Measuring the Effect of *Ayushman Bharat-Pradhan Mantri Jan Aarogya Yojna* (AB-PMJAY) on Health Expenditure among Poor Admitted in a Tertiary Care Hospital in the Northern State of India

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Abstract

Background: *Ayushman Bharat-Pradhan Mantri Jan Aarogya Yojan* (AB-PMJAY) as a financial risk protection scheme intends to reduce catastrophic health expenditure (CHE), especially among poor. The current study was carried out to assess the utility of AB-PMJAY in terms of reduction in CHE from before and after admission in a tertiary hospital in the northern state of India. **Methodology:** It was a hospital-based cross-sectional study carried out from August 2020 to October 2021 at a public tertiary hospital of Himachal Pradesh, India. Data were collected from surgery- and medicine-allied (SA and MA) specialties. Along with socio-demographic details, information for total monthly family expenditure (TMFE), out-of-pocket expenditure (OOPE), and indirect illness-related expenditure (IIE) was recorded before and after hospital admission. CHE was considered as more than 10.0% OOPE of THFE and more than 40.0% of capacity to pay (CTP). **Results:** A total of 336 participants with a mean age of 46 years were recruited (MA: 54.6%). The majority (~93.0%) of participants had illness of fewer than 6 months. The mean TMFE was observed to be INR 4213.1 (standard deviation: 2483.7) and found to be similar across specialties. The OOPE share of TMFE declined from 76.1% (before admission) to 30.0% (after admission). Before admission, CHE was found among 65.5% (10.0% of THFE) and 54.2% (40.0% of CTP) participants. It reduced to about 29.0% (based on both THE and CTP) after admission to hospital. **Conclusion:** AB-PMJAY scheme found to be useful in reducing CHE in a tertiary hospital.

Keywords: AB-PMJAY, catastrophic health expenditure, financial risk protection

BACKGROUND

Universal health coverage (UHC) implies that quality and effective health services like promotive, preventive, curative, and palliative should be available to all people and communities without any financial hardship.[1] It requires sufficient health care financing for health care services along with financial protection to the vulnerable people. Protection is required for unexpected expenditure and out-of-pocket expenditure (OOPE) for medicines, diagnostics, and other service-related hospital costs. Voluntary pre-payment for health insurance was observed to be low as only about a quarter of the population had access to any form of health insurance. Also, insurance providers cover a small fraction (1.5–2.0%) of total health care expenditure (THE) in India.[2] The coverage of health insurance schemes was observed to be low, especially among non-poor and urban areas. Low awareness was found to be associated with poor uptake of insurance policies. Evidence showed that health insurance can reduce the OOPE and its uptake can further be improved by strengthening of reimbursement mechanism.[3] Existed, national health insurance schemes like *Rashtriya Swasthya Bima Yojana* (RSBY) for below poverty line (BPL) households were observed with limitations like lack of formal regulatory, implementation mechanism, and contractual breaches.[4] Literature on various insurance schemes suggested lack of usefulness for financial risk protection.[5-8]

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Covering the limitations of RSBY, in the year 2018, "*Ayushman Bharat* Initiative", also known as *Pradhan Mantri Jan Aarogya Yojna* (AB-PMJAY), was launched. It covers 1370 medical packages of surgery, day care treatments, cost of medicines, and diagnostics. For each family, it covers financial risk up to INR 500,000 as compared to INR 30,000 of RSBY.[7] As compared to RSBY, for a large sum of financial protection, AB-PMJAY does not have a family size criterion of enrolment. Like RSBY, in AB-PMJAY, patients are not supposed to pay for health care at any stage. PMJAY is applicable to a mix of public and empanelled private hospitals for provision of health service packages at a pre-defined cost.[9]

CHE occurs when OOPE exceeds a pre-defined share of the family's ability to pay for health care. It becomes difficult for the household to meet its basic needs. CHE has increased in India for the past 2 decades (1993–2012), where it observed with an increase of about 1.5-fold.[10] Himachal Pradesh positioned as one of the better performing states (80% coverage) for implementation of RSBY. The state has an average family size of 4.6, of which 3.3 family members were enrolled in RSBY. It had observed the lowest level of financial inconsistencies with the highest hospitalization rate at 5.1 and claims ratio of 234 in its first 2 years of implementation.[11,12] Insurance schemes help to reduce CHE due to OOPE; AB-PMJAY offers such protection as it promises cashless delivery of health care services.[13,14] It is equipped with a robust management information and monitoring system. Assistance is provided at hospital with facilitators (*Aarogya Mitra*), and an efficient data management system helps to track functional domains: beneficiaries, transaction, provider, and support system. The current study was carried out to assess the extent of reduction in CHE among AB-PMJAY beneficiaries after admission in a public tertiary care hospital in the northern state of India.

