Global Journal of Medicine & Public Health

Vaccine coverage among the people of Mysuru, Karnataka, India following the second wave of COVID-19: a cross-sectional study

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ABSTRACT

Introduction

The development and broad use of an effective COVID-19 vaccine could prevent significant morbidity and mortality from the disease while mitigating the disruption and distress caused by secondary consequences of non-pharmaceutical interventions such as lockdowns and physical distancing.

Methodology

A cross-sectional study was conducted from June to July 2021 to assess the coverage of COVID-19 vaccination in Mysuru, Karnataka, India following a vaccination drive initiated by the Government of India. A door-to-door closed-ended questionnaire survey was conducted (n=138), taking adequate COVID-19 protection measures.

Results

The overall vaccine coverage among the study participants was 69%, out of which 54% were partially vaccinated and 15% were fully vaccinated. Among the participants who received the vaccine, 94% had received Covishield™ and 6% had received Covaxin™. The reasons reported for not taking vaccination included fear of side effects, non-availability of vaccine and assumptions of not being at risk of, or from, COVID-19 infection.

Conclusion

Respondents were concerned about the efficacy and safety of COVID-19 vaccines which provides an important perspective for future educational initiatives. Further research is needed, particularly in larger populations, to acquire a better understanding of vaccination acceptability and likely impressions of future COVID-19 vaccines.

Keywords: COVID-19, Vaccine, Efficacy, Safety

GJMEDPH 2022; Vol. 11, issue 2 | OPEN ACCESS

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Conflict of Interest—none | **Funding—**none

INTRODUCTION

SARS-CoV-2, the virus that causes coronavirus disease (COVID-19), was first detected in late 2019 in Wuhan, China. Since then, it has spread rapidly all over the world, causing outbreaks in nearly every country.[1,2] It is characterized by fever, cough, fatigue, shortness of breath, pneumonia and other respiratory tract symptoms. In severe situations, it can lead to death.[3] On March 11, 2020, WHO declared the COVID-19 outbreak a worldwide Public Health Emergency of International Concern (PHEIC).[4] As of January 10, 2022, there had been 308,458,509 confirmed cases and 5,492,595 deaths reported worldwide.[5]

The first confirmed case of COVID-19 in India was detected in Kerala on January 30, 2020. In the weeks that followed, several travel-related events were confirmed across the country. On March 25, 2020, the central government launched one of the world's largest lockdowns, consisting of non-pharmaceutical interventions (NPIs) such as physical distancing and restrictions on non-essential travel, in order to slow the spread of the virus and lower peak incidence.[2,6,7] With 3.6 million recorded cases and 450,000 deaths by the beginning of 2022, India is the second most COVID-19-affected country in terms of the overall number of infected persons, trailing only the USA.[8]

Countries have implemented various containment and mitigation techniques, but vaccines are the most effective weapon for fighting the disease and allowing normal activities to resume. By mid-2022, several COVID-19 vaccines were in development, with 63 candidates undergoing Phase III clinical trials.[9,10] The first mass vaccination campaign began in early December 2020, and as of 10 January 2022, there had been 9,194,549,698 doses administered worldwide.

By the end of 2021, WHO had issued emergency use authorizations for seven vaccines Pfizer/BioNTech, Covishield™, AstraZeneca, Janssen developed by Johnson & Johnson, Moderna, Sinopharm, Sinovac-CoronaVac and Bharat Biotech's Covaxin™[11]

On January 16, 2021, India began administering COVID-19 vaccinations and had delivered 1.53 billion doses overall as of 12 January 2022, including first and second doses of the currently licensed vaccines. The Oxford–AstraZeneca vaccine and Covaxin™ were the first to be approved in India, followed by Sputnik V, developed by Russia. Others, such as Moderna, Johnson & Johnson, and ZyCoV-D, were undergoing local clinical trials at the time of writing.[12,13,14]

However, there are concerns that the current vaccination rate will not be enough to stop the epidemic. In certain parts of India, there are significant discrepancies in vaccine coverage based on gender, class and rural-urban divides.[15,16] While availability and distribution of vaccines remains an issue, in regions where vaccines are available, vaccination hesitancy can be a barrier to uptake. Vaccine denial and hesitancy have existed in societies from the time of Jenner's smallpox vaccine: anti-vaccination groups have always coexisted with advancements in vaccine technology. Apprehension and refusal to accept vaccines are common in India, even for routine immunization; vaccine hesitancy linked to COVID-19 vaccines is neither new nor surprising.[15,17]

India was one of the worst-affected countries during the first and second waves of COVID-19. Hospitals were packed. Oxygen and beds for patients affected with severe COVID-19 were in low supply. This terrible scenario resulted in a significant increase in vaccination demand and a decrease in hesitation but there is still concern about a third wave of illnesses looming large. Hence, it is important to determine the amount of vaccine coverage still required in the community. This study was carried out to estimate the level of vaccination coverage and its determining factors in a selected population in urban Mysuru, India. A secondary aim was to assess individuals' history of COVID-19 infection before and after getting the COVID-19 vaccine, and associated symptoms.

