

The role of health insurance to reduce the extent of financial risk in hospitalization in India

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Abstract

Universal health coverage (UHC) has become an important health goal for several countries. India is a developing country, and developing countries are faster than developed countries to converting their demographic dividend and health transition. India faces the triple burden of disease, increasing NCDs, accidents and injuries, and the unfinished agenda of communicable diseases. In India, the primary source of health care financing is out-of-pocket. These expenditures vary with the disease, hospitalization time, health care provider choice, and health insurance. This study aims to analyze OOPE, CHE by disease, time of hospitalization, health care provider, and examine the role of health insurance. This study used unit-level data NSSO 75th round social and consumption in India (health data). OOPE is defined as total health care spending on hospitalization to net reimbursement. CHE is defined as health spending exceeding 10 percent of household consumption expenditure. This study used Linear regression, Propensity Score Matching, and Logistic regression to analyze the impact of health insurance and the level of financial risk in different socio-economic groups. The highest average spending for Cancer (₹ 56757), heart disease (₹ 46144), and Musculoskeletal (₹ 35798) in hospitalization, and the CHE is highest in Cancer(57.5), Ganito-Urinary(54.6), and Heart disease(52.1). The rural population is more likely to fall in CHE (13%) than the urban population for all illnesses. In caste, OBC (43%) and Others (42%) are more likely to fall in the CHE group as compare to SC/ST population. Health insurance does not affect choosing the type of health care provider. In wealth quantile, rich people (57%) and urban (35%) are more likely to hospitalize in a private hospital than poor and rural areas. In the non-insured group, highest CHE by disease, Cancer (75.5), Ganito Urinary (56.3), Heart disease (53.7), and in the insured group Cancer (49.4), Heart disease (44.3), and Ganito urinary (41.7). The linear regression shows that the insured population have to spend less OOPE compared to non insured group. With the increasing duration of hospitalization, the OOPE and CHE are increasing. Those who have health insurance would be 8.5 percent less likely to fall into the CHE group.

1. Introduction

Universal health coverage (UHC) has become an important health goal for several countries[1]. UHC means that all communities and individuals receive all types of health facilities without financing hardship. It includes the full spectrum of essential, quality health services, from health promotion to prevention, treatment, rehabilitation, and palliative care [2]. Millennium Development Goals (MDGs) had provided a framework for the substantial development of the world in terms of poverty, education, health, hunger, and the environment. Although they have been immensely successful, still exist high inequalities, and the progress has been uneven, especially in India. To remove such discrepancies and bring about development in a sustainable way, it continued its work to support the 2030 agenda for Sustainable Development. The concept of 17 new Sustainable Development goals (SDGs) emerged for the next fifteen years. Most of the SDG goals are to ensure healthy lives and promote well-being for all ages in the population vulnerable and exposed to the different intensity of prevailing mortality and morbidity situations.

As we know, India is a developing country, and developing countries are faster than developed countries to converting their demographic dividend and health transition. India faces the triple burden of disease, increasing NCDs, accidents and injuries, and the unfinished agenda of infectious diseases [3]. The NCDs are the leading cause of death, disability, and morbidity in India, cutting across socio-economic groups [4]. The treatment and care of NCDs. Besides, the cost of treating accidental injuries is the largest in the country. The changing demography and health have increased healthcare costs across states and among all socio-economic groups. India is one of the nations, who does have the least public health spending.

India spent only 1.3 percent of the GDP. There should enhance public health spending to a minimum of 5% of the GDP; now, the government is spending on health per person per the year 1108 that comes to ₹ 3 Per day, But OOPE is ₹ 2394 [5], so we can see the lack of spending money and people to have paid more money in their pocket. Due to the low share of government in total health care

expenditure, households have to bear most of the expenses in the event of health shock, which may lead to a fall in consumption expenditure below subsistence level, i.e., to catastrophic health expenditure. Here health insurance plays an essential role that reduces fear of visiting the hospital due to OOPE. Health insurance can provide financial protection to the household in health shock and reduce catastrophic OOP expenditure on health care [6]. Health insurance also influences healthcare-seeking behavior by improving healthcare access by reducing financial barriers to health services [7]. According to ILO-1996, "Pre-payment of small amounts by individuals into a shared fund pool that will finance the healthcare costs of enrolled members later if required. It minimizes the uncertainty of both the timing of treatment and the cost of treatment". Health insurance is conventional in all developed countries and developing countries, but the mechanism for obtaining health insurance is context-specific [8]. The coverage of health insurance of households has increased 4.90 (2005) to 28.67 (2016) according to NFHS [9-10]. The increase in health insurance is possibly due to some state and central government-funded health insurance schemes initiated in the last decade [11]. These health insurance are designed in such a manner that they can reduce out-of-pocket expenditure and over the burden of health risk. The probability of catastrophic OOP expenditure reduces by 10 percent if the household head has medical insurance [6]. The utilization of hospitalization is slightly higher in that group with health insurance, and The insured were less likely to incur out-of-pocket (OOP) expenditure. Who has insurance they have a higher probability of going private health sector? An insured person was less likely to incur OOP expenditure than the uninsured [12]. 3 out of 4 impact evaluation studies done in various Indian states show no reduction in catastrophic health expenditures among insured [13-15].

