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Catastrophic health expenditure of inpatients in emerging economies: evidence from the Indian subcontinent

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Abstract

Background Catastrophic health expenditures condensed the vital concern of households struggling with notable financial burdens emanating from elevated out-of-pocket healthcare expenditures. In this regard, this study investigated the nature and magnitude of inpatient healthcare expenditure in India. It also explored the incidence and determinants of inpatient catastrophic health expenditure.

Methodology The study used the micro-level data collected in the 75th Round of the National Sample Survey on 93 925 households in India. Descriptive statistics were used to examine the nature, magnitude and incidence of inpatient healthcare expenditure. The heteroscedastic probit model was applied to explore the determinants of inpatient catastrophic healthcare expenditure.

Results The major part of inpatient healthcare expenditure was composed of bed charges and expenditure on medicines. Moreover, results suggested that Indian households spent 11% of their monthly consumption expenditure on inpatient healthcare and 28% of households were grappling with the complexity of financial burden due to elevated inpatient healthcare. Further, the study explored that bigger households and households having no latrine facilities and no proper waste disposal plans were more vulnerable to facing financial burdens in inpatient healthcare activity. Finally, the result of this study also ensure that households having toilets and safe drinking water facilities reduce the chance of facing catastrophic inpatient health expenditures.

Conclusions A significant portion of monthly consumption expenditure was spent on inpatient healthcare of households in India. It was also conveyed that inpatient healthcare expenditure was a severe burden for almost one fourth of households in India. Finally, it also clarified the influence of socio-economic conditions and sanitation status of households as having a strong bearing on their inpatient healthcare.

Keywords Catastrophic health expenditure, Inpatient healthcare, India

JEL Classification I15, I18, I19

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Background

Out-of-pocket (OOP) healthcare expenditure is a crucial component of the consumption expenditure that is made by individuals to complement public health spending allocated to the citizens by the state insurance funds at the federal or provincial level. Consequently, a better health condition of the individual citizen boosts the productivity of individuals, which in turn amplifies the real economic growth of the country [1]. This impact of overall population health on the economic productivity of society became recognized in free market economies during the post-World War II decades [2]. Unlike them, centrally planned socialist economies regarded healthcare and education as consumption branches of the economy and this causal relationship was not properly understood [3]. In this regard, developed countries such as the United States spent around 17% of their gross domestic product (GDP) on health, whereas India spent only 3% of its GDP on health [4]. India, the largest of nations, is not a lonely example of such health spending patterns. A similar landscape is visible among the wealthy Arabic Gulf countries [5] and even some Association of Southeast Asian Nations (ASEAN) [6]. For that reason, the meagre budget allocation for the healthcare sector by the government of India escalated the OOP health expenditure. In India, 48.8% of healthcare expenditure was OOP, which depicts the significant financial burden of healthcare expenditure on households [7]. Furthermore, the healthcare sector in India was highly privatized, as nearly two thirds of providers were from the private sector [8]. The high dominance of private healthcare providers resulted in escalated OOP healthcare expenditure that led to the challenge of financial catastrophe. This phenomenon is broadly recognized in the mainstream health economics literature as the catastrophic health spending of the household frequently leading to impoverishment or debt [9].

In this context, the lack of health insurance penetration and the ageing population raised the significance of inpatient healthcare expenditures (IHE) in developing nations [10–12]. Therefore, this study strived to examine the nature and magnitude of inpatient healthcare expenditure in India and also aimed to explore the incidence and determinants of inpatient catastrophic health expenditures (ICHE) in India.

Literature review

“Health spending is viewed as catastrophic when a household must reduce its basic expenses over a certain period to cope with the medical bills of one or more of its members” [13]. The WHO [14] suggested that households spending more than 40% of their non-subsistence income on healthcare services should be termed as catastrophic

health expenditures (CHE). In this regard, researchers also used a capacity-to-pay approach for defining the CHE [13]. Similarly, Pal [15] considered household's health expenditure as catastrophic if it reduces non-healthcare spending to a level that forces the households to compromise with their consumption necessities. More specifically, the term CHE addresses the issue of financial burden incurred by the households that reinforces them to compromise their consumption bundle.