METHODS AND MATERIALS

A community-based cross-sectional study was carried out within the field practice area of the Department of Community Medicine, JSS Medical College, Mysuru, Karnataka (Medhar Block Urban Health Centre) for two months, June–July 2021. All patients above the age of 18 years who consented to participate in the study were included. Exclusion criteria were pregnant and breast-feeding mothers and those suffering from mental or physical disabilities. The study protocol was approved by the institutional ethics committee.

The Medhar block urban health centre has a total of 2,055 households in the region, with a total population of 7,842 persons (3,979 females and 3,863 males). The required sample size for this survey was calculated based on an overall acceptance rate of 80% in Asian countries, determined from a global survey.[18] At a confidence interval of 95% and an absolute precision of 7%, the sample size was calculated as 125.[19]

Sample size, $n=\frac{Z^2PQ}{L^2}$

where Z = 1.96; P = 80% for the survey response rate, Q= (100-P) and d = 7%.

The minimum number of participants required for this study was therefore 125. Using systematic random sampling, a first house in the block was selected between house numbers 1–15, after which every 15th house was selected for the study. In the case of there being no response from the 15th house selected, the next house was selected. The eldest person available in each house at the time of the survey was included in the study. A pretested, semi-structured interview questionnaire was used to collect data. The questionnaire had three parts: part 1 recorded sociodemographic factors: age, gender, education, occupation, place of residence (Table 1). Part 2 asked about the patients' existing medical history, smoking status and vaccination details (type and place of vaccination, number of doses and if not fully vaccinated, the reasons for it). Part 3 included questions to assess the history of COVID-19 infection and symptoms associated with it. The data collected was entered in a Microsoft Excel 2019 spreadsheet and was analyzed using IBM SPSS (Statistical package for Social Science) Windows, Version 26.0. The socio-demographic details were represented using mean, standard deviation and percentages. The possible association between demographic variables and vaccination coverage was found using the Chi-square test/Fisher's Exact test. A p-value of >0.05 was considered statistically significant.

Table 1 Sociodemographic profile of study participants

Variable	Characteristics	Frequency (n)	Percentage (%)
Age (in years)	18-45	68	49%
	45-60	37	27%
	>60	33	24%
Gender	Male	50	36%
	Female	88	64%
Residence	Urban	104	75%
	Rural	34	25%
Education	Professional	0	0%
	Graduate	29	21%
	Intermediate/ diploma	16	12%
	High school	28	20%
	Middle school	26	19%
	Primary school	11	8%
	Illiterate	28	20%
Occupation	Legislators, senior officials and managers	0	0%
	Professional	6	4%
	Technicians and associate professionals	5	4%
	Clerks	17	12%
	Skilled worker and shop and market sales	13	9%
	Skilled agriculture and fishery worker	1	1%
	Elementary Occupation	11	8%
	Unemployed	85	62%

RESULTS

The present study enrolled 138 study participants from the household survey. More participants were female (64%) than male, most likely because females were more likely to be at home during the day when the survey was conducted. Most respondents resided in urban areas (75%), reflecting where the survey was conducted. The mean age of the study participants was 47.77±16.61 years (Table 1).

Out of the 138 study participants, 74 (54%) were partially vaccinated with one dose, 21 (15%) were fully vaccinated with two doses and the remaining 43 (31%) had not received any vaccine. At the time, the vaccine should have been available to all those surveyed.

Among the 95 participants who had received the vaccine, 89 (94%) had received Covishield™ and 6 (6%) had received Covaxin™. The majority (91%) of them had received their vaccines at Government-run health centres. Forty-seven out of the 138 participants had a history of non-communicable disease, which should have put them at priority for vaccination, of whom 64% were vaccinated. Vaccination coverage was highest among the age group >60 years (79%) followed by 45-60 years (78%).

More male participants were vaccinated than females (86% and 59% respectively) and vaccination coverage was much higher amongst people residing in urban areas (85% vs 21%). All these differences were found to be statistically significant (Table 2, following page).

Among the selected population, 31% were not vaccinated at all. Participants were more likely to be unvaccinated in the younger age group, if they were female, and if they resided in a rural area. Illiterate people were more likely to be unvaccinated compared to people who had received more education. All these associations were found to be significant (Table 3). The reasons reported for not taking the vaccine included non-availability of vaccine (58% of those not vaccinated), fear of side effects (58%), an assumption of not being at risk of getting COVID-19 infection (10%) and recent history of COVID-19 infection (10%) (Table 4).

