



Cost of Care for Non-communicable Diseases: Which Types of Healthcare Providers are the Most Economical in India's Chhattisgarh State?

Samir Garg¹ · Narayan Tripathi¹ · Kirtti Kumar Bebarti¹

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Abstract

Background Non-communicable diseases (NCDs) affect a large number of people globally and their burden has been growing. Healthcare for NCDs often involves high out-of-pocket expenditure and rising costs of providing services. Financing and providing care for NCDs have become a major challenge for health systems. Despite the high burden of NCDs in India, there is little information available on the costs involved in NCD care.

Methods The study was aimed at finding out the average monthly cost of outpatient care per NCD patient. The average cost was defined as all resources spent directly by government and citizens to get a month of care for a NCD patient. The cost borne by the government on public facilities was taken into account and activity-based costing was used to apportion it to the function of providing outpatient NCD care. For robustness, time-driven activity-based costing and sensitivity analyses were also performed. The study was conducted in Chhattisgarh State and involved a household survey and a facility survey, conducted simultaneously at the end of 2022. The surveys had a sample representative of the state, covering 3500 individuals above age of 30 years and 108 health facilities.

Results The average monthly cost per NCD patient was Indian Rupees (INR) 688 for public providers, INR 1389 for formal for-profit providers and INR 408 for informal private providers and they managed 53.5, 34.3 and 12.0% of NCD patients respectively. The disease profile of patients handled by different types of providers was similar. The average cost per patient was lowest for the primary care facilities in the public sector.

Conclusions The average direct cost of NCD care for government and citizens put together was substantially higher in case of formal for-profit providers compared with public facilities, even after taking into account the government subsidies to public sector. This has implications for allocative efficiency and the desired public–private provider mix in health systems.

1 Background

Non-communicable diseases (NCDs) accounted for 73% of global deaths in 2019 and 86% of those took place in the low- and middle-income countries (LMICs) [1, 2]. Hypertension alone is estimated to affect 1.28 billion of the population globally [3]. The burden of NCDs continues to grow in LMICs including India [4]. Around 23% of the

adult population in India had hypertension and 15% suffered from diabetes in 2021 [5].

NCDs are chronic and complex in nature and require long-term care and follow-up [6]. This is associated with the likelihood of a greater cost of care [7, 8]. Financing and providing care for NCDs have become a major challenge for the health systems in LMICs [9]. The high expenditure on NCDs poses a significant barrier to accessing the required healthcare. This has made the socio-economic impact of NCDs very severe [10–12]. It is therefore important to understand the costs involved in NCD care [13].

Like many LMICs, India has a mixed health system. The private sector has a sizable presence in providing healthcare in India, including NCD care [14]. There is very limited information available on the relative share of public and private providers in provision of NCD care in

✉ Samir Garg
koriya@gmail.com
Narayan Tripathi
narayantripathi@gmail.com
Kirtti Kumar Bebarti
kirttibebarta@gmail.com

¹ State Health Resource Centre, Raipur, Chhattisgarh, India

Key Points for Decision Makers

After counting all the expenses incurred by patients and government, the average cost of obtaining care for NCDs is greater in cases of for-profit formal providers as compared with the public sector.

Governments should further improve their services for NCDs and make them available closer to people so that more patients receive care in the public sector. This will protect patients from incurring large expenses on healthcare. It will also bring down the overall cost of NCD care for society, reduce the dependence on unqualified health providers and mean patients will get better quality care.

India. A study by the World Health Organization (WHO) in Chhattisgarh State in 2019 reported that 40.7% of the outpatient care for NCDs was provided by public sector, 40.2% by qualified private providers and 19.1% by informal private providers [15]. In India, the government provides supply-side financing to public facilities to cover their costs but the patients may still incur out of pocket expenditure due to various gaps in the public sector, e.g. inadequate availability of the necessary drugs and diagnostics [16]. Government also purchases healthcare services from the private sector through publicly funded health insurance schemes. Such schemes hold limited relevance for NCD care as their coverage is limited to inpatient care, whereas a large part of NCD care occurs in an outpatient setting [15]. In India, the voluntary private insurance is also limited to inpatient care and a very small share of population buys it. The cost of outpatient NCD care in private sector is entirely borne by the patients out of pocket [17, 18]. The understanding on financing of NCD care will remain severely limited unless the costs are known for different types of providers and relevant comparisons can be made. Such comparisons can help in informing the current policy debates around the public–private provider mix and purchasing in India.

