DOI: 10.7860/JCDR/2022/60673.17379

Original Article

Health Management and Policy Section

Knowledge, Attitude and Practice regarding COVID-19 Vaccination in a Tertiary Care Centre of Tiruvannamalai, Tamil Nadu: A Cross-sectional Study

DP PUNITHA[1], DP SUDHAGAR[2]

ABSTRACT

Introduction: Coronavirus Disease 2019 (COVID-19) is one of the worst pandemics witnessed across the globe. COVID-19 vaccination is one of the best available strategies to minimise the severity of the infection and reduce mortality rates. Active participation and involvement of the stakeholders in taking the COVID-19 vaccine are key aspects of the vaccination's success. Lack of knowledge, negative attitude, and willingness to vaccinate may pose a significant challenge for the health authorities to complete the vaccination drives.

Aim: To assess the Knowledge, Attitude, and Practice (KAP) about COVID-19 vaccination among people of Tiruvannamalai, Tamil Nadu, India.

Materials and Methods: The present cross-sectional study was conducted in a tertiary care centre of Tiruvannamalai district, Tamil Nadu, India, in November 2021. Overall, 478 respondents aged above 18 years were included in the survey using a structured questionnaire. The questionnaire was administered to assess the KAP regarding the COVID-19 vaccine among study subjects. The study used descriptive statistics such as frequency, percentage, and sentiment analysis.

Results: Out of total sample, 99% of the study participants had taken the COVID-19 vaccine, 81% had taken the second dose, predominately 51% of the participants had taken the COVID-19 vaccine at a Government hospital, 74% of the participants mentioned that it was their responsibility to take COVID-19 vaccine. Regarding KAP, the knowledge score was 10 out of a total score of 14, the attitude score was 8 out of 10, and the total score of the COVID-19 related practice was 10 out of 10.

Conclusion: The findings of the study indicate that the vaccination drive in the population will be highly effective since the vaccine acceptance among the stakeholders was good due to sound knowledge, positive attitude, and safe COVID-19 practice.

Keywords: Behaviour, Coronavirus disease-2019, Mortality, Pandemic, Questionnaire survey, Vaccination

INTRODUCTION

The emergence of the novel Coronavirus Disease 2019 (COVID-19) was found in the seafood market in Wuhan City in the Hubei province of China in December 2019 [1]. Since its emergence, COVID-19 has hit 215 countries/territories/areas worldwide [1]. India's COVID-19 death toll is estimated to be four million, considered ten times higher than the official count [2].

India did not face a severe second wave of the COVID-19 pandemic, which showed increasing signs of COVID-19 cases [3]. Regular exercise and eating healthy food were the main protective measures against the protection from novel COVID-19 [4]. The report also indicated that 65% of the study participants practised the regulations and recommendations released by World Health Organisation (WHO), such as frequent hand washing and wearing masks. Nearly, 50% of the respondents consumed homemade immunity boosters and remedies. Interestingly, only 34% of the respondents mentioned that they had undertaken vaccines [5]. The primary measure in controlling and managing COVID-19 is to practice prevention protocols and take the COVID-19 vaccine to reduce the severity and mortality [5]. It is mentioned that more than one billion COVID-19 vaccines are successfully administered across different geographical locations in India, but the current population of India is estimated to be 1,398,198,335 [6]. As per the instructions given by the Government of India, anyone 18 years and older are only eligible to get the COVID-19 vaccine [6].

Coronavirus Disease 2019 vaccine is not entirely administered to all the population above 18 years and older in India, and individuals below 18 years are yet to be vaccinated. There may be several reasons for the non accomplishment of 100% in the vaccination drive, including vaccine hesitancy. Understanding the KAP about the COVID-19 vaccine will provide vital information to the health care service providers, COVID-19 vaccine administrators, and health policymakers to develop strategies to scale up the vaccination through enhanced participation from the public and thereby leading to 100% vaccination in the country.

The present study is novel in terms of developing an original survey questionnaire based on focus group discussion to measure KAP. The focus group discussion included health authorities, doctors, policymakers, and researchers. Based on the recommendations of the statements given by the focus group discussion health authorities, the KAP for the present study was developed. In addition, the present study has compared different studies such as across the globe related to the COVID-19 vaccine KAP to understand the previous study's outcomes and draw inferences in relation to the present study [7,8]. Hence, the present study was aimed to understand the COVID-19 vaccine KAP among citizens of Tiruvannamalai, Tamil Nadu, India.

MATERIALS AND METHODS

This cross-sectional research was conducted in the Tiruvannamalai district, Tamil Nadu, India, for one month in November 2021. The study was approved by the Institutional Ethics committee (IEC no-02 /FA-2022). Written informed consent was taken from all the participants before inclusion in the study.

Inclusion criteria: Any subjects aged above 18 years, irrespective of gender, who were willing to participate in the study were included in the study.

Exclusion criteria: Subjects below 18 years and who refused to provide consent for the study were excluded from the study.

Sample size calculation: The sample size was calculated based on a confidence level of 95% and a margin of error of 5%. The formula used to determine the sample size was=({z2*p(1-p)}/ e^2/1+{z^2*p(1-p)}/e^2*N).

In the formula,

'p' denotes the standard deviation,

'e' indicates the margin of error,

'z' refers to the z-score and

N is the size of the population.

Based on this calculation, the study should collect 218 survey responses from the study participants. Using convenience sampling, the data was collected from the respondents across Tiruvannamalai district, Tamil Nadu, India.

