



Out-of-pocket expenditure on non-communicable diseases during Covid-19. A cross-sectional study from a semi-urban area of Kannur, Kerala

Resmi Mathew, Jeby Jose Olickal*

Department of Public Health, K S Hedge Medical Academy, NITTE (Deemed to be University), Mangaluru, Karnataka, India

ARTICLE INFO

Keywords:

Noncommunicable diseases
Diabetes
Hypertension
Cost of care

ABSTRACT

Introduction: Non-communicable disease (NCD) care was drastically affected during the COVID-19 pandemic. Therefore, this study aimed to estimate the cost incurred for NCD care during the pandemic and also to compare the cost of care of private and public facility utilizers.

Methods: This community-based cross-sectional analytical study was conducted among 316 individuals aged 30 years and above from selected primary care facility service areas in Kannur district, Kerala. The total cost of illness for all NCDs was calculated from the patient's perspective and was estimated using a bottom-up approach. Direct, indirect, and total costs were summarized using the median with IQR. A median regression analysis was done to find the factors associated with total cost.

Results: The total median direct medical cost was ₹400.0 (120–2360.0), and the total median direct non-medical cost was ₹720.0 (300.0–1200.0). The total median cost of NCD care was ₹1200.0 (200.0–3990.0). There was a significant association between the place of NCD service utilization and cost. The cost of availing care from private [₹2497.5 (455.0–6490.0)] was much higher compared to public facilities [₹120.0 (0–1000.0)].

Conclusion: The expenditure on NCD care during COVID-19 was high and for a private facility utilizer, it was much higher compared to a government facility utilizer. Strengthening the services through subcentres can reduce travel expenses, hence the non-medical cost of NCD care.

1. Introduction

Non-communicable diseases (NCDs) impart premature mortality, morbidity, and a huge disease burden.¹ The most important NCDs are systemic hypertension, type 2 diabetes mellitus, and coronary artery disease. The prevalence of these diseases is higher in low-middle-income countries compared to developed countries due to urbanization. The prevalence of hypertension in India is 30%² and type 2 diabetes is 15% in rural India and 19% in urban India.³ The chronic nature of NCDs and the resultant economic burden on households of NCD patients in the form of out-of-pocket expenditure can cause impoverishment in all societies.⁴ The proportion of cost incurred out of total health care cost is higher for NCD care than for communicable diseases. They have a major impact on healthcare costs, productivity, and economic growth of individuals as well as the country.⁵ A comprehensive and integrated national action led by governments is the only viable solution to this challenge.⁶ However, proper utilization of NCD services from public facilities can reduce this OOPE (Out Of Pocket Expenditure) on NCDs.⁷

Ayushman Bharat is a scheme by the Government of India to protect

the poor and vulnerable populations from out-of-pocket expenditure.⁸ Similarly, Aardram is one of the four missions under the “Navakerala Program” launched by the Government of Kerala, aiming to completely transform the public health sector to be affordable to the community.⁹ The provision of more diagnostic and treatment services from public facilities like FHC can assure some financial risk protection. By increasing the NCD service utilization of the public healthcare system, the out-of-pocket expenditure on NCDs can be reduced.¹⁰

During the COVID-19 pandemic, in order to control the spread of the disease, aggressive locked-down strategies were adopted by all countries. Therefore, the routine care of NCDs became interrupted and many patients who were on medication, especially the elderly population, put a halt on follow-up care.¹¹ Similarly, the pandemic contributed economic crisis as well by increasing the chances of complications.¹² Therefore, this study tries to find out the direct and indirect costs incurred by NCD patients during the COVID-19 pandemic.

* Corresponding author. Department of Public Health K S Hedge Medical Academy, NITTE (Deemed to be University), Mangaluru, 575018, Karnataka, India.

E-mail address: drjebyjose@gmail.com (J.J. Olickal).

<https://doi.org/10.1016/j.cegh.2022.101210>

Received 13 November 2022; Received in revised form 18 December 2022; Accepted 26 December 2022

Available online 30 December 2022

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2. Materials and methods

2.1. Ethical clearance

This study protocol was reviewed and approved by the Institutional Ethics Committee K.S. Hegde Medical Academy (KSHEMA), Nitte Deemed to be University and the approval number is INST.EC/EC/147/2021-22. Prior permission was obtained from District Medical Officer (DMO) Kannur and Kalliasseri gram panchayat. Written informed consent was obtained from all the participants.