METHODS

It was a hospital-based cross-sectional study, in which data are collected from admitted patients in the tertiary hospital of Dr. Rajendra Prasad Government Medical College (Dr. RPGMC), Himachal Pradesh. Data were collected from August 2020 to October 2021 using a pre-structured questionnaire by a medical resident. Study participants were recruited from medicine and allied (MA) specialties like pediatrics, dermatology, and so on and surgery and allied specialties (SA) like orthopedics, obstetrics and gynaecology, otolaryngology, ophthalmology, and so on. Inclusion criteria for participants were beneficiaries of AB-PMJAY and admition in Dr. RPGMC hospital during the study period. Participants with severe illness requiring intensive care were excluded from the study. Participant details were collected from the AB-PMJAY registration counter at the hospital and later were recruited at the hospital admission ward at a suitable time. After obtaining informed consent, participants were interviewed at their convenient time in the day. Participants were visited, and information was collected at bedside in the presence of their assistant.

Data were collected on socio-demographic details, duration of illness, total monthly family income (TMFI), and total monthly family expenditure (TMFE). Both TMFI and TMFE excluded expenditure on current illness. Vulnerable social details were associated with a description of socially defined by the state government like schedule cast (SC), schedule tribe (ST), and other backward class (OBC). Information for expense incurred before and after hospital admission was collected at the time of hospital admission. Expenditure details before hospital admission were verified with available records with the participants. Direct illness-related expenditure (IE) was recorded, which was inclusive of out-of-pocket expenditure (OOPE) for medicine and diagnostics, whereas indirect IE (IIE) included loss of wages. Information was also collected for types of drugs received and investigations carried out in hospital during admission. The estimated cost of most of the drugs and other consumables was based on the rate list of the Government of Himachal Pradesh. The cost of drugs and investigations was obtained from user charges under a local body of the institute. Based on this information, expenditure was calculated to estimate the value for financial protection under the AB-PMJAY scheme. Based on standard criteria, OOPE was calculated as total direct expenditure incurred on drugs, diagnostics, and any other accessories related to illness by the family.[15] CHE was calculated as more than 10.0% OOPE of THFE and more than 40.0% of capacity to pay (CTP). The CTP was considered as a monthly expenditure on non-food-related items (THFW minus food expenditure).[16] The computerized tomography (CT) scan machine was not functional during data collection; CHE without the expenditure for CT scan was also calculated. Participants were also interviewed for AB-PMJAY, like level of awareness, source, and satisfaction of services. Assuming AB-PMJAY reduces OOPE from 30.0% to 10.0%, a sample size of 336 study participants was calculated at a 5.0% level of significance and 80.0% study power.[10]

Data collected were coded and then entered in Microsoft Excel spreadsheets and analyzed using Epi Info (version 7.2). Categorical data were analyzed using frequencies and percentages and their 95% confidence interval (CI). Continuous variables like expenditure were reported with mean, standard deviation (SD), median, and interquartile range (IQR). The strength of association of variables with CHE was assessed with logistic regression analysis, and odds ratio (OR) with 95% CI was calculated. Indian national rupees (INR) were used as a value indicator for income, expenditure, and costs. Prior ethical approval was sought from Institute Ethics Committee (IEC), Dr. RPGMC (IEC/170/2019 dated 21/12/2019).

