ORIGINAL ARTICLE

Economic Cost and Its Factors for COVID-19 vaccination among Adults in India: A Community Based Study

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ABSTRACT

Background: Government of India introduced COVID-19 vaccination in January 2021. COVID-19 vaccination tends to increase the herd immunity in the community. There are limited studies on out-of-pocket expenditure (OOPE) in COVID- 19 vaccination in India. ***Objective:*** The present study aims to estimate the OOPE for availing the COVID-19 vaccines and find the factors associated with OOPE. ***Methods:*** A community based cross- sectional study was conducted during September 2021- February 2022in urban poor locality, Bengaluru, India. A pre-tested validated semi-structured questionnaire was used to assess the direct and indirect costs for administration of COVID-19 vaccine in 438 participants above 18 years using probability proportional to population size by interview method. Data was analysed using descriptive statistics. ***Results:*** The total direct cost was $214.03USD, indirect cost was $4828.93USD for COVID-19 vaccination. Factors associated with higher OOPE was type of vaccine (OR=2.141, 95% CI=1.07-4.24) occupation of participant (OR=2.043, 95% CI= 1.37-3.03), reported stress following vaccination (OR=1.72, 95% CI=1.098-2.703), adverse event within 48hrs (OR=2.125, 95% CI= 1.248-3.62), received any medication for adverse event (OR= 1.721, 95% CI= 1.022-2.84). ***Conclusion:*** The majority of the people utilized the government facility for vaccination. Factors associated with higher OOPE were: 2 times with type of vaccine, occupation of the study subject and adverse events within 48hrs.

Keywords: COVID-19 vaccination, health expenditure, out of pocket expenditure

International Journal of Human and Health Sciences Vol. 08 No. 03 July'24

DOI: http://dx.doi.org/10.31344/ijhhs.v8i3.721

Introduction

Out of Pocket Expenditures (OOPE) is defined as the expenditures directly made by households at the point of receiving health care. This indicates the extent of financial protection available for households towards healthcare payments and is also described as health spending on hospitalization net of reimbursement.[1,2]

World Health Organization published that high OOPE on health impoverishes 55 million Indians annually in March 2022. National Health Accounts 2019-20 estimated India's government health expenditure at 1.35% of Gross Domestic Product, OOPE as 52% of the current health expenditure, as against the world average of 18%. Low public health spending in India has resulted in high OOPE.[3]

The government's efforts to improve public healthcare is conspicuous with OOPE as a share of total health expenditure decreasing to 48.8% in 2017-18 from 64.2% in 2013-14.[4] Around 90% of all households incurring impoverishing OOPE are already at or below the poverty line. The need of an hour is to exempt the urban slum and vulnerable people from OOPE with a good health financing policy.[5]

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OOPE in health care comprises of the cost of travel, loss of wages, cost of registration, consultation to physicians, hospital charges, and cost of medications, food and lodging of caregivers.[6] The situation in a household may arise where they have to borrow money or sell their assets or when they have to get contributions from friends/relatives to meet their health care expenses,[7] then this is called as catastrophic health expenditure.

India began its largest COVID-19 vaccination drive on 16th January 2021 to cover healthcare and frontline workers and scaled up to cover citizens above 45 years of age. The Ministry of Health & Family Welfare, Government of India had prioritized the groups depending on the potential availability of vaccines. Individuals with higher risk were given priority. From May 1st, 2021, all eligible citizens above the age of 18 years could get the COVID-19 vaccine.[8-10] In India, Covishield (AstraZeneca's vaccine manufactured by Serum Institute of India) in the month of January, Covaxin (manufactured by Bharat Biotech Limited) in the month of March, Sputnik - V in the month of April 2021, were the vaccines granted emergency use authorization by the Central Drugs Standard Control Organization.[8-10] COVID-19 vaccination was provided both at the Government COVID Vaccination Centre (CVC)and private CVC.[8] OOPE affects the vaccination drive and herd immunity in the community,[11] and the data regarding OOPE in COVID-19 vaccination is scarce hence this study has been undertaken as it affects the financial condition and stability of the household in India. When the cost of expenditure on immunization affects the day today activities of the household, it affects the zeal for vaccination. The present study objectives were to estimate the OOPEs for availing COVID-19 vaccination, to find out the factors associated with OOPE for availing COVID-19 vaccination in adults above 18 years in Bengaluru, India.