The nature of healthcare spending provided the idea about the components of health expenditure. Medicinal expenditure occupies a large part of a household's OOP spending on healthcare services [16]. Similarly, scholars concluded that households belonging to rural areas spent a significant part of their income on transportation to get to facilities, which created a financial burden for them in Serbia [17]. It was evident from Kosovo that 80% of the household's OOP health payments were composed of expenditures on medicine, pharmaceutical products, diagnostic services and outpatient services [18]. Further scholarship confirms that inefficient reimbursement rates and lack of availability of cutting-edge technologies promote the increasing trend of out-of-pocket spending in the ASEAN region [19].

Focussing on low/middle-income countries, scholars evidenced that the global share of health spending observed a rapid long-term growth in the economies of Brazil, Russia, India, China and South Africa (BRICS) since the 1990s [20]. More particularly, in India, spending on healthcare increased by a factor of 2.5% from 1993–1994 to 2004–2005 [16]. The real cost of hospitalization also doubled from 1987 through 2003, which made OOP health expenditure catastrophic [21]. The per capita OOP healthcare expenditure in hospitalization is also an increasing trend from 2004 to 2018 in India [22]. Taking a time horizon of 19 years [23] confirmed that in BRICS countries the increasing trend of out-of-pocket health expenditure deteriorates the affordability of medical care to poor citizens among BRICS nations.

The higher incidence of CHE is a major obstruction to achieving universal health coverage (UHC), which prioritized that people should have access to essential healthcare services with adequate quality, effectiveness and affordability [24–26]. BRICS countries are significantly vulnerable in accessing healthcare services due to high population density [27]. Further, incurrence of CHE is low in the majority of developed countries with well-established prepayment mechanisms that are either financed by taxes or insurance [28]. In contrast, past studies also evidence that repercussions of CHE are more severe in the context of low- and middle-income countries, which heavily rely upon direct payment mechanisms to meet their healthcare needs [29–31].

Emerging economies were facing a lot of challenges including rising prosperity diseases, lack of health insurance coverage and inefficient resource allocation which made health expenditure a major financial burden [32]. Using National Sample Survey Office (NSSO) data from India, Gaddman and Rao [33] highlighted the increased inequality of CHE incidence in emerging economies. More particularly, it was evident from China that the incidence and intensity of CHE increased [34]. This study also confirmed that the occurrence of CHE was concentrated in poor households, reinforcing the inequality among the households in the economy. However, at the individual level, either discontinuing economic activities or losing jobs were more likely to experience CHE than those who either continued economic activities or did not lose jobs [35].

Furthermore, using the logistic regression model, Sriram and Albadrani [36] clarified that the incidence and intensity of catastrophic health expenditure were extremely high in the case of poorer households associated with private healthcare facilities. In the case of India, Romaniuk et al. [37] and Sahoo et al. [38] confirmed that total spending on healthcare as a percentage of gross domestic product is lower than the global average. Using the Oaxaca decomposition method, Akhtar et al. [39] confirmed that IHE was growing among richer households, whereas poorer households spent a larger amount on using outpatient healthcare services. Moreover, this study also revealed inequality in CHE incidence as continuously decreasing, meanwhile, inequality in outpatient CHE incidence has been growing for the last decades. Furthermore, emphasizing BRICS economies [40] found that limited resources and inefficient cost-effective allocation are major weaknesses that deteriorate people's standard of living.

The major determinants of CHE in Iran were socio-demographic, economic and disease-related factors [41]. The increased burden of the population, coupled with epidemiological transitions such as pervasive infectious and parasitic diseases, injuries and accidents and chronic non-communicable diseases, has also posed tremendous financial challenges in accessing healthcare services [15, 42].