RESULTS

A total of 336 participants were recruited, of which 183 (54.6%) were from MA specialties. The mean age of participants was about 46 years and was statistically similar for both groups of specialties. The majority (58.3%) of participants were of more than 46 years of age, and their distribution is statistically

indifferent between both groups. Participants of 1–15 (high in MA) and 31–45 (high in SA) years of age were statistically different. Female represented less (36.9%), and almost all (~97.0%) were from vulnerable social strata (SC/ST/OBC) with a mean family size of five. Their distribution was statistically similar across both specialties. Overall, the mean duration of illness was found to be 2.8 days, inclusive of before and after hospital admission. It was statistically higher in SA speciality (3.2 vs 2.5). The majority (~93.0%) of participants had illness of fewer than 6 months without any statistical difference between specialties. TMFI distribution was also observed to be statistically similar across specialties. The majority (73.5%) of participants reported an income of INR 5001 to 10,000 per month. About three quarter (76.1%) of participants had OOPE before admission, which reduced to 30.6% after hospital admission. It was statistically indifferent across both the specialties [Table 1].

Mean and median values of income and incurred expenditure were found to be statistically indifferent across specialities. Overall, before admission, the mean and median IE expenditure were observed to be INR 6689.1 and INR 3000.0, respectively. Before admission, OOPE contributed the most of IE as its mean (INR 5042.3) and median (INR 1500.0) were observed to be 75.4% and 50.0% of mean IE, respectively. After hospital admission, the mean and median expenditure were observed to be INR 3105.0 and 1600, respectively. Mean OOPE (INR 1401.2) shared about 45.0% of mean IE after admission. The median values for OOPE after admission were

observed to be 0 as at least half of participants did not pay at all [Table 2]. The mean cost of drugs supplied by the hospital was observed to be INR 740.5 and INR 278.7 for diagnostics. SA was observed with a statistically high mean cost for provided drugs (INR 859.6 vs 640.8) and diagnostics (INR 386.7 vs 188.5) [Table 3].

Almost all (99.1%) have heard about the AB-PMJAY scheme from their local village level body (~92.0%). Multiple responses about the level of scheme awareness showed that almost half of them (49.4%) were aware of the coverage of services, 38.0% about services which can be availed at any other state, 35.0% about type of services, and 11.0% about availability of services at private hospitals. Feedback of the scheme showed that 25.8% received mobile phone messages for hospital admission, 20.2% gotten messages about the claimed amount, and only 2.1% received messages about the final amount. Hospital level facilitators (*Aarogya Mitra*) reported to provide necessary information about the scheme, but only 6.8% were aware of the grievance redressal system. The level of satisfaction was assessed and observed that about 95.0% had rated hospital services as good and none reported it poor. All were satisfied for quality of general services, treatment, behavior of health care professionals (HCPs) at hospital, and the file management system.

Assessed for both criteria, CHE was found to be among 65.5% (10.0% of THFE) and 54.2% (40.0% of CTP) participants before hospital admission. It was statistically high in MA as compared to SA specialties. The CHE after admission was

Table 1: Description of participants receiving care at a public tertiary care hospital under PMJAY, Himachal Pradesh, India 2020–21

Characteristics	SA (153)	MA (183)	Both (336)	*P*
Mean age in years (SD)	47.7 (18.5)	45.6 (21.4)	46.5 (20.1)	0.34
Age groups in years, *n* (%)				
1-15	5 (3.3)	25 (13.7)	30 (8.9)	0.00
16-30	24 (15.7)	20 (10.9)	44 (13.1)	0.19
31-45	37 (24.2)	29 (15.8)	66 (19.6)	0.05
46-60	48 (31.4)	59 (32.2)	107 (31.8)	0.87
>60	39 (25.5)	50 (27.3)	89 (26.5)	0.74
Female, *n* (%)	56 (36.6)	68 (37.2)	124 (36.9)	0.91
Socially vulnerable group, *n* (%)	151 (98.7)	175 (95.6)	326 (97.0)	0.10
Mean members in family (SD)	5.0 (0.9)	4.9 (0.8)	5.0 (0.9)	0.84
Mean duration of illness in months (SD)	3.2 (3.7)	2.5 (3.1)	2.8 (3.4)	0.04
Duration of illness in months, *n* (%)				
<6	139 (90.8)	173 (94.5)	312 (92.9)	0.19
6-12	12 (7.8)	9 (4.9)	21 (6.2)	0.27
>12	2 (1.3)	1 (0.5)	3 (0.9)	0.43
TMFI, N (%)				
<5000	29 (19.0)	43 (23.5)	72 (21.4)	0.31
5001-10000	114 (74.5)	133 (72.7)	247 (73.5)	0.71
10001-15000	8 (5.2)	5 (2.7)	13 (3.9)	0.23
>15000	2 (1.3)	2 (1.1)	4 (1.2)	0.86
OOPE before admission, *n* (%)	111 (72.5)	145 (79.2)	256 (76.1)	0.15
OOPE after admission, *n* (%)	42 (27.4)	61 (33.3)	103 (30.6)	0.24

