



# Tracking of Financial Burden: A Longitudinal Study of Out-of-Pocket Expenditure (OOPE) among Rural Households with Hypertension (HTN)

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## Abstract

**Objectives** The study aimed to determine the monthly expenditure pattern and out-of-pocket expenditure (OOPE) associated with managing hypertension in households with patients with hypertension in a rural community in Karnataka, India.

**Materials and Methods** A longitudinal study was conducted over a period 6 months in a rural community under a rural primary health center in Karnataka. One hundred and one households were included in the study with at least one member diagnosed with hypertension. Household income and other sociodemographic variables were also recorded to assess the economic impact relative to household resources. Monthly spending on nonhealth essentials and hypertension-related OOPEs revealed significant financial strain on households.

**Statistical Analysis** Descriptive statistics were used to summarize the study of population's demographic characteristics, monthly expenditure in nonhealth essentials, and OOPE. Inferential statistics of Friedman and chi-square tests (Fischer's exact) were used to determine factors associated with OOPE.

**Results** The population's median age was  $59.1 \pm 12$  years, with a median of 5 (3–10) years since diagnosis with hypertension. Micro to macro vascular complications related to hypertension were present in 17 (22.66%), and 13 (24.52%) were admitted to the hospital in the past 1 year/for 6 months' follow-up. Seventy-two (71.30%) had a monthly OOPE on health (INR) of  $\geq 500$ . Higher socioeconomic status and visits to private health facilities for hypertension treatment were associated with higher OOPE.

**Conclusion** Monthly expenditure among households with patients with hypertension in the rural community shows no significant variation for nonhealth essential items. Higher OOPE was associated with households having higher socioeconomic status and visits to private health facilities for treatment of hypertension.

## Keywords

- ▶ economic status
- ▶ health expenditures
- ▶ health facilities
- ▶ hypertension
- ▶ rural population

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## Introduction

High blood pressure, or HTN, is a major global health concern and one of the main causes of cardiovascular morbidity and death.<sup>1</sup> In countries with low and middle income, health systems frequently find it difficult to control chronic disease-related treatment and lifestyle modifications seen in HTN.<sup>2</sup> In India, HTN is gradually increasing in rural and urban populations, especially among the rural population. Treating HTN poses unique issues for rural communities because of financial barriers, lack of awareness, and limited access to health care.<sup>3</sup> These factors worsen the health and financial ill-effects of HTN by contributing to underdiagnosis and undertreatment among the rural population. The prevalence of HTN has been steadily increasing in rural India, which is in line with more general epidemiological changes.<sup>4</sup> A recent systematic review disclosed that 12% of the studies showed poorer HTN control among rural patients than urban patients.<sup>5</sup> The prevalence was slightly higher in urban areas at 12.5% (12.25–12.80%) than in rural areas at 10.6% (10.50–10.78%).<sup>6</sup> Despite this heavy burden of HTN, rural communities frequently lack the health care infrastructure to screen for, diagnose, and treat HTN adequately.<sup>7</sup> Inadequate health care access and low health literacy lead to poor disease management, higher complications, and financial strain in rural families, causing poverty and catastrophic health expenditures.<sup>8</sup>

HTN in India significantly impacts households, leading to high expenses and productivity loss. Socioeconomic (SE) inequality contributes to higher medical costs among lower-income households.<sup>9</sup> Planning treatments and strategies for the prevention and control of HTN requires understanding the SE disparities in the diagnosis and treatment of HTN, especially among the rural population.<sup>10</sup> A review study published in 2019 has suggested that the greatest loss of income among noncommunicable diseases (NCDs) was attributed to HTN, followed by diabetes and cardiovascular diseases—the NCDs lower gross domestic product, resulting in productivity losses and significant macroeconomic impact.<sup>11</sup> Another study in Mumbai's Malwani slum revealed that managing HTN and related disorders costs around ₹7,154 annually, with government and private health care costs averaging ₹6,073 and ₹8,235, respectively.<sup>12</sup> However, rural community-based studies lack information on out-of-pocket expenditure (OOPE) for treatment and hospitalization among patients with HTN in India. The current study aimed to assess the monthly expenditures on essential household needs like food, electricity, and liquefied petroleum gas (LPG) and determine the OOPE among patients with HTN in a rural community in Karnataka, India.