Data Collection

An online survey with the help of a structured questionnaire was used to collect the data. The questionnaire included: the respondents' demographic details, COVID-19 vaccine-related behaviour, and KAP about the COVID-19 vaccine. The questionnaire for the survey was developed based on the results of the focus group discussion conducted with the experts in the field. Content validity was checked with the experts and the 15 pilot study respondents, and then the questionnaire was refined based on the comments and feedback received from the concerned. The reliability of the questionnaire developed for the study based Cronbach's alpha value indicated a good internal consistency with a value of 0.88. The knowledge-related question was based on multiple choice questions with one correct answer and three wrong answers. For every correct answer, 1 point was assigned and 0 points were assigned to every wrong answer.

Using the concept of sentiment analysis, the overall score of the KAP was determined. In total, 14 questions were covered under the knowledge factor. Score of 12 and above was considered to be good knowledge about the COVID-19 vaccine. Under attitude, 10 questions were asked to the study participants. A positive response was assigned 1 point, and a negative response was assigned with 0 points. A score of 8 and above is considered a positive attitude toward COVID-19. Finally, under the practice, 10 questions were asked to the respondents. A score of 1 was assigned for every correct practice, and for the wrong practice score of 0 was assigned. Score of 8 and above was considered to be good practice for the COVID-19 vaccine. For the overall computation of the KAP score, any question secured by over 70% of subjects was assigned a value of 1, and below 70% was assigned with a value of 0 for the purpose of this study only. The final score of KAP was calculated based on the overall values received for each question.

STATISTICAL ANALYSIS

The study employed descriptive statistics, including frequency and percentage, to analyse the data related to eight demographic details and four COVID-19 vaccine-related behaviours.

RESULTS

Predominantly the respondents of the present study were females from the age group of 21-30 years living in urban areas, and the occupation of respondents was students from the Undergraduate (UG) programme. In addition, the majority of the respondents were unmarried from a nuclear family with an annual income below two lakhs [Table/Fig-1].

The majority of the respondents had taken the COVID-19 vaccine, predominantly the respondents have taken the second dose of the COVID-19 vaccine, Government hospitals and the COVID-19 vaccination camps were the main places where the respondents took the vaccine and most of the respondents have mentioned that it is their responsibility to take the COVID-19 vaccine [Table/Fig-2].

Demographic profile	Category	n (%)
Gender	Male	187 (39.1)
	Female	291 (60.9)
Age (years)	≤20	55 (11.5)
	21-30	404 (84.5)
	31-40	11 (2.3)
	41-50	8 (1.7)
	51-60	0
	61-70	0
	>70	0
Current residential location	Rural area	121 (25.3)
	Semi-urban area	110 (23)
	Urban area	247 (51.7)
Occupation	Student	446 (93.3)
	Homemaker	2 (0.4)
	Working in a private firm	14 (2.9)
	Working in a government firm	4 (0.8)
	Practitioners such as doctors/lawyer	12 (2.5)
Educational qualification	Below 10^{th} standard	2 (0.4)
	11^{th}-12^{th} standard	38 (7.9)
	Undergraduate programme	288 (60.3)
	Postgraduate programme	145 (30.3)
	PhD programme	5 (1.0)
	PostDoc	0
Marital status	Married	33 (6.9)
	Unmarried	445 (93.1)

Family type	Nuclear family	403 (84.3)
	Joint family	75 (15.7)
Annual income (in lakhs)	<2	224 (46.9)
	3-4	114 (23.8)
	5-6	47 (9.8)
	7-8	30 (6.2)
	8-9	26 (5.4)
	>10	37 (7.7)

[Table/Fig-1]: Demographic profile of the respondents (n=478).

COVID-19 vaccine taken status	Frequency	Percentage
Yes	474	99.2%
No	4	0.8%
Number of COVID-19 vaccine doses take by the respondents		
Single dose	93	19.5%
Second dose	385	80.5%
Place where the COVID-19 vaccine was taken		
Place where the COVID-19 vaccine was taken	**Frequency**	**Percentage**
Government hospital	243	50.8%
COVID 19 vaccination camps	151	31.6
Private hospital	74	15.4%
Community health centre	3	0.6%
Special camps organised by the educational institutions	2	0.4%
Primary health centre	2	0.4%
Drive organised by the housing society	1	0.2%
Special camps organised by the educational institutions	1	0.2%
Drive organised by the company where I am employed	1	0.2%
Main reason for taking the COVID-19 vaccine or not taking the COVID-19		
It is my responsibility to take the COVID-19 vaccine	354	74.1%
Recommended by health authorities	85	17.8%
Compulsion from other authorities/parents/peers	19	4%
It is a prerequisite to travel from one place to other place	15	3.1%
COVID-19 vaccine might cause harmful side-effects	5	1.1%

[Table/Fig-2]: COVID-19 vaccine related behaviour.

The knowledge score was 10 out of a total score of 14. The knowledge-related questions such as 'how to handle unusual reactions after the COVID-19 vaccine, perception such as severe allergic reactions to the first dose of the COVID-19 vaccine, usage of painkillers such as paracetamol before receiving the COVID-19 vaccine and suitability of the COVID-19 vaccine' are the areas which require interventions and improvement [Table/Fig-3].

The attitude score was 8 out of 10. It is considered to be a good score. This is mainly indicating the trust of the respondents towards the COVID-19 vaccine. The areas in attitude that need intervention and improvement are the perception of the long-term health complications related to the COVID-19 vaccine, and the cost of the COVID-19 vaccine is assumed to be high [Table/Fig-4].