In recent years, availability of information on cost of healthcare in India has improved. Some studies have reported the high economic burden of NCDs in terms of out-of-pocket expenditure (OOPE) and catastrophic health expenditure for those utilising care from private sector providers [19–22]. Multiple studies conducted in different states of India have reported the input costs incurred by public facilities [23–30]. There is a very small set of

studies reporting on the costs in the private sector but none of these studies have focused on NCD care [23, 30]. The national household surveys in India tend to collect information on OOPE for episodic care but tend to neglect the costs of long-term care. There are a couple of studies that have compared the cost of care among different types of providers but they have not covered outpatient NCD care [31, 32]. Hence, the present study is aimed at carrying out a comparison of cost of outpatient NCD care across the different types of healthcare providers in a state of India.

2 Material and Methods

2.1 Sampling and Data Collection

The study was conducted in Chhattisgarh, a state in central India that has population of around 30 million [18]. This study involved two sets of data collection:

1. Household survey: A household survey was conducted on the self-reported NCDs, type of provider accessed for healthcare and OOPE (Supplementary file). The survey was carried out in Chhattisgarh in November–December 2022. The survey was designed to collect data on NCDs in population above 30 years of age considering that the bulk of NCD burden is concentrated in this age group [33]. For the purpose of the survey, a NCD was defined as any non-communicable ailment that an individual had been detected with, longer than 3 months preceding the survey.

The household survey asked the Individuals if they had been diagnosed with any NCD. From each individual self-reporting as a NCD patient, further questions were asked about the providers utilized over the preceding 30 days. From those who had not received any outpatient treatment during the 30 day period, no further questions were asked. To allow a clear comparison between the different types of providers, the NCD patients who had used more than one provider over the preceding 30 days were excluded from the analysis. From those utilizing a single provider over the preceding 30 days, further questions were asked on the OOPE incurred. The OOPE were asked for the preceding 1 month, which included all outpatient healthcare and medical products utilized by each patient for NCD care.

The household survey had a representative sample of the state's population. For a type-1 error of 5% and power of 95%, the minimum sample size required was 385 NCD patients. To take into account the two-stage sampling, the above requirement was raised by 50%, i.e., to 578 NCD patients. Enough sample households were needed to yield

the above number of NCD patients. Assuming that 20% of the individuals older than 30 years of age had a NCD detected, the need was to cover 2890 individuals [15]. Assuming an average of two individuals above 30 years of age per household, 1445 households were needed to be surveyed.

The sample was selected through a two-step process using systematic random sampling. First, one district was selected from each of the five geographical divisions of the state. Within each sample district, five sampling units were selected covering the rural and urban areas. Each sampling unit consisted of 65 households. In the sampled households, the survey aimed to interview all individuals above the age of 30 years. The actual survey was able to cover 1558 households, collecting data on 3500 individuals above the age of 30 years.

2. Facility survey: A survey of public health facilities was carried out in November–December 2022 to find the supply-side input costs of treating a NCD patient for a month (Supplementary file). It collected data on various kinds of input costs, number of NCD outpatients utilising the services and the time allocation by various kinds of staff for outpatient NCD care.

The government owns the following types of health facilities [31]:

- i. Sub Health Centre (SHC) at 3000–5000 population,
- ii. Primary Health Centre (PHC) at 20,000–30,000 population,
- iii. Community Health Centre (CHC) at 80,000–120,000 population
- iv. District Hospital (DH) at around a million population
- v. Medical college (MC) hospital at around 5 million population.

The MCs provide tertiary care along with medical education. The CHCs and DHs mainly provide secondary care services whereas the PHCs and SHCs focus on primary care.

The sample for the facility survey was also representative of the state and selected from the same districts as

covered in the household survey. The sample size for each type of public facility was calculated for a single mean for a specified precision. For subcentres, assuming a standard deviation of INR 150 and an acceptable error of INR 50 in monthly government spending per NCD patient, the sample size required was of 35. To account for the two-stage sampling, we increased the above requirement by 50%, i.e. to 53 subcentres. Using a similar process, the minimum required sample size for the PHCs, CHCs, DHs and MCs was calculated as 24, 14, 5 and 2, respectively. From each of the five districts covered in household survey; one MC (where available), one DH, three CHCs, six PHCs and twelve SHCs were selected out of the complete list of each facility type through systematic random sampling.