In literature, two approaches were used to understand the economic hardship of health care payment-estimating catastrophic health spending and distress health financing. As we found in the literature that OOPE is varied by disease, some diseases contribute more to OOPE and CHE. Therefore it is essential to understand OOPE and CHE according to various diseases and other characteristics. Health insurance is designed to reduce financial hardship. In literature, it has not been clearly found that health insurance helps reduce financial hardship during hospitalization and choose a health care provider. So in this paper, we analyzed the OOPE and CHE with various diseases and socio-economic characteristics; we would also see the impact of health insurance on OOPE, CHE, hospitalization time, and choosing the type of health care provider.

2. Data and Methods

This study used unit-level data NSSO 75th round social and consumption in India: health data. This survey round is the only database that provides comprehensive and comparable information on the morbidity pattern and healthcare utilization covering India's entire population. The survey covered all states and union territories, and households were selected at multistage stratified sampling procedure. 75th round was collected from 1,13,823 households (64,552 in rural areas and 49,271 in urban areas), covering 5,55,115 persons (3,25,883 in rural areas and 2,29,232 in urban areas), and a total number of hospitalized cases is 93925, The data set of NSS has different level. The data related to inpatients and outpatients are given separately. The study focused on hospitalization and medical expenditure services received as inpatient medical institutions and health insurance. We merged information of household, demographic characteristics, and hospitalization information (365 days). According to our key indicators, we exclude missing values and exclude the women admitted to the hospital for delivery or pregnancy. For hospitalization expenditure, we included both medical and non-medical expenses. We had medicine, health care provider fees, bed charges, diagnostic tests, other medical expenses (blood, oxygen, physiotherapy, attended charge, etc.) in medical spending. In non-medical, transport charge, food expenditure and lodging charge, etc. Hospitalization is defined as stay overnight in the hospital anytime in 365 days before the survey. Hospitalization is a binary variable; it is defined as one if an individual was hospitalized in the last 365 days before the survey, otherwise 0. OOPE is defined as a total sum of medical and non-medical expenditure, subtracted by reimbursement.

Outcome variables

The OOPE for each disease, the catastrophic health expenditure, health insurance, and hospitalization were used as an outcome variable in the analyses.

Predictor variables

The study incorporates several predictor variables to understand their linkage with the outcome variables. The socio-economic and demographic factors used as the predictor variable in the analysis are current age, residence, religion, caste (Social), education, wealth index, marital status, type of hospitalization, and the region.

In the NSSO data set, there is not wealth index variable. So we created a wealth index in the NSSO data set. We used consumption expenditure to create the wealth index. We divided consumption expenditure into five parts: consumption expenditure (20%, 40%, 60%,...)

North- Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Uttarakhand

Central- Chhattisgarh, Madhya Pradesh, Uttar Pradesh

East- Bihar, Jharkhand, Odisha, West Bengal

Northeast- Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura

West- Dadra & Nagar Haveli, Daman & Diu, Goa, Gujarat, Maharashtra

South- Andaman & Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Lakshadweep, Pondicherry, Tamil Nadu, Telangana

Diseases first categorized into four parts

Communicable diseases- Fever, Filariasis, tetanus, diarrhea, jaundice, respiratory diseases, anemia, tuberculosis, HIV/AIDS
NCDs- Cancer, diabetes, heart diseases, hypertension, asthma, musculoskeletal, genitourinary, psychiatric, and neurological illnesses.

Injuries- Accidental injury, road traffic accidents and falls, accidental drowning and submersion, burns and corrosions, poisoning, intentional self-harm, assault, contact with venomous/harm-causing animal and plants

Others- Eye and ear diseases, gastrointestinal, skin, obstetric

We divided the disease based on previous literature into 17 essential categories

Fever, Gastro-Intestinal, Injury, Genito-Urinary, Heart disease, Heart disease, Musculoskeletal, Neurological, diarrhea, Asthma, Cancer, Eye, Hypertension, Jaundice, Respiratory disorder, Tuberculosis, Diabetes, Others

2.1 Analytical approach

For this study, descriptive, bivariate, and multivariate analyses have been carried out using Stata (version 15). Descriptive statistics and bivariate analysis are done to estimate the change in health insurance and OOPE (mean and median). Bivariate analysis was used to understand the socio-economic and demographic differentials in the OOPE, CHE, and other predictor variables. Multivariate analysis in binary logistic regression, linear regression, and propensity score matching has been used in all these situations. The dependent variable is dichotomous and has mutually exclusive and exhaustive categories. The independent variables are categorical, and age (in linear regression) as used continuously, so the binary logistic regression technique's performance is the most appropriate one. We present results in the form of the Odds Ratio (OR). It explains the odds of the exposed group and the unexposed group. The calculations were adjusted by using appropriate weights wherever required.

Out of pocket expenditure= Total health expenditure – Reimbursement

Catastrophic health expenditure= OOPE/household consumption expenditure (≥ 10)

When it is greater than or equal to 10%, it will fall under the CHE group.

2.1.1 Linear regression

The log-linear regression model was applied to assess the impact of health insurance schemes' on India's health care expenditure. The OOPE is dependent variables that are continuous and skewed. On the other hand, health insurance status will be the primary independent variable. A set of independent variables at the household and individual levels will be used as covariates. This regression model was adjusted for states because India exhibits significant variation in demographic, social, economic, and health parameters.