METHODS

Study design and Setting: This community based cross-sectional study was conducted in the urban field practice area, by the Department of Community Medicine of a medical institution in the South Indian region. The study was for a duration of 6 months between September 2021 and February 2022. The urban field practice area caters to the urban poor population. The total population of urban field practice area was 34,877, out of this total population residing in urban poor locality was 7688. The number of urban poor locality consisted of 11 areas.

Study Participants and Sampling: Participants included COVID -19 fully vaccinated individuals and more than 18 years of age. The sample size was determined at a 95% confidence interval (CI) using the formula $n=Z^2_{\alpha/2}pq/d^2$, $\alpha= 0.05$, where coverage of fully vaccinated adults was 26% in September 2021 in Karnataka, India,[12] allowable error was 20% of prevalence, it was 273.34. Assuming design effect 1.5 and 10% additional size the sample size was calculated to 438.

Data collecting tool and technique: A comprehensive review of literature was conducted on the direct and indirect costs of COVID-19 vaccination by the research team for the content validity. Our questionnaire consisted of both open and closed ended questions of the socio-demographic characteristics, type of vaccine, place of vaccination, side effects following vaccination and self-prescribed medications received for 3 days post vaccination. Expenditure incurred for COVID 19 vaccination was captured under two broad categories Direct cost (cost of vaccine and administration charges, medications,) Indirect cost included travel expenses (participant & attender for the vaccination), loss of wages (participant & attender for the vaccination day) was obtained. The questionnaire was validated by internal and external experts. A pilot study was conducted, and questionnaire was administered by interview method to the participants.

Participants willing to provide informed written consent, residing in urban poor locality for more than 6 months and fully vaccinated for more than 15 days and within 1 month were enrolled in the study. Participants partially vaccinated, locked houses for more than 2 visits, seriously ill were excluded. Using probability proportional to population size (PPPS) corresponding number of participants meeting the inclusion and exclusion criteria were interviewed. In each area, an approximate centre was marked, one of the roads was selected randomly by lottery method. After tossing coin one of the sides of road was chosen randomly. After walk through survey, a household was selected randomly. After interviewing a first household, the next household was selected by tossing the coin until the required sample was met.

Operational definitions:

Fully vaccinated means either two weeks after they receive their second dose in a two-dose series OR or two weeks after their first dose for single-dose vaccines according to the Centre of Disease Control.[13]

Higher OOPE was considered as Rs.500 Indian National Rupee (INR) or $6.75 according to the study conducted by Goruntla where the median willing to pay for a dose of COVID-19 vaccine was INR: 500 and also depending on the minimum price of availability of adult vaccines in India and also the affordability of vaccines in the urban poor.[14] Average Exchange rate for the year 2021 was $0.0135USD.

Data analysis: Data collected was entered in MS excel and computed using SPSS 25. Descriptive statistics in percentages, mean, median and Standard deviation was calculated. Inferential statistics logistic regression was used to assess the factors associated with COVID-19 vaccination. *P <0.05* was considered statistically significant.

RESULTS

The mean age of the participants 42.37±14.41. Majority of participants 428 (97.7%) availed the vaccination in the government sector. Table 1 describes the socio-demographic profile of participants. The majority of the study participants had hypertension 52 (64.2%), followed by diabetes mellitus 35 (43.2%) and thyroid disorders 7 (8.6%). 428 of the participants (97.7%) utilized the government facility. Majority administered Covishield 398 (90.9%). Fever was the most common adverse event following immunization in 265 (60.5%) (Table 2). OOPE for direct and indirect incurred by the participants for COVID-19 vaccination is shown in Table 3. Higher OOPE was coded as 1. The factors associated with higher OOPE was with type of vaccine (OR=2.141, 95% CI=1.07-4.24) occupation of the study subject (OR=2.043, 95% CI= 1.37-3.03), reported stress following vaccination (OR=1.72, 95% CI=1.098-2.703), adverse event within 48hrs (POR=2.125, 95% CI= 1.248-3.62), received any medication for adverse event (OR= 1.721, 95% CI= 1.022-2.84) (Table 4). The factors which were included in the bivariate logistic regression was included in the multivariate logistic regression and the predictor type of vaccine p 0.006, was significant, with Odds Ratio=2.820, 95% CI=1.342-5.928 and was associated with higher OOPE and rest of the factors were not significant statistically (Table 5).

