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Abstract

Background: One of the keys to preventing a re-emergence of the COVID-19 pandemic is the attainment and maintenance of high vaccination coverage in urban and rural areas.

Aims: To estimate the coverage of COVID-19 vaccination in a rural population and identify the determinants of vaccination.

Methodology: A cross-sectional survey was conducted in April 2023 in 5 rural districts of Sindh Province, Pakistan. From each district, 30 clusters (villages) were randomly selected, and 7 households were randomly sampled from each cluster using the 30/7 technique. Household members above 12 years of age were included. Vaccination status was categorized as non-vaccinated, partially vaccinated (either with 1 dose or without booster) and completely vaccinated (2 doses with 1 booster). Adjusted odds ratios with 95% confidence intervals using multinomial logistic regression were computed to determine the factors associated with partial and complete vaccination. Data was analysed using SPSS version 20.

Results: Among the 3545 individuals surveyed across 1050 households, 25.9% were not vaccinated, 55.0% were partially vaccinated, and 19.1% were fully vaccinated. Younger age, lack of formal education and residing in flood-affected districts were significantly negatively associated with being vaccinated, while living at

Conclusion: Vaccination coverage was low in some of the districts, particularly the flood-affected districts, mainly due to certain myths. There is a need for community outreaches to debunk myths about COVID-19 vaccination among these rural populations.

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Background

Because of the mass vaccinations, transmission of COVID-19 pandemic has slowed down globally and it is no longer considered a public health emergency of international concern (1). While re-infection with newer strains is a concern in some countries, the vaccines remain effective against all new strains (2). The need for boosters and constant surveillance will continue, as immunity against infection and vaccination wane in a few months (3). Ineffective surveillance and non-availability of vaccines may provoke a re-emergence of infection to epidemic levels (4).

Rural populations are highly vulnerable to adverse effects of any epidemic due to limited resources and preparedness (5). Awareness and prevention among rural populations have been found to be below desired levels (6). The key to preventing the re-emergence of the pandemic is to maintain high vaccination coverage and reduce urban–rural disparities. The urban–rural disparity in vaccination coverage of COVID-19 is wide, even in developed countries like the United Kingdom and United States (7,8). Vaccine hesitancy is also high in rural areas when compared to urban areas (9).

Pakistan has seen a steady decline in COVID-19 cases and deaths since the commencement of its vaccination campaign. By July 2022, two-thirds of the eligible population in the country was vaccinated for COVID-19 (10). However, urban–rural disparities in vaccine coverage are not known.

Study objective

Underserved communities without formal work or requirement to travel may not consider the COVID-19 vaccine a high priority as they struggle day-to-day with poverty, hunger and ill-health. This study aimed to estimate the coverage of COVID-19 vaccine in the underserved communities of 5 rural districts of Sindh and identify determinants of vaccination in these communities.

Methodology

This cross-sectional survey assessed the vaccination coverage in 5 rural districts of Sindh Province in Pakistan. It was carried out on 1–30 April 2023 and analysis and write-up was completed in July 2023. The 5 districts included were Dadu, Jamshoro, Hyderabad (flood-affected area), Tharparkar (desert area) and Tando Allahyar. The project was carried out in collaboration with the non-government organization (NGO) Thardeep Rural Development Program (TRDP), which is working to alleviate poverty in 5 districts of Sindh. The population in the 5 districts varies from 0.5 to 1.5 million.

WHO's 30/7 technique was used for sampling in each district. This technique is used by the Expanded Programmes on Immunization to assess vaccination coverage and is considered a satisfactory method (11). According to the technique, a geographical area is identified and a population of interest defined, then 30 sites, termed clusters, are randomly selected in each geographical area and at least 7 units are chosen from which information is gathered on each cluster (12).

In this study, from each district (geographical area) 210 households (units) were selected. Then 30 clusters (villages) were randomly selected from a list of 2336 villages in Tharparkar, 1592 in Tando Allahyar, 2506 in Jamshoro, 2516 in Dadu and 850 in Hyderabad. From each village, 7 households were randomly sampled. Overall, 1050 households in 5 districts were surveyed. All eligible members of the household above 12 years of age were asked about their COVID-19 vaccine status and their vaccine cards checked to verify.