## Methodology

### Study Tool

A pretested semistructured questionnaire collected baseline information on household characteristics, income, and medical history linked to HTN. Moreover, monthly spending on food-related monthly expenditure, education-related

monthly expenditure, electricity/water amenities, LPG expenditure, and recreation-related expenditure was gathered to track alterations and tendencies in household spending patterns linked to HTN. Two subject experts in community medicine did validation and feedback was incorporated into the questionnaire before the commencement of the pilot study. This study was part of a larger study involving other NCD conditions like diabetes and both HTN and diabetes.

### Data Collection

A longitudinal study was conducted in a rural community under a rural primary health center (PHC) in a coastal district of Karnataka between 2019 and 2022.

Accredited Social Health Activists workers were contacted in person to identify the households with HTN patients in the PHC area. The study was focused on households having at least one member diagnosed with HTN and who was put on treatment for at least 1 year before the data collection. In case there was more than one individual with comorbid NCDs of diabetes and both HTN and diabetes, the individuals with HTN were considered separately for estimating the financial burden and OOPE, especially if both have different patterns of health care utilization or varying costs associated with their treatment. These rural residents had a domicile in the study area for at least 6 months. Consenting adult patients willing to participate in the study and provide financial data were recruited consecutively till the required sample size was achieved. The households with HTN patients who were unavailable to the investigator, even after two informed visits, were excluded. In case monthly visits were not possible due to coronavirus disease pandemic travel restrictions, telephonic interviews were employed to collect data, thereby ensuring lower participant attrition.

Additionally, a medical records review was conducted on the study participants to ascertain medical records, including financial details on medication, frequency of medical visits to both outpatient departments of health care facilities, and any in-patient hospitalizations in up to 1 year. Monthly follow-up visits to the households were conducted to track monthly expenditures for essential household needs (food, electricity, LPG, and others) and any incidental health care expenditures for patients with HTN were noted.

### Sample Size Calculation

The sample size was calculated based on the study done in Malwani slum, where the OOPE among HTN patients was estimated to be 34.2%.<sup>12</sup> The estimated minimum sample size of 87 was determined to estimate the expected proportion with 10% absolute precision and 95% confidence using a Statulator.<sup>13</sup>

### Operational Definitions Used in the Study

Complications in HTN: HTN complications, like myocardial infarction, stroke, heart failure, chronic kidney disease, and peripheral artery disease, result from sustained high blood pressure.<sup>14</sup>

Health-related OOPE: Health care expenses, including medical consultations, medications, and hospital stays,

that were directly paid by individuals or households, excluding reimbursable insurance payments or third-party payers, reflecting the financial burden of health care.<sup>15</sup>

**Food-related monthly expenditure:** The total monthly spending a household does for food and beverage items for human consumption, including groceries, dining out, take-out, and special occasions.<sup>16</sup>

**Education-related monthly expenditure:** A household's total spending on education-related goods and services, including tuition fees, school supplies, transportation, extra-curricular activities, tutoring, and other expenses related to formal or informal education.<sup>17</sup>

**Electricity/water amenities:** The monthly expenditure for electricity/water amenities includes charges for consumption, water usage, fixed fees, taxes, and other associated costs, not including installation or repair of infrastructure.

**LPG expenditure:** LPG-related monthly expenditure refers to a household's monthly expenditure on LPG for cooking and heating, including costs for cylinders, transportation, and additional charges.<sup>18</sup>

**Recreation-related expenditure:** It is the monthly spending of the patients on leisure activities and services, including gym memberships, fitness classes, sports equipment, hobbies, and entertainment events. This expenditure affects HTN management, considering both direct and indirect costs.<sup>19</sup>

**Ethical Considerations**

Before collecting participant data, participants were provided with an information sheet on the study protocol and the need for follow-up visits to measure trends and expenditure patterns. Then, each participant was asked to sign a written informed consent form. All gathered information was kept private and utilized exclusively for the study. Before statistical analysis, the final data set's identifiable data was anonymized. The Institution's Central Ethics Committee (CEC) granted study permission via letter NU/CEC/2019/0241, dated June 13, 2019.