With the reference to [Table/Fig-5], the total score of the COVID-19-related practice was 10 out of 10. This indicates that the respondents are well informed about what needs to be done, how it should be done, and their roles and responsibilities regarding the COVID-19 vaccine [Table/Fig-5].

	How long should you stay in the place after getting COVID-19 vaccine?	**Frequency**	**Percentage**	**Acceptable knowledge adequacy (Above 70%=1 and below 70%=0)**
KQ1	Atleast 15 minutes	390	81.5%	1
	Atleast 50 minutes	43	8.9%	
	Atleast one hour	40	8.3%	
	Atleast two hours	5	1.1%	
	Total	478	100	
KQ2	**When you have an unusual reaction after the COVID-19 vaccine, you**	**Frequency**	**Percentage**	0
	Take immediate tablets to overcome the symptom	121	25.3%	
	Go to the doctor the next day after observing the symptom for 24 hours	121	25.3%	
	Immediately inform the healthcare provider where you have vaccinated	146	30.5%	
	It is quite usual to have an unusual reaction, so remain quite	90	18.8%	
	Total	478	100	

KQ3	**Most of the COVID-19 vaccines are**	**Frequency**	**Percentage**	1
	Two dose vaccines	444	92.9%	
	Single dose Vaccine	21	4.3%	
	Triple dose vaccines	11	2.3%	
	Four dose vaccines	2	0.4%	
	Total	478	100	
KQ4	**The second dose of the COVID-19 vaccine helps to**	**Frequency**	**Percentage**	1
	Boost the immune response and strengthen immunity	401	83.9%	
	Boost the body's muscles	23	4.8%	
	Boost the nerves	12	2.5%	
	Boost the overall look of the body	42	8.8%	
	Total	478	100	
KQ5	**Minor side-effects of the COVID-19 vaccine are**	**Frequency**	**Percentage**	1
	Normal	432	90.4%	
	Abnormal	19	4%	
	Not acceptable	16	3.3%	
	Risky	11	2.3%	
	Total	478	100	
KQ6	**Common side-effects after the vaccination indicate that**	**Frequency**	**Percentage**	1
	The vaccine is not accepted by the body	58	12.1%	
	The person's body is building protection to COVID-19 infection	387	81%	
	The signs for major illness expected	28	5.8%	
	The sign for the need to admit to ICU	5	1.1%	
	Total	478	100	
KQ7	**Select the common side-effect(s) of the COVID-19 vaccine**	**Frequency**	**Percentage**	1
	Arm soreness and headache	34	7.1%	
	Mild fever and tiredness	72	15.1%	
	Muscle and joint aches	4	0.8%	
	All of the above	368	77%	
	Total	478	100	
KQ8	**When to contact the health service provider?**	**Frequency**	**Percentage**	1
	If there is redness or tenderness (pain) were at the site of injection that increases after 24 hours	34	7.1%	
	If side-effects do not go away after a few days	61	12.8%	
	If you are unable to perform day-to-day activities such as walking	20	4.2%	
	All of the above	363	76%	
	Total	478	100	
KQ9	**If you experience an immediate severe allergic reaction to a first dose of the COVID-19 vaccine**	**Frequency**	**Percentage**	0
	You should not receive additional doses of the vaccine	238	49.8%	
	You should receive the additional dose of the vaccine	89	18.6%	
	You should try other vaccine types to check the reaction	77	16.1%	
	You should wait for one year and then take the additional dose of the vaccine	74	15.5%	
	Total	478	100	
KQ10	**Taking painkillers such as paracetamol before receiving the COVID-19 vaccine to prevent side-effects is**	**Frequency**	**Percentage**	0
	Good practice	78	16.3%	
	Recommended	107	22.4%	
	Not recommended	220	46.1%	
	It doesn't carry any benefit	73	15.3%	
	Total	478	100	
KQ11	**Even after the COVID-19 vaccine, you**	**Frequency**	**Percentage**	1
	Must follow all the COVID-19 prevention protocols	440	92.1%	
	Must follow selected COVID-19 prevention protocols	30	6.2%	
	Can stop following COVID-19 prevention protocols	1	0.2%	
	Can stop wearing mask	7	1.5%	
	Total	478	100	

KQ12	**While a COVID-19 vaccine will prevent serious illness and death, we still don't know the extent to which it keeps you from being infected and passing the virus on to others.**	**Frequency**	**Percentage**	
	True	428	89.5%	1
	False	50	10.5%	
	Total	478	100	
KQ13	**Select the practice (s) which need to be followed after the COVID-19 vaccine**	**Frequency**	**Percentage**	
	Keep atleast 1 m from others.	20	4.2%	
	Wear a mask, especially in crowded, closed, and poorly ventilated settings.	27	5.6%	
	Clean your hands frequently	10	2.1%	1
	Cover any cough or sneeze in your bent elbow	3	0.6%	
	When indoors with others, ensure good ventilation, such as by opening a window	6	1.3%	
	Follow all of the above.	412	86.2%	
	Total	478	100	
KQ14	**COVID-19 vaccines are safe for**	**Frequency**	**Percentage**	
	18 years and older	135	28.2%	
	Those with pre-existing conditions of any kind, including auto-immune disorders. These conditions include: hypertension, diabetes, asthma, pulmonary, liver, and kidney disease	12	2.5%	0
	Those with chronic infections that are stable and controlled	7	1.5%	
	All of the above	324	67.8%	
	Total	478	100	

[Table/Fig-3]: Results of knowledge about COVID-19 vaccine.