Training took place in centrally located Hyderabad District; the data collectors, hired through

collaboration with TRDP, had previous experience in conducting field surveys. Data collectors comprising 5 males and 5 females (2 for each district) were trained first through an orientation on the questionnaire and then by piloting the tool on a subset of the population.

The survey teams were monitored and they shared their data with the project office in Karachi every week. Each questionnaire was checked for completeness and accuracy, and the data were entered and analysed using SPSS version 20.

Data was gathered on socio-demographic variables (age, gender, education, monthly income and distance from vaccination facility) and COVID-19 vaccination status. Vaccination status was categorized as non-vaccinated, partially vaccinated (1 dose or without booster) and completely vaccinated (2 doses with 1 booster). For those who were not vaccinated or partially vaccinated, their reasons for not getting vaccinated were also requested.

Community leaders within the survey areas were approached and permission to collect data was sought. Seven households were randomly selected from the household lists of the selected villages. The head of household was approached for data collection. Since the project was implemented in collaboration with a rural NGO that has good presence and acceptance in these communities, there were no refusals.

Informed consent from participating adult members of each household was obtained, while assent was sought from those aged 12–17 years. The consent form and questionnaires were translated into the local language (Sindhi).

Statistical analysis

Socio-demographic characteristics were summarized as percentages for qualitative variables and means and standard deviations for quantitative variables. Frequencies and percentages of vaccination coverage were computed according to each district and Tehsil (sub-district).

Frequencies and percentages of reasons for non-vaccination or partial vaccination were also computed. The predictors of partial and complete vaccination including age, gender, socioeconomic index, distance from vaccination facility and district were estimated by calculating adjusted odds ratios with 95% confidence intervals using multinomial logistic regression.

The socioeconomic index was generated using principal component analysis. Six items (house type, home ownership, water source, sanitation type, household monthly income and possession of household items) were reduced to a composite indicator and categorized as low, moderate or high. The constructed composite indicator explained 67.2% of cumulative variance.

Ethical approval

This study was approved by Institutional Review Board of Jinnah Sindh Medical University (IRB No. JSMU/IRB/2022/1627).

Results

Data were collected from 3545 individuals from 1050 households in the 5 districts (210 from each district). Table 1 shows the descriptive characteristics of the participants. The sample included individuals of all age groups with the age group of 18–32 constituting the highest proportion (31.0%) and the age group of 61 and above comprising the lowest (6.7%). Almost two-thirds (61.2%) had no formal education.

Overall, 25.9% were not vaccinated and 55% were partially vaccinated (Figure 1). Among the reasons for non-vaccination (Figure 2) were the perception of COVID-19 as mild (34.5%), fear of side effects (22.7%), unavailability of vaccine (19.8%) and fear of acquiring COVID-19 infection from the vaccine (15.8%).

Less common reasons included the perception that children under 18 were not eligible (2.3%), refusal due to acute or chronic sickness (2.1%), fear of injection (1.2%), avoided due to pregnancy (1%) and belief that COVID-19 does not exist (0.4%).

Reasons for partial vaccination (Figure 3) included the perception that COVID-19 has ended (30.2%), field teams not conducting home-based vaccination (26%), unaware about boosters (24.1%) and experience of side effects after being vaccinated (14.1%).

Table 2 shows the unadjusted and adjusted relationships of socio-demographic factors with the likelihood of being partially and completely vaccinated. Younger age groups of 12–17 (OR=0.17,

95% CI=0.10–0.30) and 18–32 (OR=0.50, 95% CI=0.30–0.84) years were significantly less likely to have received complete vaccination than the older age group of 61 and above.

Both groups were also significantly less likely to be partially vaccinated. Those who had no formal education (OR=0.17, 95% CI=0.11–0.28) or education from 1–8 years (OR=0.31, 95% CI=0.19–0.52) were significantly less likely to have been completely vaccinated than graduates and above. There was a significant negative association of having no formal education with being partially vaccinated.

Gender and socioeconomic status had no significant relationship with being partially or completely vaccinated. Compared to Tharparkar, residents of Dadu (OR=0.03, 95% CI=0.01–0.04), Jamshoro (OR=0.05, 95% CI=0.03–0.08), Tando Allahyar (OR=0.09, 95% CI=0.05–0.15) and Hyderabad (OR=0.03, 95% CI=0.02–0.05) were significantly less likely to have received complete vaccination.

Residents of Dadu, Jamshoro and Hyderabad districts were less likely to be partially vaccinated. Those who lived