In Colombia, households having older people (age > 60 years), individuals with chronic illness, disabled member(s), pregnant women and children (age < 5 years) are more prone to having CHE [43]. Similarly, the literacy level of the head of the household reduces the existence of CHE in the households in India [15]. People living in rented houses, not having supplementary health insurance coverage and households using more inpatient services were more likely to incur CHE [44].

Moreover, among the determinants of CHE, household per-capita income, size of household, having health insurance and literate head of household were negatively related to the occurrence of CHE [14, 45]. Conversely, in this regard, Lara and Gomez [43] concluded that the number of dependent persons in the household, the number of disabled persons in the household and the usage of inpatient service and outpatient services were positively associated with the occurrence of CHE. Moreover, the prevalence of CHE is much less likely for households having sufficient economic resources and a high capacity to pay [46]. Health spending may not be catastrophic for households with sufficient economic resources or savings, which increases the capacity to pay in the real sense [46]. In contrast, payments for healthcare services may be catastrophic for poorer households lacking terms of sufficient capacity to pay [47].

Though the review of above literature repeatedly highlighted the role of inpatient healthcare expenditure as a major contributor to OOP healthcare expenditure, few studies were available on measuring its nature and magnitude. Secondly, the previous literature accounted for only explicit costs (e.g. different types of medical expenses) in defining ICHE without taking into account inclusive costs or imputed costs such as the loss of household income (LHI) due to inpatient activities. Thirdly, as this study is going to redefine the measurement of ICHE, it is relevant to re-examine the incidence and determinants of ICHE. Fourthly, few studies were focussed on the sanitation status of the households as the determinant of ICHE, but we are trying to incorporate the source of drinking water, source of garbage disposal and types of latrines used by households as determinants of ICHE in addition to the other determinants. In this context, the study investigated the nature and magnitude of inpatient healthcare expenditure in India and explored the incidence and determinants of ICHE.

Materials and methods

Data sources and variables

The study was based on the large dataset collected by the 75th Round of the National Sample Survey (NSS) of the Government of India. The data pertained to 93 925 Indian households¹ and covered information about the usage of alternative schools of medicine, the cost of treatment and types of ailments. The data collection instrument, that is, the schedule of the 75th Round of NSS, had 13 blocks but the study used data from 20 variables (Table 1) which belonged to 4 blocks only (blocks 0, 1, 3 and 7).

¹ <https://microdata.gov.in/nada43/index.php/catalog/152/datafile/F24>.

Table 1 Description of objectives and related variables along with methods used. Source: Author compilation from Household Social Consumption: Health, National Sample Survey Organisation 75th round, 2017

Objectives	Variables	Description of variables	Measurement of variables	Methods used
To explore the nature of inpatient health expenditure in India	DSF	Doctor/surgeon's fee	Indian rupee (₹)	Pie-chart and descriptive statistics
	MR	Medicinal expenditure	Indian rupee (₹)	
	BC	Bed charge	Indian rupee (₹)	
	DTR	Diagnostic test charge	Indian rupee (₹)	
	TFPR	Transportation charges to the hospital	Indian rupee (₹)	
	OME	Other medical expenditure	Indian rupee (₹)	
	ONM	Other non-medical expenditures	Indian rupee (₹)	
To evaluate the magnitude of inpatient health expenditure in India	IHE	Inpatient health expenditure	Indian rupee (₹)	Bar chart
	HCE	Household consumption expenditure	Indian rupee (₹)	
To measure the incidence of inpatient catastrophic health expenditure in India	LHI	Loss of household Income	Indian rupee (₹)	Bar chart
	ICHE	Inpatient catastrophic health expenditure	Catastrophic health expenditure = 1; 0 = otherwise	
To factor out the determinants of inpatient health expenditure in India	HS	Household size	Number of persons belonging to the household	Heteroscedastic probit model
	MSC	A major share of childbirth expenses	Households spend more than 50% of their IHE in childbirth = 1; 0 = otherwise	
	RLG	Religion	Hindu = 0; Islam = 1; Christian = 2; Sikh = 3; Jain = 4; Buddhism = 5; Zoroastrianism = 6; other = 7	
	SG	Social group	Scheduled tribe = 0; scheduled caste = 1; other backward caste = 3; general = 4	
	LTR	Latrine use status	Any type of latrine is used by household = 1; otherwise = 0	
	NH	Number of latrine users in the household	Number of people used the latrine	
	SDW	Source of drinking water	Protected source of drinking water = 1; otherwise = 0	
	WD	Waste disposal setup	Waste disposal facility available = 1; otherwise = 0	
	CMD	Communicable diseases	Any household member affected by any communicable diseases = 1; otherwise = 0	
	SI	Sanitation Index	This is a composite index considering the categorical variables including latrine use, waste disposal and safe source of drinking water.	