The total number of public facilities of each type, the required sample size and the actual covered sample size are given in Table 1.

The surveys were carried out by the State Health Resource Centre (SHRC), a technical agency working for the Department of Health and Family Welfare, Government of Chhattisgarh. The interviews were conducted in person at the sample households and facilities. The ethics approval was obtained from the Institutional Ethics Committee of SHRC. Written informed consent was obtained from all the respondents and legal representatives. The data was entered and analysed in MS Excel. The dataset was anonymised before starting the analysis.

2.2 Definitions and Data Analysis

- (a) Formal and informal private providers

The privately owned health facilities registered with the government were classified as formal providers. Providers operating without medical qualification and registration were treated as informal providers.

- (b) Average direct cost of care

The direct cost of care is defined as sum of the costs borne by the government, community and patients while

Table 1 No. of public facilities in Chhattisgarh and sample size covered (2022)

Type of public facility	Minimum required sample size	Sample size covered in facility survey	Total number of facilities in Chhattisgarh	Proportion of facilities covered in survey
Sub Health Centre (SHC)	53	57	5200	1.1%
Primary Health Centre (PHC)	24	29	800	3.6%
Community Health Centre (CHC)	14	15	170	8.8%
District Hospital (DH)	5	5	27	18.5%
Medical College Hospital (MC)	2	2	6	33.3%

ensuring that no cost gets counted twice [34–38]. This definition allows a fair comparison of costs for private and public providers. While public sector facilities receive government subsidies to meet their input costs (e.g. building, staff, supplies etc.), for-profit private providers have to meet all their expenses out of the payments they take from patients [39]. Therefore, for a valid comparison between public and private providers, the costs borne by government also need to be taken into account in addition to the costs borne by patients.

The average direct cost of care in public facilities was taken as sum of (a) mean monthly government expenditure per NCD patient on inputs in public facilities and (b) mean monthly OOPE incurred by patients or their families [31, 32].

For private providers, the OOPE incurred per patient was taken as the average direct cost of care. The expenditure by private facilities on inputs was not added to OOPE because it would amount to double counting of those costs.

The indirect cost, i.e. the loss of income due to illness was not included. All costs were taken in Indian Rupees (INR) and at 2022 prices.

(c) Costs incurred by government on NCD care in public facilities

Detailed data on the costs borne by government on public facilities was collected for 20 items of expenditure, classified under six main types of inputs to production—human resources, medicines, diagnostics, infrastructure, utilities and others. Annualised costs of capital items such as land, buildings, furniture and equipment were calculated by using discount rates over the expected lifespan of each asset [40]. The cost of the land used by government facilities was taken at the current open market prices for the year 2022. Land was discounted at 10% per annum as the open market interest on borrowing capital is around 10% in India. Buildings were discounted at 14% as their lifespan was taken as 25 years [40–42]. The furniture and equipment were discounted at 30% with a lifespan of 5 years. The detailed steps used for finding out monthly spending by government for the different types of public facilities have been described in the Supplementary file.

The monthly government cost per NCD patient in public facilities was computed by using two different methods:

Activity-based costing (ABC): In public facilities, most of the staff and infrastructure were deployed for multiple cost centres, i.e. functions such as outpatient care, inpatient care, public health and outreach activities and non-clinical activities. Therefore, counting the costs separately for outpatient NCD care alone was not possible in

this context. ABC was applied to apportion the different resources to the function of outpatient NCD care.

Among the various components of costs in public facilities, human resources account for the biggest share in an Indian context [40]. Therefore, apportioning was done by using staff time as the basis, as done in several earlier costing studies in India [40–42]. The per-patient average cost was computed by dividing the total monthly government cost on NCD care by the average number of NCD patients seen in a month by each type of public facility. A detailed description of the calculations for ABC is given in the Supplementary file.

The impact of changing some of the main variables on the cost of care was examined through a sensitivity analysis (Supplementary file). The key variables were increased or decreased by 30% to examine the change in cost of care. For sensitivity analysis, the relevant variables were discount rates on capital costs, volume of patients seen and the staff-time share allocated to NCD care.

