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COVID-19 Vaccination Coverage and Breakthrough Infections in People Aged 12 Years and Above

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ABSTRACT

Introduction: WHO declared COVID-19 as public health emergency of international concern in January 2020, and later declared as pandemic on 11 March 2020.One of the major risk groups for covid-19 are people in overcrowded urban slums and migrants.

Objectives: To determine the COVID 19 vaccination coverage among people aged 12 years and above in the field practice area of UHTC, NMC, Nellore; To estimate the prevalence of breakthrough infections after COVID 19 vaccination in the field practice area of UHTC, NMC, Nellore.

Methodology: A community based cross sectional study was conducted in Urban slums belonging to Urban Field Practice area of Narayana Medical College, Nellore, Andhra Pradesh for a period of three months. Data was collected with Predesigned, pretested, semi structured questionnaire, and entered in Microsoft excel and data was analyzed by using 'SPSS version 25'.

Results: In the present study 92.4% (183 out of 198) of the study subjects had taken COVID vaccine of which 142(71.7%) had taken two doses, 25(12.6%) and 16(8.1%) had taken one dose and booster dose respectively.

Conclusion: Prevalence of breakthrough infection rate is relatively high in urban slums and migrants because of overcrowding and lack of sanitation practice in urban slums.

Key word: COVID-19 vaccination, Break through infections, urban slums.

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INTRODUCTION:

The ongoing pandemic of Corona virus disease 2019(COVID-19) is caused by Severe Acute Respiratory Syndrome Corona virus 2 (SAR-COV-2). The virus was first identified in December 2019 in Wuhan, China. The world health organization declared it as public health emergency of international concern in January 2020, and later declared as pandemic on 11 March 2020. After an increasing trend over the past five weeks, globally, the number of weekly cases during the week of 11 to 17 July 2022 remained stable, with just under 6.3 million new cases. The number of new weekly deaths was like the figure reported during the previous week, with 11,000 fatalities reported[1].

India began its COVID vaccination program on 16 January 2021, by operating 3006 vaccination centers across the country. As on July 11, 2022, about 1.98 billion doses of vaccine have been administered including first, second and booster doses[2].

A breakthrough COVID infection is defined as the detection of SARSCoV-2 RNA or antigen in a respiratory specimen collected from a person ≥14 days after receipt of all recommended doses of an approved COVID-19 vaccine[3].

Immunization is the process where in a person is made immune or resistant to an infectious disease, typically by administering vaccine and stimulating human body to the pathogen there by making immune system competent enough to combat the infection. From history we can easily make out how vaccines helped in eradicating smallpox, eliminating polio from India. Vaccines also help in reducing disease burden, mortality and morbidity associated with a disease. By vaccinating two-thirds of the population we can reach herd immunity threshold thereby preventing further spread of the disease and breaking the transmission chain[4].

During the early stages of the COVID pandemic, scientists hypothesized that SARS-CoV-2 transmission would be slowed by herd immunity resulting from spontaneous infection, vaccination, or both[5].

The present study was conducted to determine the COVID 19 vaccination coverage and to estimate the proportion of breakthrough infection among people aged 12 years and above in the field practice area of Urban Health Training Center, Narayana Medical College, Nellore.

METHODOLOGY

A community based cross-sectional study was conducted among 198 people aged 12 years and above residing for more than one year in the field practice area of urban health training centre of Narayana Medical College, Nellore. People who were sick and not able to give information were excluded from the study. The study was conducted from March 2022 to May 2022. The study was conducted by house-to-house visit. To select the sample population first one street was selected randomly and then in the selected street one house was selected randomly. The subsequent houses were selected by following right hand rule. In each house only one subject was selected randomly to include in the study. Data was collected three days a week. During the three-month study period 198 subjects were studied. The data was collected from the selected subject after taking the written informed consent. The data was collected in a pre-designed pretested questionnaire by interview method. The data was entered in MS Excel and then analyzed using SPSS version 25. Ethical clearance was taken from the Institutional Ethics Committee.

