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Determinants of COVID-19 Vaccine Acceptance and Disease Outcomes Among Home Isolated Patients: A Descriptive Study from South India

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Abstract
COVID-19 has presented unprecedented challenges to global health systems. Vaccination remains the most effective strategy to reduce disease transmission, severity and mortality. However, vaccine acceptance and outcomes vary across populations. This study aimed to assess the vaccination status, determinants of vaccine acceptance, disease severity, recovery timelines and awareness levels among COVID-19 positive individuals under home isolation in Chittoor, Andhra Pradesh. A descriptive follow-up study was conducted between June and December 2022 at the Government Hospital, Chittoor. Adult patients diagnosed with COVID-19 and advised home isolation were interviewed using a structured questionnaire. Data on vaccination status, clinical outcomes, awareness levels and perceived barriers to vaccination were collected via telephone. Descriptive statistics and logistic regression were used for analysis. Out of 504 participants, 72.8% were vaccinated and 57.5% had received two doses. Family vaccination coverage was also high (80%). Most patients (65.7%) experienced mild illness, while only 4.2% developed severe symptoms. Symptoms requiring medical attention were reported by 22.6%, but only 20.6% were shifted to hospital care. Recovery to full health was delayed in many cases, with 27% taking over two weeks. Vaccine hesitancy was low (3.2%), primarily due to fear of adverse effects and lack of awareness. Awareness regarding when, where, and whom to contact for vaccination exceeded 92% and 96.8% expressed willingness to motivate family members to get vaccinated. The findings highlight high vaccine uptake, strong community awareness and low vaccine hesitancy among COVID-19 patients in home isolation. Vaccination was associated with milder illness and fewer hospital admissions. However, delayed recovery in a subset of patients and the presence of minimal hesitancy underscore the need for continued health education and post-COVID care strategies. Strengthening public trust and ensuring equitable vaccine access remain essential to enhance pandemic response and preparedness.

INTRODUCTION

The COVID-19 pandemic has posed an unprecedented global health crisis, affecting millions of people across continents. As of June 4, 2021, over 17.2 crore cases and 37 lakh deaths have been reported worldwide, with India contributing 2.86 crore cases and 3.4 lakh deaths[1]. The second wave in India was particularly devastating and studies have indicated that failure to adhere to preventive protocols and vaccine hesitancy were key contributors to the surge[2]. The high proportion of asymptomatic cases and the emergence of more infectious variants have exacerbated the situation, enabling widespread transmission even among those who remained indoors. Vaccination has been globally recognized as one of the most successful and cost-effective public health interventions for controlling the spread of COVID-19[3,4]. The Indian government has made COVID-19 vaccines freely available to the public. However, a significant portion of the population has expressed reluctance or outright refusal to be vaccinated, despite its accessibility. This phenomenon, known as vaccine hesitancy, has been defined by the WHO Strategic Advisory Group of Experts (SAGE) on Immunization as a "delay in acceptance or refusal of vaccination despite availability of vaccination services[5]. Recognizing its public health implications, the WHO listed vaccine hesitancy as one of the top ten threats to global health in 2019[6]. Data from the Government of India suggests that post-vaccination breakthrough infections remain rare. For instance, among the 10.03 crore individuals who received only the first dose of Covishield, just 0.02% tested positive for COVID-19. Similarly, among 1.57 crore individuals who received both doses, only 0.03% tested positive. For Covaxin, 0.04% of recipients tested positive after either one or both doses (MoHFW, 2021). These statistics highlight the effectiveness of vaccination in preventing severe disease, hospitalization and mortality. Despite this evidence, vaccine hesitancy persists due to various factors, including misinformation, fear of adverse effects, lack of trust in governmental health systems and poor communication regarding the safety of vaccines[7,8]. A major determinant of vaccine acceptance is trust particularly the belief that the vaccine is safe and effective. Although the severity and rapid spread of COVID-19 during the second wave increased public awareness and risk perception, many individuals still carried misconceptions and doubts. Interestingly, more people expressed willingness to receive the vaccine during the second wave and lockdown compared to the pre-lockdown phase, regardless of their previous beliefs[9]. Although several studies have explored vaccine acceptance in general populations, limited research exists on the determinants of vaccine uptake specifically among individuals who tested positive for COVID-19. Particularly lacking are comparative assessments of vaccinated and unvaccinated COVID-19 positive patients managed under home isolation. Addressing this gap is crucial for understanding behavioral patterns and outcomes associated with vaccination status. This study aims to assess the vaccination status of COVID-19 positive cases under home isolation, compare disease outcomes between vaccinated and non-vaccinated individuals and explore perceived reasons for vaccine acceptance both before and after testing positive for COVID-19.