In previous studies, IHE was considered catastrophic when it exceeded 10% of the total household consumption expenditure. However, this study used a binary dummy variable named EXICHE that depicted whether the expenditure done by the household was burdensome or not. Further, the novelty of this study was to redefine ICHE by including loss of household income due to inpatient activity, which is termed EXICHE.

Moreover, the inpatient health expenditure that is used in defining the ICHE was composed of a total of seven

variables: doctor/surgeon's fee (DSF), medicinal expenditure (MR), bed charge (BC), diagnostic test charge (DTR), transportation charge to the hospital (TFPR), other medical expenditures (OME) and other non-medical expenditures (ONM). Among seven variables, OME constituted the spending on attendant charges, physiotherapy, personal medical appliances, blood and oxygen, whereas ONM consisted of the costs associated with registration fees, food, transport for other than patients, expenditures on escort and lodging. The above seven variables

helped us in exploring the composition/nature of IHE. More specifically, the registration fee is a common element that is associated with medical events and does not depend upon the severity of the patient’s healthcare service use. For that reason, this is considered as ONM. Finally, to explore the determinants of ICHE, nine variables – household size (HS), religion (RLG), social group (SG), major share of childbirth expenses in IHE (MSC), latrine utilize status (LTR), number of latrine users in the household (NH), source of drinking water (SDW), waste disposal setup (WD) and whether any family members are afflicted with any communicable diseases (CMD) – were used as explanatory variables.

From the above nine variables, to avoid possible multicollinearity issues in the model, a new composite variable was indexed, named sanitation index (SI), which was composed of three binary-categorical variables such as latrine use status (LTR), sources of drinking water (SDW) and waste disposal setup (WD). The principal components analysis (PCA) method was used to develop the above index, which measures the households’ overall sanitation status. Ultimately, the study used seven variables to factor out the determinants of ICHE.

Model specification

To examine the nature of IHE, the study used the percentage approach with a pie chart and descriptive statistics such as mean, standard deviation and coefficient of variation of different components of IHE and LHI due to inpatient. Further, the magnitude of IHE reflects the total percentage of household consumption expenditure spent on inpatient health expenditure by a household in a year. In this context, Eq. 1 clarifies the formula for measuring the magnitude of IHE.

$$\text{Magnitude of IHE} = \frac{\sum_{i=1}^n \text{IHE}_i}{\sum_{i=1}^n \text{HCE}_i} * 100 \quad (1)$$

Here, IHE and HCE depict the monthly expenditure of households in inpatient activity and consumption, respectively. In this regard, subscript *i* pertains to households’ identity. Moreover, earlier studies emphasize several dimensions such as the distortion of the customary standard of living, the opportunity cost of the health expenditure and the fraction of OOP health expenditure of the total budget of the household to measure the CHE [48–50]. Subsequently, the capacity-to-pay approach developed by [13] and the consumption necessity approach were used to capture the financial burden of health expenditure on households [15]. In this context, this study attempted to redefine CHE in the case of inpatient activity by including LHI as an inclusive cost. ICHE is a binary dummy variable that

can have a notional value of 1 or 0, indicating whether or not the household possesses financial burden for inpatient activity of the household. $\text{ICHE}_i = 1$ depicts the household affected by financial catastrophe due to inpatient activity, otherwise; $\text{ICHE}_i = 0$. Equation 2 shows the definition of ICHE.

