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RESEARCH ARTICLE

A Cross-sectional Study of COVID-19 Vaccination and Public Perception in Selected Rural Community

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Abstract: The COVID-19 vaccination program in India demonstrated rapid deployment, yet rural populations exhibited lower vaccination rates compared to urban centers. A cross-sectional survey was conducted in rural areas of Surampalem of Andhra Pradesh state in India to evaluate vaccination status, assess public perception, and identify barriers to vaccine uptake. The study included 312 participants (151 males, 161 females) through a door-to-door survey using a structured questionnaire. Results indicated that Covaxin was administered to 168 participants while 144 received Covishield. It is found that 67% of the surveyed population required their second dose, indicating a substantial gap in complete vaccination coverage. Common misconceptions identified among participants included concerns about adverse effects, doubts regarding vaccine efficacy, belief in natural immunity superiority, and fears about vaccine interactions with comorbidities. Statistical analyses using one-way ANOVA and Student's t-tests showed no significant differences between groups regarding vaccine doses, age versus gender, and age versus vaccine type ($p > 0.005$). Educational interventions were implemented through awareness camps and distribution of informational brochures to address identified misconceptions. Data was shared with local health authorities to facilitate targeted vaccination drives. The study results show the need for continued education and awareness programs in rural communities to improve COVID-19 vaccine acceptance and completion rates.

Keywords: COVID-19; Vaccination; Rural healthcare; Vaccine hesitancy; Public health education.

1. Introduction

The COVID-19 pandemic posed unprecedented challenges to global healthcare systems, with vaccination emerging as a crucial preventive strategy [1]. India, being the second-most populous country globally, initiated one of the world's largest vaccination drives in January 2021 [2]. While urban areas demonstrated substantial progress in vaccine coverage, rural regions faced distinct challenges in achieving comparable vaccination rates [3]. The rural healthcare landscape in India presents unique obstacles, including limited access to healthcare facilities, inadequate infrastructure, and prevalent vaccine hesitancy [4].

Additionally, the digital divide between urban and rural populations affected the initial vaccine registration process through the CoWIN platform, potentially contributing to lower vaccination rates in rural areas [5]. Vaccine hesitancy, recognized by the World Health Organization as one of the top ten global health threats, has been particularly prominent in rural communities [6]. This hesitancy often stems from various factors, including misinformation, cultural beliefs, and concerns about vaccine safety and efficacy [7]. Understanding these barriers is essential for developing targeted interventions to improve vaccine acceptance and completion rates.

Rural areas near Surampalem, located in the East Godavari district of Andhra Pradesh, represent a microcosm of the challenges faced in India's rural vaccination program. Despite the availability of two primary vaccines - Covaxin and Covishield - significant gaps exist in achieving complete vaccination coverage [8].

The disparity between first and second dose administration rates suggests the need for targeted interventions to ensure complete immunization schedules [9, 10]. The present study was undertaken to evaluate the vaccination status in rural communities around Surampalem, identify barriers to vaccine uptake, and implement educational interventions to address vaccine hesitancy.

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2. Materials and Methods

2.1. Study Design

A cross-sectional, community-based survey was conducted between March and September 2024 in rural areas surrounding Surampalem, East Godavari district, Andhra Pradesh. The study employed a mixed-methods approach combining quantitative data collection through structured questionnaires and qualitative assessment of vaccine hesitancy factors [11].

2.2. Study Population and Sampling

A total of 312 participants were recruited through convenience sampling, comprising 151 males and 161 females. The inclusion criteria encompassed residents aged 18 years and above who provided verbal consent for participation. The sample size was determined using standard epidemiological calculations with a 95% confidence interval and 5% margin of error [12].