Table 1: Socio-demographic profile of participants (n=438)

Variables	Frequency	Percentage
Age in years		
19-20	17	3.9
21-30	99	22.6
31-40	94	21.5
41-50	101	23.1
51-60	80	18.3
61-70	40	9.1
71-80	7	1.6
Gender		
Male	245	55.9
Female	193	44.1
Religion		
Hindu	377	86.1
Muslim	61	13.9
Marital Status of Participant		
Married	359	82.0
Unmarried	78	17.8
Divorced	1	0.2
Education of Participant		
Illiterate	81	18.5
Primary school	35	8.0
Middle school	56	12.8
High school	121	27.6
intermediate/diploma	67	15.3
Graduate	63	14.4
Professional/postgraduate	15	3.4
Occupation of Participant		
Unemployed	163	37.2
Unskilled worker	87	19.9
Semi-skilled worker	79	18.0
Skilled	37	8.4
Clerical/shop Farmer	37	8.4
Semi-professional	21	4.8
Professional	14	3.2
Education of Head of household		
Illiterate	88	20.0
Primary school	52	11.9
Middle school	52	11.9
High school	138	31.5
Intermediate/diploma	60	13.7
graduate	45	10.3
professional/postgraduate	3	0.7

Variables	Frequency	Percentage
Occupation of Head of household		
Unemployed	7	1.6
Unskilled worker	42	9.6
Semi-skilled worker	112	25.6
Skilled	94	21.5
Clerical/shop Farmer	161	36.8
Semi-professional	12	2.7
Professional	10	2.3
Total income of Household		
<10000	80	18.3
≥10000 – 20,000	220	50.2
≥20000- 30,000	79	18.0
≥30000-40,000	30	6.8
≥40000-50,000	10	2.3
>50,000	19	4.33
Co-morbidity		
Yes	81	18.5
No	357	81.5

Table 2: Percentage distribution of the type, place, adverse event after receiving COVID-19 vaccination

Variables	Frequency	Percentage
Types of Vaccine		
Covishield	398	90.9
Covaxin	40	9.1
Reported Stress following vaccination		
Yes	335	76.5
No	103	23.5
Adverse Event Following Immunization within 48hrs		
Yes	367	83.8
No	71	16.2
Adverse Event Following Immunization*		
Fever	265	60.50
Myalgia	161	36.8
Pain at the injection site	195	44.5
Headache	43	9.8
Malaise	13	3.0
Received any medication for Adverse Events		
Yes	367	85.6
No	71	14.4
Type of medicine		
Antipyretic	325	74.2
Analgesic	32	7.3
Antihistamine	10	2.3
None	71	16.2

*Multiple responses

DISCUSSION

The COVID-19 pandemic created havoc to many nations' lives, health, and economies. Vaccination is an effective measure to prevent against infectious diseases. COVID-19 vaccination helped save lives, stabilize health systems and drive economic recovery.[15]

In the current study majority of the participants 97.7% utilized the government CVC and only 2.3% utilized the private CVC for COVID-19 vaccination, which was in contrast to study by Pattnaik et al. where 21.1% preferred vaccination in the private centre. This could be due to study population where the age group was children, 12-23 months.[16]

This study was conducted in the urban poor locality. Study conducted by Sriram et al. revealed that considering the poor people alone, the proportion of people becoming poor after making OOP payments has increased in the urban areas but has decreased in the rural areas to a small extent. This shows that people in the urban areas are faced with higher levels of OOP health expenditures which push them into poverty.[17]

Our study revealed the most common adverse event was fever in 60.50%, myalgia in 36.8%, pain at the injection site 44.5%, headache in 9.8%and malaise in 3.0 %. which was in contrast Study conducted in Bangladesh by Parvej et al. showed fever (36.05%), muscle pain (31.69%), pain in the injection site (30.67%), and headache (23.40%) can be due to different geographical location.[18] Around 85.6 % had received medication for the adverse events, which was in contrast to study conducted by Parvej et al. where only 37.65 had received medication.[18] In the current study the most common medication received is antipyretic 74.2%, which is similar to Jain et al.[19]