**Statistical Analysis**

Data thus collected were entered into MS Excel and analyzed using SPSS Version 29.0. Descriptive statistics of age, gender, income level, and baseline expenditures were summarized using median and interquartile range (IQR). The monthly expenditure data on food, electricity, and LPG over the 6 months were analyzed to identify any significant changes or patterns in nonhealth essential items. Inferential statistics of chi-square tests were used to determine changes in monthly expenditure patterns and factors significantly associated with OOPE among HTN patients.

**Results**

**Sociodemographic Description of the Study Population**

46 (45.54%) of the 101 adult consenting patients with hypertension were 61 years or older. The median age of the study population was 59.1 ± 12 years, as seen in

► **Table 1.** Most participants are married, with a significant proportion of unmarried or widowed individuals. Most households have two or more earning members and a low frequency of complications related to HTN, suggesting manageable HTN. Most participants have not been hospitalized for HTN-related issues, suggesting better access to health care facilities. The study participants also showed that over

**Table 1** Sociodemographic data of the study population (N = 101)

Socio-characteristics	Variables	Frequency, n (%)
Age group (in years)	≤ 40	7(6.93)
	41–50	22 (21.78)
	51–60	26 (25.74)
	≥ 61	<b>46 (45.54)</b>
Educational status	No formal education	25 (24.8)
	Primary to secondary school	<b>66 (65.3)</b>
	PUC and above	10 (9.9)
Marital status	Married	<b>76 (75.24)</b>
	Unmarried/widow/widower	25 (24.75)
Sex	Male	47 (46.53)
	Female	<b>54 (53.46)</b>
Earning members in the family	0–1	43 (42.57)
	≥ 2	<b>58 (57.42)</b>
Socioeconomic status as per Modified BG Prasad classification <sup>20</sup>	Upper class	11 (10.9)
	Upper middle	29 (28.7)
	Middle	<b>39 (38.6)</b>
	Lower middle	20 (19.8)
	Lower	2 (2)
Complications related to hypertension	Yes	17 (22.66)
	No	<b>84 (83.16)</b>
Admitted to hospital in the past 1 year/for 6 months' follow-up	Yes	13 (24.52)
	No	<b>88 (87.12)</b>
Duration of hypertension diagnosis (in years)	≤ 5	<b>53 (52.47)</b>
	≥ 6	48 (47.52)
Health insurance of any type	Present	39 (38.6)
	Absent	<b>62 (61.4)</b>
Monthly out-of-pocket expenditure on health (INR)	≥ 500	<b>72 (71.30)</b>
	≤ 499	29 (28.7)
Number of households with more than one comorbidity	Present	5 (5.0)
	Absent	<b>96 (95.0)</b>

Abbreviations: INR, Indian rupees; PUC, pre-university course. Note: Bold represents the highest percentage.

half of the participants have been living with HTN for 5 years or less, with a median of 5 (3–10) years since the diagnosis of HTN.

### Monthly Expenditure Patterns of the Households in the Study Population (N = 101)

► **Table 2** shows the self-reported average monthly expenditure on food was ₹3,187, suggesting stable spending despite financial pressures from managing HTN. Education expenses remain constant at ₹1,000 per month, and LPG expenses are fixed at ₹750 per month, indicating a stable cost. Recreation expenditures show variability, with an average of ₹683, suggesting discretionary spending adjustments. Essential household expenditures like food, education, electricity, and LPG remain stable despite financial strain. Recreation expenses show more variability, suggesting households prioritize these areas, potentially at the expense of flexibility in other budget categories. Understanding these patterns can help assess HTN's impact on financial planning and guide interventions for financially burdened households in rural settings. The monthly expenditure patterns, however, did not show any significant variations in expenditures related to the nonhealth essential items of the households with patients with HTN.