AQ1	**Currently, there are several safe and effective vaccines that prevent people from getting seriously ill or dying from COVID-19.**	**Frequency**	**Percentage**	**Positive attitude (Above 70% =1 and below 70%=0)**
	Agree	401	83.9%	
	Disagree	77	16.1%	1
	Total	478	100	
AQ2	**Take whatever vaccine is made available to you first, even if you have already had COVID-19. It is important to be vaccinated as soon as possible once it's your turn and not wait.**	**Frequency**	**Percentage**	
	Agree	363	75.9%	1
	Disagree	115	24.1%	
	Total	478	100	
AQ3	**Approved COVID-19 vaccines provide a high degree of protection against getting seriously ill and dying from the disease, although no vaccine is 100% protective.**	**Frequency**	**Percentage**	
	Agree	430	90	1
	Disagree	48	10	
	Total	478	100	
AQ4	**More evidence is needed on the use of the different COVID-19 vaccines in children to be able to make general recommendations on vaccinating children against COVID-19.**	**Frequency**	**Percentage**	
	Agree	440	92.1%	1
	Disagree	38	7.9%	
	Total	478	0	
AQ5	**Most of the approved COVID-19 vaccines are safe**	**Frequency**	**Percentage**	
	Agree	452	94.6%	
	Disagree	26	5.4%	1
	Total	478	100	
AQ6	**Long-term health complications can occur for individuals taking the COVID-19 vaccine.**	**Frequency**	**Percentage**	
	Agree	198	41.4	0
	Disagree	280	58.6%	
	Total	478	100	
AQ7	**All the eligible age groups must take the COVID-19 vaccine**	**Frequency**	**Percentage**	
	Agree	458	95.8%	
	Disagree	20	4.2%	1
	Total	478	100	

AQ8	The citizen must follow the guidelines issued by the statutory health authorities related to the COVID-19 vaccine.	Frequency	Percentage	
	Agree	470	98.3%	1
	Disagree	8	1.7%	
	Total	478	100	
AQ9	COVID-19 vaccines are extremely costly	Frequency	Percentage	
	Agree	147	30.8%	0
	Disagree	331	69.2%	
	Total	478	100	
AQ10	COVID-19 vaccine is not available in India	Frequency	Percentage	
	Agree	47	9.8%	1
	Disagree	431	90.2%	
	Total	478	100	

[Table/Fig-4]: Results of attitude towards COVID-19 vaccine.

PQ1	If I or anyone around me develops any unusual reactions after the COVID-19 vaccine, I will seek/recommend medical intention immediately.	Frequency	Percentage	Safe COVID-19 vaccine practice (Above 70%=1 and below 70% =0)
	Agree	453	94.8%	
	Disagree	25	5.2%	1
	Total	478	100	
PQ2	I am following the guidelines issued by the healthcare service providers to take my second COVID-19 vaccine as per the scheduled time.	Frequency	Percentage	
	Yes	465	97.3%	1
	No	13	2.7%	
	Total	478	100	
PQ3	Before taking the COVID-19 vaccine, I will disclose all the health-related issues and the medications, if any, to the healthcare service provider.	Frequency	Percentage	
	Yes	440	92.1%	1
	No	38	7.9%	
	Total	478	100	
PQ4	I am careful not to take any unapproved COVID-19 vaccine	Frequency	Percentage	
	Yes	442	92.5%	1
	No	36	7.5%	
	Total	478	100	
PQ5	I recommend the COVID- 19 vaccine to all the eligible age groups among my friends and family members.	Frequency	Percentage	
	Yes	464	97.1%	1
	No	14	2.9%	
	Total	478	100	
PQ6	I am watching out for the updated guidelines issued by the statutory authorities related to COVID -19 vaccine and I am willing to follow the same.	Frequency	Percentage	
	Yes	466	97.3%	1
	No	12	2.7%	
	Total	478	100	
PQ7	I am following all COVID-19 restrictions even after the second dose of the COVID-19 vaccine.	Frequency	Percentage	
	Yes	464	97.1%	1
	No	14	2.9%	
	Total	478	100	
PQ8	If there is any mild discomfort after the COVID-19 vaccine, I will consult healthcare providers and take the necessary medications.	Frequency	Percentage	
	Yes	441	92.3%	1
	No	37	7.7%	
	Total	478	100	
PQ9	I am sharing my knowledge on the COVID-19 vaccine with my known network and recommending them to take the COVID-19 vaccine.	Frequency	Percentage	
	Yes	465	97.2%	1
	No	13	2.8%	
	Total	478	100	

	All the approved COVID-19 vaccines are safe. Hence, I have taken the COVID-19 vaccine.	Frequency	Percentage	
PQ10	Yes	467	97.7%	1
	No	11	2.3%	
	Total	478	100	

[Table/Fig-5]: Results of practice related to COVID-19.

DISCUSSION

The results of the study indicate that regarding knowledge of the COVID-19 vaccine, more awareness is required to handle the unusual reaction after the COVID-19 vaccine, severe allergic reactions to the first dose of the COVID-19 vaccine, and painkillers such as paracetamol before receiving the COVID-19 vaccine to prevent side-effects and safe intake of COVID-19 vaccines. Perception of the respondents, such as long-term health complications and the cost of the COVID-19 vaccine under attitude, also warrants a need to conduct awareness. Interestingly, all the practice questions related to COVID-19 have secured more than 100%, meeting the eligibility to consider good practice.