COVID-19 vaccination plan and strategies in India have undergone several amendments and modifications since its initiation and improved as well as addressed its earlier pitfalls and drawbacks.[20] In the current study, the cost of vaccine and administration charges in the Government CVC is 0% as per with the National COVID Vaccination Programme, where it is provided free of cost to all the eligible beneficiaries.[21]

In order to pace the vaccination programme, individuals who could afford had the availability of vaccine in the private hospital and the Centre

Table 3: OOPE incurred for COVID-19 vaccination

Direct cost (n=438)	No. of participants (%)	Median INR	Median in Dollars	Total amount in INR	Total amount in USD
1. Cost of vaccine & administration charges	7(1.59%)	1125	$15.18	13750	185.63
2. Medication	24(5.47%)	27.20	$0.36	2104	28.40
Total Direct Cost				15854	214.03
Indirect cost					
1.Travel expenses (to and from) participant & Attendee	282(64.38%)	120	$1.62	64229	867.10
2. Loss of wages participant & Attendee	210(47.94%)	1000	$13.5	293470	3961.85
Total Indirect Cost				357699	4828.93
Grand Total				373553	5042.96

Median is calculated for only who have incurred the cost

Table 4: Bivariate logistic regression of variables associated with OOPE on COVID-19 vaccination

Variables in the Equation								
		B Co-efficient constant	S.E.	Wald	df	Sig.	Exp(B)	95% of CI LB-UB
Step 1[a]	Age	-.006	.007	.832	1	.362	.994	.981 -1.07
	Constant	.221	.298	.550	1	.458	1.247	
Step 1[a]	Gender (1)	.437	.194	5.085	1	.024	1.548	0.442 -0.944
	Constant	-.282	.145	3.752	1	.053	.755	
Step 1a	Comorbidity	.229	.247	.855	1	.355	1.257	0.774 -2.401
	Constant	-.452	.460	.967	1	.325	.636	
Step 1a	Type of vaccine	.761	.352	4.670	1	**.031**	**2.141**	**1.073 -4.24**
	Constant	-1.492	.683	4.778	1	.029	.225	
Step 1a	Place of vaccination	1.452	.796	3.322	1	.068	4.271	0.892 -20.34
	Constant	-1.517	.814	3.475	1	.062	.219	
Step 1a	Education	.290	.248	1.368	1	.242	1.337	0.94 -2.65
	Constant	-.563	.461	1.494	1	.222	.569	
Step 1a	Occupation	.714	.202	12.521	1	**.000**	**2.043**	**1.37-3.035**
	Constant	-1.202	.345	12.164	1	.000	.300	
Step 1a	Education of household	-.074	.240	.096	1	.756	.928	0.581 -1.45
	Constant	.097	.442	.048	1	.826	1.102	
Step 1a	Occupation of head of household	21.198	15191.270	.000	1	.999	1607969059.351	0.000
	Constant	-42.401	30382.541	.000	1	.999	.000	

Variables in the Equation								
		B Co-efficient constant	S.E.	Wald	df	Sig.	Exp(B)	95% of CI LB-UB
Step 1[a]	Duration	.009	.007	1.618	1	.203	1.009	.995 -1.02
	Constant	-.163	.137	1.399	1	.237	.850	
Step 1[a]	Reported stress following vaccination	.544	.230	5.598	1	**.018**	**1.723**	**1.098-2.703**
	Constant	-.998	.419	5.678	1	.017	.369	
Step 1[a]	Adverse event within 48 hr of vaccination	.754	.272	7.695	1	**.006**	**2.125**	**1.248-3.62**
	Constant	-1.426	.513	7.741	1	.005	.240	
Step 1[a]	Received any medication for side effect	.543	.266	4.171	1	**.041**	**1.721**	**1.022 -2.84**
	Constant	-1.031	.500	4.255	1	.039	.357	

a. Variable(s) entered on step 1: Gender, Comorbidity, Type of vaccine, Place of Vaccination, Education of participant, Occupation of participant, Education of head of household, Occupation of head of Household, Duration, Side effect, reported stress following vaccination, Received any medication for side effect

Table 5: Multivariate logistic regression of variables associated with OOPE on COVID-19 vaccination