MATERIALS AND METHODS

A descriptive study with follow-up was conducted to assess the determinants of COVID-19 vaccine acceptance among patients diagnosed with COVID-19 and placed under home isolation. The study was carried out at the Government Hospital, Chittoor, Andhra Pradesh, India. Approval for the study was obtained from the Institutional Ethics Committee (IEC/AIMSR/2022). The study period spanned from June 1 to December 30, 2022. The study population included all adult COVID-19 positive patients (aged 18 years and above) diagnosed through RT-PCR and registered as positive at the triage room of the hospital. Only those who were advised home isolation were considered eligible for inclusion. Patients were excluded if their mobile numbers were incorrectly recorded or if they did not respond to the initial contact attempt. Data collection was carried out using a structured, self-administered, close-ended questionnaire, which was adapted from previously validated tools and theoretical frameworks used in vaccine acceptance research (Dror *et al.,* 2020). The questionnaire comprised items on sociodemographic information, medical history, previous comorbidities, vaccination status and follow-up responses related to their experience with COVID-19 infection. The questionnaire's internal consistency and reliability were assessed prior to use. Verbal informed consent was obtained from each participant before data collection. Interviews were conducted over the phone by trained personnel, which included medical officers, medical social workers (MSWs) and health workers. The interviews were administered in the local language, Telugu, to ensure clear understanding and accurate responses. Primary data collection focused on assessing the participant's vaccination status and the key determinants influencing their decision to accept or reject the vaccine, both before and after contracting COVID-19. A follow-up phone call was conducted at the end of the home isolation period to record clinical outcomes and compares the disease progression between vaccinated and unvaccinated individuals. Additionally, each participant was educated about the official COVID-19 home isolation guidelines as issued by the Ministry of Health and Family Welfare, Government of India.

Statistical Analysis: Descriptive statistics, including frequencies and percentages, were used to summarize the demographic and clinical characteristics of the study population. To identify the determinants of vaccine acceptance, logistic regression models were applied. Both crude odds ratios (ORs) from univariate analyses and adjusted odds ratios (aORs) from multivariate analyses were calculated, with statistical significance set at α=0.05. All statistical analyses were performed using SPSS software.

RESULTS AND DISCUSSIONS

A total of 504 COVID-19 positive individuals under home isolation were included in the study. The demographic characteristics of the participants are summarized below, providing insight into the population's composition by gender, religion, marital status, type of family, and education level. These factors play an important role in understanding vaccination behavior and disease outcomes.

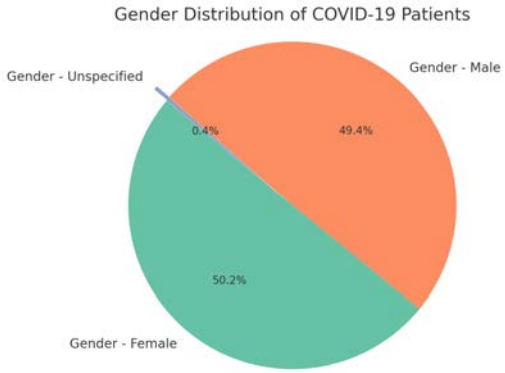

Fig. 1: Gender Distribution of COVID-19 Patients Under Home Isolation

The sample was almost equally distributed between males and females, with 49.4% (n=249) being male and 50.2% (n=253) female. Only 0.4% (n=2) of participants did not specify their gender (Fig. 1).

Table 1: Distribution of Participants by Religion and Marital Status (n=504)

Category	Frequency	Percentage (%)
Religion-Hindu	465	92.3
Religion-Muslim	17	3.4
Religion-Others	20	4
Religion-Unspecified	2	0.4
Marital Status-Married	310	61.5
Marital Status-Unmarried	175	34.7
Marital Status-Divorced	2	0.4
Marital Status-Separated	3	0.6
Marital Status-Widow	8	1.6
Marital Status-Unspecified	6	1.2

The vast majority of participants identified as Hindu (92.3%, n=465). Muslims accounted for 3.4% (n=17), while 4.0% (n=20) identified with other religions. Only 0.4% (n=2) did not specify their religion. Most of the participants were married (61.5%, n=310), followed by unmarried individuals (34.7%, n=175). A small number were widowed (1.6%, n=8), separated (0.6%, n=3), or divorced (0.4%, n=2). Marital status was unspecified for 1.2% (n=6) of the participants (Table 1).