2.2. Design and setting

This cross-sectional study was conducted from October 2021 to July 2022 among individuals aged 30 years and above in the service areas of selected FHC (Family Health Centre) at a semi urban part of Kannur District, Kerala. FHCs are upgraded PHCs (Primary Health Centre) with improved infrastructure, service provision, and human resources, and due importance is given to the quality of care. Improved provisions for NCD screening and treatment through the pre-check counter, designated NCD clinics, laboratory services, ECG monitoring, and community-based NCD screening camps are provided by FHCs. FHCs enable a web-based appointment system (E-health) for patient reception to drug delivery and also have improved amenities in the OPDs.

2.3. Sample size estimation and sampling technique

The sample size was calculated for another objective of this project, assessing the NCD service utilization from public facilities and the calculated sample size was 387.¹³ Among 387, 316 participants utilized NCD services from public or private facilities and the sample size used for the current analysis is 316. Among the 34 FHCs in Kannur District, one FHC (Kalliasseri) was chosen by convenience sampling method. Out of 18 wards of Kalliasseri, two wards were chosen by simple random sampling. By proportionate sampling, required was selected.

2.4. Method of data collection

The student researcher and an Accredited Social Health Activist (ASHA) worker visited the household and interviewed the participants at their house. A validated semi-structured questionnaire was used. Content validity was done by three subject experts. The questionnaire included domains to capture the socio-demographic and behavioural data, questions to explore NCD service utilization for hypertension, diabetes, and Cardio Vascular Disease (CVD), and questions to know the cost of NCD care, from the patient's perspective.

2.5. Cost calculation

The total cost of illness for all NCDs was calculated from the patient's perspective and was estimated using a bottom-up approach. The total cost was calculated by adding total direct and indirect costs. Direct costs are directly attributable to the patient care for diagnosing a disease or while getting treated. Direct medical costs are the expenses incurred for laboratory tests and medications. The direct non-medical costs are the costs of meals en route to the hospital and travel. Indirect costs are not directly related to patient care or costs incurred not as a result of medical management of NCDs, like loss of wages for the patient and the caretaker.

2.6. Statistical analysis

The data were entered into EpiCollect 5 mobile application and analysis was done using STATA Version 14. Categorical variables such as gender, occupation, marital status, type of ration card, social class, and alcohol and tobacco use were summarized as frequencies in percentages.

Continuous variables such as age and cost of care were summarized as mean (standard deviation), and median (interquartile range) based on the normality of the data. Direct, indirect, and total costs were summarized using median (interquartile range) or mean (standard errors). A simple and multiple median regression analysis was done to find the factors associated with the total cost. A p-value less than 0.05 was considered statistically significant.

3. Results

The mean (SD) age of the participants was 56.7 (\pm 11.7) years. Among them, 70% (n = 221) of the participants were females, half of the participants (n = 154) had high school education, 71% (n = 223) were unemployed, and 84% (n = 265) were married. Around 66% (n = 209) of them had BPL ration card and 28% (n = 86) belonged to class 5 social class. Of all, 5% (n = 16) were alcohol users and 3% (n = 6) were using tobacco [Table 1].

Out of the total respondents, 45% (n = 144) had self-reported hypertension, around 30% (n = 95) had self-reported diabetes and 6% (n = 21) had self-reported CVD. About, 37% (n = 119) reported any one NCD. The distribution of the cost of care among the service utilizers in the population is shown in Table 2. The average direct medical cost for NCD care in the population is ₹400.0 (120–2360.0), the average direct non-medical cost is ₹720.0 (300.0–1200.0), and the total cost is ₹1200.0 (200.0–3990.0). For a private facility utilizer, the average direct medical cost is ₹1740.0 (360.0–6000.0), the average direct non-medical cost is ₹650.0 (300.0–1200.0), and the total cost is ₹2890.0 (660.0–7540.0).

The distribution of the cost of care for NCD among the service

Table 1
Socio-demographic and behavioural details of participants (N=316).