Eleven (8%) out of the 138 participants knew they had been infected with COVID-19 (Fig 2). All of these had been infected before getting vaccinated and they had had symptoms for an average duration of 7 days. 82% of those infected with COVID-19 had taken the vaccine after recovery. Six of the 11 participants who had been infected reported having a residual cough.

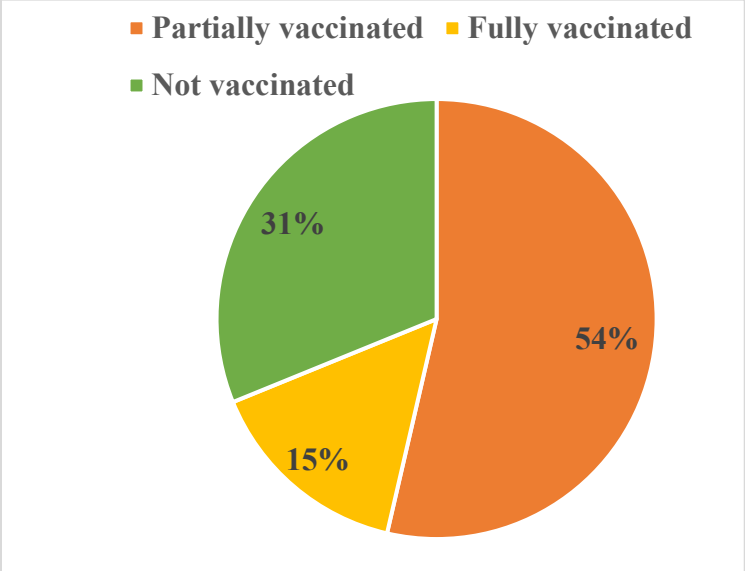

Fig 1: Vaccine coverage in Mysuru, India during the second wave of the pandemic in June-July 2021

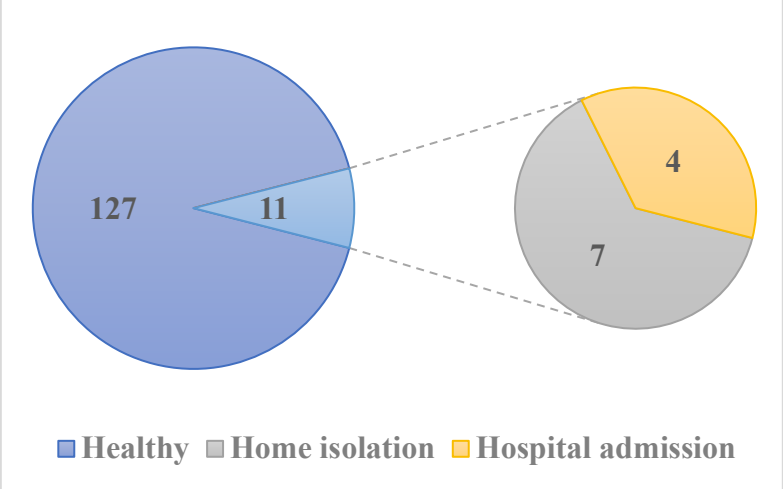

Fig 2: Eleven participants had a known previous COVID-19 infection, and four had been hospitalized.

Table 2 Factors associated with vaccine coverage *(*Statistically significant)*

Variable	Characteristics	Partially vaccinated (%)	Fully vaccinated (%)	Not vaccinated (%)	Chi-square value	p-value
Age (in years)	18-45	34 (50%)	6 (9%)	28 (41%)	12.351	0.015*
	45-60	24 (65%)	5(13%)	8 (22%)		
	>60	16 (49%)	10 (30%)	7 (21%)		
Gender	Male	34 (68%)	9 (18%)	7 (14%)	10.831	0.004*
	Female	40 (45%)	12 (14%)	36 (41%)		
Place of residence	Urban	67 (65%)	21(20%)	16 (15%)	49.758	<0.001*
	Rural	7 (21%)	0 (0%)	27(79%)		
Education	Graduate	23 (79%)	4 (14%)	2 (7%)	17.402	0.066
	Intermediate/dip	9 (56%)	0 (0%)	7 (44%)		
	High school	11 (39%)	5 (18%)	12 (43%)		
	Middle school	11(42%)	4 (15%)	11 (42%)		
	Primary school	6 (55%)	2 (18%)	3 (27%)		
	Illiterate	14 (50%)	6 (21%)	8 (29%)		

Table 3 Factors associated with hesitation for vaccination *(*Statistically significant)*