The median food expenditure of ₹2,000, with an IQR ranging from ₹1,000 to ₹3,000, indicates that households spend a significant portion of their budget on food. The wide range suggests that household food costs vary considerably, potentially influenced by family size, dietary needs, and local food prices. This expenditure is a substantial component of the household budget, reflecting a relatively stable necessity despite other financial pressures. The time series plot, as seen in ► **Fig. 1**, analyzed the variations in the population's health expenditure and nonhealth expenditures. As seen in ► **Fig. 1**, stable categories like education, LPG, and electricity/water showed minimal changes over time, while variable categories like food showed small fluctuations, indicating external factors influencing household spending.

### Factors Associated with Monthly OOPE

► **Table 3** shows the factors associated with monthly OOPE in the study population. The higher OOPE was significantly associated with visits to private health care facilities and SE status. Lower OOPE was significantly associated with visits to government facilities like the nearby PHCs.

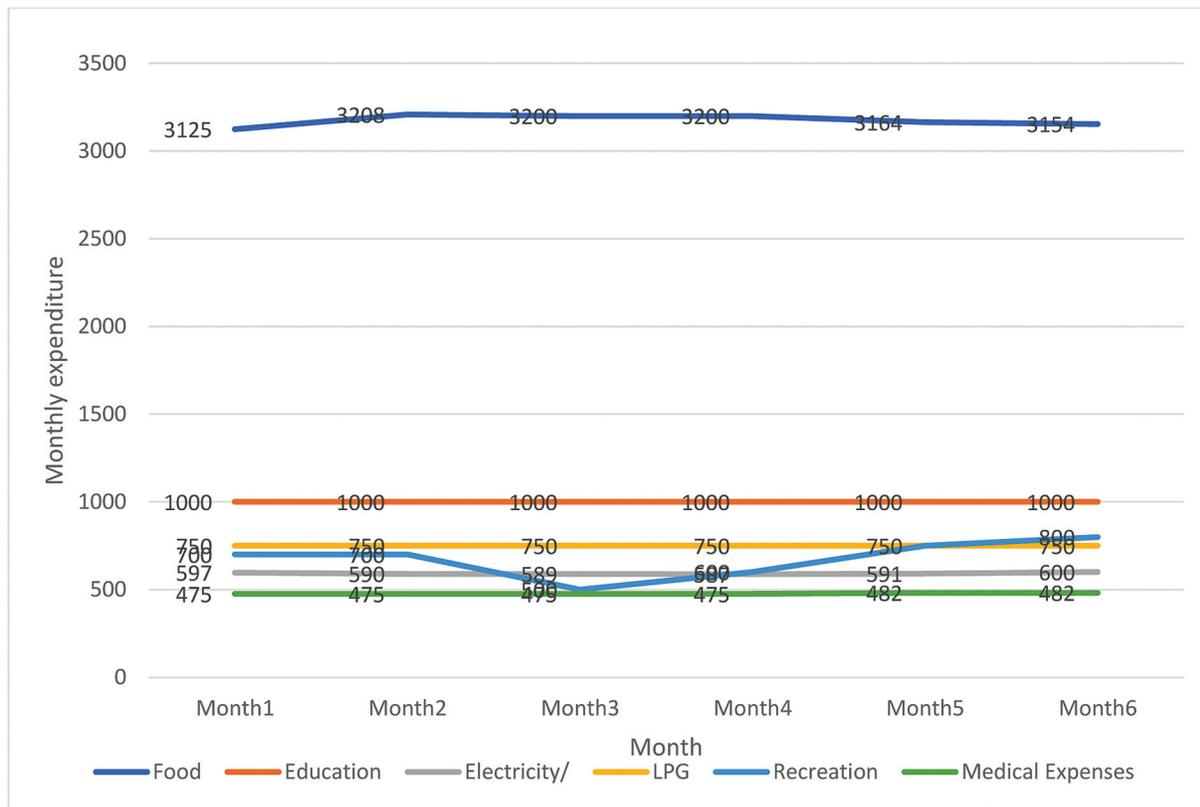
### Discussion

The current study findings reveal that health-related expenditures are significantly higher for hospitalization and medicine purchases from the pharmacy. Monthly expenditures are highest for food among households with patients with HTN when compared with other amenities like electricity, LPG, and recreation purposes. Household financial management is influenced by fixed expenses like education and utility costs, but discretionary spending can be adjusted to cope with unforeseen medical or essential costs. Households with HTN patients experience significant OOPEs associated with visits to