TMFI=Total Monthly Family Income, OOPE=Out-of-Pocket Expenditure

Table 2: Description of income and expenditure receiving care at a public tertiary care hospital under PMJAY, Himachal Pradesh, India 2020-21

Characteristics	SA (153)	MA (183)	Both (336)	*P*
Mean TMFI (SD)	7343.1 (2517.3)	6961.7 (2588.2)	7135.4 (2559.5)	0.17
Median THFI (IQR)	7000 (6000-8000)	7000 (6000-8000)	7000 (6000-8000)	NC
Mean TMFE (SD)	4041.8 (1623.4)	4356.3 (3018.0)	4213.1 (2483.7)	0.24
Median TMFE (IQR)	4000 (3000-4950)	4000 (3000-5000)	4000 (3000-5000)	NC
Mean IE before admission (SD)	5654.2 (16361.3)	7554.4 (11074.8)	6689.1 (13747.5)	0.20
Mean OOPE before admission (SD)	4166.1 (14625.2)	5774.9 (9659.2)	5042.3 (12181.4)	0.22
Mean IIE before admission (SD)	1488.2 (1911.1)	1779.5 (1811.1)	1646.9 (1860.2)	0.15
Median IE before admission (IQR)	2500 (1000-5000)	4000 (1700-9000)	3000 (1200-7000)	NC
Median OOPE before admission (IQR)	1000 (1000-4000)	2000 (500-7000)	1500 (200-5075)	NC
Median IIE before admission (IQR)	1000 (1000-2000)	1300 (950-2000)	1000 (800-2000)	NC
Mean IE after admission (SD)	3213.6 (4317.8)	3014.8 (2940.1)	3105.0 (3626.1)	0.61
Mean OOPE after admission (SD)	1359.5 (3900.7)	1436.0 (2312.0)	1401.2 (3132.0)	0.82
Mean IIE after admission (SD)	1867.7 (1707.2)	1660.2 (1703.2)	1754.7 (1705.6)	0.27
Median IE after admission (IQR)	1550 (1100-4000)	1666 (1000-5500)	1600 (1000-4500)	NC
Median OOPE after admission (IQR)	0 (0-1000)	0 (0-3500)	0 (0-2000)	NC
Median IIE after admission (IQR)	1300 (1000-2000)	1200 (900-1866)	1300 (1000-1900)	NC

TMFI=Total Monthly Family Income, TMFE=Total Monthly Family Expenditure, IE=Direct Illness Related Expenditure, IIE=Indirect Illness Related Expenditure, OOPE=Out-of-Pocket Expenditure, NC=Not Computed

Table 3: Description of drugs and diagnostics support received by surveyed participants receiving care at a tertiary care hospital under PMJAY, Himachal Pradesh, India 2020-21

Characteristics	SA (153)	MA (183)	Both (336)	*P*
Mean cost of drugs (SD)	859.6 (467.4)	640.8 (622.2)	740.5 (566.2)	0.00
Median cost of drugs (IQR)	830 (570-1145)	475 (200-870)	665 (280-1025)	NC
Mean cost of diagnostics (SD)	386.7 (243.9)	188.5 (188.2)	278.7 (236.8)	0.00
Median cost of diagnostics (IQR)	330 (250-450)	140 (40-290)	250 (93-375)	NC

NC=Not Computed

reduced to about 29.0% based on both criteria. After admission, omitting expenditure related to CT scan was observed with CHE of about 8.0% using both criteria for CHE [Table 4]. Logistic regression analysis observed that age was not significantly associated with CHE before or after admission. Furthermore, for both before and after hospital admission, assessment for association was observed to be non-significant for gender, vulnerable social class, and TMFI. Both before and after hospital admission, for both CHE criteria, SA specialties were significantly positively associated before admission to hospital. The association between SA and CHE declined to almost half and insignificant after hospital admission [Table 5].