$$\begin{aligned} \text{ICHE}_i &= 1 \text{ if } \left[\left\{ \frac{(\text{IHE}_i + \text{LHI}_i)/12}{\text{HCE}_i} \right\} * 100 \right] \geq 10, \\ \text{ICHE}_i &= 0; \text{ otherwise} \end{aligned} \quad (2)$$

The headcount approach was used to measure the incidence of ICHE, calculated as the percentage of households whose monthly inpatient health expenditure was equal to or greater than 10% of monthly consumption expenditure. More specifically, it represents the number of households that face the problem of ICHE from the total number of households (TH). Moreover, this study uses the following formula given in Equation 3 to measure the incidence of ICHE.

$$\text{Incidence of ICHE} = \left(\frac{\text{NICHE}}{\text{TH}} \right) * 100 \quad (3)$$

The heteroscedastic probit model was used to identify the variables that influence ICHE. For that reason, one of the goals of this investigation was to determine the odds of getting ICHE on the basis of the socio-economic factors included in the current study.

$$P_i = \beta_0 + \beta_i x_i + \varepsilon_i \quad (4)$$

In the above Equation 4, the parameter $\beta_i (i = 1, 2, 3, 4, 5, 6, 7, 8)$ represents the probability of the happening of the ICHE by one unit change in the variable X_i , following a ratio variable. Otherwise, in the case of a categorical variable β_i represents the difference in probability of getting affected by ICHE from its base category.

Results

Figure 1 explored the nature of the inpatient health expenditure by household in India. In this regard, the pie chart showed that among several components, bed charge occupied a significant space in inpatient health expenditure by households. In this regard, the lack of availability of beds by government hospitals forces the patient to get admitted to private hospitals, which amplifies the contribution of bed charges. Moreover, it is also reported that community healthcare centres have the capacity of only 30 indoor beds with one operation theatre (OT), X-ray, labour room and laboratory facilities per 120 000 people in India [51].

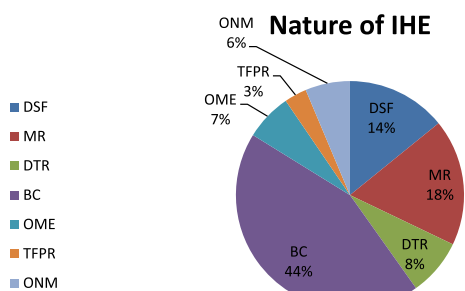


Fig. 1 Nature of healthcare expenditure in India (Source: Household Social Consumption: Health, National Sample Survey Organisation 75th round, 2017)

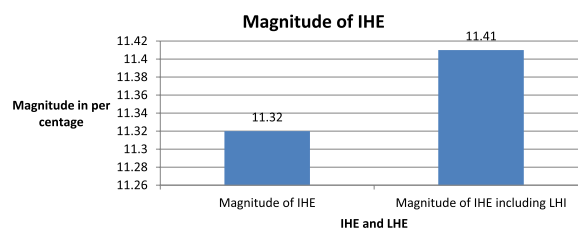


Fig. 2 Magnitude of inpatient healthcare expenditure in India (Source: Household Social Consumption: Health, National Sample Survey Organisation 75th round, 2017)

Table 2 Descriptive statistics. Source: Author estimation by Stata software 14 version from Household Social Consumption: Health, National Sample Survey Organisation 75th round, 2017

Variables	Mean	Standard deviation	Coefficient of variation
DSF	4968.54	716 452.8	14 419.79
MR	6303.42	908 887	14 418.95
DTR	2835.94	408 900.6	14 418.52
BC	15 316.82	2 208 628	14 419.62
OME	2338.087	337 215.6	14 422.71
TFPR	1117.56	161 134.8	14 418.45
ONM	2225.72	320 904.9	14 418.03
IHE	35 106.067	5 079 117	14 348.22
LHI	17 682.5	53 874.03	304.6743

The study conducted by Singh [52] revealed that more than 58% of the population was associated with accessing private healthcare services that were associated with high cost. For that reason, it may be concluded that the lesser availability of hospitalization facilities and higher cost of private medicals amplified the cost of bed charges and ultimately created a financial burden for the households in meeting the inpatient activities.