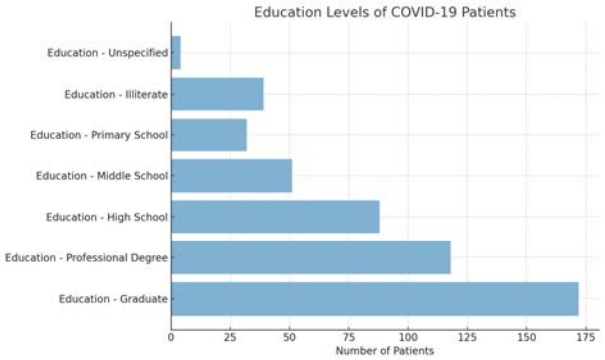

Fig. 2: Education Levels of COVID-19 Patients Under Home Isolation

The majority of respondents lived in nuclear families (79.0%, n=398). Joint families accounted for 14.1% (n=71), followed by three-generation families (3.6%, n=18) and extended families (2.8%, n=14). Family type was unspecified in 0.6% (n=3) of cases. A significant proportion of participants were graduates (34.1%, n=172) or held professional degrees (23.4%, n=118). Others had completed high school (17.5%, n=88), middle school (10.1%, n=51), or primary school (6.3%, n=32). A smaller portion were illiterate (7.7%, n=39), and 0.8% (n=4) did not report their education level (Fig. 2). This demographic data provides a foundation for analyzing the participants' vaccination status, understanding the determinants of vaccine acceptance before and after COVID-19 infection and comparing disease outcomes among different subgroups.

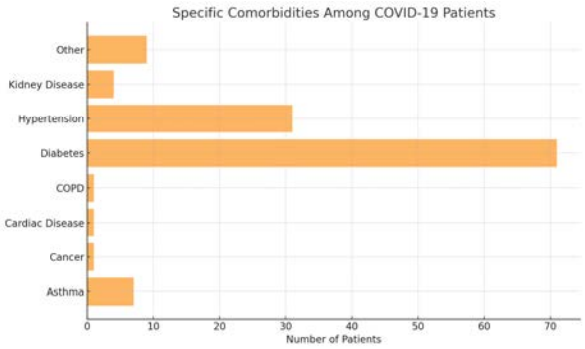

Fig. 3: Prevalence of Specific Comorbidities Among COVID-19 Patients in Home Isolation

The bar chart presents the distribution of specific comorbid conditions reported by COVID-19 positive patients under home isolation. Among the listed conditions, diabetes (14.1%) and hypertension (6.2%) were the most prevalent, indicating a higher vulnerability of patients with metabolic and cardiovascular disorders. Other conditions like asthma, kidney disease and COPD were less common. These findings highlight the need for close monitoring and

prioritization of individuals with chronic illnesses, particularly diabetes and hypertension, during COVID-19 management and vaccination strategies (Fig. 3).

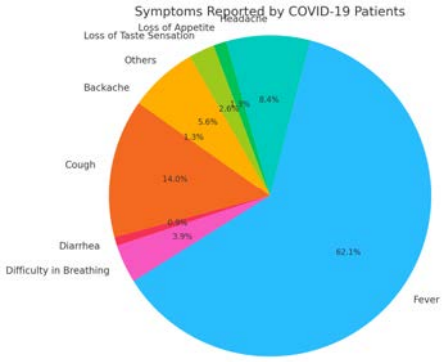

Fig. 4: Common Symptoms Reported by COVID-19 Patients Under Home Isolation

The pie chart illustrates the range and frequency of symptoms experienced by COVID-19 positive patients during home isolation. Fever was the most commonly reported symptom, accounting for 62.1% of cases, followed by cough (14%) and headache (8.4%). Other symptoms such as difficulty in breathing, backache, and loss of taste or appetite were reported less frequently. This distribution emphasizes the dominance of typical viral symptoms like fever and respiratory issues in mild-to-moderate COVID-19 cases managed at home (Fig. 5).