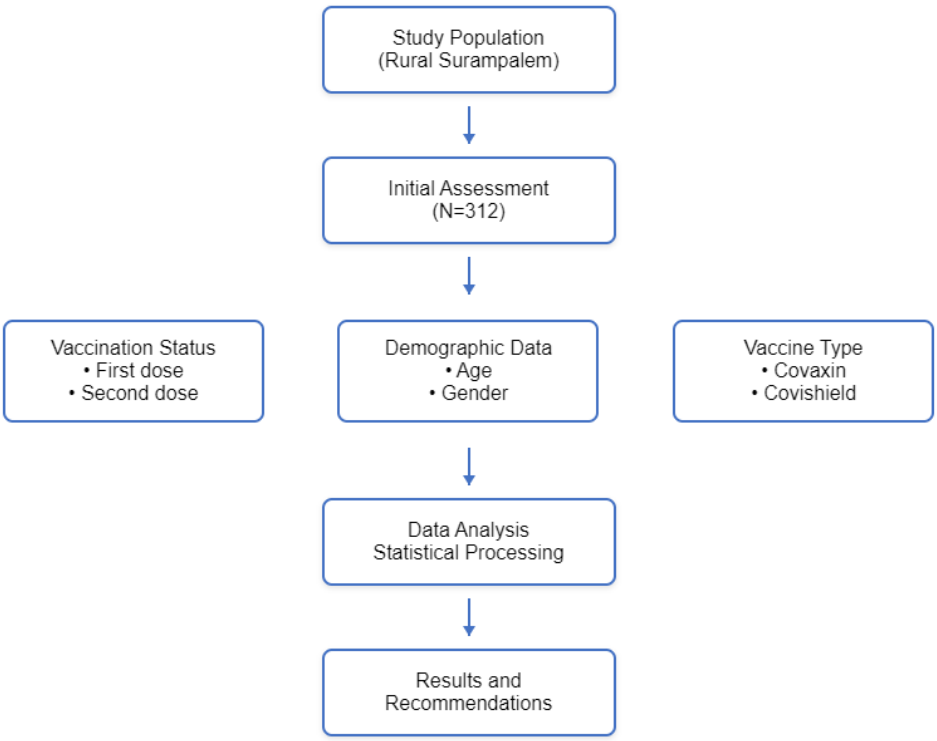

Figure 1. Flow chart showing the systematic approach used in conducting the vaccination coverage study

2.3. Data Collection Tool

A structured questionnaire was developed based on previously validated survey instruments used in similar vaccination studies [13]. The questionnaire consisted of three main sections:

- Demographic information (age, gender, occupation)
- Vaccination status (type of vaccine, number of doses received)
- Knowledge and perception regarding COVID-19 vaccines

2.4. Survey

Trained field workers conducted door-to-door surveys using the standardized questionnaire. Each field worker was assigned to collect data from 20-30 participants to ensure thorough coverage and quality data collection. The surveyors were trained in proper data collection techniques and ethical considerations [14].

2.5. Statistical Analysis

Data analysis was performed using standard statistical software. Descriptive statistics were used to summarize demographic characteristics and vaccination status. One-way ANOVA was conducted to assess differences between groups regarding vaccine doses, while Student's t-tests evaluated relationships between age versus gender and age versus vaccine type. Statistical significance was set at $p < 0.005$ [15].

2.6. Educational Intervention

Based on the identified knowledge gaps and misconceptions, educational interventions were designed and implemented through:

- Development and distribution of information brochures addressing common myths
- Organization of community awareness camps
- Individual counseling sessions during home visits [16]

2.7. Ethical Considerations

Data quality was ensured through regular monitoring and verification of collected information. The study protocol adhered to ethical guidelines, including informed consent, participant confidentiality, and data protection measures. The institutional ethics committee approved the study protocol [17]. The collected data was systematically compiled and shared with local health authorities to facilitate targeted vaccination drives and follow-up interventions [18].

3. Results

3.1.1. Demographic Characteristics

Among the 312 participants surveyed, gender distribution showed nearly equal representation with 151 (48.4%) males and 161 (51.6%) females. Figure 2 presents the demographic characteristics of the study population, including age distribution and gender proportions.