Syed Alwi SAR et al., found that social media was the main source of information about COVID-19 [7]. The overall acceptance of the COVID-19 vaccine was high, accounting for 83.3%. Only in the case of elders (60 years and above) and pensioners the COVID-19 vaccine acceptance percentage is relatively lowest. The main reason for the non acceptance of the COVID-19 vaccine was due to side-effects, safety, lack of information, effectiveness, and religious and cultural factors. The study also reported that participants with diabetes mellitus and hypercholesterolaemia showed hesitancy to take COVID-19 vaccine. Age, religion, and residence were the main predictors of COVID-19 vaccine hesitancy.

Mohamed NA et al., included the participants with a mean age of 37.07 years. The results of their study indicate that 62% displayed poor knowledge about the COVID-19 vaccine, and only 64.5% were shown a willingness to get COVID-19 vaccine [8]. Interestingly, the study found that higher knowledge of the COVID-19 vaccine was due to the factors such as higher education, higher income, and the participants who were living with individuals with severe risk of contracting COVID-19. The study also reported that participants representing lower age groups, higher educational qualifications, and female gender were more likely to get COVID-19 vaccines.

Interestingly, Magadmi RM and Kamel FO highlighted that only 44.7% of the respondents were ready to accept the COVID-19 vaccine if provided and 55.3% of the respondents had displayed hesitancy in taking the COVID-19 vaccine [9]. The study reported that respondents in a young age group, male gender, and the respondents who had received seasonal influenza vaccine showed more likelihood to take the COVID-19 vaccine. Concern about the side-effects of the COVID-19 vaccine was the main barrier to accepting the COVID-19 vaccine. The respondents were willing to accept the COVID-19 vaccine if there could be studies assuring COVID-19 safety and effectiveness.

Contrary to this finding, Sharma M et al., found that 47.5% of the respondents displayed hesitancy to take COVID-19 vaccine [10]. The MTMs initiation model used in the study had three variables: behavioural confidence, participatory dialogue, and changes in the physical environment. The study found that all the variables influenced COVID-19 acceptance among the respondents who did not have any hesitancy to take COVID-19 vaccine, and the model explained 54.8% of the variance. The authors mentioned that MTMs could be used to formulate strategies for college students to increase their acceptance of the COVID-19 vaccine.

In the student context, Barello S et al., reported that 86.1% of the students had shown positive intention to get the COVD-19 vaccine, whereas 13.9% of the students did not show intention to get the COVID-19 vaccine [11]. The study did not observe any differences in the intention to get COVID-19 vaccines among the healthcare and non healthcare students. The author mentioned that knowing the student's perspective on the COVID-19 vaccine and their support towards health engagement and consciousness might help plan multidisciplinary educational strategies. In the context of the mothers, Walker KK et al., reported that perception of the COVID-19 threat influenced the mother's decision to follow the COVID-19 protective behaviours [12]. But the mothers were hesitant to take the COVID-19 vaccine due to reasons such as the safety of the COVID-19 vaccine, the efficacy of the COVID-19 vaccine, and confusion caused due to conflicting information about the COVID-19 vaccine.

Joshi A et al., reviewed 22 eligible studies available in PubMed [13]. The study found that 82% of the studies were conducted with the general population. From the 22 study finding, gender, age, education, and occupation were the main socio-demographic variables influencing vaccine acceptance. The factors such as trust in authorities, risk perception of COVID-19 infection, efficacy of the COVID-19 vaccine, influenza vaccination status, and vaccine safety affected the acceptance of the COVID-19 vaccine. The study reported that the COVID-19 vaccine acceptance globally in March 2020 was 86%, but it dipped to 54% in July 2020 and enhanced to 72% in September 2020. Regarding vaccine hesitancy, the study reported that the average vaccine hesitancy in April 2020 was 21%, in July 2020 was 36% and in October 2020 was 16%. The authors reported that these fluctuating vaccine acceptance or vaccine hesitancy might hamper the effort to control or eliminate COVID-19. The authors also highlighted the importance of paying attention to the barrier and facilitators of the COVID-19 vaccine to formulate strategies for the maximum coverage of the COVID-19 vaccine.

AlShurman BA et al., used 48 articles related to the COVID-19 vaccine. The selected articles were focused on research outcomes such as demographics, social factors, vaccination beliefs and attitudes, vaccine perceptions, perceptions related to health, perceived barriers related to the COVID-19 vaccine, and the recommendation for the COVID-19 vaccine. The analyses revealed that age, gender, education level, race/ethnicity, the safety of the COVID-19 vaccine and its effectiveness, previous influenza vaccination history, and self-protection from COVID-19 were the critical factors that influenced the use of the COVID-19 vaccine. Most reviewed studies reported a high intention to get COVID-19 vaccination, ranging from 60-93%. Zahid HM and Alsayb MA reported that the overall COVID-19 vaccine acceptance rate was 79.2% [14,15]. The study found that the respondent's age, sex, and nationality significantly influenced their vaccination status. The reason the respondents who had been vaccinated or had the intention to get vaccinated was due to the perception such dangerous infection of the COVID-19 vaccine varies from person to person, the safety of the COVID-19 vaccine, and the need to get the COVID-19 vaccination. The main factors influencing the motivation to opt for the vaccine were confidence in government decisions and responsibility towards stopping the pandemic. The study also reported that the demotivating factors for the COVID-19 vaccine were due to a lack of clinical trials and information about the side-effects. The residents of Saudi Arabia had shown good acceptance of the COVID-19 vaccine.