Variable	n	%
Age in years		
<45	42	13.3
45–60	132	41.8
>60	142	45.0
Gender		
Female	221	69.9
Male	95	30.1
Education		
Class 1-7	89	28.2
Class 8-10	154	48.7
Class 11-12	42	13.3
Graduate and above	31	9.8
Occupation		
Unemployed	223	70.6
Daily waged	45	14.2
Retired	31	9.8
Monthly salaried	17	5.4
Marital status		
Married	265	84.0
Widow/Widower	46	14.6
Unmarried	3	0.9
Divorced	2	0.6
Type of ration card		
BPL	209	66.1
APL	107	33.9
Social class		
Class 1	29	9.2
Class 2	63	19.9
Class 3	63	19.9
Class 4	75	23.7
Class 5	86	27.2
Alcohol use		
Yes	16	5.1
No	300	94.9
Tobacco use		
Yes	8	2.5
No	308	97.5

BPL- Below Poverty Line, AP- Above Poverty Line.

Table 2
Distribution of cost of care among NCD service utilizers from Government and private facilities (N = 316).

Variable	Government facility utilizers (N = 168)			Private facility utilizers (N = 148)			Overall (N = 316)		
	n (%)	Median (IQR)	Mean (SE)	n (%)	Median (IQR)	Mean (SE)	n (%)	Median (IQR) in INR	Mean (SE) in INR
Direct medical cost									
Consultation	86 (51.2)	60.0 (10.0–60.0)	49.2 (10.5)	93 (62.8)	300.0 (60.0–800.0)	607.0 (75.0)	179 (56.6)	60.0 (30.0–400.0)	339.1 (44.4)
Medication	5 (2.3)	1250.0 (1200.0–1800.0)	1454.8 (300.8)	76 (51.4)	4080.0 (1900.0–9300.0)	6833.0 (855.6)	81 (25.6)	3600.0 (1800.0–8400.0)	6501.0 (815.6)
Lab	95 (30.1)	120.0 (60.0–330.0)	294.8 (45.7)	122 (82.4)	360.0 (160.0–660.0)	606.0 (75.0)	218 (68.9)	240.0 (110.0–595.0)	467.9 (47.6)
Total	111 (35.1)	120.0 (60.0–390.0)	356.1 (60.7)	141 (95.3)	1740.0 (360.0–6000)	5369.5 (902.9)	253 (80.0)	400.0 (120.0–2360.0)	3148.9 (527.0)
Direct non-medical cost									
Travel	64 (38.1)	720.0 (9360.0–1200.0)	849.5 (78.8)	97 (65.5)	600.0 (300.0–1200.0)	1010.5 (122.2)	161 (50.9)	700.0 (300.0–1200.0)	946.5 (80.0)
Meals (patient)	1 (0.6)	240.0 (9240.0–240.0)	240.0 (0)	11 (7.4)	300.0 (100.0–400.0)	350.0 (81.7)	12 (3.8)	300.0 (150.0–400.0)	340.8 (75.2)
Meals (care taker)	0 (0)	0	0	1 (0.7)	500.0 (500.0–500.0)	500.0 (0)	1 (0.3)	500.0 (500.0–500.0)	500.0 (0)
Total	65 (38.7)	720.0 (360.0–1200.0)	840.1 (78.1)	98 (66.2)	650.0 (300.0–1200.0)	1044.6 (123.6)	163 (51.6)	720.0 (300.0–1200.0)	963.1 (80.7)
Indirect cost									
Loss of wages (patient)	10 (6.0)	144.0 (12.0–3960.0)	1340.9 (609.2)	7 (4.7)	16.0 (9.0–4200.0)	1749.3 (928.6)	17 (5.4)	144.0 (12.0–3960.0)	1509.0 (508.4)
Loss of wages (caretaker)	0 (0)	0	0	11 (7.4)	2000.0 (700.0–3600.0)	1945.5 (439.3)	11 (3.5)	2000.0 (700.0–3600.0)	1945.4 (439.3)
Total	10 (6.0)	144.0 (12.0–3960.0)	1742.7 (357.9)	21 (14.7)	1000.0 (400.0–2016.0)	1699.8 (383.3)	31 (9.8)	800.0 (144.0–3600.0)	1584.0 (321.2)
Total cost	119 (70.8)	360.0 (110.0–1440.0)	911.2 (113.6)	141 (95.3)	2890.0 (660.0–7540.0)	6349.0 (945.1)	261 (82.6)	1200.0 (200.0–3990.0)	3842.0 (539.3)

utilizers is depicted in Table 3. The total direct medical cost comes to around 79% of total spending for NCD care. For a government facility utilizer, medication expense for NCD comes to around 7% of total spending. Similarly for private facility utilizer, the expense for medication was 58% of their total expenditure on NCD care. Out of the total expenditure on NCD care, 15% was spent on travel expenses. For government facility utilizers, 50% of the total cost and for private facility utilizers, 11% of the total cost was spent on travel.