In this regard, Table 2 presented that on average, a household in India annually spends around ₹35 000 in inpatient activities, from which around ₹15 000 is spent only on paying fees for bed rent. Empirical evidence also explored that around one fourth of IHE was spent on medicinal expenditure and doctor/surgeon’s fees, whereas another one fourth of IHE was spent on transportation costs to the hospital, other medical and non-medical expenditures and diagnostic test fees. Moreover, the above findings suggested that getting medicines, doctor’s services and the costs of transportation to hospitals

were comparatively affordable for households. In India, taking into account the product basket of *Pradhan Mantri Bhartiya Janaushadhi Pariyojana*,² 1800 drugs are facilitated freely to patients, which keeps the share of medicinal expenditure quite low among the components of IHE [53]. Moreover, the coefficient of variation indicates that IHE, along with its components, widely fluctuated. In this context, it can be argued that there existed an inequality in inpatient health expenditure.

It was also found that on average a household in India lost an income of around ₹17 000 per year due to inpatient activities. A lower coefficient of variation in LHI indicated almost all the households equally bear the burden of loss of household income due to inpatient activity.

Figure 2 exhibits the magnitude of inpatient healthcare expenditure in India. In India, households spent around 11% of their household consumption expenditure on inpatient healthcare expenditure. Moreover, by including the loss of household income as an inclusive cost of household inpatient activity, the expenditure on inpatient activity increases by around 0.1%. In this context, it can be argued that average inpatient health expenditure was entirely catastrophic because the average inpatient healthcare expenditure exceeds 10% of its average household consumption expenditure.

As per the old definition³ of ICHE, Fig. 3 empirically found that around 26% of Indian households faced the challenges of ICHE. Furthermore, by including the loss of household income due to inpatient activity as an inclusive cost (new definition), the incidence of ICHE was amplified by 2% of total households. Although 2% of households seems a small number in percentage terms, in absolute terms it will be a big number.

Table 3 presents the results obtained from the heteroscedastic probit model that explained the potential determinants of inpatient healthcare expenditure in

² This is a scheme of the Government of India to make quality generic medicine available at affordable prices to all Indians.

³ Inpatient health expenditure become catastrophic, while it exceeds 10% of household consumption expenditure.

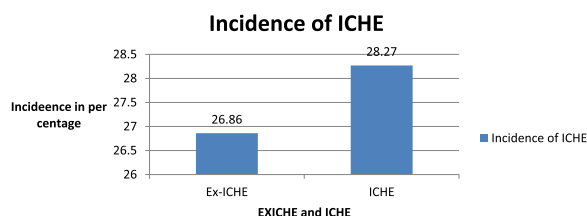


Fig. 3 Incidence of ICHE in India (Source: Calculated and compiled from Household Social Consumption: Health, NSSO 75th round, 2017)

Table 3 Heteroscedastic probit model. Source: Author estimation by Stata software 14 version from Household Social Consumption: Health, National Sample Survey Organisation 75th round, 2017

Variables	Coefficients	P-values
Household size	0.08***	0.002
Major share of childbirth expenses (yes, 1; no, 0)	-1.47***	0.000
Religion (base = Hindu)		
Islam	0.28***	0.007
Christian	-0.10***	0.001
Sikh	-0.18	0.485
Jain	0.27	0.455
Buddhism	0.09**	0.035
Zoroastrianism	-1.40***	0.091
Others	-0.03	0.646
Social group (base = ST)		
SC	0.16*	0.001
OBC	0.86*	0.002
General	0.31*	0.001
Household members use the latrine	-0.05***	0.003
Sanitation index	-0.04*	0.001
Communicable diseases (yes, 1; no, 0)	0.16*	0.005
Constant	-0.13	0.440
Mean VIF of the model	2.79	

* $P < 0.01$, ** $P < 0.05$, *** $P < 0.1$; VIF indicates variance inflation factor, which measures multicollinearity.