The regression models used for OOPE is defined as

$$\ln(\text{OOPE}) = \alpha + \beta_1(\text{Health insurance}) + \beta_2(\text{hospitalization}) + \beta_3(\text{sex}) + \beta_4(\text{social group}) + \beta_5(\text{education}) + \beta_6(\text{wealth index}) + \beta_7(\text{sector}) + \beta_8(\text{religion}) + \beta_9(\text{marital status}) + \beta_{10}(\text{Type of disease}) + \epsilon$$

2.1.2 Propensity score matching

In cross-sectional data, PSM establishes that an intervention of interest (in this case, health insurance) contributes to an exciting outcome. This method ensures that other observed background characteristics or variables are matched in intervention and non-intervention groups to control their influence. Using a counterfactual model, we estimated the average outcome of the treated households (which is the incidence of CHE in households with insurance coverage in this study) and the average outcome that the treated households would have obtained in the absence of health insurance, which is unobserved. The average treatment on treated (ATT), which measures the average difference in CHE incidence that health insurance affords to households with health insurance coverage, is a measure of health insurance effectiveness. We matched the following six variables: sex, social group (caste), education of the individual, economic quintile, choice of public or private provider, and disease category. The leading causes of hospitalization were categorized into four groups: infectious disease, NCDs, injuries, etc. The nearest neighbor matching method with replacement was used in combination with a logit model.

3. Results

The finding is the divide in the following part to draw out the answer to these questions: the extent of OOPE and CHE by diseases and other characteristics. Second, To what extent would health insurance help to reduce OOPE and CHE. Our results show (Table1) that the highest average spending for cancer (₹ 56757), heart disease (₹ 46144), and Musculoskeletal (₹ 35798) in hospitalization. The highest spending is on NCDs (₹ 33839) then injury (₹ 29288). Total spending on hospitalization is (₹ 21552), total reimbursed (₹ 1986), and total OOPE (₹ 19563). The highest OOPE is in cancer (₹ 51934), Heart disease (₹ 39458), and Musculoskeletal (₹ 26848). The percentage of reimbursed of total spending is highest in heart disease (5.9), Musculoskeletal (5.6), Ganito urinary (5.3), and overall share 3.4 percent reimbursed of total expenditure. In figure 1 suggests that the CHE is highest in cancer (57.5), Ganito-Urinary(54.6), and Heart disease(52.1). The lowest CHE was found in Diarrhoea (11.6), Fever (20.4), and Respiratory disorder (28.0).

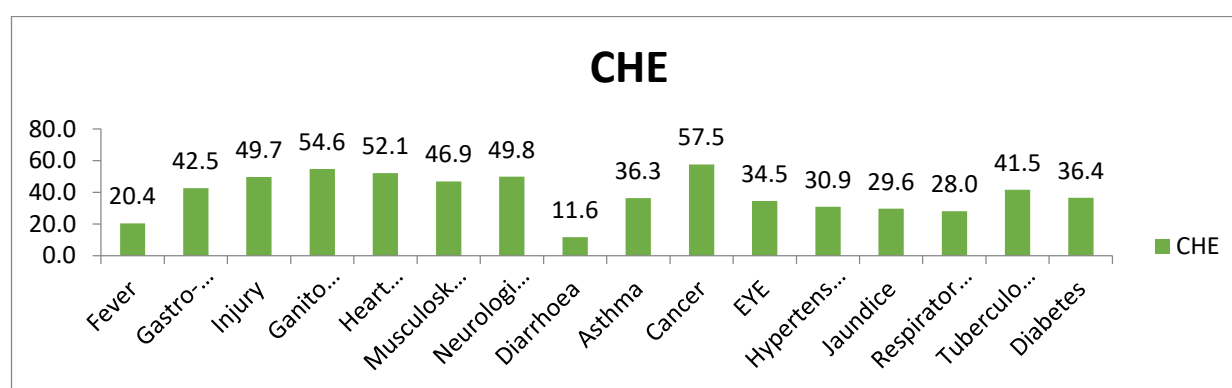
In table 2, the odds ratio of CHE, according to communicable, non-communicable, injury, and For all disease, the model shows that the rural population is more likely to fall in CHE (13%) as compared to the urban population. In caste, OBC (43%) and Others (42%) are more likely to fall in the CHE group as compare to SC/ST population. In the wealth index, middle (34 %) and richest (58%) have less likely to have CHE than poor groups. Females (28%) have less likely to CHE in comparison to males. More education is likely to fall more in CHE. Incommunicable disease, our finding provides that in the social group, OBC (54 %) and others (68%) are more likely to fall in CHE in comparison to SC/ST population, in the middle (46%) and rich (62%) have less likely, and 60+ ages (57 %) group are more likely to fall in CHE group in comparison to their reference group. NCDs group are showing that urban area (21 %) less likely to have NCDs diseases. In the case of injuries, age group 60+ (76%) are more likely to fall in the CHE group than 0 to 14 age groups.

In table 3, our study found that the CHE is 36 percent less likely to have in the insured group than the not-insured group. In the age group, 60+ (31%), NCDs (228%), injury (224%), and in caste others (38 %) are more likely to fall in CHE with comparison to 0-14, Communicable diseases and SC/ST population. In this table, another model for hospitalization shows that

Table 1 Mean spending on hospitalization, the amount reimbursed and out-of-pocket expenditure (in Rs.), and share of the amount reimbursed to total health spending by disease in India, 2018.

