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Knowledge, barriers and facilitators regarding COVID-19 vaccine and vaccination programme among the general population: A cross-sectional survey from one thousand two hundred and forty-nine participants

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A R T I C L E   I N F O

A B S T R A C T

Background and aims: The success of the COVID-19 vaccination program is dependent on people's knowledge and attitude regarding the vaccination program. Higher vaccine acceptance can be ensured by strengthening the facilitators and limiting the barriers being observed among the general population.
Material and methods: Indexed study is a cross-sectional web-based survey using a pre-validated questionnaire to assess knowledge, barriers and facilitators of COVID-19 vaccine and vaccination programme administered on adults across India using a Google online survey platform.
Results: A total of 1294 responses (age: 38.02 ± 13.34 years) were collected. Most of the participants had limited knowledge regarding the eligibility of vaccines in vulnerable population groups such as people with allergies (57.89%) and immune-compromised patients (62.98%), pregnant and lactating women (41.89%) and patients with chronic illness (34.78%). Older participants (>45 years) were more willing to take the COVID-19 vaccine ($p < 0.001$) as they believed the vaccine is not harmful and considered it as societal responsibility. Younger participants (<45 years) and those residing in urban settings raised concerns on the availability of the vaccine and authenticity of the vaccine ($p < 0.001$).
Conclusion: There is a scope for improvement in people's knowledge regarding COVID-19 vaccine and the vaccination programme by addressing the barriers and facilitators which can improve the participants' turnover at vaccination centres.

1. Introduction

The unprecedented COVID-19 disease has significant physical, mental, social, emotional and economic implications [1–4]. Various preventive strategies such as regular handwashing, social distancing and confinement have been implemented with the objective to curtail the spread of coronavirus. These preventive measures have yielded limited success in preventing COVID-19 infection and the second wave of the disease has shocked the world. The currently proposed vaccination program against COVID-19 seems promising in providing protection against the virus [5].

The success of the mass COVID-19 vaccination program depends on the turnover of eligible candidates at the vaccination centres. Unfortunately, a significant proportion of eligible candidates are not turning up to get their dose of vaccine, which indicates

hesitancy amongst people to participate in the COVID-19 vaccination program [6,7].

Vaccine hesitancy poses threat to the success of the COVID-19 vaccination drive [7]. The acceptance and hesitancy are largely determined by people's knowledge, attitude, practices and concerns regarding the safety, efficacy, risks and benefits associated with the COVID-19 vaccination program [8]. Some western studies have assessed people's opinion regarding the vaccination program before the introduction of the vaccine using semi-structured surveys [9—11]. Besides, participation in the COVID-19 vaccination program is dependent on local socio-demographic and cultural correlates [10].

There is a paucity of studies conducted in India to evaluate the willingness of people towards getting vaccinated against COVID-19 including facilitators and barriers. We conducted this study to interpret the knowledge, attitude, practices and concerns of the Indian population regarding the COVID-19 vaccination program.

2. Material and methods

2.1. Study design and setting

A web-based cross-sectional survey was carried out on the general population using a validated questionnaire to assess the knowledge, attitude, practices and concerns of people regarding the COVID-19 vaccination program. This study was approved by the Institutional Ethics Committee, All India Institute of Medical Sciences, New Delhi.

This large cross-sectional survey was conducted between March 13, 2021 and March 25, 2021 via an online platform across different regions in India. Data were collected through a Google Form and telephonic interviews. Participants were informed regarding the study objectives, duration of participation, declaration of confidentiality and voluntary participation before administration of the questionnaire. Participants providing informed consent were directed to the main questionnaire. This web link was sent by investigators to their personal and social contacts via email or Whatsapp messenger. In cases where participants had limited technical knowledge and/or limited literacy level, investigators conducted the telephonic interview and filled the Google form on their behalf.

2.2. Study participants

Participants aged 18 years and above representing different socio-demographic variables such as age, gender, socio-economic status and place of residence were recruited to fulfil the principal of maximum diversity. The investigators used personal and social contacts for recruitment of the participants from different regions of India via purposive and snowball sampling techniques. A sum of 1327 responses were received via Google forms and telephonic interviews. However, certain responses were excluded due to invalid entries and/or duplication of data. The final data comprised 1294 participants across different states of India.