Time-driven activity-based costing (TD-ABC): The TD-ABC method was used to add to robustness of the analysis. In the context of general healthcare, TD-ABC is suitable for calculating the cost per patient [43–47]. A process map was prepared for NCD care (Supplementary file). Based on the processes involved in NCD care, data were collected to find out the average staff time required per NCD patient. The staff reported the average time they spent on a typical NCD patient in a month. The staff included were those who came in contact with NCD outpatients or who were involved in a service or administrative task directly attributable to NCD outpatients. The same applied to the inclusion of time they spent on a NCD patient. It included the time of doctors, nurses and paramedics (in attending to the patient and keeping records); laboratory staff (in taking samples, conducting tests, preparing and giving reports, keeping records); pharmacists (or other staff dispensing medicines and keeping records) and the staff involved in patient registration. It did not include the tasks where time spent by a staff was not traceable to NCD care, even though the task could be indirectly and partially related to it, e.g. official meetings, training programmes and routine facility reporting.

The cost per minute of practical staff capacity was used to calculate the monthly input cost per patient. A sensitivity analysis was carried out to see the impact on the TD-ABC estimate of average cost. The final estimation of average cost per NCD patient depended on two main variables—the average time spent per NCD patient and the total staff time available in a month. The above variables were altered by 30% for the sensitivity analysis.

A detailed description on the steps used for the TD-ABC calculations are given in the Supplementary file.

2.3 Out-of-Pocket Expenditure

The out-of-pocket expenditure (OOPE) included all the expenditure incurred by a NCD patient or family during the preceding month (30 days) for receiving NCD care. It included:

- (i) Medical expenses: paying the fees, buying medicines or tests
- (ii) Non-medical expenses: food and transport of the patient and accompanying family members during the outpatient visits

3 Results

The socio-economic and demographic profile of individuals covered in the household survey is given in Supplementary file. The survey covered 3500 individuals above the age of 30 years and 621 of them reported themselves as existing patients of NCDs who had utilised a single provider during the preceding 30 days. In addition, there were 56 NCD patients who had not utilised any provider and 22 patients who had utilised more than one provider in the 30 day period. The results presented here are limited to the NCD patients utilising a single provider over 30 days preceding the survey.

3.1 Share of Different Types of Providers in Outpatient Care for NCDs

According to the household survey, the majority of the patients utilised the public providers for outpatient NCD care (Table 2).

Among the public providers, the facilities at primary level (SHCs and PHCs) had a bigger share than others. Among the formal for-profit providers, private hospitals had a greater share of NCD care utilisation than private clinics.

3.2 The Disease Profile of NCD Patients

The information on types of providers accessed by patients of various diseases is given in Table 3.

Of the patients who sought care with each type of provider, around half were seeking care for hypertension. A relatively smaller share of diabetes patients accessed the informal private providers.

3.3 Costs Borne by Government on Providing Subsidies to Public Facilities

The human resources and infrastructure were the main cost drivers in public facilities. Human resources contributed

Table 2 Proportion of NCD patients handled by different types of providers (Chhattisgarh household survey 2022)

Type of provider	Patients accessing NCD care Number (%) (N = 621)
Public providers	
Sub Health Centre (SHC)	78 (12.5)
Primary Health Centre (PHC)	91 (14.7)
Community Health Centre (CHC)	78 (12.5)
District Hospital (DH)	77 (12.3)
Medical College (MC)	9 (1.4)
All public providers	333 (53.5)
Formal for-profit providers	
Private hospital	150 (24.1)
Private clinic	63 (10.2)
All formal for-profit providers	213 (34.3)
Informal private providers	
Informal allopathic providers	58 (9.4)
Traditional healers	9 (1.4)
Private pharmacy	8 (1.3)
All informal private providers	75 (12.1)

NCD non-communicable disease

51% of the average cost followed by infrastructure at 16% share. The shares of other main inputs were utilities (14%), medicines (13%) and diagnostics (5%). The tables with detailed breakdowns of input costs for each type of public facility are given in the Supplementary file.

Table 4 reports the average monthly cost borne by government per NCD patient in public facilities. It compares the cost estimates based on ABC and TD-ABC. The detailed table on apportioning of costs under ABC is given in the Supplementary file.