Diseases	Total Spending on Hospitalization (Std. Err.)	Amount Reimbursed (Std. Err.)	OOPE (Std. Err.)	Reimbursed as a percentage of total health Spending (Std. Err.)
Fever	9907 (190)	580 (41)	9327 (185)	2.5 (0.112)
Gastro-Intestinal	21845 (551)	1592 (153)	20254 (527)	3.8 (0.205)
Injury	29288 (626)	2473 (249)	26811 (544)	3.5 (0.174)
Ganito urinary	26688 (734)	2838 (264)	23847 (687)	5.3 (0.326)
Heart disease	46144 (1237)	6680 (480)	39458 (1114)	5.9 (0.315)
Musculoskeletal	35798 (1236)	5745 (587)	30051 (1066)	5.6 (0.384)
Neurological	29218 (1056)	2369 (356)	26848 (989)	2.6 (0.240)
diarrhoea	4914 (172)	121 (29)	4793 (169)	1.2 (0.193)
Asthma	15508 (766)	908 (264)	14600 (703)	2.5 (0.383)
Cancer	56757 (3345)	4823 (950)	51934 (3133)	5.5 (0.559)
EYE	12248 (455)	903 (114)	11343 (444)	3.5 (0.374)
Hypertension	18208 (1147)	2709 (738)	15494 (796)	4.2 (0.465)
Jaundice	13155 (585)	489 (96)	12659 (580)	2.6 (0.376)
Respiratory disorder	12355 (647)	541 (100)	11814 (641)	2.0 (0.272)
Tuberculosis	23810 (1388)	1039 (298)	22771 (1358)	2.7 (0.467)
Diabetes	18055 (1090)	1774 (308)	16281 (1044)	4.2 (0.488)
Others	17410 (945)	658 (108)	16751 (940)	2.2 (0.238)
Communicable disease	10821 (170)	624 (51)	10196 (161)	2.4 (0.088)
NCDs	33839 (495)	4066 (183)	29770 (451)	4.8 (0.139)
Injury	29288 (626)	2473 (249)	26811 (544)	3.5 (0.174)
Others	18594 (417)	1161 (91)	17432 (406)	3.2 (0.147)
Total	21552 (201)	1986 (69)	19563 (184)	3.4 (0.064)

Fig.1 The catastrophic health expenditure in hospitalization by disease in India, 2018



health insurance does not affect choosing the type of hospitalization care. In wealth quantile, rich people (57%) and urban (35%) are more likely to hospitalize in a private hospital than poor and rural areas.

In table 4, our study found that in the insured group (₹ 5700) less median out-of-pocket expenditure compares to the uninsured group (₹7540), and the total OOPE is ₹ 7000. In this table, one column shows the share of OOPE (In insured group) and total OOPE. This column tells us rough information about reimbursement (health insurance coverage) levels within the group; low

share means higher reimbursement than another group. Our study found that with increasing hospitalization days, patients hospitalized in private, increasing with age and education, reimbursement would increase.

In table 5, our study shows that CHE in the insured group is less than the non-insured group. In the non-insured group, highest CHE by disease, cancer (75.5), Ganito Urinary (56.3), Heart disease (53.7), and in the non-insured group Cancer (49.4), Heart disease (44.3), and Ganito urinary (41.7). In the non-insured group, NCDs (51.8) have the highest CHE after that injury (49.4), but in the insured group, injury (40.2) have the highest than NCDs (39.4). CHE is increasing (both in insured and non-insured) with increasing hospitalization duration and age but decreasing with increasing wealth index. In a social group, CHE in un-insured group OBC (40.0), Others (38.5), and SC/ST (33.0), and insured group OBC (33.9), Others (28.9), and SC/ST (25.1). CHE level in private hospital 57.8 (non-insured), 44.3 (insured) and in public hospital 17.1 (non-insured), 11.8 (insured).

The result from linear regression shows that the insured population is less OOPE compared to non insured group. The average difference in $\log(\text{OOPE})$ will be -0.48 coefficient, from non-insurance to insurance group. The average out-of-pocket expenditure increase 1.76 times when people are hospitalized in private compared to the public. With increasing age, OOPE is also increasing.

The PSM results show that those households with health insurance were only 7.9% less likely to experience CHE than those with no insurance for the unmatched sample estimate. The calculated ATT values in the treated and control groups were 0.29 and 0.38, respectively, which means that 29% of the health insurance population had CHE compared to 38% of the non-insured population after matching the background characteristics. This number indicates that health insurance helps reduce CHE; those who have health insurance would be 8.5 percent less likely to fall in the CHE group.

Table2 Odds ratio and confidence interval for incurring catastrophic health expenditure on hospitalization for communicable diseases, NCDs, injuries, and all diseases in India, 2018.