India. This model is associated with a dummy dependent variable, henceforth the sign of the observed coefficients postulates the probability of households facing inpatient catastrophic health care expenditure. Moreover, the positive and negative sign of the coefficient reflects whether the movement of the variables amplifies or reduces the chance of occurrence of ICHE among the households. The mean value of the variance inflation factor reflected the issues of the multicollinearity in this model, which was very negligible, thereby assuring the reliability of the coefficient.

The results of the heteroscedastic probit model indicated that the size of households was positively associated

with the occurrence of ICHE among the households in India. The results also conveyed that keeping the Hindu religion as a base household, those households practising Islam, Buddhism and Jainism were more likely to experience ICHE. Moreover, coefficient signs of social groups concluded that the scheduled caste (SC), other backward classes (OBC) and general category households were more exposed to ICHE than the scheduled tribe (ST) households. The results from Table 3 also illustrated that having sanitation facilities within households reduced the ICHE. Finally, the results also demonstrated that households associated with communicable diseases were more prone to facing ICHE compared with non-communicable diseases.

Discussion

The results from Table 3 indicated that when the size of households grows, there is a greater likelihood that they may face ICHE among the households in India. This result inherently coincided with previous scholarly findings by [43]. In this regard, one can argue that at a given level of income, as the number of family members increases, the magnitude of out-of-pocket health expenditure also increases, which may lead to an increase in the burden of financial catastrophe. Moreover, it was also evident that those households that spent a large portion of their total consumption expenses on the delivery of a new child reduced their risk of being negatively impacted by ICHE. This finding implies that emphasizing the spending on child healthcare of households reduces the probability of the incidence of wasting, stunting and the problem of malnutrition [54–56]. Further, this can reduce the chance of future hospitalization, which in turn lessens the chance of facing ICHE by the households.

The study ensured that keeping the Hindu religion as a base household, those households practising Christianity and Sikhism are less likely to experience ICHE, whereas households practising Islam, Buddhism and Jainism are more likely to experience ICHE. Furthermore, empirical evidence also concluded that SC, OBC and general category households have a higher likelihood of being affected by the ICHE than the ST households, which might be due to limited accessibility of hospitals to the tribal community, and less awareness of using hospitals may lead to producing this kind of result [57]. The earlier studies also confirm that to presence of blind belief among the tribals restricts them to hospitalization in case of the presence of any disease [58]. This may be another reason for lessened number of hospitalizations, which in turn reduces the share of healthcare expenditure from total income and reduces the chance of loss of household income that suppresses the occurrence of ICHE among tribal households.

Within this framework, the negative coefficient of the sanitation index reflected that increasing household sanitation facilities reduced the ICHE among households in India. More specifically, the composition of the sanitation index showed that having safe sources of drinking water, garbage disposal facilities and latrine facilities reduced the likelihood of occurrence of inpatient events within households.

Therefore, it can be concluded that the sanitation facilities of the households played a significant role in determining the burdensome inpatient health expenditure of the household. However, this study found that poor sanitation facilities of households is a significant reason for households being affected by ICHE. This is because inadequate availability of sanitation facilities may cause different types of communicable as well as infectious diseases [59]. Moreover, in this concern, scholarships also evidenced from 145 countries that poor hygiene and lack of accessibility to clean water amplify the global burden of diarrhoeal diseases [60]. In this line, the existing literature concludes that poor hygienic status causes different types of outbreaks of diseases [61]. Henceforth, the significant association between sanitation status and the incidence of diseases may lead to frequent visits to the hospital, which results in both loss of household income and high volume of out-of-pocket health expenditure. Further, the increased magnitude of household income loss and healthcare spending leads to increase in the probability of occurrence of ICHE among the households.

