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Article

Knowledge levels of acceptance and hesitancy of COVID-19 vaccine among general population of the Kingdom of Saudi Arabia

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Abstract: On 11th March 2020, the World Health Organization declared COVID-19 as a pandemic. Vaccination programs have advanced greatly in the global health period, despite widespread anti-vaccination attitudes and misinformation. Vaccine hesitancy of COVID-19 vaccine is currently a major issue in Saudi Arabia. This cross-sectional study was carried out from June 25, 2021 to October 2021 in order to investigate the knowledge levels of acceptance and hesitancy of COVID-19 vaccine among Saudi's nationals. The data was collected through a close-ended structured questionnaire from a total of 565 respondents. Overall, 78.41% respondents were female, 62.48% having university level education and 61.06% were unemployed. Majority of the participants 82.30% (n=465) think that Pfizer vaccine has the highest efficiency against COVID-19. Our study concludes that majority of the participants have satisfactory knowledge about COVID-19 vaccination. Concerns over vaccine components, effectiveness of vaccine and possible side effects are among the key causes for vaccine hesitancy.

Keywords: COVID-19; Coronavirus; Vaccine hesitancy; Kingdom of Saudi Arabia

1. Introduction

On 11th March 2020, the World Health Organization (WHO) declared COVID-19 as a pandemic [1]. The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2]. Till to-date, SARS-CoV-2 has infected over 107,301,950 people, with more than 2,419,094 deaths. The frequency of COVID-19 positive samples and fatalities were brought to a halt by a combination of therapeutic and non-therapeutic interventions. Non-pharmaceutical methods used throughout the globe to combat the epidemic, on the other hand, have gotten more relaxed with time [3,4]. As a result, achieving herd immunity or implementing successful vaccination becomes crucial. Obtaining COVID-19 herd immunity by natural methods or permitting a significant number of individuals to get infected would place enormous demand on healthcare facilities and may result in about 30 million fatalities globally [5]. So, widespread vaccination is now the only means to stop COVID-19 from spreading. Effective vaccination programs have helped to prevent millions of fatalities each year [6–8]. Vaccination programs have advanced greatly in this crucial times, despite widespread anti-vaccination attitudes and misinformation [9,10]. Pfizer, AstraZeneca, Janssen, Moderna, Sinopharm and Sinovac are among the vaccines

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currently authorized by the WHO. Although all of the vaccines have mild to severe adverse effects, they are all safe and efficacious. COVID-19 vaccinations protect against infection as well as serious sickness and death. Despite the fact that mass vaccination programs have been implemented across the world, the success of these programs has been hampered by vaccine hesitancy in people [11,12], which is described as the hesitation in accepting or refusing accessible vaccinations [13]. Concerns regarding COVID-19 vaccinations may be seen all around the world [14,15]. Different studies identified numerous associated factors with hesitancy of COVID-19 vaccine. These factors include, socio-demographic features, model of health belief, psychological antecedents, knowledge of vaccine, beliefs of conspiracy, safety and efficacy of vaccine and the fear of side effects of vaccine [15–18].

Following the worldwide initiation of a mass vaccination program against COVID-19, the Kingdom of Saudi Arabia (KSA) also launched its vaccination campaign for Saudi nationals and immigrants residing in the Kingdom. Currently, three different vaccines, including Pfizer-BioNTech, Moderna and AstraZeneca are widely administrated in KSA [19]. Initially, the frontline workers, healthcare professionals and older people were prioritized due to the limited production and availability of vaccine doses [20]. The vaccine was rolled out for the younger population in the later stages [19]. However, vaccine hesitancy is the biggest challenge in the national vaccine campaign. A range of religious, ethnic, social and cultural beliefs may influence the vaccination campaign. Additionally, safety concerns of newly approved vaccines also hinder vaccine acceptability. Another problem is the perceived side effects of the rapidly developed vaccine. Despite the coordinated international efforts for mass vaccination, the anti-vaxxers have spread the disinformation regarding hazards and side effects related to COVID-19 vaccines creating hurdles in vaccinating the masses. The success of the national vaccine campaign depends not only on its availability, efficacy and safety but also on people's acceptance [21–24]. The two barriers that can hamper the vaccine campaign are structural and attitudinal. Systemic issues that influence an individual's ability to access the service such as availability of vaccine, outlet location and affordability, are structural barriers. In contrast, beliefs and perceptions influencing vaccine acceptance come under attitudinal barriers [25,26]. Currently, the government has administered more than 16.8 million free doses at more than 587 vaccination facilities across the Kingdom. In June 2021, the country approved the Pfizer vaccine for children between 12 to 18 years of age. The availability of free vaccines and the countrywide presence of vaccination centers indicate that structural barriers are not restricting the KSA from achieving full vaccination coverage. Thus, the attitudinal barriers are the leading cause of vaccination hesitancy. In the Kingdom, the government focuses on communication and behavioral strategies such as engagement of religious scholars, government officials and celebrities and broadcasting vaccination messages through various media outlets and social media platforms. There are few studies on vaccination acceptance and hesitancy and knowledge levels, so a questionnaire-based study was conducted to investigate the knowledge levels of acceptance and hesitancy among people in KSA. The results obtained through this study will aid in gathering helpful information for improving vaccination coverage in the Kingdom.