The median regression analysis of the cost of care for NCD care is depicted in Table 4. After adjusting to the covariates, individuals availed of NCD service from private facilities spent a significantly high amount on NCD care compared to government facility utilizers (₹2124, 95% CI = 1368.7–2879.2, p < 0.001).

4. Discussion

This cross-sectional study was conducted among 316 participants in the Kannur district, Kerala to find the direct, indirect, and total costs incurred for NCD care. This study identified the proportion of known hypertension, diabetes mellitus, and CVD as 45%, 30%, and 6%

respectively.

In the study population, of the total cost, 80% was direct medical costs for NCD care, 16% was spent on direct non-medical costs, and 5% was spent on indirect costs. The results were comparable with a prevalence-based cost of illness study conducted in Bangladesh where the direct medical cost was 90% and the indirect medical costs spent was 9%.¹⁴ This is also, similar to the results of a systematic review conducted in low and middle-income countries where the direct medical cost comprises the major share of the total cost of health care.¹⁵

In a similar study conducted at Thrissur, Kerala, to find out the health care utilization and OOPe, it was found that, median cost of total direct expenses for health was ₹5000 whereas median indirect cost was ₹500.¹⁶ In the current study, among the service utilizers, the median direct medical cost of NCD care was ₹400.0 (120–2360.0) and the median direct non-medical cost was ₹720.0 (300.0–1200.0). Also, the median total medical cost was ₹1200.0 (200.0–3990.0).

In this study, individuals with NCD spent more than 50% of their total expenditure on medications and for a private facility utilizer, the spending on medication is more. Comparable findings were observed in a study conducted in Georgia¹⁷ where, out of the total cost, more than

Table 3
Distribution of cost for NCD service utilization among individuals (N = 316).

Utilization	Overall (N = 316)		Government (N = 168)		Private (N = 168)	
	Amount spent in INR	% of total spending	Amount spent in INR	% of total spending	Amount spent in INR	% of total spending
Total	1002756	100	107588	100	895168	100
Consultation	60690	6.1	4235	3.9	56455	6.3
Medication	526584	52.5	7274	6.8	519310	58
Laboratory charges	101995	10.2	28060	26.1	73935	8.3
Travel	152392	15.2	54370	50.5	98022	11
Meals (patient)	4090	0.4	240	0.2	3850	0.4
Meals (caretaker)	500	0	0	0	500	0.1
Loss of wages for patient	25654	2.6	13409	12.5	12245	1.4
Loss of wages for caretaker	21400	2.1	0	0	21400	2.4
Direct medical cost	796669	79.4	39569	36.8	757100	84.6
Direct nonmedical cost	156982	15.7	54610	50.8	102372	11.4
Indirect cost	49105	4.9	13409	12.5	35696	4

INR- Indian Rupees.

Table 4
Multiple median regression analysis of factors associated with the cost of care on NCD (N = 316).

Variable	Unadjusted coefficient (95%CI)	Adjusted coefficient (95%CI)	p-value
Age in years			
>60	1510 (721.32–2298.67)	908 (–426.68–2242.68)	0.182
45–60	150 (–645.46–945.46)	214 (–1020.52–1448.52)	0.733
<45	Reference	Reference	–
Gender			
Male	1170 (611.33–1728.66)	400 (–543.34–1343.34)	0.405
Female	Reference	Reference	–
Education			
Class 1-7	970 (11.45–1928.54)	998 (–565.98–2561.98)	0.210
Class 8-10	769 (–135.77–1673.77)	806 (–621.31–2233.31)	0.267
Class 11-12	235 (–853.30–1323.30)	894 (673.37–2461.37)	0.263
Graduate and above	Reference	Reference	–
Occupation			
Daily waged	–160 (–1477.55–1157.55)	376 (–1497.50–2249.50)	0.693
Retired	1720 (323.24–3116.76)	770 (–1233.07–2773.07)	0.450
Unemployed	410 (–754.48–1574.48)	480 (–1203.30–2163.30)	0.263
Monthly salaried	Reference	Reference	–
Social class			
Class 1	–75 (–1156.50–1006.50)	598 (–863.21–2059.21)	0.421
Class 2	700 (–135.21–1535.21)	306 (–791.23–1403.23)	0.584
Class 3	–60 (–895.21–775.21)	–6 (–1106.08–1094.08)	0.991
Class 4	430 (–365.71–1225.71)	82 (–939.64–1103.64)	0.875
Class 5	Reference	Reference	–
Place of NCD care			
Private facility	2395 (–368.31–608.31)	2124 (1368.75–2879.24)	<0.001
Government facility	Reference	Reference	–

CI- Confidence Interval, Regression constant = –1582.