2.3. Survey questionnaire

A validated 39-item questionnaire developed in a previous study [12] was used to obtain data. The information related to socio-demographic profile such as age, gender, socioeconomic status and place of residence was obtained. The next section of the questionnaire comprises items assessing knowledge about eligibility to get COVID-19 vaccine amongst different population groups and sources of information regarding COVID-19 vaccine. Further, the items were included to evaluate the general attitude regarding

COVID-19 vaccine, drivers and barriers for participation in the vaccination programme and concerns towards the COVID-19 vaccine. The responses were marked on 3-point and 5-point Likert scales.

2.4. Statistical analysis

The baseline characteristics of the participants were presented as frequency and percentages. According to the distribution of data, the association between qualitative variables was assessed using Chi-squares test or Fisher's Exact test. The data was analysed using STATA/SE version 14.2 (StataCorp LP, College Station, TX, USA). P-value ≤ 0.05 was considered statistically significant for all analyses.

3. Results

3.1. Socio-demographic profile of the participants

The socio-demographic details of the included participants (n = 1294) are depicted in Supplementary Table 1. The sample has a slight predominance of male participants (58.35%) with the mean age of 38.02 ± 13.34 years (range, 18—91 years). There has been a fair representation of participants from different places of residence and socio-economic status (according to Kuppuswamy scale), with a moderately greater number of participants from cities (47.60%) belonging to middle socio-economic status (53.79%).

3.2. Extent of information regarding COVID-19 vaccine and vaccination program

The extent of information participants had on eligibility to get vaccinated amongst different population groups is depicted in Table 1. The overall level of knowledge was low as almost half of the participants either did not know or they reported incorrect responses stating that children and adolescent (below <18 years) (46.68%) and pregnant and lactating women (41.89%) were eligible for getting the COVID-19 vaccine. More than half of the participants were either unaware or responded incorrectly stating that active COVID-19 patients (53.55%), immune-compromised patients (62.98%) and allergic participants (57.89%) were eligible for COVID-19 vaccine.

3.3. Sources of information influencing the decision of getting vaccinated

In this section it has been found that the decision of getting vaccinated against COVID-19 is influenced or will be influenced by the information obtained from various sources such as news from healthcare workers (86.55%), government agencies (84.62%), family and friends (83.77%), news from TV/radio (81.76%) and social media platforms (74.48%) (Table 2). The influence of information obtained from reliable sources such as news from national TV and radio ($p < 0.001$) and government agencies ($p < 0.01$) and non-reliable sources such as social media ($p < 0.05$) was found to be significantly associated with the age. As the age increased, the influence of information obtained from reliable sources also increased whereas information from non-reliable sources impacted people of lower age groups. Similarly, the influence of social media ($p < 0.01$) was significantly associated with the place of residence, affecting the people residing in rural areas. Moreover, information obtained from reliable sources such as government agencies ($p < 0.01$) and healthcare workers ($p < 0.05$) was significantly associated with socio-economic status. The higher the socio-economic status, the higher was the influence from reliable sources.

Table 1
Knowledge regarding the COVID-19 vaccines and vaccination programme.

S.No	Population groups	Number of responses by participants (Percentage)			Association with socio-demographic correlates			
		Correct	Incorrect	Don't know	Age	Gender	Socioeconomic group	Residence
1.	Vaccine is legally mandatory	749 (57.88)	385 (29.76)	160 (12.36)	n.s.	n.s.	p < 0.001	p < 0.001
2.	When will the protective immunity achieved [a]	268 (20.76)	781 (60.50)	242 (18.74)	n.s.	n.s.	p < 0.05	n.s.
	Vaccination is indicated in							
3.	Infants <1 years of age [b]	966 (74.71)	102 (7.89)	225 (17.40)	p < 0.001	n.s.	p < 0.001	n.s.
4.	Children and adolescents <18 years of age	690 (53.32)	452 (34.93)	152 (11.75)	p < 0.001	n.s.	p < 0.001	p < 0.001
5.	Adults >18 years [b]	1031 (79.74)	187 (14.46)	75 (5.80)	n.s.	n.s.	p < 0.05	p < 0.05
6.	Pregnant ladies and lactating mothers	752 (58.11)	273 (21.10)	269 (20.79)	n.s.	n.s.	p < 0.05	p < 0.05
7.	Patients with chronic diseases like diabetes, hypertension and heart diseases	844 (65.22)	301 (23.26)	149 (11.51)	p < 0.001	n.s.	p < 0.001	n.s.
8.	Persons having active COVID-19 infection	601 (46.45)	479 (37.02)	214 (16.54)	p < 0.001	n.s.	p < 0.001	p < 0.01
9.	Persons recovered from COVID-19 infection	994 (76.82)	158 (12.21)	142 (10.97)	p < 0.001	n.s.	p < 0.001	p < 0.05
10.	Person allergic to food items/drugs	545 (42.12)	439 (33.93)	310 (23.96)	p < 0.05	n.s.	p < 0.01	p < 0.05
11.	Immunocompromised patients	479 (37.02)	455 (35.16)	360 (27.82)	n.s.	n.s.	n.s.	n.s.