Parameter Estimates									
Variable		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
1.00	Intercept	-4.374	1.788	5.986	1	.014			
	Age	-.022	.011	4.034	1	.045	.979	.958	.999
	Gender	-.516	.230	5.012	1	.025	.597	.380	.938
	Education	-.313	.096	10.530	1	.001	.731	.606	.884
	Occupation	.096	.072	1.743	1	.187	1.100	.955	1.268
	Education of head of household	-.027	.073	.132	1	.716	.974	.844	1.124
	Total income of household	.000	.000	.008	1	.931	1.000	1.000	1.000
	Comorbidity	.045	.291	.024	1	.877	1.046	.591	1.850
	Duration	.009	.008	1.236	1	.266	1.009	.993	1.024
	Type of vaccine	1.037	.379	7.481	1	**.006**	**2.820**	**1.342**	**5.928**
	Place of vaccination	1.643	.876	3.520	1	.061	5.172	.929	28.790
	Reported stress following vaccination	.183	.363	.255	1	.614	1.201	.590	2.446
	AEFI within 48 hrofvaccination	.789	.514	2.360	1	.125	2.202	.804	6.028
	Received any medication for AEFI	-.200	.419	.228	1	.633	.819	.361	1.860

a. The reference category is: 0.00

capped the maximum price, for Covishield 780 INR or $10.53, Covaxin 1410 INR or $19.04, Sputnik V 1145 INR or $15.46 in June 2021.[21] South Africa's government purchased Oxford and AstraZeneca vaccine for health workers costs $5.25 a dose, European Union (EU) at $2.15. The Moderna vaccine's costed US about $15 a dose, and EU paid $18.The Oxford-AstraZeneca vaccine costed UK$3 and US$4. The lower price in the cost of vaccine in these countries was due to investment in the research and development of vaccines.[22]

In the present study, the cost of vaccine and administration charges in the private CVC was five times that of Government CVC. Similarly, with the views of Rackimuthu et al. where they reiterated that pricing of vaccines in the private sector was several times the cost at which the vaccines are being sold to the government, creating an exponential burden for the proportion of the population availing vaccines from private hospitals.[20] However, even the most recent guidelines have scope for further improvement to bolster India's COVID-19 vaccination response. The current service charge that has been capped at 150 Indian rupees is 50% more than the earlier prescribed 100 Indian rupees. This hike in service charge is not strongly justified and will only add to the financial burden of the Indian population, especially those belonging to lower socio-economic status.[20]

The results of the logistic regression on factors of COVID-19 vaccination revealed the independent variables type of vaccine, occupation of the study participant and adverse event within 48 hrs, had 2 times higher OOPE and reported stress following vaccination and received any medication following side effects had 1-time higher OOPE. However, when the individual variables were assessed, it was found to be not significant. In the multivariate logistic regression only type of vaccine was found to have1 time the higher OOPE whereas other variables were found to be not significant. This could be due to the confounding effect and interaction effect.[23]

To our knowledge, this is the only study calculated on OOPE on COVID-19 vaccination in adults. Further studies involving larger population need to be conducted across different parts of the country.

CONCLUSION

Most of the study population utilized the government facility. The cost of vaccine and administration charges in the private CVC was high. The factors associated with higher OOPE was type of vaccine, occupation of the study subject, reported stress following vaccination, adverse event within 48hrs, received any medication for adverse event. The need to further re-strategize vaccination policy and plans in India against COVID-19 should be emphasized tohelp achieve long-term positive outcomes by vaccinating as many individuals as possible in the shortest feasible timeframe by hopefully considering a more people-centric approach.

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Lavanya, Dr. Ambika, Dr. Anjaly K Prakash, Dr. Anusha G V, Dr. Ashwini A, Dr. Bhoomika Choudary, Dr. Bhomika M O and Medical social workers Akshay Kumar, Shivaprasad and Health Inspector Durgesh for the support rendered for the smooth conduction of study. Authors are grateful for the study participants.

Conflict of Interest: None declared.

Funding Statement: Nil.

Ethical Approval: The study was approved by the Institutional Ethical Committee, Akash Institute of Medical Sciences & Research Centre.

Authors' Contribution: Sunil Kumar- Concept of article, statistical analysis, revision draft Lakshmi Hulugappa- Concept of article, Methodology, co-ordinated the data collection, drafted the first article Srividya- Critical revision and final approval Manjula – Statistical analysis Madhura M M- revision of article

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