Discussion

CHE respective to >10.0% of THFE and >40.0% of CTP among participants was observed to be declined, respectively, from 65.5 to 29.8% and from 54.2 to 29.5% before and after hospital admission. It could had been decreased up to 7.7 and 8.0% if the CT scan machine was functional in the hospital. Since participants were beneficiaries of PMJAY, the decline in CHE was inferred due to the health insurance scheme. Government hospitals purchase drugs as per the approved rate list and also charge for various diagnostic tests at a nominal level. Therefore, the government's mean financial contribution to various medicines and diagnostics toward participant illness was INR 740.5 and 278.7, respectively. A decline in CHE can also be observed as a majority of reduction of financial expenditure was observed due to OOPE. Its mean value declined about two-third, from INR 5042.3 before to INR 3105.0 after hospital admission. This reduction was also observed in its median values, where it declined up to half. Mean and median IIE before and after admission were observed with a marginal increase from INR 1646.9 to 1754.7 and from INR 1000 to 1300, respectively. This trend was observed for both SA and MA specialties [Table 2]. CHE was not observed to be significantly associated with age, gender, socially vulnerable groups, and family income. SA specialities were found to be associated with about 2.5 times more CHE before admission, which had reduced to about its non-significant half after hospital admission. During hospital stay, the government supported for drugs and diagnostics as about INR 1000 per patient. Therefore, CHE using both criteria were observed to be declined after receiving free drugs and diagnostic-related services under PMJAY. It would have been reduced further given CT scan services were available to participants. IIE stayed more or less the same before and after admission as they were not covered by PMJAY.

Table 4: CHE among surveyed participants receiving care at a tertiary care hospital under PMJAY, Himachal Pradesh, India 2020-21

Characteristics	SA (153)	MA (183)	Both (336)	*P*
10.0% of THFE				
Before admission, *n* (%)	86 (56.2)	134 (73.2)	220 (65.5)	0.00
After admission, *n* (%)	42 (27.5)	58 (31.7)	100 (29.8)	0.40
Before admission (without CT), *n* (%)	16 (10.5)	10 (5.5)	26 (7.7)	0.08
40.0% of CTP				
Before admission, *n* (%)	64 (41.8)	118 (64.5)	182 (54.2)	0.00
After admission, *n* (%)	40 (26.1)	59 (32.2)	99 (29.5)	0.22
Before admission (without CT), *n* (%)	15 (9.8)	12 (6.6)	27 (8.0)	0.27

THFE=Total Monthly Family Expenditure, CHE=Catastrophic Health Expenditure

Table 5: Logistic regression analysis for CHE among surveyed participants receiving care at a tertiary care hospital under PMJAY, Himachal Pradesh, India 2020-21

Characteristics	>10.0% of TMFE		>40.0% of CTP	
	Before	**After**	**Before**	**After**
Age in years	1.0 (1.0-1.1)	1.0 (0.9-1.1)	1.0 (0.9-1.1)	1.0 (0.9-1.2)
Female	1.6 (0.9-2.6)	1.3 (0.8-2.2)	0.7 (0.5-1.2)	1.5 (0.9-2.3)
Socially vulnerable group	0.9 (0.2-3.9)	0.9 (0.2-3.8)	0.6 (0.1-2.7)	1.0 (0.2-4.0)
Monthly family income				
<5000	Ref	Ref	Ref	Ref
5001-10000	1.6 (0.9-2.7)	1.4 (0.8-2.6)	1.2 (0.7-2.0)	1.2 (0.7-2.1)
10001-15000	1.2 (0.3-4.3)	0.6 (0.1-2.8)	1.3 (0.4-4.4)	0.5 (0.1-2.4)
>15000	0.3 (0.0-2.9)	3.4 (0.4-27.2)	0.3 (0.0-3.5)	1.0 (0.1-10.6)
SA	2.3 (1.4-3.6)	1.2 (0.8-1.2)	2.6 (1.6-4.0)	1.3 (0.8-2.2)