Al-Wutayd O, et al., highlighted that only 35.8% of the respondents was hesitant to receive COVID-19 vaccine [16]. The main reason for the hesitancy towards the COVID-19 vaccine includes side-effects, belief in conspiracy theories and negative perception of the inefficacy of the COVID-19 vaccine. Other factors such as urban residency, reservations about vaccine safety, uncertainty about vaccine efficacy, the COVID-19 vaccine's failure to decrease hospitalisation and death, and the unrealised need for vaccination awareness were the reasons for higher vaccine hesitancy. Factors such as one chronic disease, awareness of someone who tested COVID-19 positive, and trust in the information from the health ministry and physicians were associated with reducing the hesitancy of the COVID-19 vaccine. Musa S et al., reported that age groups, nationalities, and recovery from COVID-19 were the main predictors that determined the vaccine hesitancy level [17]. Interestingly, the study reported that parents of adolescents from North African, African, Asiatic, and European/American/Oceanian were less likely to have vaccine hesitancy when compared to parents of adolescents from the Gulf countries. The author recommended effective communication mainly targeting the Gulf countries, parents of younger children aged 12 years, and of those with chronic disease or individuals infected with COVID-19, which will enhance the trust/vaccine confidence leading to enhancing the COVID-19 intake.

Tahir MJ et al., reported that 70.8% of the respondents were willing to take the COVID-19 vaccine, and 66.8% of the respondents displayed a positive attitude toward vaccination [18]. Barry M et al., reported that 33.27% of the respondents had already received the vaccine/enrolled to get the vaccine, and 66.73% did not enroll to get the Vaccine [19]. The non enrollment for the vaccine was seen more in the female gender when compared to males. Yu Y et al., found positively associated factors for the PSCV, which include the perceived protection effect of vaccination, self-perceived physical fitness for vaccination, compulsory COVID-19 testing experience, perceived need to travel, general trust toward the Government and trust toward the government vaccination programme, and negatively associated factors include perceived low efficacy of vaccination, concerns about side-effects and chronic disease status [20].

Finney Rutten LJ et al., found that there was a significant vaccine hesitancy in general public attitudes in the United States of America (USA) towards the COVID-19 vaccine [21]. The authors reported that building on efforts was essential at the policy and community level to ensure population access to COVID-19 vaccination. The author also recommended that a strong healthcare system is vital to enhance vaccine hesitancy. Taye BT et al., indicated that the percentage of COVID-19 vaccine acceptance was 69.3%. The main reason for COVID-19 vaccine acceptance was attributed to the knowledge and status of the health science student and part of the family practicing COVID-19 prevention [22]. Salerno L et al., reported that vaccine hesitation or resistance among the students was due to higher endorsements or conspiracy statements and negative perceptions about vaccines [23].

Taye BT et al., and Dratva J et al., one-third of the participants intended to take COVID-19 vaccine, and 68% were unsure about getting the COVID-19 vaccine [22,24]. The study found that apart from the demographic characteristics, vaccination history, travel vaccination, trust in vaccination, and 5C dimensions were associated with vaccination intention. Sharma M et al., found that perceived advantages and behavioural confidence were higher among the vaccine non hesitant group than the hesitant ones [25]. Kumari A et al., developed a 39-item questionnaire to assess the knowledge, attitude, practices, and concerns regarding the COVID-19 vaccine, and Cronbach's alpha value was 0.86, indicating good internal consistency [26]. Based on the above literature, it is evident that studies related to the COVID-19 vaccine are limited in the Indian context. The present study will contribute to bridging the gap in the literature.

With reference to [Table/Fig-6], while comparing the previous research studies on COVID-19 vaccine knowledge, attitude, acceptance, and hesitancy, the results of the present indicate a higher knowledge, positive attitude, and practice towards the COVID-19 vaccine [7-10,13,15,18,21,22,24].

Authors name	Place and year of the study	Critical finding
Syed Alwi SAR et al., [7]	Malaysia, 2021	Overall acceptance of the COVID-19 vaccine was high.
Zahid HM and Alsayb MA [15]	Saudi Arabia, 2021	Overall COVID-19 vaccine acceptance rate was 79.2%.
Mohamed NA et al., [8]	Malaysia, 2021	Only 64.5% were shown a willingness to get COVID-19 vaccine.
Sharma M et al., [10]	USA, 2021	47.5% of the respondents displayed hesitancy to take COVID-19 vaccine
Al-Wutayd O et al., [16]	Pakistan, 2021	35.8% of the respondent were hesitant to receive the COVID-19 vaccine
Tahir MJ et al., [18]	Pakistan, 2021	70.8% of the respondents had shown a willingness to take COVID-19 vaccine if available
Finney Rutten LJ et al., [21]	USA, 2021	Significant vaccine hesitancy in general public attitudes in the USA towards the COVID-19 vaccine
Taye BT et al., [22]	Ethiopia, 2019	COVID-19 vaccine acceptance was 69.3%
Dratva J et al., [24]	Switzerland, 2021	68% were unsure about getting the COVID-19 vaccine
Mohamed NA et al., [8]	Malaysia, 2021	62% displayed poor knowledge about the COVID-19 vaccine
Magadmi RM et al., [9]	Saudi Arabia, 2021	44.7% of the respondents were ready to accept the COVID-19 vaccine
Magadmi RM et al., [9]	Saudi Arabia, 2021	55.3% of the respondents had displayed hesitancy in taking the COVID-19 vaccine
Joshi A et al., [13]	Articles available in PubMed	COVID-19 vaccine acceptance globally in March 2020 was 86%, but it dipped to 54% in July 2020 and enhanced to 72% in September 2020
Joshi A et al., [13]	Articles available in PubMed	Average vaccine hesitancy in April 2020 was 21%; in July 2020 was 36% and in October 2020 was 16%.
Tahir MJ et al., [18]	Pakistan, 2021	66.8% of the respondents had shown a positive attitude toward vaccination
Punitha DP and Sudhagar DP	India, 2021	99% of the study participants had taken the COVID-19 vaccine 81% had taken the second dose 51% of the participants had taken the COVID-19 vaccine at a Government hospital 74% of the participants mentioned that it was their responsibility to take COVID-19 vaccine. Regarding KAP, the knowledge score was 10 out of a total score of 14, the attitude score was 8 out of 10, and the total score of the COVID-19-related practice was 10 out of 10.