50% of individuals spent on medications and, the results were not identical to the findings of another study where 83% of total spending was on medication. In this study, around 10% of total was on laboratory expenses and this was identical with the results in another study where 9% of spending was on laboratory investigations.¹⁴ The travel expenses for a government facility utilizer were high and the expenditure for medication was less compared to a private facility utilizer. This might be due to the availability of NCD medication from the government sector and inadequate service provision through peripheral centres like subcentres so that people had to travel.¹⁸

The expenditure on NCD care for a private facility utilizer was found to be much higher compared to a government facility utilizer and which constituted more cost for medication, consultation, and laboratory expenses with a median cost of ₹120 (0–1000.0) and ₹2497.5 (455.0–6490.0) respectively. The results obtained in a similar study conducted in Bangladesh and the current study were compared and the direct cost of NCD care was 320.1 USD 3.51 USD respectively.¹⁴ Similarly, the median total cost of NCD care in Bangladesh and in the present study were 366.6 and 7.78 USD respectively. The cost of care on NCD was found to be high in the study conducted at Bangladesh as this study participants were exclusively diabetic patients. Here, in the present study the proportion of diabetic individuals were only 24% and that might be reason for the disparity in cost.

This study identified that 52% of total spending is on medication and

the results were not identical to the findings of another study where 83% of total spending was on medication. Around 10% of total was on laboratory expenses and this was identical with the results in another study where 9% of spending was on laboratory investigations.¹⁴

Out of the total 80% of expenditure on NCD care as direct medical costs, a government facility utilizer spends 37% and a private facility utilizer spends 85%. Around 16% of the total cost is spent on direct non-medical expenses while availing of NCD care and was 51% for a government facility utilizer compared to 11% for a private facility utilizer. This points toward the availability of medication free of cost, consultation, and laboratory facilities at an affordable cost from a public facility.¹⁸ However, in order to avail of these services, the beneficiary has to travel to the facility from distant localities. This eventually increases the travel expenses and will result in a high direct non-medical cost. According to study conducted at Kerala, proximity to public facility to avail health care was identified as a determinant that increases OOPE.¹⁹ Hence, there is a need for the decentralization of health care delivery at the sub-center level through new initiatives like health and wellness centres so that people can easily avail services, especially services related to NCDs, and thereby reduce the direct non-medical expenses such as travel expenses while availing NCD care.

In the current study, we identified a significant association between the place from where NCD service is availed and the cost of care on NCD. Compared to the median cost of ₹120.0(0–1000.0) for a government facility utilizer, an individual availing NCD care from a private facility spends a median cost of ₹2497.5 (455.0–6490.0) and individuals utilizing the private facilities for NCD care spent ₹2395 more compared to those who utilize NCD services from government facilities and the association was found to be statistically significant ($p < 0.001$). This finding is consistent with the observations in a study conducted in Kenya where the cost incurred from a public and private facility was 31USD and 129.7USD respectively.¹⁸ According to the National Health Accounts, the OOPE for healthcare is maximum in Kerala compared to other states and it is higher than the national average. As the health care utilization from private facilities increases, the OOPE also increases. This also indicates the importance of strengthening the public health care system in diagnosing and treating NCDs.

There are a few limitations in the current study. The cost of NCD care is captured in this study as per the information given by the participant to the researcher. The data quality will vary according to the participant's memory of the expenditure incurred in the past year. Hence, there is a chance for memory or recall bias. Also, as a health care provider accompanied for data collection, the social desirability bias cannot be ruled out. As the current study used a questionnaire to collect the data using a direct interview method. The chances of suggestive errors cannot be avoided.

5. Conclusions

The expenditure on NCD care during COVID-19 was high, and the expenditure for a private facility utilizer was much higher than a government facility utilizer. The cost incurred on NCD care for a government facility utilizer is mainly for travel and a private facility utilizer spends out of pocket on NCD care for medication. With proper utilization of public facilities and improving awareness among beneficiaries, the out-of-pocket expenditure on health care can be reduced considerably.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Data availability

The datasets analysed during the current study are available from the

corresponding author on reasonable request.

Declaration of competing interest

None.

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