The government subsidy per NCD patient was highest for MCs and lowest for SHCs (Table 4). The sensitivity analysis showed that the average NCD care cost in public facilities was most sensitive to the volume of patients seen, followed by the human resources and infrastructure (Supplementary file).

The detailed calculations of average cost per NCD patient through TD-ABC and the sensitivity analysis are given in the Supplementary file. Using TD-ABC, the average monthly government expenditure per NCD patient was INR 236. This was around 70% of the cost found through ABC (INR 338). This ratio was lowest for PHCs (56%) and highest for DHs (84%).

For further analysis and comparison between different types of providers, the higher estimate of government spending, i.e. the estimate obtained through ABC was used.

Table 3 Proportion of patients with different NCDs accessing the three types of providers (Chhattisgarh household survey 2022)

Disease	Public providers Number (%) <i>N</i> = 322	Formal for-profit providers Number (%) <i>N</i> = 213	Informal private providers Number (%) <i>N</i> = 72	<i>p</i> value
Hypertension	165 (49.69)	84 (39.44)	38 (52.78)	0.088
Diabetes	52 (15.53)	40 (18.78)	4 (5.56)	0.021*
Knee and joint pain	28 (8.39)	23 (10.8)	8 (11.11)	0.539
Body pain	21 (6.21)	8 (3.76)	7 (9.72)	0.176
Asthma	8 (2.48)	6 (2.82)	3 (4.17)	0.744
Refractive error	7 (2.17)	2 (0.94)	0 (0)	0.145
Thyroid	5 (1.55)	7 (3.29)	1 (1.39)	0.329
Mental illness	5 (1.55)	1 (0.47)	0 (0)	0.317
Cataract	4 (1.24)	2 (0.94)	0 (0)	0.628
Cardiovascular disease	3 (0.93)	4 (1.88)	0 (0)	0.357
Injury	3 (0.93)	2 (0.94)	0 (0)	0.707
Stroke	2 (0.62)	9 (4.23)	3 (4.17)	0.012*
Cancer	1 (0.31)	0 (0)	0 (0)	0.647
Sickle cell	0 (0)	1 (0.47)	0 (0)	0.386
Others	27 (8.07)	23 (10.80)	7 (9.72)	0.451
Don't know	1 (0.31)	1 (0.47)	1 (1.39)	0.506

NCD non-communicable disease

**p* < 0.05

Table 4 Average monthly input cost borne by government per NCD patient (INR) (Chhattisgarh health facility survey 2022)

Type of public facility	Average monthly input cost borne by government per NCD patient (INR)	
	According to ABC	According to TD-ABC
SHC	175	133
PHC	364	203
CHC	409	274
DH	382	317
MC	519	435
All public facilities	338	236

NCD non-communicable disease, *INR* Indian rupees, *ABC* activity-based costing, *TD-ABC* time-driven activity-based costing, *SHC* Sub Health Centre, *PHC* Primary Health Centre, *DH* District Hospital, *MC* Medical College Hospital

3.4 OOPE for Different Types of Providers

In one of its columns, Table 5 reports the findings on OOPE from the household survey. As presented in Table 5, MCs have the highest OOPE among public facilities, followed by district hospitals. The primary level public facilities involve the lowest OOPE.

The average OOPE was about four times larger for formal-private providers than the public facilities. The informal private providers had larger average OOPE than the primary level public facilities (PHCs and SHCs).

3.5 Average Direct Cost of Care for Different Types of Providers

Table 5 combines the costs borne by the government as calculated in Table 4 with the findings on OOPE from household survey to provide the total direct monthly cost per patient for different types of providers. The formal for-profit private providers had around two times larger average cost of care than public facilities. The cost of care for informal providers was lower than other providers except the SHCs. Among public facilities, MCs had the highest average cost per NCD patient per month, followed by DHs and CHCs (Table 5).