Background characteristics	Communicable Diseases		NCDs		Injuries		All Diseases	
	Odds Ratio	CI	Odds Ratio	CI	Odds Ratio	CI	Odds Ratio	CI
Sector***								
Rural®								
Urban	0.94	[0.80-1.09]	0.79***	[0.70-0.90]	1.04	[0.88-1.25]	0.87***	[0.81-0.94]
Religion***								
Hinduism®								
Islam	0.48***	[0.39-0.58]	0.79***	[0.67-0.93]	0.83	[0.66-1.04]	0.66***	[0.59-0.73]
Christianity	0.65***	[0.50-0.85]	0.70***	[0.55-0.89]	0.89	[0.63-1.25]	0.77***	[0.67-0.88]
Others	1.42	[0.83-2.43]	1.36*	[0.98-1.89]	1.04	[0.69-1.55]	1.19	[0.96-1.48]
Social group***								
ST/SC®								
OBC	1.54***	[1.29-1.85]	1.23*	[1.03-1.46]	1.69***	[1.36-2.10]	1.43***	[1.29-1.58]
Others	1.68***	[1.36-2.06]	1.25*	[1.04-1.50]	1.60***	[1.27-2.02]	1.42***	[1.28-1.58]
Wealth Index***								
Poor®								
Middle	0.54***	[0.45-0.65]	0.64***	[0.55-0.75]	0.66***	[0.54-0.81]	0.66***	[0.60-0.72]
Rich	0.38***	[0.31-0.65]	0.45***	[0.39-0.53]	0.42***	[0.35-0.51]	0.46***	[0.42-0.51]
Gender***								
Male®								
female	0.95	[0.83-1.09]	0.91	[0.80-1.03]	0.72***	[0.61-0.85]	0.83***	[0.77-0.89]
Age(years)***								
>60®								
60+	1.57**	[1.11-2.22]	0.96	[0.66-1.41]	1.76***	[1.16-2.67]	1.61***	[1.35-1.93]
Marital status***								
never married®								
currently married	1.03	[0.83-1.28]	1.23	[0.94-1.59]	1.30**	[1.02-1.65]	1.37***	[1.21-1.54]
Widowed/divorced/separated	0.94	[0.66-1.33]	1.06	[0.78-1.44]	1.10	[0.71-1.69]	1.28***	[1.08-1.51]
Education***								
Illiterate®								
Primary	0.76***	[0.63-0.92]	0.98	[0.83-1.16]	0.93	[0.74-1.17]	0.90**	[0.82-1.00]
Secondary	1.08	[0.87-1.33]	1.15	[0.97-1.36]	0.90	[0.72-1.13]	1.10**	[1.00-1.22]
Higher Secondary	1.22	[0.96-1.55]	1.52***	[1.23-1.88]	1.33***	[1.02-1.75]	1.41***	[1.25-1.59]

*p<0.1 **p<0.05, *p<0.1

Table3 odds ratio, and confidence interval of incurring CHE and type of health care on hospitalization for health insurance in India, 2018.

Covariates	Odds ratio			
	CHE		Type of health care	
	Odds Ratio	C.I.	Odds Ratio	C.I.
Health Insurance/Scheme				
No [®]				
Yes	0.64***	[0.59-0.70]	0.96	[0.89-1.05]
Sex				
Male [®]				
Female	0.85***	[0.79-0.92]	1.00	[0.92-1.07]
Social group				
SC/ST [®]				
OBC	1.42***	[1.28-1.57]	1.88***	[1.70-2.08]
Others	1.38***	[1.23-1.54]	1.73***	[1.56-1.91]
Education				
Illiterate [®]				
Primary	0.88*	[0.79-0.97]	0.83***	[0.75-0.91]
Secondary	1.07	[0.97-1.19]	1.11**	[1.00-1.23]
Higher Secondary	1.35***	[1.19-1.53]	1.92***	[1.69-2.19]
Age				
0-14 [®]				
15-60	1.10	[0.94-1.29]	0.56***	[0.48-0.65]
60+	1.31***	[1.08-1.57]	0.59***	[0.49-0.70]
Wealth quantile				
Poor [®]				
Middle	0.73***	[0.65-0.81]	1.14**	[1.02-1.27]
Rich	0.63***	[0.57-0.69]	1.57***	[1.43-1.72]
Sector				
Rural [®]				
Urban	0.65***	[0.60-0.70]	1.35***	[1.26-1.46]
Religion				
Hindu [®]				
Islam	0.62***	[0.56-0.69]	0.68***	[0.61-0.75]
Christianity	0.80***	[0.69-0.92]	1.02	[0.89-1.17]
Others	1.04	[0.81-1.34]	1.54***	[1.23-1.92]
Marital status				
Unmarried [®]				
currently married	1.17*	[1.02-1.33]	1.19***	[1.06-1.35]
widowed/divorced/separated	1.13	[0.94-1.35]	1.15*	[0.98-1.37]
Type of disease				
Communicable disease [®]				
NCDs	3.28***	[2.97-3.61]	1.44***	[1.32-1.58]
Injury	3.24***	[2.90-3.63]	1.35***	[1.22-1.49]
Others	2.16***	[1.93-2.42]	1.19***	[1.07-1.33]

***p<0.01, **p<0.05, *p<0.1

Table 6 Linear regression of log(OOPE) and health insurance, adjusting by different socio and demographic characteristics (365 days before the survey), 2018.