[Table/Fig-6]: Comparison of research studies on COVID-19 vaccine knowledge, attitude, acceptance, and hesitancy [7-10,13,15,16,18,21,22,24].

Limitation(s)

The study used convenience sampling to collect the data from the respondents. Hence, the results of the study cannot be generalised.

CONCLUSION(S)

Study subjects had good knowledge about the COVID-19 vaccine, a positive attitude, and excellent COVID-19 vaccine-related practices. This finding will provide more confidence to the stakeholders involved in the administration of COVID-19, which includes the health authorities, doctors, and policymakers, to conduct the COVID-19 vaccine drive across the country actively. The study results can be used to develop health promotion strategies to promote the COVID-19 vaccine.

More COVID-19 vaccine related behaviour can be included in future studies. In addition, a study can be explicitly conducted with the population below 18 years of age since the population below 18 is not yet vaccinated. The KAP of these populations could be different, which may be highly required for the various stakeholders involved in the vaccination administration.

REFERENCES

[1] Gov. in. [cited 2022 Nov 3]. Available from: https://www.mohfw.gov.in/pdf/UpdatedDetailedClinicalManagementProtocolforCOVID19adultsdated24052021.pdf#:~:text=The%20outbreak%20of%20Novel%20coronavirus,territories%2Fareas%20worldwide.

[2] Pathak S, Frayer L, Silver M. India's pandemic death toll estimated at about 4 million: 10 times the official count. NPR. 2021 Jul 20 [cited 2022 Nov 3]; Available from: https://www.npr.org/sections/goatsandsoda/2021/07/20/1018438334/indias-pandemic-death-toll-estimated-at-about-4-million-10-times-the-official-co.

[3] Ojha S. Rise in Covid-19 cases in India: Expert explains the reasons and consequences [Internet]. mint. 2021 [cited 2022 Nov 3]. Available from: https://www.livemint.com/news/india/rise-in-covid-19-cases-in-india-expert-explains-the-reasons-and-consequences-11630979037805.html.

[4] Measures taken against contracting COVID-19 in India 2021 [Internet]. Statista. [cited 2022 Nov 3]. Available from: https://www.statista.com/statistics/1104660/india-measures-taken-against-coronavirus-covid-19/.

[5] BBC News. Covid vaccine: India becomes second country to cross two billion COVID jabs. BBC [Internet]. 2021 Mar 11 [cited 2022 Nov 3]; Available from: https://www.bbc.com/news/world-asia-india-56345591.

[6] India population (2022)- Worldometer [Internet]. Worldometers.info. [cited 2022 Nov 3]. Available from: https://www.worldometers.info/world-population/india-population/.

[7] Syed Alwi SAR, Rafidah E, Zurraini A, Juslina O, Brohi IB, Lukas S. A survey on COVID-19 vaccine acceptance and concern among Malaysians. BMC Public Health [Internet]. 2021;21(1):1129. Available from: http://dx.doi.org/10.1186/s12889-021-11071-6.

[8] Mohamed NA, Solehan HM, Mohd Rani MD, Ithnin M, Che Isahak CI. Knowledge, acceptance, and perception on COVID-19 vaccine among Malaysians: A web-based survey. PLoS One. 2021;16(8):e0256110. Available from: http://dx.doi.org/10.1371/journal.pone.0256110.

[9] Magadmi RM, Kamel FO. Beliefs and barriers associated with COVID-19 vaccination among the general population in Saudi Arabia. BMC Public Health. 2021;21(1):1438. Available from: http://dx.doi.org/10.1186/s12889-021-11501-5.

[10] Sharma M, Batra K, Batra R. A theory-based analysis of COVID-19 vaccine hesitancy among African Americans in the United States: A recent evidence. Healthcare (Basel). 2021;9(10):1273. Available from: http://dx.doi.org/10.3390/healthcare9101273.

[11] Barello S, Nania T, Dellafiore F, Graffigna G, Caruso R. "Vaccine hesitancy" among university students in Italy during the COVID-19 pandemic. Eur J Epidemiol. 2020;35(8):781-83. Available from: http://dx.doi.org/10.1007/s10654-020-00670-z.

[12] Walker KK, Head KJ, Owens H, Zimet GD. A qualitative study exploring the relationship between mothers' vaccine hesitancy and health beliefs with COVID-19 vaccination intention and prevention during the early pandemic months. Hum Vaccin Immunother. 2021;17(10):3355-64. Available from: http://dx.doi.org/10.1080/21645515.2021.1942713.

