. Londoño Agudelo E, García Fariñas A, Pérez Ospina V, Taborda Pérez C, Villacrés Landeta T, et al. Out-of-pocket expenditure for hypertension care: a population-based study in low-income urban Medellin, Colombia. *Global Health Action.* 2020;13(1):18-24

4. **Mills KT, Stefanescu A, and He J.** The global epidemiology of hypertension. *Nature Reviews Nephrology.* 2020;16(4):223-37.

5. **Adams J, Hosseini M, Peng W, and Sibbritt D.** Health care utilisation and out-of-pocket expenditure associated with hypertension: an analysis of Australian adults from the 45 and Up. *Journal of Human Hypertension.* 2020;34(12):833-40.

6. Gheorghe A, Griffiths U, Murphy A, Legido-Quigley H, and Perel P. The economic burden of cardiovascular disease and hypertension in low-and middle-income countries: a systematic review. *BMC Public Health.* 2018;18(1):1-11.

7. Sum G, Hone T, Atun R, Millett C, Suhrcke M, et al. Multimorbidity and out-of-pocket expenditure on medicines: a systematic review. *BMJ Global Health.* 2018;3(1):5-15.

8. Tamblyn R, Winslade N, Qian CJ, Moraga T, and Huang A. What is in your wallet? A cluster randomized trial of the effects of showing comparative patient out-of-pocket costs on primary care prescribing for uncomplicated hypertension. *Implementation Science.* 2018;13(1):1-14.

9. World Health Organization. World Health Survey B—Individual Questionnaire. World Health Organization, Evidence and Information Policy, 2002. Accessed online from https://apps.who.int/healthinfo/systems/surveydata/index.php/catalog/whs/about (lastly accessed in July 2022)

10. European Society of Cardiology & European Society of Hypertension. Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). *European Heart Journal.* 2018;39(33): 3021-3104.

11. Zhang X, Xu Q, Guo X, Jing Z, Sun L, et al. Catastrophic health expenditure: a comparative study between hypertensive patients with and without complication in rural Shandong, China. *BMC Public Health.* 2020;20(1):1-13.

12. Oyando R, Njoroge M, Nguhiu P, Kirui F, Sigilai A, et al. Patient costs of hypertension care in public health care facilities in Kenya. *The International journal of health planning and management.* 2019;34(2):1166-78.

13. Fasseeh A, ElEzbawy B, Adly W, ElShahawy R, George M, et al. Healthcare financing in Egypt: a systematic literature review. *Journal of the Egyptian Public Health Association.* 2022;97(1):1-11.