Prob > F=0

Adj R-squared=0.3963

N=63778

Log(OOPE)	Coefficients	P>t	Std. Err.
Health Insurance/Scheme			
No			
Yes	-0.48	0.00	0.012
Type of hospitalization			
Public			
Private	1.76	0.00	0.010
Sex			
Male			
Female	-0.10	0.00	0.011
Social group			
SC/ST®			
OBC	0.06	0.00	0.013
Others	0.05	0.00	0.014
Education			
Illiterate			
Primary	-0.02	0.20	0.013
Secondary	0.08	0.00	0.014
Higher Secondary	0.13	0.00	0.017
Age	0.01	0.00	0.000
Wealth quantile			
Poor			
Middle	0.12	0.00	0.013
Rich	0.23	0.00	0.013
Sector			
Rural			
Urban	-0.11	0.00	0.012
Religion			
Hindu			
Islam	-0.10	0.00	0.015
Christianity	-0.06	0.03	0.027
Others	0.01	0.78	0.031
Marital status			
Unmarried			
currently married	0.02	0.17	0.018
widowed/divorced/separated	-0.10	0.00	0.028
Type of disease			
Communicable disease			
NCDs	0.76	0.00	0.013
Injury	0.75	0.00	0.016
Others	0.41	0.00	0.014
Constant	7.21	0.00	0.018

4. Discussion

Governments worldwide are trying to provide good health care quality by creating awareness about health issues, robust infrastructure, and promoting health insurance. Hospitalization spending varies with the diseases, type of health care provider, days of hospitalization, and health insurance. This study is an attempt to understand financial risk by various parameters. First, the hospitalization rate is 2738 (per 100000 populations), in which for communicable disease 1049, for NCDs 802, and Injury 375. Hospitalization is higher in private hospitals (1521) compare to public hospitals (1217). When Second, total spending on hospitalization is more elevated in Cancer, Heart disease, Musculoskeletal, and the highest OOPE in Cancer, Heart disease, and Musculoskeletal. Third, the mean duration of hospitalization in the private sector (6.2 days) better than in government (6.0 days) hospitals. Our study found that median OOPE, then we discovered that OOPE increased with increasing duration of hospitalization, education, age, and wealth quantile. OOPE in a private hospital (14750) much more than the public hospital (2295). The mean duration of hospitalization in private health care is higher than in government health care except for Neurological

Table 7 Impact Assessment of health insurance on CHE using Propensity Score Matching (PSM)

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
CHE	Unmatched	0.29704	0.376083	-0.07904	0.004544	-17.4
	ATT	0.29704	0.382199	-0.08516	0.008057	-10.57
	ATU	0.376083	0.293047	-0.08304	.	.
	ATE			-0.08351	.	.

diseases, Asthma, Eye, Jaundice, Diabetes, and Tuberculosis. The hospitalization duration changes with the type of disease, so the highest hospitalization was Cancer, Neurological Diseases, and Tuberculosis. Many programs for awareness and financing for T.B. patients, but the duration of hospitalization is in the top three. The duration of hospitalization is higher in injury (7.6 days) after that NCDs (7.4 days) and for Communicable disease (5.0 days). Fourth, The extent of catastrophic health spending was varying with diseases. The impact of CHE was highest in cancer (57.5%), Ganito urinary (54.6), heart disease (52.1), and lowest in Diarrhoea (11.6%) and fever 920.4). CHE's extent was greater In a private hospital (54.6) than a public hospital (16.0%).

Table 8 Hospitalization rate per 100000 populations (during 365 days before the survey) by diseases and health care providers (public/private) in India, 2018.

Disease	Hospitalization Rate per 100000 Population		
	Public	Private	Total
Fever	310	379	690
Gastro-Intestinal	113	161	275
Injury	157	218	375
Ganito urinary	52	111	163
Heart disease	72	113	184
Musculoskeletal	46	78	124
Neurological	69	86	155
diarrhoea	64	38	102
Asthma	35	30	65
Cancer	30	26	56
EYE	51	50	101
Hypertension	27	32	59
Jaundice	26	30	56
Respiratory disorder	46	44	90

Tuberculosis	20	18	37
Diabetes	22	31	53
Others	76	77	153
Communicable disease	506	542	1049
NCDs	319	483	802
Injury	157	218	375
Others	234	277	511
Total	1217	1521	2738

Fifth, choosing the type of health care for hospitalization does not depend upon sex and health insurance. Increasing with wealth index, people prefer private hospitals. In the Urban area, people prefer private hospitals compare to rural people. The hospitalization in private health care for NCD (44%) and injury (35%) is more likely to communicable. Sixth, This study found that health insurance would help to reduce out-of-pocket expenditure and CHE. Our findings are agreeing with earlier studies. As a result, higher OOP expenditure on health care might be required at old age [16 17]. Our studies show that old age people are less hospitalized in private hospitals but frequently visit the hospital that may be the reason for to increase in OOPE and CHE in old age. Our studies say that urban households are more hospitalized in a private hospital. Still, households belonging to urban areas spend a lower proportion of total household expenditure on health care than rural households [6]. OOPE is higher in a richer and educated sector that shows the ability to pay for good care quality. The study shows that the OOPE is much higher in India's richer section and other developed countries like Canada and the USA [18 19]. Low and middle households fell into poverty due to health-related debt. It has been found that OOPE is directly responsible for the deepening of poverty in rural and urban areas; every year, 32 million to 39 million Indian population falls into poverty due to OOPE [20-23]. Hospitalization due to communicable diseases, NCDs, and injuries has increased over time, confirming India's diseases' triple burden [24]. The study tells us that share of NCDs is more than other diseases. The share of NCDs in out-of-pocket health expenditure incurred by households has increased over time in India [25]. Higher hospitalization for NCDs, Injury, and communicable in private health centers higher than the government health center. People prefer private hospitals Irrespective of the economic status [26]. Even the less educated, poor section, rural section of the population consult private hospitals and pay twice as much on treatment than government hospitals [27-30]. They visit private hospitals due to the poor quality of public hospitals. [31 32]. A major portion of indebtedness in the Indian population is due to a preference for private hospitals. [33-34]. The long duration of inpatients have high treatment cost of diseases, not only treatment cost but also aggravates other indirect expenses like food, lodging, and transportation of escorts, which contribute to OOPE