Variable	Characteristics	Unvaccinated (%)		Chi-square value	p-value
		Yes	No		
Age (in years)	18-45	28 (65%)	40 (43%)	6.272	0.043*
	45-60	8 (19%)	29 (31%)		
	>60	7 (16%)	26 (27%)		
Gender	Male	7 (16%)	43 (45%)	10.763	0.001*
	Female	36 (84%)	52 (55%)		
Place of residence	Urban	16 (37%)	88 (93%)	48.970	<0.001*
	Rural	27 (63%)	7 (7%)		
Education	Graduate	2 (5%)	27 (28%)	12.599	0.027*
	Intermediate/ diploma	7 (16%)	9 (10%)		
	High school	12 (28%)	16 (17%)		
	Middle school	11 (26%)	15 (16%)		
	Primary school	3 (27%)	8 (8%)		
	Illiterate	8 (19%)	20 (21%)		

Table 4: Reasons given for not being vaccinated *(respondents could give more than one answer)*

Reasons for not being vaccinated	n (%)
Fear of side effects	17 (55%)
Non- availability of vaccine	17 (55%)
Assumption of not being at risk of COVID- 19 infection	3 (10%)
Recent history of COVID- 19 infection	3 (10%)
Do not trust the vaccine	1 (3%)
Fear of getting COVID- 19 infection	2 (6%)

DISCUSSION

In the present study, the overall vaccine coverage among the selected urban population in Mysuru was 69% of which 74 (54%) were partially vaccinated, 21 (15%) were fully vaccinated and the remaining 43 (31%) had not received any vaccine; of these, 58% reported that the vaccine was unavailable.

In a similar study in Bengaluru, only 583 (36%) out of 1,638 study participants had taken the COVID vaccine of which 91% were partially vaccinated and the remaining 8.5% were fully vaccinated; however this was undertaken at an earlier stage of the pandemic when vaccine roll-out had only recently begun.[19] Similar studies have been conducted around the world. Jordan, Kuwait and other Arab countries have been found to have a low acceptance rate, of 29% for COVID-19 vaccines,[20] China has been shown to have a very high acceptance rate, of 90% (out of 19 countries studied), with relatively high acceptance rates (>80%) in Asian countries, which also have high trust in government. Acceptance rates are also high in Brazil, India and South Africa.[18]

Similar to this study, others have found males more likely to be vaccinated compared to females and people with histories of chronic disease to have high rates of COVID-19 vaccine acceptance.[20]

In the present study, around 31% of participants were not vaccinated, similar to recorded rates in Ireland (35%) and the United Kingdom (31%) at the time;[21] higher rates have been recorded in other countries, for example 56% in Portugal.[22] A similar study carried out in Bengaluru, India, showed socioeconomically disadvantaged groups and those having poor knowledge regarding COVID-19 to be more likely to have a negative attitude toward vaccination. Further, fear of losing a day's pay, possible adverse events, lack of knowledge and financial distress are among other reported reasons for vaccine hesitancy.[19]

In the present study, out of the 95 participants who received the vaccine, 94% received Covishield™ while 6% received Covaxin™. Only 11 participants were aware of a previous COVID-19 infection and none of the participants reported breakthrough infection. According to Government of India data, 23,940 people in India were infected with COVID-19 after receiving Bharat Biotech's Covaxin™ throughout the research period, accounting for 0.13% of all vaccination doses given, while the Serum Institute of India's Covishield™ has been linked to 119,172 breakthrough infections, or 0.07% percent of all doses delivered.[23]

This study has some limitations. The data was collected during the first weeks of the second lockdown imposed in India. The number of female respondents in the study was much larger than the number of male respondents. Social circumstances may have affected vaccine acceptance, hesitancy and resistance rates. The study is limited to a single geographic region in Mysuru and is not a representative survey of the entire State of Karnataka, or of India. We noticed that even among some individuals who had accepted the vaccine, there were doubts over safety, but some had been forced to get vaccinated by their employers. This aspect of vaccination hesitancy was not quantified.

CONCLUSION

The overall vaccine coverage among the study participants was 69% out of which 54% were partially vaccinated and 15% were fully vaccinated. Gender, age and place of residence were all found to be significant factors associated with vaccine coverage. The study found that respondents were concerned about the efficacy and safety of COVID-19 vaccinations, which provides an essential perspective for future educational campaigns aimed at increasing vaccination rates. Moreover, as additional studies confirm the safety and effectiveness of existing vaccine candidates, vaccine acceptance may be raised in future study communities. More research, especially in a larger population, is needed to gain a better understanding of vaccination acceptability, willingness to pay for vaccines, public behaviour and perceptions of future COVID-19 vaccines. This will aid decision-makers in developing effective ways to help India successfully implement the COVID-19 vaccination campaign.

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