[13] Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. Predictors of COVID-19 vaccine acceptance, intention, and hesitancy: A scoping review. Front Public Health. 2021;9:698111. Available from: http://dx.doi.org/10.3389/fpubh.2021.698111.

[14] AlShurman BA, Khan AF, Mac C, Majeed M, Butt ZA. What demographic, social, and contextual factors influence the intention to use COVID-19 vaccines: A scoping review. Int J Environ Res Public Health. 2021;18(17):9342. Available from: http://dx.doi.org/10.3390/ijerph18179342.

[15] Zahid HM, Alsayb MA. Assessing the knowledge and attitude toward COVID-19 vaccination in Saudi Arabia. Int J Environ Res Public Health [Internet]. 2021;18(15):8185. Available from: http://dx.doi.org/10.3390/ijerph18158185.

[16] Al-Wutayd O, Khalil R, Rajar AB. Sociodemographic and behavioural predictors of COVID-19 vaccine hesitancy in Pakistan. J Multidiscip Healthc [Internet]. 2021;14:2847-56. Available from: http://dx.doi.org/10.2147/JMDH.S325529.

[17] Musa S, Dergaa I, Abdulmalik MA, Ammar A, Chamari K, Saad HB. BNT162b2 COVID-19 vaccine hesitancy among parents of 4023 young adolescents (12–15 years) in Qatar. Vaccines (Basel). 2021;9(9):981. Available from: http://dx.doi.org/10.3390/vaccines9090981.

[18] Tahir MJ, Saqlain M, Tariq W, Waheed S, Tan SHS, Nasir SI, et al. Population preferences and attitudes towards COVID-19 vaccination: A cross-sectional study from Pakistan. BMC Public Health. 2021;21(1):1759. Available from: http://dx.doi.org/10.1186/s12889-021-11814-5.

[19] Barry M, Temsah MH, Aljamaan F, Saddik B, Al-Eyadhy A, Alenezi S, et al. COVID-19 vaccine uptake among healthcare workers in the fourth country to authorize BNT162b2 during the first month of rollout. Vaccine. 2021;39(40):5762-68. Available from: http://dx.doi.org/10.1016/j.vaccine.2021.08.083.

[20] Yu Y, Lau MMC, Jiang H, Lau JTF. Prevalence and factors of the performed or scheduled COVID-19 vaccination in a Chinese adult general population in Hong Kong. Vaccines (Basel). 2021;9(8):847. Available from: http://dx.doi.org/10.3390/vaccines9080847.

[21] Finney Rutten LJ, Zhu X, Leppin AL, Ridgeway JL, Swift MD, Griffin JM, et al. Evidence-based strategies for clinical organisations to address COVID-19 vaccine hesitancy. Mayo Clin Proc. 2021;96(3):699-707. Available from: http://dx.doi.org/10.1016/j.mayocp.2020.12.024.

[22] Taye BT, Amogne FK, Demisse TL, Zerihun MS, Kitaw TM, Tiguh AE, et al. Coronavirus disease 2019 vaccine acceptance and perceived barriers among university students in northeast Ethiopia: A cross-sectional study. Clin Epidemiol Glob Health [Internet]. 2021;12(100848):100848. Available from: http://dx.doi.org/10.1016/j.cegh.2021.100848.

[23] Salerno L, Craxì L, Amodio E, Lo Coco G. Factors affecting hesitancy to mRNA and viral vector COVID-19 vaccines among college students in Italy. Vaccines (Basel). 2021;9(8):927. Available from: http://dx.doi.org/10.3390/vaccines9080927.

[24] Dratva J, Wagner A, Zysset A, Volken T. To vaccinate or not to vaccinate-this is the question among Swiss university students. Int J Environ Res Public Health. 2021;18(17):9210. Available from: http://dx.doi.org/10.3390/ijerph18179210.

[25] Sharma M, Davis RE, Wilkerson AH. COVID-19 vaccine acceptance among college students: A theory-based analysis. Int J Environ Res Public Health. 2021;18(9):4617. Available from: http://dx.doi.org/10.3390/ijerph18094617.

[26] Kumari A, Ranjan P, Chopra S, Kaur D, Upadhyay AD, Kaur T, et al. Development and validation of a questionnaire to assess knowledge, attitude, practices, and concerns regarding COVID-19 vaccination among the general population. Diabetes Metab Syndr [Internet]. 2021;15(3):919-25. Available from: http://dx.doi.org/10.1016/j.dsx.2021.04.004.

PARTICULARS OF CONTRIBUTORS:

1. Senior Assistant Professor, Department of General Medicine, Government Tiruvannamalai Medical College and Hospital, Tiruvannamalai, Tamil Nadu, India.
2. Associate Professor, Department of General Medicine, School of Professional Studies, Garden City University, Bengaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. DP Punitha,
Tiruvannamalai Medical College, Outer Ring Road, Vengikkal, Tiruvannamalai Taluk, Tiruvannamalai District, Tiruvannamalai, Tamil Nadu, India.
E-mail: dpunitha1976@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Oct 11, 2022
- Manual Googling: Nov 21, 2022
- iThenticate Software: Nov 25, 2022 (5%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 09, 2022**
Date of Peer Review: **Nov 02, 2022**
Date of Acceptance: **Nov 28, 2022**
Date of Publishing: **Dec 01, 2022**