The wealthier households are less vulnerable and have to spend less of their total budget on health care than wealthier households. Health insurance can help to reduce CHE without increasing public expenditure on health. Selvaraj and Karan (2012) used NSSO data and applied pre and post-intervention periods (2004-05 and 2009-10) to assess health insurance programs' implications for the poor[15]. They did not find any beneficial effects, but the impacts on financial risk protection are less specific and tend to be context-dependent, especially for poor beneficiaries [36-38]. 3 out of 4 impact evaluation studies done in various Indian states show no reduction in catastrophic health expenditures among insured [13-15]. Our research shows that health insurance did help reduce the OOPE and CHE, supported by one study that reported a decline in out-of-pocket (OOP) payments and catastrophic health expenditures [39]. Health insurance can be an effective way to avoid the burden of high OOP healthcare spending. Hence we will say that health insurance policy will reduce OOPE and CHE that is very subjective, especially in the Indian scenario.

Limitations of the study

Our analysis is based on inpatients care only (hospitalization). This study may underestimate the CHE and OOPE of households due to not included outpatients. The data limited to 365 days before the survey. The data set may have recall bias

because the period is so long (365 days). Second, we calculated CHE based on household spending exceeding 10% of consumption expenditure. These methods have limitations as poor households spend a small amount of consumption expenditure in the CHE group. Moreover, any little spending on health by the BPL family put them into the CHE group.

Policy implications

The study found that OOPE and CHE were less compared to a private hospital in public hospitals. Our research found that people are less hospitalized in public hospitals, there may be less quality of care or equipment. With health insurance, OOPE and CHE can be reduced. The government should focus on the quality and equipment of government hospitals. The government should establish a program like T.B. that in India implemented long ago to develop a program to help patients with a disease like cancer, heart disease. No health insurance covers maternity care, so this is also included in any health insurance plan. Our study found that poor populations and old age populations were the most vulnerable group as they are more susceptible. The government should focus on these groups make some policies. The present form of health insurance/scheme help reduce CHE but not in a substantial manner. The government should come with health insurance according to disease and improve government hospitals' quality of care.

Declarations

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Consent for publication Not applicable

Availability of data and materials The dataset that supports this study's findings are available on the Government of India MOSPI website.

Code availability Not applicable

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Table 4 Median OOPE in the insured and uninsured group on hospitalization for different socio-economic characteristics in India, 2018.

Covariates	OOPE		
	Non-insured	Insured	Total
Fever	4700	3880	4500
Gastro-Intestinal	9800	6950	9200
Injury	11800	9100	11100
Ganito urinary	15400	10200	14100
Heart disease	16050	11800	15000
Musculoskeletal	12000	7500	10950
Neurological	11810	9000	10950
diarrhoea	2226	1490	2150
Asthma	6480	4100	6050
Cancer	27000	7700	18600
EYE	6700	2520	6600
Hypertension	7080	3013	5300
Jaundice	7000	5700	6850
Respiratory disorder	6220	2600	5320
Tuberculosis	7810	4300	7580
Diabetes	9000	4600	7820
Others	7350	6370	7050
Total	7540	5700	7000
Communicable disease	4700	3650	4450
NCDs	13800	7875	11900
Injury	11800	9100	11100
Others	8000	5800	7500
Sex			
Male	8500	5700	7680
Female	6750	5770	6600
Duration of stay			
1-2 days	3270	2620	3100
3-5 days	7140	5000	6700
6 to 10 days	13770	9300	12650
10 to 20 days	25370	13200	21850
Above 20 days	41350	17250	36850
Social group			
SC/ST	5320	4250	5050
OBC	8300	6000	7550
Others	9370	6100	8450
Level of care			
Public hospital	2380	2050	2295
Private hospital	15700	11600	14750
Education			
Illiterate	6500	5800	6350
Primary	6200	4500	5900
Secondary	8900	5500	8000
Higher Secondary	12350	7500	11000

Table 4 Median OOPE in the insured and uninsured group on hospitalization for different socio-economic characteristics in India, 2018.

Covariates	OOPE		
	Non-insured	Insured	Total
Age			
0-14	5700	4600	5560
15-60	7750	5700	7090
60+	10850	6170	9500
Wealth quantile			
Poor	5700	4500	5500
Middle	7380	6300	7100
Rich	11900	6300	10160
Sector			
Rural	6800	5430	6550
Urban	9200	6000	8200
Religion			
Hindu	7780	6000	7200
Islam	5820	4500	5650
Christianity	9800	4944	6700
Others	11400	6350	10600
Marital status			
Unmarried	5960	4730	5750
currently married	9000	6100	8028
widowed/divorced/separated	7100	5150	6600
Total	7540	5700	7000

Table 5 Percentage of CHE in different health insurance/scheme groups on hospitalization by different disease and socio-economic characteristics in India, 2018.