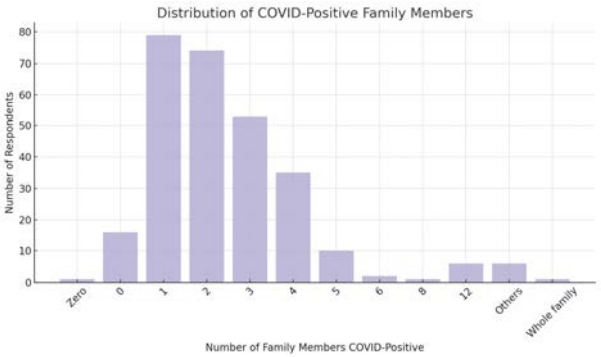

Fig. 5: Distribution of COVID-Positive Family Members Among Infected Individuals

The bar chart displays the number of COVID-positive family members reported by individuals during home isolation. The majority of respondents had 1-2 family members infected, with 1 member (˜78) and 2 members (˜74) being the most frequently reported. A smaller percentage reported larger household outbreaks, including up to 12 members or even the entire family. These findings highlight significant intra-household transmission, emphasizing the need for better isolation practices and preventive strategies within families during community outbreaks (Fig. 6).

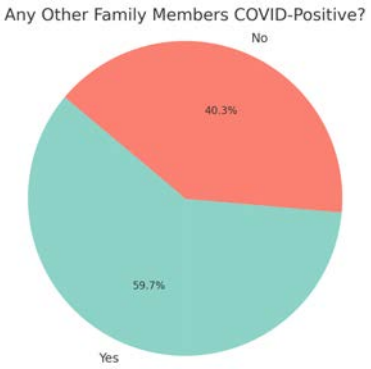

Fig. 6: Incidence of COVID-19 Among Other Family Members

The pie chart represents whether other family members of the respondents also tested COVID-positive. A significant 59.7% reported that at least one other member in their household was infected, while 40.3% reported no additional cases. This emphasizes the high rate of intra-household transmission, underscoring the need for effective isolation and infection control measures within homes to prevent the spread of COVID-19 among family members (Fig. 7).

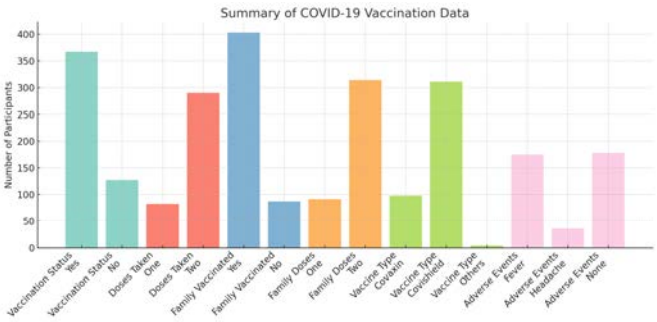

Fig. 7: Overview of COVID-19 Vaccination Status, Coverage and Adverse Events

This bar chart provides a consolidated overview of key vaccination-related indicators among study participants. It shows that the majority were vaccinated and most family members were also vaccinated, indicating strong community uptake. Two doses were more common than one for both individuals and families. Covishield was the most frequently received vaccine. Regarding side effects, fever was the most common adverse event, followed by headache, though a considerable proportion reported no side effects. This summary supports the effectiveness and general acceptance of COVID-19 vaccination in the study population (Fig. 8).

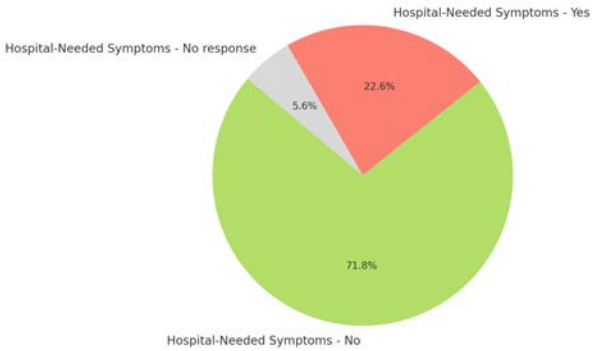

Fig. 8: Proportion of COVID-19 Patients Developing Symptoms Requiring Hospital Evaluation

This pie chart illustrates whether COVID-19 patients under home isolation developed symptoms severe enough to necessitate hospital care. A majority (71.8%) did not experience such symptoms, while 22.6% reported symptoms that required hospital evaluation. A small portion (5.6%) did not provide a response. These findings indicate that most cases managed at home were mild, reinforcing the role of vaccination and early intervention in reducing the need for hospitalization (Fig. 9).