Footnote: n.s.- Non significant.
For all other questions the number of responses is 1294.
[a] The number of responses for S.No. 2 is 1291.
[b] The number of responses for S.No. 3 and 5 is 1293.

Table 2
Source of information affecting opinion of the general population regarding COVID-19 vaccine and vaccination programme.

S. No	Sources of knowledge affecting opinion regarding COVID-19 vaccination program participation	Number of responses by participants (Percentage)			Association with socio-demographic correlates			
		Insignificant	Somewhat significant	Significant	Age	Gender	Socioeconomic group	Residence
1.	National News channel and Radio	236 (18.24)	530 (40.96)	528 (40.80)	p < 0.001	n.s.	n.s.	n.s.
2.	Government Agencies	199 (15.38)	506 (39.10)	589 (45.52)	p < 0.01	p < 0.01	p < 0.01	n.s.
3.	Social Media[a]	330 (25.52)	558 (43.16)	405 (31.32)	p < 0.05	n.s.	n.s.	p < 0.01
4.	Discussion amongst friends and family	210 (16.23)	660 (51.00)	424 (32.77)	n.s.	n.s.	p < 0.01	n.s.
5.	Healthcare Provider	174 (13.45)	465 (35.94)	655 (50.61)	n.s.	n.s.	p < 0.05	n.s.

Footnote: n.s.- Non significant.
For all other questions the number of responses is 1294.
[a] The number of responses for S.No. 3 is 1293.

3.4. General attitude towards the COVID-19 vaccine

There is an overall positive attitude of people towards the vaccine (Table 3) as majority were willing to get vaccinated as their chance comes (83.6%), willing to pay for the vaccine (75.43%) and willing to recommend it to their family and friends (82.77%). The willingness to get vaccinated was significantly associated with the age (p < 0.001) and socio-economic status (p < 0.001). Higher age group and socio-economic status was associated with greater willingness to get vaccinated. The willingness to pay for the vaccine was also significantly positively associated with the socio-economic status (p < 0.001). As the socio-economic status increases, the willingness to pay for the vaccine also increases. Apart from this, the willingness to recommend the vaccine to family and friends was found to be significantly associated with the place of residence (p < 0.05). The more the developed an area, the greater the willingness of people residing there to recommend the vaccine to their family and friends.

3.5. Facilitators driving the acceptance of COVID-19 vaccine

Various factors have been found associated with COVID-19 vaccine acceptance (Table 4) such as people believe that the vaccine is harmless (77.13%), vaccine benefits outweigh its risks (73.47%), getting vaccinated is a societal responsibility (80.38%), sufficient data is available about the vaccine (64.69%), the vaccine will eradicate COVID-19 (73.80%), role models getting vaccinated (70.23%) and many people around getting vaccinated (75.35%).

Table 3
General attitude of the general population towards COVID-19 vaccine and vaccination programme.