4 Discussion

The present study found that the average total cost of care per NCD patient was INR 688 per month for public sector facilities. This included the average OOPE of INR 350 per patient. This is the first Indian study to report the total direct cost of care per NCD patient. Earlier studies on NCD care

Table 5: Cost of care per NCD patient per month for public and for-profit private providers

Type of provider	Cost per patient per month		
	Average government expenditure (INR) (A)	Average OOPE (INR) (B)	Total average direct cost (INR) (A + B)
Public providers			
SHC	175	118	293
PHC	364	180	544
CHC	409	498	907
DH	382	581	963
MC	519	801	1320
All public providers	338	350	688
All formal for-profit providers	0	1389	1389
All informal private providers	0	408	408

NCD non-communicable disease, *INR* Indian rupees, *ABC* SHC: Sub Health Centre, *PHC* Primary Health Centre, *DH* District Hospital, *MC* Medical College Hospital

costs in India have covered either the cost borne by patients (OOPE) or government (input costs), but none have reported both components together. A study on episodic OOPE for NCD care in Kerala has reported that the average OOPE was INR 911 in public hospitals and INR 6349 in private hospitals [19]. A recent Indian study on cost of ambulatory care at a public tertiary hospital has reported that the median monthly input cost for diabetes mellitus was INR 804 per patient [48]. Another study in a public tertiary hospital in India has reported the mean input cost of outpatient NCD care as INR 3097 monthly [49].

Our study is the first to compare the cost of outpatient NCD care among different types of providers (by ownership) in India. It involved representative samples of the population and health facilities of the state. Its facility survey covered more than a 100 facilities which is rare in Indian studies on healthcare costing. Through the combination of household and facility surveys, it provides a unique insight into the costs of care in the mixed health system of India. The study counted all the costs and also accounted for the government subsidies to public providers. The formal private sector came out to be twice as expensive as the public sector. The sensitivity analysis showed that even if the government funded input costs were to increase substantially, the public sector will still be more economical for government and patients put together. This finding can have significant policy implications. The overall allocative efficiency can improve if ways are found to provide services to a larger share of NCD patients through public providers. For inpatient care, India has implemented policies to purchase care from private sector using publicly funded insurance as a mechanism. Existing studies have shown that such purchasing by government has not helped in bringing down the OOPE incurred by the patients [50–53]. Yet there have been suggestions to extend the purchasing to primary care as well, presumably with the expectation that it will help in shifting many patients from

hospital-based care to primary care and thereby reduce the overall costs of care in the health system [53, 54]. The current study however shows that purchasing outpatient NCD care from private providers will increase the cost of care because it will encourage more patients to utilise the expensive private sector. An increase in access to NCD care will come at a lower cost if it is done by expanding the reach of public sector services.

What explains the higher average cost in case of formal private providers in India? There is no regulation of prices for the private providers in the Indian health system [29, 55]. Like many LMICs, there are huge power asymmetries between formal providers and patients in India [56, 57]. This allows the formal private sector to charge prices way above the cost of production [56, 58–63]. Another reason for the higher costs in the private sector is connected to the tendency to prescribe costlier or unnecessary drugs and diagnostic tests [58, 59, 64–67]. Poor regulation coupled with the presence of a large private sector is contributing to greater costs of healthcare per patient [68]. There could also be a consumer perception that quality is better in private facilities, allowing them to charge higher prices.

Our study is also the first to report the share of informal private providers in NCD care and the average cost of utilising their services. The informal providers were found to be relatively inexpensive in comparison to formal private sector or the secondary-level public facilities. The accessibility and affordability of such providers might have improved the access to NCD care, especially for the poorer patients [69]. However, such providers practice without any medical training and it can lead to poor-quality care and safety for NCD patients. Concerns have been expressed about the quality of care they provided [70]. Our study found that the primary-level public facilities were cheaper than the informal private providers. This suggests that expanding and improving NCD care in public primary facilities can be a suitable direction

for policies. In recent years, India has moved in this direction and implemented a nationwide initiative to expand the availability of services for NCDs by strengthening primary-level public facilities as ‘Health and Wellness Centres’. A comparison of our findings with a 2019 assessment in Chhattisgarh showed that the share of public primary providers had risen alongside a decline in the share of the informal providers in NCD care [15]. This suggests that the ‘Health and Wellness Centre’ policy may be beginning to show some of the desired results.

Our study also provides a useful comparison of cost in public facilities at different levels of care: tertiary, secondary and primary. Similar to previous findings, the costs were lowest at the primary level and highest at the tertiary level [71, 72]. This quantifies the potential cost savings for government and patients if a NCD patient were to be treated at primary level instead of the higher levels.