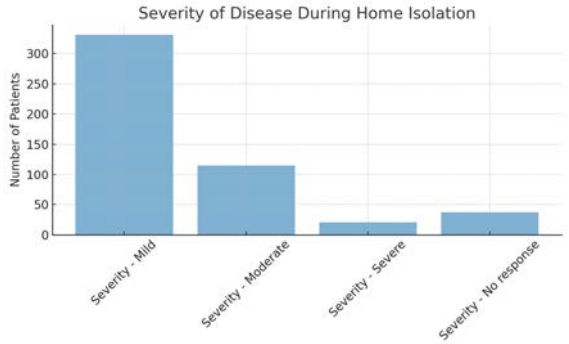

Fig. 9: Severity of COVID-19 Illness Among Patients Under Home Isolation

This bar chart displays the distribution of disease severity among COVID-19 positive individuals during home isolation. A large majority (over 300 patients) experienced mild illness, while a smaller portion had moderate symptoms. Only a few patients developed severe disease and a minimal number did not report their severity status. These results suggest that home isolation was largely effective in managing mild-to-moderate COVID-19 cases, with severe cases being relatively rare likely due to early diagnosis and vaccination (Fig. 9). The table 2 shows the presence of severe symptoms and hospital shifts among COVID-19 patients who were initially managed at home. While a majority (78%) of the patients reported no severe symptoms, a significant minority developed concerning signs such as breathlessness (14.3%) and oxygen desaturation (5.4%).

Table 2: Critical Symptom Development and Hospital Shifts Among Home-Isolated COVID-19 Patients

Variable	Frequency	Percentage (%)
Symptom-Breathlessness	72	14.3
Symptom-Decreased O2 Saturation	27	5.4
Symptom-Mental Confusion	5	1
Symptom-Chest Pain	7	1.4
Symptom-No Symptoms	393	78
Hospital Shift-No	354	70.2
Hospital Shift-Yes	104	20.6
Hospital Shift-No response	46	9.1

About 20.6% of the patients were shifted to a hospital, indicating that some home-managed cases progressed to moderate or severe illness. These findings stress the need for close monitoring of symptoms during home isolation to ensure timely referral and intervention.

Table 3: Timeline of Symptom Relief, Recovery and Return to Baseline Health in COVID-19 Patients (n=504)

Time Interval	Symptoms Subside (n=504)	Recovery Symptoms Subside (%)	Recovery from COVID (n=504)	Regained from COVID (%)	Original Health (n=504)	Regained Original Health (%)
<1 week	236	46.8	122	24.2	105	20.8
1-2 weeks	184	36.5	211	41.9	166	32.9
2-3 weeks	44	8.7	138	27.4	136	27
3-4 weeks	25	5	22	4.4	63	12.5
>4 weeks	15	3	11	2.1	34	6.8
Total	504	100	504	100	504	100

This table 3 presents the recovery timeline of COVID-19 patients in terms of symptom resolution, full recovery and regaining pre-illness health status. While 46.8% experienced symptom relief within the first week, only 24.2% reported full recovery in that time. The highest proportion of patients (41.9%) recovered fully in 1-2 weeks, whereas 27% regained full health in 2-3 weeks. A smaller but notable segment experienced prolonged recovery, taking >3 weeks to return to their baseline health. These findings highlight that symptom resolution often precedes complete recovery and a considerable number of patients may continue to experience post-viral fatigue or other lingering effects even after initial improvement.