S.No	General attitude domain	Number of responses by participants (Percentage)					Association with socio-demographic correlates			
		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Age	Gender	Socioeconomic group	Residence
1.	Willingness to take the COVID-19 vaccine [a]	34 (2.63)	39 (3.02)	139 (10.75)	337 (26.06)	744 (57.54)	$p < 0.001$	n.s.	$p < 0.001$	$p < 0.01$
2.	Prefer natural immunity over acquired immunity by getting COVID-19 vaccine	263 (20.32)	371 (28.67)	248 (19.17)	222 (17.16)	190 (14.68)	$p < 0.001$	$p < 0.05$	$p < 0.001$	$p < 0.01$
3.	Willingness to pay for the COVID-19 vaccine	45 (3.48)	98 (7.57)	175 (13.52)	467 (36.09)	509 (39.34)	$p < 0.001$	$p < 0.01$	$p < 0.001$	$p < 0.01$
4.	Willingness to recommend vaccine to friends and family	29 (2.24)	54 (4.17)	140 (10.82)	409 (31.61)	662 (51.16)	$p < 0.001$	n.s.	$p < 0.001$	$p < 0.05$

Footnote: n.s.- Non significant.
For all other questions the number of responses is 1294.
[a] The number of responses for S.No. 1 is 1293.

Table 4
Facilitators driving the acceptance of COVID-19 vaccine amongst general population.

S. No	Facilitators driving the acceptance of the vaccine	Number of responses by participants (Percentage)					Association with socio-demographic correlates			
		Strongly Disagree	Disagree	Neither Disagree nor agree	Agree	Strongly agree	Age	Gender	Socioeconomic Group	Residence
1.	No harm in taking the COVID-19 vaccine	16 (1.24)	72 (5.56)	208 (16.07)	465 (35.94)	533 (41.19)	$p < 0.001$	n.s.	$p < 0.001$	n.s.
2.	Protection against COVID-19 infection	8 (0.62)	52 (4.02)	190 (14.68)	539 (41.65)	505 (39.03)	$p < 0.001$	$p < 0.05$	$p < 0.001$	n.s.
3.	Availability of COVID-19 vaccine free of cost	36 (2.78)	126 (9.74)	287 (22.18)	471 (36.40)	374 (28.90)	n.s.	$p < 0.001$	n.s.	$p < 0.01$
4.	Recommendation from healthcare professional/doctor	27 (2.09)	125 (9.66)	247 (19.09)	462 (35.70)	433 (33.46)	$p < 0.01$	$p < 0.01$	n.s.	n.s.
5.	More benefits of getting the COVID-19 vaccine over its risks [a]	16 (1.24)	83 (6.42)	244 (18.87)	466 (36.04)	484 (37.43)	$p < 0.001$	$p < 0.05$	$p < 0.001$	n.s.
6.	Taking COVID-19 vaccine is a societal responsibility	22 (1.70)	58 (4.47)	174 (13.45)	487 (37.64)	553 (42.74)	$p < 0.001$	n.s.	$p < 0.001$	n.s.
7.	Sufficient data regarding the vaccine's safety and efficacy is released by the government	47 (3.63)	140 (10.82)	270 (20.86)	483 (37.33)	354 (27.36)	$p < 0.05$	$p < 0.05$	n.s.	$p < 0.05$
8.	Many people are taking the COVID-19 vaccine	28 (2.16)	114 (8.81)	177 (13.68)	555 (42.89)	420 (32.46)	$p < 0.05$	n.s.	$p < 0.05$	$p < 0.001$
9.	Will help in eradicating the COVID-19 infection	26 (2.01)	66 (5.10)	247 (19.09)	528 (40.80)	427 (33.00)	$p < 0.05$	n.s.	$p < 0.05$	n.s.
10.	Role models/political leaders/senior doctors/scientists have taken the COVID-19 vaccine [a]	62 (4.80)	87 (6.73)	236 (18.25)	467 (36.12)	441 (34.11)	$p < 0.01$	n.s.	n.s.	n.s.

Footnote: n.s.- Non-significant.
For all other questions the number of responses is 1294.
[a] The number of responses for S.No. 5 and 10 is 1293.

Various motivating factors such as no harm in taking the vaccine ($p < 0.001$), recommendation from healthcare professionals ($p < 0.01$) and considering it a societal responsibility ($p < 0.001$) were found to be significantly associated with the age. The higher the age of the people, the greater was the motivation to get vaccinated. Moreover, these motivating factors such as no harm in taking the vaccine ($p < 0.001$) and protection by the vaccine against the COVID infection ($p < 0.001$) were significantly associated with socio-economic status. The higher the socio-economic status, the greater was the motivation to get vaccinated. In addition to this, the motivating factor such as availability of sufficient data regarding the vaccine ($p < 0.05$) was found to be significantly associated with the place of residence. The more developed the place of residence, the higher was the motivation to get vaccinated.