Finally, this study also concluded that communicable diseases have more potential to create a financial burden compared with non-communicable diseases [62]. In this connection, one may argue that the presence of communicable diseases in households may create the chance of transmission to other household members and cause their hospitalization [63]. Further, as more members become affected, the inpatient out-of-pocket healthcare expenditure gets amplified. The drive to increase the cost of care is largely driven by the absence of point-of-care diagnostic medical devices in rural and remote areas. Furthermore, this leads to significant commuting costs to outpatient primary care centres or regional hospitals, which are frequently unaffordable for ordinary citizens. Consecutively, this leads to neglected disease, which ultimately ends up in an advanced stage of infection leading to inevitable hospital admission. At that stage, the illness is hard to treat, its prognosis is unpredictable and costs are far higher compared with preventive early stage intervention. This phenomenon, caused by the effective absence of timely and accessible medical care provision by the attending physician and nursing staff, is broadly known as a “boomerang effect” [64]. This entire

chain of events in turn raises the incidence of inpatient catastrophic health expenditure among households even more [65].

Conclusions and policy implications

The study filled an important research gap by redefining the ICHE to include not only the inpatient health expenditures, but also the loss of household income, an implicit cost for inpatient events. It also brought to the awareness of the researchers that the sanitation status of households played a crucial role in determining the magnitude of inpatient health expenditure. Finally, it concluded that households’ average spending on inpatient health expenditure is severely burdensome, and empirically it is evident from India that more than one fourth of households were prone to becoming affected by ICHE.

The findings of the study accentuate the relevance of comprehensive intervention of fiscal policy tools, which is imperative in reducing the incidence of burdensome inpatient health expenditures. In this regard, it can be suggested to the government of India to allocate enough capital to enhance bed capacity and revenue spending to ensure the required supply of medicines. Moreover, the government may ensure the accessibility of good sanitation facilities along with safe water to the households. Additionally, the awareness campaign may be organized regularly by local governments to let people know the importance of maintaining good sanitation. Furthermore, the government might focus on enhancing the penetration of health insurance so that the magnitude of OOP health expenditure can be minimized, which in turn reduces the chance of ICHE happening by household.

Abbreviations

ASEAN	Association of Southeast Asian Nations
BC	Bed charge
BRICS	Brazil, Russia, India, China and South Africa
CHE	Catastrophic health expenditures
CMD	Communicable diseases
DSF	Doctor/surgeon’s fee
DTR	Diagnostic test charge
EXICHE	ICHE with LHI
GDP	Gross domestic product
HS	Household size
ICHE	Inpatient catastrophic health expenditures
IHE	Inpatient healthcare expenditures
LHI	Loss of Household Income
LTR	Latrine use status
MR	Medicinal expenditure
MSC	Major share of childbirth expenses in IHE
NH	Number of latrine users in the household
NSS	National Sample Survey
NSSO	National Sample Survey Office
OBC	Other backward classes
OME	Other medical expenditures
ONM	Other non-medical expenditures
OOP	Out-of-pocket
OT	Operation theatre
SC	Scheduled caste
SDW	Source of drinking water

SG	Social Group
ST	Scheduled tribe
TFPR	Transportation charge to the hospital
TH	Total number of households
UHC	Universal health coverage
WD	Waste disposal setup

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Author contributions

H.S.P., H.S.R. and M.J. designed the study; H.S.P. collected and analysed the data; H.S.R. and M.J. interpreted the data; H.S.P. wrote the first manuscript; H.S.R. and M.J. critically reviewed manuscript and supervised the study. All authors approved the final version submitted to *Health Research Policy and System*.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Competing interests

The authors declare no competing interests.

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