Table 4: Assessment of Affordability and Productivity Related to COVID-19 Vaccination (n=504)

Question	Response	Frequency	Percent	Valid Percent	Cumulative Percent
Are you leading your productive life now?	No	12	2.4%	2.4%	7.7%
	Yes	465	92.3%	92.3%	100.0%
	Total	504	100.0%	100.0%	
Are you willing to take the vaccine if it is freely available?	No	16	3.2%	3.2%	10.5%
	Yes	451	89.5%	89.5%	100.0%
	Total	504	100.0%	100.0%	
If not freely available, are you willing to pay and get vaccinated?	No	84	16.7%	16.7%	24.6%
	Yes	380	75.4%	75.4%	100.0%
	Total	504	100.0%	100.0%	

This table 4 shows the participants' productivity status post-COVID-19 and their willingness to receive the vaccine based on affordability. A majority **(92.3%)** reported leading a productive life after recovery, suggesting a strong return to normalcy. Importantly, **89.5%** were willing to get vaccinated if the vaccine was free, indicating broad acceptance. However, only

75.4% were willing to pay for it, underscoring that cost remains a barrier for some. These insights are valuable for guiding policy decisions on subsidized vaccination programs and public health outreach.

Table 5: Awareness and Motivation Toward COVID-19 Vaccination (n=504)

Question	Response	Frequency	Percent	Valid Percent	Cumulative Percent
Do you know when to take the vaccine after COVID infection?	Yes	416	82.5%	82.5%	100.0%
	No	69	13.7%	13.7%	
	Missing	19	3.8%	3.8%	
Do you know where to get vaccinated?	Yes	470	93.3%	93.3%	100.0%
	No	15	3.0%	3.0%	
	Missing	19	3.8%	3.8%	
Do you know whom to contact for vaccination now?	Yes	465	92.3%	92.3%	100.0%
	No	21	4.2%	4.2%	
	Missing	18	3.6%	3.6%	
Will you motivate your family members to take the vaccine?	Yes	488	96.8%	96.8%	100.0%
	No	10	2.0%	2.0%	
	Missing	6	1.2%	1.2%	

This table 5 shows the information about assesses public awareness and willingness to promote COVID-19 vaccination among patients. Awareness was impressively high, with over **82%** of respondents knowing when to take the vaccine post-infection, and more than **93%** aware of where and whom to contact. Additionally, **96.8%** expressed a willingness to motivate their family members to get vaccinated. The low rates of misinformation and high levels of proactive engagement reflect the success of local public health outreach and education programs.

Table 6: Reported Reasons for COVID-19 Vaccine Hesitancy (n=504)

Reason	Frequency	Valid Percent	Cumulative Percent
Adverse effects	2	0.4%	98.0%
Fear of adverse effects of vaccination	1	0.2%	98.2%
Lack of awareness	1	0.2%	98.4%
Lack of awareness and no support from family	1	0.2%	98.6%
Lack of belief in vaccine and lack of knowledge	1	0.2%	98.8%
Lack of knowledge about vaccine	1	0.2%	99.0%
Miscellaneous (e.g., "-N", "-Na", "-None")	5	1.0%	100.0%

This table 6 outlines the reasons provided by participants for hesitating or refusing COVID-19 vaccination. Although the overall rate of vaccine hesitancy was low, the main reasons cited included concerns about adverse effects, lack of awareness, and limited support from family. A small number also mentioned doubt in vaccine efficacy and general misinformation. These findings highlight the need for targeted health education and trust-building strategies to address specific fears and misconceptions among hesitant individuals. The COVID-19 pandemic has significantly tested global health systems, with vaccination emerging as a cornerstone strategy to mitigate disease burden. This study, conducted in Chittoor, Andhra Pradesh, adds valuable evidence to the ongoing discourse on vaccine acceptance, behavioral determinants and clinical outcomes in post-infection recovery. Particularly, it sheds light on the real-world impact of vaccination during the second wave in India a period marked by both health system strain and mass immunization efforts.