Evidence observed CHE from 26.8 to 41.4% in all expenditure quintiles, but the current study observed high CHE as 65.5% and 54.2% according to both criteria.[17,18] This difference might be due to the fact that CHE trends in India are reported from surveys like consumer expenditure and health care utilization surveys. The current study collected data from admitted cases in the hospital who had contacted various facilities before admission. In addition, the extent of CHE was observed to be varied following the nature of health illness. However, conditions like stroke were observed with CHE up to 40.0%, and analysis observed CHE up to 68.0% for non-communicable diseases.[19,20] Since the current study included poor people as beneficiaries, evidence showed CHW of 47.0% among multi-dimensionally poor.[21] Type of illness was observed to be associated with CHE as evidence showed that CHE was observed as low as 28.0% for communicable disease and as high as 74.0% for cancer.[22] Before admission, CHE in the current study is assessed at hospital and inclusive of hospital costs. It was found to be high but ranged within to the reported CHE for various health conditions.

CHE is significantly associated with socio-economic inequalities and is observed to be supported by financing mechanisms like taking loans, utilization of savings, and health insurance.[23,24] Factors like age, household size, employment, health insurance, family income, hospitalization, and savings were associated with CHE.[25] Nature of illness, like severity, complications, and duration, was also associated with CHE.[26,27] Nature of health facility, private, was observed to positively influence CHE due to its expensive care.[28] The poor faces the most and in the absence of ways to finance health care in case of health emergency and push them further to poverty. Support for health care has the potential to reduce CHE, which makes them decide to choose health care facilities for care. Community worker support was utilized by the poor and observed with a negative association with CHE.[29] In India, evidence has suggested that CHE has increased to 1.5 times from 1993–94 to 2011–12 and 2.2-fold from 1995–96 to 2014.[10] Evidence from 2005–12 showed that CHE was observed negatively associated with households receiving remittances.[30] Improved services at public health care facilities and regulation of public–private partnership and financial security have foundational roles in reducing CHE. Further prioritization of vulnerable people like the poor and living in rural and tribal areas reduces impoverishment due to OOPE.[31]

The AB-PMJAY scheme was focused on publicly funded health care for up to 500 million marginalized people of India. It offers an approach to provide free institutionalized quality health care for improving the health of the poor. Since poor face CHE, the scheme aims to drastically reduce the health-related CHE.[32] It is observed from the current study the beneficiaries of the scheme had a drastic reduction in CHE of both criteria and specialties. Availability of

functional logistics like CT scan in the current study could have reduced CHE further. The scheme appeared to cover direct medical expenses related to drugs and diagnostics irrespective of nature of services from either SA or MA specialities. Analysis of the current study observed that the scheme reduces OOPE significantly, whereas indirect expenditures like loss of wages of the patient and the attendants contribute to CHE. Although participants were well aware of the scheme, efforts focusing on types of services and utilization of private hospitals can be done. Facilitators appointed under the scheme can be utilized effectively to inform the participants.

This study measured the usefulness of the financial risk protection scheme, AB-PMJAY, in reducing hospital-related CHE among participants, but the study is to be viewed with some limitations. Effectiveness of the scheme cannot be ascertained as there is no comparator arm to substantiate. Being a cross-sectional study, recall and berkansonian bias might be present as participants were interviewed only after the hospital admission.[33] Generalization of study to a different public hospital cannot be done as only one institute was covered. Using rate price for generic drugs and diagnostics at hospital is an under-representation scheme at market rate. However, analysis does indicate the utility of the AB-PMJAY scheme in reducing CHE. Based on limitations, it is recommended that a community-based cohort study will be more appropriate to avoid measurement and selection bias.

Conclusion

Health insurance scheme AB-PMJAY has reduced the OOPE and CHE among study participants. It offered financial risk protection to the participants as intended by the scheme. Effectiveness of the scheme relies on readiness and all-time availability of health infrastructure that patients utilize. Despite limitations in the study, it can be stated that unavailability of drugs and/or diagnostic services during any point of hospital admission can underestimate the reduction in CHE. Since the scheme was launched in 2018, services were hampered due to COVID-19 pandemic. In that case, AB-PMJAY becomes vital to reduce CHE. Logistics management at the hospital level can further protect the patients by making services available and accessible. Microplanning at the level of health facilities to improve the effectiveness has a value for implementation.

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Conflicts of interest
There are no conflicts of interest.

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