Covariates	CHE in Percentage		
	Non-insured	Insured	Total
Fever	19.3	14.9	18.3
Gastro-Intestinal	43.6	31.8	41.1
Injury	49.4	40.2	47.3
Ganito urinary	56.3	41.7	52.6
Heart disease	53.7	44.3	51.4
Musculoskeletal	46.2	38.4	44.3
Neurological	52.7	39.5	49.9
diarrhoea	12.0	7.1	11.2
Asthma	32.2	26.9	31.0
Cancer	75.5	49.4	68.0
EYE	40.6	26.7	37.2
Hypertension	33.3	25.1	31.2
Jaundice	28.6	16.4	26.4
Respiratory disorder	29.4	21.1	27.6
Tuberculosis	35.4	30.5	34.4
Diabetes	41.4	26.5	37.7
Others	33.4	26.6	32.0
Total	37.6	29.7	35.8
Communicable disease	21.4	16.3	20.3
NCDs	51.8	39.4	48.8
Injury	49.4	40.2	47.3
Others	40.3	29.4	37.9
Sex***			
Male	40.0	30.7	37.8
Female	35.2	28.6	33.7
Duration of stay***			
1-2 days	14.6	12.0	14.1
3-5 days	32.6	24.5	30.8
6 to 10 days	53.7	37.4	49.5
10 to 20 days	68.8	50.9	64.3
Above 20 days	78.1	61.6	74.2
Social group***			
SC/ST	33.0	25.1	31.1
OBC	40.0	33.9	38.7
Others	38.5	28.9	36.4
Level of care***			
Public hospital	17.1	11.8	16.0
Private hospital	57.8	44.3	54.6
Education***			
Illiterate	36.6	33.0	35.9
Primary	32.5	27.4	31.4
Secondary	39.7	29.2	37.3
Higher Secondary	44.6	29.0	40.1
Age***			
0-14	24.4	18.9	23.4

Table 5 Percentage of CHE in different health insurance/scheme groups on hospitalization by different disease and socio-economic characteristics in India, 2018.

Covariates	CHE in Percentage		
	Non-insured	Insured	Total
15-60	39.0	31.1	37.2
60+	46.3	32.4	42.7
Wealth quantile***			
Poor	44.2	40.5	43.5
Middle	35.6	30.6	34.6
Rich	30.9	20.6	28.2
Sector***			
Rural	39.1	33.9	38.0
Urban	35.7	25.1	33.2
Religion***			
Hindu	39.3	32.6	37.8
Islam	32.1	24.3	30.9
Christianity	31.1	15.8	25.2
Others	35.5	22.3	33.5
Marital status***			
Unmarried	28.9	21.6	27.5
currently married	41.7	32.6	39.5
widowed/divorced/separated	39.4	31.3	37.6
Total	39.2	30.7	37.2

***p<0.01, **p<0.05, *p<0.1

Table 9 Mean duration of hospital stay (days) by diseases and health care providers (public-private) in India, 2018.

Diseases	Mean duration of hospitalization (Days)		
	Public (Std. Err.)	Private (Std. Err.)	All (Std. Err.)
Fever	4.9 (0.060)	4.9 (0.054)	4.9 (0.040)
Gastro-Intestinal	5.6 (0.137)	6.0 (0.083)	5.8 (0.076)
Injury	7.5 (0.153)	7.7 (0.121)	7.6 (0.095)
Genito-Urinary	7.6 (0.244)	6.6 (0.111)	6.9 (0.111)
Heart disease	7.0 (0.169)	7.2 (0.131)	7.1 (0.104)
Musculoskeletal	7.9 (0.252)	7.8 (0.222)	7.8 (0.166)
Neurological	8.5 (0.281)	8.0 (0.193)	8.2 (0.165)
diarrhoea	3.2 (0.050)	3.7 (0.107)	3.4 (0.050)
Asthma	6.5 (0.236)	5.7 (0.169)	6.2 (0.150)
Cancer	9.4 (0.571)	10.6 (0.499)	10.0 (0.378)
Eye	3.2 (0.112)	2.9 (0.077)	3.0 (0.068)
Hypertension	4.7 (0.167)	5.3 (0.223)	5.1 (0.141)
Jaundice	6.7 (0.191)	5.7 (0.177)	6.1 (0.130)
Respiratory disorder	5.0 (0.169)	5.1 (0.132)	5.0 (0.108)
Tuberculosis	8.0 (0.371)	8.1 (0.410)	8.0 (0.274)
Diabetes	7.7 (0.474)	6.3 (0.223)	6.9 (0.243)
Others	5.1 (0.163)	6.1 (0.182)	5.6 (0.122)
Communicable disease	5.0 (0.048)	5.0 (0.045)	5.0 (0.033)
NCDs	7.7 (0.108)	7.3 (0.073)	7.4 (0.062)
Injury	7.5 (0.153)	7.7 (0.121)	7.6 (0.095)
Others	4.8 (0.088)	5.5 (0.071)	5.2 (0.056)
Total	6.0 (0.044)	6.2 (0.036)	6.1 (0.028)