(35.55%), unforeseen future side-effects of the vaccine (35.62%), faultiness of the vaccine (19.32%), rapid development (55.72%) and pharmaceutical gains (22.02%). Various concerns such as availability of the vaccine ($p < 0.001$) and authenticity of the vaccine ($p < 0.001$) were found to be significantly associated with age. The lower the age, the greater was the concern regarding the vaccine. Moreover, concerns such as vaccines are being promoted for commercial gains of pharmaceutical companies ($p < 0.05$) were found to be significantly associated with the place of residence. The more developed an area, the greater was the concern of people residing there. In adjunct to this, the fear of non-availability of the vaccine ($p < 0.001$) and side-effects of the vaccine ($p < 0.05$) was significantly associated with socio-economic status. The lower the socio-economic status, the greater was the apprehension regarding the vaccine.

3.6. Barriers related to COVID-19 vaccine hesitancy

Certain barriers associated with COVID-19 vaccine have been reported (Table 5) such as concerns about availability of the vaccine

4. Discussion

Mass vaccination is considered to be an effective public health measure to control the COVID-19 pandemic. However, the half-

Table 5
Barriers related to COVID-19 vaccine hesitancy amongst general population.

S.No	Barriers related to vaccine hesitancy	Number of responses by participants (Percentage)					Association with socio-demographic correlates			
		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Age	Gender	Socioeconomic group	Residence
1.	Lack of easy availability of COVID-19 vaccine	109 (8.42)	383 (29.60)	342 (26.43)	365 (28.21)	95 (7.34)	$p < 0.001$	n.s.	$p < 0.001$	$p < 0.001$
2.	Immediate serious side effects after taking COVID-19 vaccine	86 (6.65)	341 (26.35)	475 (36.71)	305 (23.57)	87 (6.72)	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$
3.	COVID-19 vaccine may be faulty or fake	199 (15.38)	433 (33.46)	412 (31.84)	181 (13.99)	69 (5.33)	$p < 0.001$	n.s.	$p < 0.001$	$p < 0.05$
4.	COVID-19 vaccine was rapidly developed and approved.	50 (3.86)	187 (14.45)	336 (25.97)	558 (43.12)	163 (12.60)	$p < 0.05$	n.s.	n.s.	n.s.
5.	COVID-19 vaccine might have unforeseen future effects.	67 (5.18)	266 (20.56)	500 (38.64)	366 (28.28)	95 (7.34)	n.s.	n.s.	n.s.	n.s.
6.	COVID-19 vaccine is being promoted for commercial gains of pharmaceutical companies.	189 (14.61)	378 (29.21)	442 (34.16)	178 (13.76)	107 (8.26)	$p < 0.01$	n.s.	$p < 0.001$	$p < 0.05$

Footnote: n.s.- Non-significant.
For all questions the number of responses is 1294.

hearted participation of the general population in this campaign is a matter of concern and has potential to defy the whole purpose. It is important to understand the factors that affect people's decision/opinion to take the vaccine.

We conducted this web-based cross-sectional survey to evaluate the knowledge, attitude, practices and concerns of people regarding the COVID-19 vaccine. A representative sample of 1294 participants across India was recruited to complete the pre-developed validated questionnaire on knowledge, attitude, practices and concerns regarding the COVID-19 vaccine.

Our study revealed that people aged 45−60 years, residing in urban areas and having a high or middle socio-economic status have comparatively higher mean scores of knowledge but still overall there is a lack of appropriate knowledge and awareness among people regarding the eligible candidates for the vaccine and the duration in which the vaccine will provide its protective effects. Moreover, there are various sources of information such as healthcare workers, family and friends, government agencies, news from TV/radio and social media platforms significantly affecting the knowledge of people regarding the vaccine. Though many people are relying on authentic information sources, the issue of concern is the information obtained from social media as it might provide false information, thus increasing vaccine hesitancy among people. In a study conducted by Kourlaba et al. [8], it was reported that people dependent on social media for COVID-19 vaccine information were unwilling to get vaccinated. This calls for the need to convey correct COVID-19 vaccine updates through reliable sources to the public, especially people residing in the rural districts and belonging to lower socio-economic status. Moreover, the government should use and direct the social media platforms to deliver authentic information about the vaccine to alleviate vaccine dropout rates and enhance the willingness.