The public sector in most LMICs, including India, has been under-funded and not able to provide the full range of required health services [29]. For example, the government spends a very small amount on diagnostic services. For a scenario where public facilities provide the full range of diagnostic services, our sensitivity analysis showed an increase in public sector costs. However, that did not change the overall conclusion on comparison with private sector. Increasing government spending on strengthening the public facilities may not result in proportionally increased average cost per patient as it may help in attracting more patients there.

One of the major sources of OOPE in India has been the expenditure on medicines [16]. Chhattisgarh has implemented a policy to provide free essential drugs at public health facilities [73]. The government is able to procure drugs at low prices due to the large volumes. Providing drugs free to patients helps in bringing down the OOPE [74].

In terms of costing methods, we estimated the government spending per NCD patient using ABC as well as TD-ABC. According to existing literature, both methods have been used widely for costing of specific healthcare services. The TD-ABC method is expected to reduce the need for tedious data collection which is often the case with ABC. Which of the two methods was more accurate depended upon the extent to which health staff could trace the tasks and time spent on specific services. Both methods involved approximate judgements by staff about the time they allocated to outpatient NCD care. The difference was in the way staff were asked this question. Under ABC, staff reported the proportion of their total time they thought they spent on outpatient NCD care. Under TD-ABC, staff estimated time (in minutes) they could directly attribute to each task involved in providing services to a typical NCD patient. The average cost arrived through the TD-ABC method was lower, perhaps because TD-ABC could not help in overcoming the

challenge of allocating the indirect or support tasks. The difference between the ABC and TD-ABC estimates could also indicate the extent to which existing staff capacity was deployed towards service delivery. ABC was additionally useful in this study as the sensitivity analysis was able to show the impact of drastically changing one of the inputs such as the diagnostics costs.

4.1 Limitations

The comparison of costs between the public and private sector did not take into account any differences in the quality of care. Though the disease mix was found to be similar for different providers, the severity of illness could not be taken into account. There was no evidence available on differences in the quality of care and the severity of illnesses handled by public and private providers. However, if these differences were substantial, the cost comparison arrived here could be less robust.

The surveys took place at the end of 2022 and captured information on a 1 month period, but we believe that seasonality did not play a significant role with respect to our main conclusion. It is unlikely that the prices of medicines or the fees charged by doctors in India vary with seasons. We expect the comparison of average cost for different providers to hold across seasons.

Our study was limited to one state, Chhattisgarh. India is a large and diverse country and the costs of healthcare may vary across states. However, like in our study, the average cost per NCD outpatient in the public sector may be lower than the formal for-profit sector in many states. We expect this pattern to hold in multiple states to the extent they have some key similarities in their health systems—similar design of public facilities, provision of free medicines in public sector and poor price regulation in private sector [33, 56, 58–63, 68, 74].

5 Conclusions

The current study adds to the sparse literature available on comparing different types of healthcare providers in LMICs in terms of cost of NCD care. It carries out a valid comparison of average cost for outpatient NCD care between the public and private providers while taking into account the subsidies public facilities receive from the government. The total cost per patient was substantially higher for formal for-profit providers in comparison to public facilities. The study provides important evidence to inform the policy debates on public–private provider mix and purchasing for NCD care in India. Policies to strengthen and expand direct provisioning of NCD care through the public sector can help in reducing the overall costs to society.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s41669-024-00489-4>.

Declarations

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Conflict of interest The authors declare that there are no competing interests.

Consent for publication Not applicable. The dataset was completely anonymised before analysis. The publication of this research does not involve any information identifiable to the study participants.

Consent to participate The study was carried out with written informed consent of all respondents and legal representatives.

Ethics approval and consent to participate The study was approved by the Institutional Ethics Committee of State Health Resource Centre, Chhattisgarh (Reference SHRC-2021-08). The study was performed in accordance with the ethical standards as laid down in the World Medical Association's Helsinki Declaration in 1964 and its later amendments. All methods were carried out in accordance with relevant guidelines and regulations.

Availability of data and materials The datasets used and/or analysed during the current study are available from the corresponding author and State Health Resource Centre, Chhattisgarh on reasonable request.

Code availability declaration Not applicable.

Author contributions SG and NT contributed to the study design; SG and NT contributed to writing of the manuscript. SG, NT and KB analysed the data; KB, NT and SG contributed to design of tools and KB contributed to the data collection. All authors read, reviewed and approved the final manuscript.

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