Vaccination Uptake and Willingness: Our findings show that 72.8% of COVID-19 positive individuals under home isolation had received at least one dose of a COVID-19 vaccine and 57.5% had completed two doses. This reflects an encouraging level of uptake and is consistent with national-level data reported during the same period by the Ministry of Health and Family Welfare. A similarly positive trend was noted in a national-level study by Khobragade *et al.* (2022), which reported increasing vaccine coverage in both urban and rural populations, especially post-second wave[10]. In parallel, an even higher proportion (80%) of participants reported that their family members had also been vaccinated, with 62.3% completing both doses. These figures reinforce findings from the global vaccine acceptance survey by Lazarus *et al.* (2021), which found that in countries where trust in public health institutions was high, family and peer influence significantly improved vaccination rates[9]. Over 89% of participants in our study expressed willingness to receive the vaccine if it were freely available reflecting widespread acceptance and trust. However, 16.7% were unwilling to pay for the vaccine, echoing affordability concerns documented in studies from low- and middle-income countries (Dubé *et al.,* 2013). This reiterates the importance of publicly funded vaccine drives to ensure equitable access, particularly in economically vulnerable populations[11]. A small but important portion (3.2%) of participants was unwilling to be vaccinated even if it were free. Reasons included concerns over adverse effects, fear and misinformation consistent with the psychological dimensions of vaccine hesitancy documented by Dror *et al.* (2020) and the "Three Cs" model (confidence, complacency, and convenience) proposed by MacDonald[12].

Awareness and Health-Seeking Behavior: Awareness of vaccination logistics was notably high in this population: over 92% of respondents knew when, where, and how to get vaccinated. In addition, 96.8% stated they would encourage their family members to be vaccinated, indicating strong community support for immunization efforts. These findings align with those of Shapiro *et al.* (2021), who emphasized the importance of clear and consistent health messaging in driving vaccine uptake. In the Indian context[13], Singh *et al.* (2021) also reported that government communication and community health worker engagement were key in raising awareness and trust in vaccines[14].

Such high awareness levels appear to reduce vaccine hesitancy and enhance household-level vaccination coverage. This supports the World Health Organization's Strategic Advisory Group of Experts (SAGE) framework, which highlights knowledge as a core determinant of vaccine uptake (WHO, 2014).

Disease Severity and Outcomes: Most participants in our study (65.7%) experienced only mild symptoms during home isolation. Only 4.2% developed severe disease and 22.6% reported symptoms necessitating medical attention such as breathlessness (14.3%) and oxygen desaturation (5.4%). These results support data from Thompson *et al.* (2021), who demonstrated that vaccinated individuals had significantly reduced risk of severe illness and hospitalization[15]. Our findings also resonate with those of Polack *et al.* (2020), who showed in clinical trials that mRNA-based vaccines conferred strong protection against severe COVID-19[16]. Real-world evidence from India further validates this., Bhatnagar *et al.* (2021) found a clear association between full vaccination and lower ICU admissions among COVID-19 patients during the delta-driven second wave[17]. Only 20.6% of patients in our study required hospital admission, reaffirming the protective impact of vaccination, particularly in a high-transmission setting with limited health infrastructure.

Recovery Trajectory: In terms of recovery, 46.8% of participants reported symptom subsidence within one week, but only 24.2% achieved full recovery in that period. A progressive return to baseline health was seen in subsequent weeks, with 27.0% taking over two weeks. These findings are in line with those reported by Tenforde *et al.* (2020), who observed prolonged symptoms in outpatients, even those with mild or moderate disease, highlighting the clinical relevance of post-acute COVID-19 syndrome[18]. Delayed recovery has both medical and socioeconomic implications. Only 92.3% of participants reported returning to productive life by the end of the follow-up period, indicating that COVID-19 may have lingering effects on workforce participation and overall well-being. This supports the conclusions of Blomberg *et al.* (2021), who emphasized the burden of long-COVID and the need for structured follow-up care[19].

Sociocultural and Psychological Factors: Our data also hint at the complex sociocultural context influencing vaccine attitudes. While refusal rates were low, reasons cited for vaccine avoidance such as fear of adverse effects or "lack of knowledge" reflect deeper issues related to public trust, health literacy and access to credible information.

These challenges echo global experiences, particularly in lower-income and rural settings, where vaccine hesitancy is often driven by historical distrust in healthcare systems, as well as sociopolitical influences (Larson *et al.,* 2014). Tailored interventions that include culturally sensitive health promotion and community engagement are vital to address these barriers effectively[20].

CONCLUSION

This study concludes that most COVID-19 patients under home isolation in Chittoor were informed, vaccinated and willing to advocate for vaccination within their families. Vaccinated individuals experienced milder symptoms and required fewer hospitalizations. While vaccine acceptance was high, a small segment of the population still harbored doubts due to fear and misinformation. Efforts should now focus on dispelling myths through targeted education, transparent communication about vaccine safety and building trust in public health systems. Continued community engagement and support can help enhance vaccine uptake and improve pandemic preparedness in the future.

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