Our results indicate that the majority of our sample (83.6%) is willing to get vaccinated when their chance comes. Similar willingness rates have been reported in studies conducted in Australia (80%) [13] and UK (76.9%) [14]. Our findings also indicate that people over the age of 45 years showed greater willingness to get vaccinated. This result is in accordance with studies conducted in Australia [13] and Greece [8] where people over 65 years were willing to get vaccinated whereas it is in contrast to the other study conducted in France [15] where people aging 75 years and above were reluctant in getting vaccinated. Further, our results revealed that people residing in urban areas and belonging to high socio-economic status showed the intent to get vaccinated as well as

pay for the vaccine as compared to people residing in rural areas and belonging to lower socio-economic status respectively. Similar findings have been reported in one of the studies conducted in Japan [16] where people having low income levels had lower vaccine acceptance. Similarly in a study conducted in China [17], the willingness to pay for the vaccine was determined by socio-economic factors. Since, India is a nation with wide economic disparities so government authorities should make sure that vaccines are available either at free of cost or at subsidized rates for people belonging to lower socio-economic class in order to ensure wide vaccination coverage.

The willingness of getting vaccinated is multifaceted and is largely influenced by various drivers and barriers. The determinants of COVID-19 vaccine include usefulness of the vaccine in eradication of the disease, recommendation by doctors and role models, sufficient data available about the safety of the vaccine and considering it a societal responsibility to get vaccinated. Though various drivers are associated with the vaccine acceptance, there are certain concerns related to the perceived safety of the vaccine, perceived efficacy, perceived risks and rapid development of the vaccine that might hold people back in getting vaccinated. Our results depict that people belonging to the low socio-economic status and residing in rural areas have greater aversion to the COVI-19 vaccine which is a matter of concern as nearly 70% of the Indian population resides in rural areas. Since our result reveals that people have trust in health authorities and they agree to follow the advice of their doctor, the healthcare professionals should be equipped with the knowledge of the vaccine development and efficacy so that they can confidently answer the concerns of the public and make them understand the rationale for getting vaccinated against COVID-19.

Our study has some practical implications. The results indicate that people might be opting to get vaccinated for wrong reasons such as getting vaccinated if it is available free of cost or if many people around them are getting vaccinated. Moreover, poor knowledge and hesitancy in COVID-19 vaccine acceptance among people belonging to low income levels and rural areas might be a huge barrier in the success of the vaccination drive. The key is to disseminate correct knowledge through reliable channels to instil confidence among people in getting vaccinated. Government officials should take steps to disseminate credible information about the vaccine development, its safety and efficacy, time needed for providing protection and the significance of herd immunity. In addition, collaborations with local community leaders and/or

celebrities can be done to influence general and local populations' decision on getting vaccinated.

Our study has certain strengths and limitations. This is one of the first attempts to assess knowledge, facilitators and concerns regarding the COVID-19 vaccine using a validated and reliable questionnaire. The identified drivers and barriers associated with COVID-19 vaccine can help health authorities to analyze gaps and further build vaccine literacy. On the other hand, our study holds a few limitations. First, though we have collected data from different parts of the country, the participants were not recruited using stratified random sampling technique. It is difficult to claim that this sample is a true representation of the country's population and generalise the findings. Second, this study used a self-reported questionnaire which could lead to more socially desirable responses from participants.

5. Conclusion

This cross-sectional study is one of the first attempts in India assisting to figure out the COVID-19 vaccine acceptance and hesitancy among people by assessing their knowledge, facilitators and barriers regarding the vaccine. The study has raised concerns regarding the vaccine acceptance that might affect the mass vaccination drive. The findings of this study would prove to be useful for public health policy makers and concerned government officials assisting them to implement effective strategies to achieve mass vaccine acceptance. Since it is a cross-sectional study presenting a snapshot of community responses at a point of time, similar longitudinal studies should be carried out to gain insights about people's attitude and concerns regarding the vaccine with respect to the developing situation in India.

Declarations

Not applicable.