3.1.2. Vaccination Status

The analysis of vaccination status revealed that Covaxin was administered to 168 (53.8%) participants, while 144 (46.2%) received Covishield. A significant finding indicated that 67% of the surveyed population had not received their second dose of the COVID-19 vaccine. Figure 2 illustrates the distribution of vaccine types among the study population.

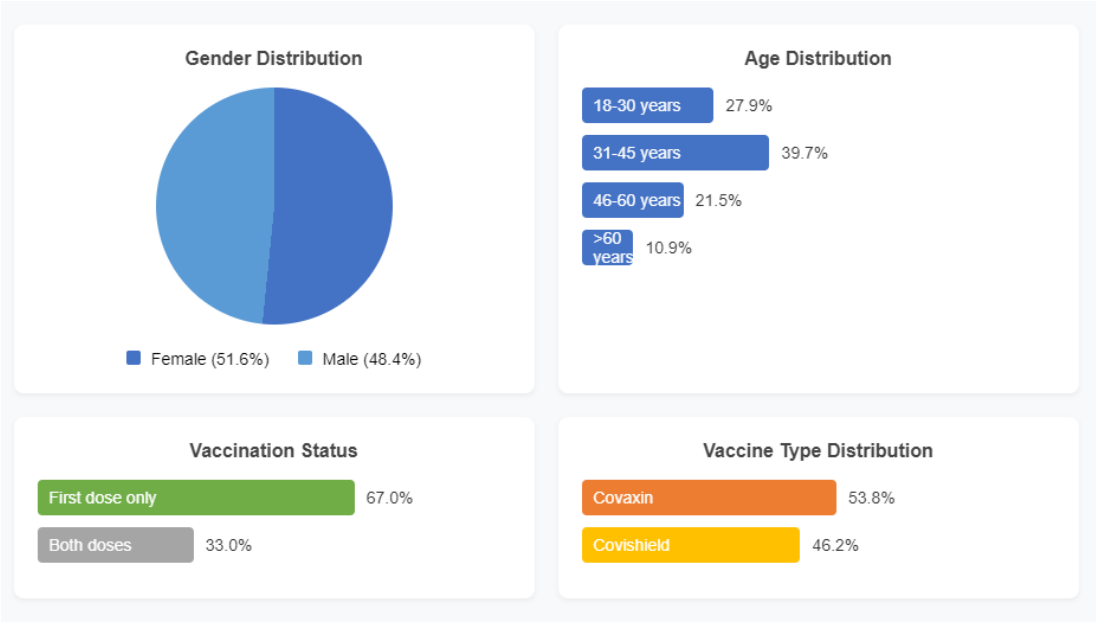

Figure 2. Demographic Characteristics of Study Participants (N=312)

3.1.3. Statistical Analysis

Statistical testing using One-way ANOVA revealed no significant differences between groups regarding vaccine doses ($p > 0.005$). Similarly, Student's t-tests showed no statistically significant differences in age versus gender and age versus vaccine type distributions ($p > 0.005$). Figure 3 represents the statistical analysis outcomes.