**Table 2** Median monthly expenditure among the households in the study population over 6 months' follow-up in the study population (N = 101)

Particulars	Median and interquartile range (IQR) of variables in months						Chi-square table value	p-Value
	1st	2nd	3rd	4th	5th	6th		
Food	3,125 (2,500–3,710)	3,208 (2,450–3,825)	3,200 (2374.5–3,925)	3,200 (2,475–3,861.5)	3,164 (2,421.5–3,982.5)	3,154 (2,423–3,945)	6.041	0.302
Education	1,000 (625–1,500)	1,000 (625–1,500)	1,000 (625–1,500)	1,000 (625–1,500)	1,000 (625–1,500)	1,000 (625–1,500)	1.000	–
Electricity/ water amenities	597 (414–794)	590 (420–767.5)	589 (426.5–765)	587 (437.5–766.5)	591 (424.5–754)	600 (423.5–765)	5.695	0.337
LPG	750 (700–850)	750 (700–850)	750 (700–850)	750 (700–850)	750 (700–850)	750 (700–850)	1.000	–
Recreation	700 (500–1,150)	700 (500–1,050)	500 (500–1,000)	600 (500–1,000)	750 (500–1,100)	800 (500–1,000)	0.506	0.992
Medical expenses	475 (315–745)	475 (315–747.50)	475 (315–754)	475 (315–749.50)	482 (315–754)	482 (315–757)	59.65	0.001 <sup>a</sup>

Abbreviation: LPG, liquefied petroleum gas.  
Note: Bold represents the highest percentage.  
<sup>a</sup>p-Value < 0.05.



**Fig. 1** Median monthly expenditures of households over a 6-month period ( $N = 101$ ).

private health care facilities and the SE status of the households of the patients with HTN irrespective of the age group, level of education, marital status, and the number of earning members in the family. Lower OOPes were associated with visits to government health facilities like the nearby PHCs.

### Financial Impact on Essential Expenditures

The high cost of essential items such as food, electricity, and LPG exacerbates this financial burden with almost similar spending patterns in the population on medicines among households with HTN. This finding aligns with previous research that highlights how chronic illnesses like HTN disproportionately affect low-income households, as seen in the study by Patel et al, which found households with chronic illnesses in rural India often experience reduced spending on necessities due to high medical expenses.<sup>21</sup>

The study contrasts with a study conducted on the National Sample Survey in India in 2018, which showed that elderly adults from higher SE status and financially independent individuals incurred higher OOPE compared with those who were partially or fully economically dependent as there were no association found with OOPE of more than 500 INR with gender, age, marital status, and educational level.<sup>22</sup>

### Health Care Expenditures and Its Implications

The average monthly expenditure on HTN-related health care was found to be at par with nonhealth care essentials. The findings align with the study using the National Sample

Survey estimates of 2017–18 in India, where the outpatient consultation charges for HTN related to outpatient visits in public facilities ranged from INR 277 (standard deviation [SD] 571) to INR 695 (SD 1,431) depending on the type of private hospital/clinic, similar to our study.<sup>23</sup> The study findings contrast the study conducted by Ramanna et al, where the mean expenditure among households with patients with HTN was 1,464, which was much higher compared with the current study.<sup>24</sup> The study contrasts the high expenditure seen in the average annual basic household expenditure in the Philippines, which is \$12,255.59, with the HTN-attributable OOPE of \$147.75, which was seen in approximately 23.7% of the households, primarily for nonmedical expenses like dietary requirements and transportation to health care consultations, which were significantly lower with a median expenditure of 100 to 1,500 INR and more than 72 (71.30%) of the households with HTN patients spending more than INR 500 per month on medicines as seen in ► **Tables 2** and **3**.<sup>25</sup>

Other studies conducted in Nigeria also showed higher expenditure patterns among those with HTN, that is, ₦36,814 (INR 1,900). These costs included the average monthly cost of controlling HTN, where laboratory tests and medications accounted for the largest portion of this expense. A similar study conducted among those who attended the outpatient departments for treatment of HTN in Egypt incurred a direct OOPE of 682.4 ± 283.8 Egyptian pounds (~1,175.58 INR), which was higher when compared with the present study finding.