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Declaration of competing interest

The Author(s) declare(s) that there is no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2021.04.015.

References

[1] Chopra S, Ranjan P, Singh V, Kumar S, Arora M, Hasan MS, et al. Impact of COVID-19 on lifestyle-related behaviours- a cross-sectional audit of responses from nine hundred and ninety-five participants from India. Diabetes Metab Syndr 2020;14(6):2021—30.
[2] Kumari A, Ranjan P, Sharma KA, Sahu A, Bharti J, Zangmo R, et al. Impact of COVID-19 on psychosocial functioning of peripartum women: a qualitative study comprising focus group discussions and in-depth interviews. Int J Gynaecol Obstet 2021;152(3):321—7.
[3] Mazumder A, Bandhu Kalanidhi K, Sarkar S, Ranjan P, Sahu A, Kaur T, et al. Psycho-social and behavioural impact of COVID 19 on young adults: qualitative research comprising focused group discussion and in-depth interviews. Diabetes Metab Syndr 2021;15(1):309—12.
[4] Ranjan P, Kalanidhi KB, Kaur D, Sarkar S, Sahu A, et al. Psycho-social and behavioral impact of COVID-19 on middle-aged and elderly individuals: a qualitative study. J Educ Health Promot 2021 (In press).
[5] Qualls N, Levitt A, Kanade N, Wright-Jegede N, Dopson S, Biggerstaff M, et al. Community mitigation guidelines to prevent pandemic influenza—United States, 2017. MMWR Recomm Rep (Morb Mortal Wkly Rep) 2017;66(1):1.
[6] Samanth Subramanian. Indian healthcare workers are missing second Covid vaccine doses. Quartz 2021 [cited 2021 Mar 20] Available from: https://www.msn.com/en-us/money/other/indian-healthcare-workers-are-missing-second-covid-vaccine-doses/ar-BB1dHA3d.
[7] McAteer J, Yildirim I, Chahroudi A. The VACCINES Act: deciphering vaccine hesitancy in the time of COVID-19. Clin Infect Dis 2020;71(15):703—5.
[8] Kourlaba G, Kourkouni E, Maistreli S, Tsopela CG, Molocha NM, Triantafyllou C, et al. Willingness of Greek general population to get a COVID-19 vaccine. Glob Health Res Policy 2021;6(1). 1-0.
[9] Harapan H, Wagner AL, Yufika A, Winardi W, Anwar S, Gan AK, et al. Acceptance of a COVID-19 vaccine in southeast Asia: a cross-sectional study in Indonesia. Front Public Health 2020;8.
[10] Lazarus JV, Ratzan SC, Palayew A, Gostin LO, Larson HJ, Rabin K, et al. A global survey of potential acceptance of a COVID-19 vaccine. Nat Med 2021;27(2):225—8.
[11] Shekhar R, Sheikh AB, Upadhyay S, Singh M, Kottewar S, Mir H, et al. COVID-19 vaccine acceptance among health care workers in the United States. Vaccines 2021;9(2):119.
[12] 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 2021;15(3):919—25.
[13] Seale H, Heywood AE, Leask J, Sheel M, Durrheim DN, Bolsewicz K, et al. Examining Australian public perceptions and behaviors towards a future COVID-19 vaccine. BMC Infect Dis 2021;21(1):1—9.
[14] Thorneloe R, Wilcockson H, Lamb M, Jordan CH, Arden M. Willingness to receive a COVID-19 vaccine among adults at high-risk of COVID-19: a UK-wide survey. 2020.
[15] Peretti-Watel P, Seror V, Cortaredona S, Launay O, Raude J, Verger P, Fressard L, Beck F, Legleye S, l'Haridon O, Léger D. A future vaccination campaign against COVID-19 at risk of vaccine hesitancy and politicisation. Lancet Infect Dis 2020;20(7):769—70.
[16] Machida M, Nakamura I, Kojima T, Saito R, Nakaya T, Hanibuchi T, et al. Acceptance of a COVID-19 vaccine in Japan during the COVID-19 pandemic. Vaccines 2021;9(3):210.
[17] Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong LP. Understanding COVID-19 vaccine demand and hesitancy: a nationwide online survey in China. PLoS Neglected Trop Dis 2020;14(12):e0008961.