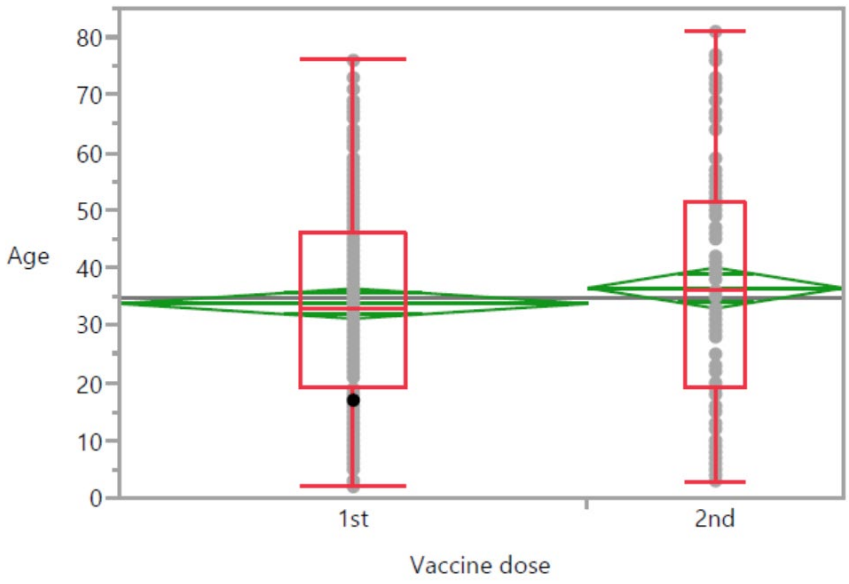

Figure 3. Distribution of vaccine types and vaccination status

3.1.4. Vaccine Hesitancy

Four primary concerns emerged regarding vaccine hesitancy:

- Fear of adverse effects
- Doubts about vaccine efficacy
- Belief in natural immunity superiority
- Concerns about vaccine interactions with existing health conditions

3.2. Discussion:

3.2.1. Vaccination Coverage Patterns

The study findings indicate a substantial gap in complete vaccination coverage, with 67% of participants lacking the second dose. This observation aligns with previous studies reporting similar challenges in rural vaccination programs [19]. The equal distribution between vaccine types (Covaxin and Covishield) suggests no significant preference for either vaccine, contrary to urban studies showing marked preferences [20].

3.2.2. Demographic Influences

The balanced gender distribution in our study population provides robust insights into vaccination patterns across both genders. The absence of significant statistical differences in age-gender relationships suggests that demographic factors may not be primary determinants of vaccine acceptance in this rural setting [21].

3.2.3. Barriers to Vaccination

The identified misconceptions about COVID-19 vaccines mirror findings from other rural health studies [22]. The prevalence of concerns regarding adverse effects and vaccine efficacy highlights the need for targeted educational interventions. These findings correspond with global studies on vaccine hesitancy in rural communities [23].

3.2.4. Educational Intervention

The implementation of educational interventions through brochures and awareness camps addressed specific misconceptions identified during the survey is summarized in Table 1. This approach aligns with successful intervention strategies reported in similar community-based studies [24]. The sharing of data with local health authorities facilitated a coordinated approach to improving vaccination coverage [25].

Table 1. Identified Barriers and Intervention Strategies

Barrier	Concerns	Intervention	Outcome
Safety Concerns	Fear of adverse effects	Information brochures, Individual counseling	Improved understanding of vaccine safety profile
Efficacy Doubts	Questions about vaccine effectiveness	Awareness camps with statistical data	Enhanced awareness of vaccine efficacy
Natural Immunity Belief	Preference for natural infection	Educational sessions with scientific evidence	Corrected misconceptions about immunity
Health Condition Concerns	Worries about vaccine interactions with existing conditions	Healthcare provider consultations	Addressed specific medical concerns

3.2.5. Study Limitations

The study's limitations include the use of convenience sampling and potential recall bias among participants. Additionally, the cross-sectional nature of the study prevents the assessment of temporal changes in vaccination patterns and attitudes [26, 27]

4. Conclusion

The study revealed significant gaps in COVID-19 vaccination coverage in rural Surampalem, with 67% of participants requiring second doses. Despite the absence of statistical differences in demographic factors, vaccine hesitancy emerged as a primary barrier to complete vaccination. The implementation of educational interventions addressed common misconceptions, while data sharing with health authorities enabled targeted vaccination drives.

Compliance with ethical standards

Conflict of interest statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study. The research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

Statement of ethical approval

This study was approved by the Institutional Ethics Committee of GSL Medical College and General Hospital, Rajahmundry (Protocol No. IEC/2021/089). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and the Indian Council of Medical Research (ICMR) guidelines for research involving human participants.

Statement of informed consent

Written informed consent was obtained from all individual participants included in the study. The consent forms were provided in both English and Telugu (local language). For illiterate participants, the consent form was read aloud in their preferred language, and their thumb impression was obtained in the presence of a literate witness.

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