**Table 3** Factors associated with monthly out-of-pocket expenditure in the study population ( $n = 101$ )

Characteristic	Variables	Monthly out-of-pocket expenditure in INR $n$ (%)		Chi-square value	$p$ -Value	
		$\leq 499$	$\geq 500$			
Age group (in years)	< 50	7 (24.1)	<b>22 (75.9)</b>	0.416	0.63	
	$\geq 51$	22 (30.6)	<b>50 (69.4)</b>			
Highest level of education	Up to primary	22 (29.3)	<b>53 (70.7)</b>	0.055	0.815	
	Above primary	7 (26.9)	<b>19 (73.1)</b>			
Marital status	Married	20 (26.3)	<b>56 (73.7)</b>	0.862	0.445	
	Others	9 (36.0)	<b>16 (64.4)</b>			
Earning members in the family	0–1	12 (27.3)	<b>32 (72.7)</b>	0.079	0.779	
	$\geq 2$	17 (29.8)	<b>40 (70.2)</b>			
Socioeconomic status <sup>b</sup>	Higher (class I and II)	6 (15.0)	<b>34 (85.0)</b>	6.08	<b>0.015<sup>a</sup></b>	
	Lower (class III, IV, and V)	23 (37.7)	<b>38 (62.3)</b>			
Health insurance (any type)	Present	9 (31.0)	<b>30 (41.7)</b>	0.986	0.321	
	Absent	20 (69.0)	<b>42 (58.3)</b>			
More than one comorbidity in the household	Present	2 (6.9)	<b>3 (4.2)</b>	0.327	0.567	
	Absent	27 (93.1)	<b>69 (95.8)</b>			
Years since being diagnosed with hypertension	$\leq 5$	20 (37.7)	<b>33 (62.3)</b>	4.43	<b>0.035<sup>a</sup></b>	
	$\geq 6$	9 (18.8)	<b>39 (81.3)</b>			
Medicines purchased from	Government health facilities/primary health centers	<b>24 (54.5)</b>	20 (45.5)	25.4 <sup>c</sup>	<b>&lt; 0.001<sup>a</sup></b>	
	Others	5 (8.8)	<b>52 (91.2)</b>			
	Private health facilities	14 (17.5)	<b>66 (82.5)</b>	23.63	<b>&lt; 0.001<sup>a</sup></b>	
	Others	15 (71.4)	6 (28.6)			
	Generic medicine stores	10 (40.0)	<b>15 (60.0)</b>	2.068		0.202
	Others	19 (25.0)	<b>57 (75.0)</b>			

Abbreviation: INR, Indian rupees.

Note: Bold represents highest percentage.

<sup>a</sup> $p$ -Value < 0.05.

<sup>b</sup>Modified BG Prasad classification.

<sup>c</sup>Fischer's exact test.

### Impact on Nonessential Expenditures

Research suggests that managing HTN in households reduces spending on nonessential items due to substantial out-of-pocket costs and economic strain. In the current study, the households with HTN patients' variable spending on recreation reflect the prioritization of medical expenses over quality-of-life enhancements. The current study findings align with a research in Sri Lanka, which found that households with chronic NCD patients face higher OOPes for medicines, pharmaceutical products, medical laboratory tests, and ancillary services.<sup>26</sup>

### Limitations

The study on HTN's financial burden has limitations due to its focus on a single rural community, suggesting that future

research should include a diverse sample and additional variables for a more comprehensive understanding. Future research should explore these issues and provide evidence-based recommendations for mitigating chronic diseases' financial impact.

### Conclusion

Monthly expenditure among households with patients with HTN in the rural community shows no significant variation for nonhealth essential items. Higher OOPE was associated with households with higher SE status and visits to private health facilities for treatment of HTN.

### Conflict of Interest

None declared.

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