RESULTS

TABLE 1: COVID vaccination profile in the locality

Vaccine Taken	Frequency	Percent
Yes	183	92.4
No	15	7.6
Total	198	100
Vaccine type		
COVISHIELD	80	43.7
COVAXIN	103	56.3
Total	183	100

In the present study 92.4% were vaccinated. Out of 183 vaccinated 56.3% received COVAXIN and 43.7% received COVISHIELD. In the present study out of 15 participants who did not receive vaccine, 7 (46.6%) had not taken vaccine due to the fear of vaccination, 5(33.3%) had not got vaccine due to

other reasons, 2(13.3%) were not aware of vaccine and only 1(6.66%) had not taken because of severe illness.

TABLE 2: Distribution of study subjects by breakthrough infection

Breakthrough infection	Type of Vaccine		Total	P Value
	COVISHIELD	COVAXIN		
Yes	9 (11.25%)	8(7.77%)	17(9.29%)	<0.0001
No	71(88.75%)	95(72.73%)	166(90.71%)	
Total	80(100%)	103(100%)	183(100%)	

The prevalence of breakthrough infection was 9.29%. The prevalence was 11.25% in COVISHIELD vaccine receivers compared to 7.77% in COVAXIN receivers and the difference was statistically significant.

The overall prevalence of breakthrough infection was 9.29%. The prevalence of breakthrough infection was 18.75% in individuals who have received one dose of vaccine, 9.86% in individuals who have received two doses of vaccine, and zero prevalence was reported in individuals who have received three doses of vaccine. The differences were statistically significant.

TABLE 3: Distribution of study subjects by breakthrough infection and number of doses of vaccine

Breakthrough infection	NUMBER OF DOSES TAKEN			Total	**P Value**
	One	Two	Booster		
Yes	3 (18.75%)	14 (9.86%)	0	17(9.29%)	**<0.0001**
No	13 (81.25%)	128 (90.14%)	25 (100%)	166(90.71%)	
Total	16 (100%)	142 (100%)	25 (100%)	183(100%)	

DISCUSSION:

In the present study 92.4% of the study population was vaccinated, of them 56.3% got vaccinated with COVAXIN and 43.7% got vaccinated with COVISHIELD. A study conducted by K.Tyagi et al. (2021)[6] at Fortis CDOC Centre of Excellence for Diabetes, Metabolic Diseases & Endocrinology, New Delhi, India estimated COVID vaccination coverage as 91.87% which is almost similar to our study .The same study reported that 24.78% of the vaccinated individuals received COVAXIN and 75.22% received COVISHIELD. However, these findings were different from our study.

In the present study the overall prevalence of breakthrough infection was 9.29%. The prevalence of breakthrough infection was 18.75% in individuals who have received one dose of vaccine, 9.86% in individuals who have received two doses of vaccine, and zero prevalence was reported in individuals who have received three doses of vaccine. The differences were statistically significant.

A higher prevalence of breakthrough infection (16.8%) was reported in a study conducted by K.Tyagi*et al. (*2021)[6] at Fortis CDOC Center of Excellence for Diabetes, Metabolic Diseases & Endocrinology, New Delhi, India. Compared to our study a lower prevalence of breakthrough infection (1.2%) was reported by Sunil Kumar et al (2021).[4].

In the present study 7.6% of the study population was not taken vaccine. Out of them 46.6% has not taken vaccine due to fear of vaccination ,33.3% has not got vaccine due to other reasons, 13.3% were not aware of

vaccine and only 6.66% has not taken because of severe illness.

LIMITATIONS: This study is done in a small, selected group of people; therefore, the results cannot be generalized

CONCLUSION: The vaccine coverage was good with a proportion of 92.4% of the study subjects being vaccinated. The incidence of breakthrough infection with COVID was 9.29% and a higher incidence (18.75%) was reported after 1st dose. A statistically significant high incidence of breakthrough COVID infection was reported in COVISHIELD vaccine receivers compared to COVAXIN vaccine receivers.

RECOMMENDATIONS:

The reasons for breakthrough infections needs to be investigated; A continuous surveillance of vaccinees is required for early detection of breakthrough COVID infections; Booster doses of vaccine is required to maintain high levels of immunity.

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