2. Materials and Methods

This was cross-sectional study carried out at three cities; Makkah, Jeddah and Riyadh in Saudi Arabia. The study duration was from June 25, 2021 to October 7, 2021. The study approval was taken from the research and ethical committee of the institution. The criteria for inclusion in our study were all the participant of both the gender having age over 18 years having permanent residential status in Saudi Arabia whereas the criteria for exclusion were all the participants having major diseases and not willing to take part in our survey. An informed consent was taken from all the participants in our study. Data was collected from all the participants by using validated and self-structured questionnaire. The questionnaire was printed in hard form and Google doc was also generated which was shared with the participants by using sites of social network like Twitter, WhatsApp

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and Facebook. The participants were selected mainly from Makkah, Riyadh and Jeddah. All the participants were informed about the aim of study. Inclusion and exclusion criteria were followed strictly. The questionnaire was translated both in English and Arabic to help the participants in understanding the questions. For determining the validity of the questionnaire, a pretest was carried out for both the version of questionnaire. The questionnaire was categorized into three main parts. The first part consists of socio-demographic information, second part consist of questions about knowledge of COVID-19 vaccine while the third part consist of questions about barriers of COVID-19 vaccination. All the data was analyzed by using IBM SPSS version 24. For variables like age, mean and standard deviation were computed while for variables like gender, job status, level of education, frequencies and percentages were computed.

3. Results

In the current study, a total of 565 respondents were enrolled in the final round. Three hundred and sixty responses (63.72%) were gathered by using printed questionnaires whereas 205 (36.28%) responses were collected through Google forms. In the current study, there were 122 (21.59%) males and 443 (78.41%) females. The mean age (SD) was 36 (11.2) years. The minimum age was 18 years and maximum age was 71 years. On the basis of age wise distribution, 136 (24.07%) respondents were in the age group 18-24 years, 118 (20.88%) in 25-34 years, 130 (23%) in 35-44 years, 77 (13.63%) in 45-54 years, 71 (12.57%) in 55-64 years while 33 (5.84%) respondents were in age group ≥65 years. On the basis of education level, 123 (21.77%) participants were in high school level, 353 (62.48%) were in university level, 74 (13.10%) were highly educated while 13 (2.30%) were not educated. In our study, 220 (38.94%) participants were employed whereas 345 (61.06%) were unemployed Table 1.

Table 1. Demographic characteristics of the respondents.

Parameter	Sub-category	Frequency (%)
Gender	Male	122 (21.59%)
	Female	443 (78.41%)
Age	18-24 years	136 (24.07%)
	25-34 years	118 (20.88%)
	35-44 years	130 (23%)
	45-54 years	77 (13.63%)
	55-64 years	71 (12.57%)
	≥65 years	33 (5.84%)
Job status	Employed	220 (38.94%)
	Unemployed	345 (61.06%)
Level of education	High school level	123 (21.77%)
	University level	353 (62.48%)
	Highly education	74 (13.10%)
	Not educated	13 (2.30%)

In the current study, 49 (8.67%) respondents were from Riyadh, 436 (77.17%) from Makkah and 80 (14.16%) respondents were from Jeddah Figure 1. In our study, 124 (21.95%) participants responded that they suffer from chronic diseases while 441 (78.05%) participants responded that they do not suffer from chronic diseases.

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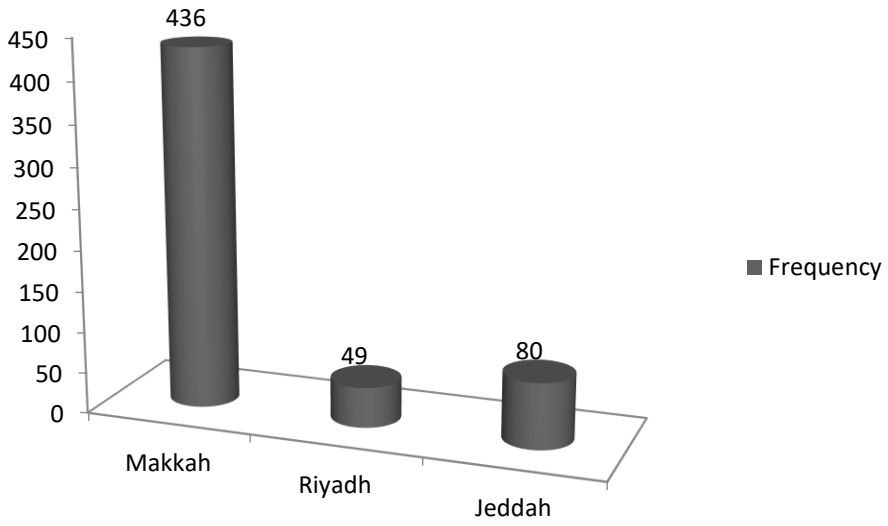

Figure 1. Participants from different regions of the Kingdom of Saudi Arabia.

In response to question about number of approved vaccines in Saudi Arabia, 355 (62.83%) participants responded that there is only one approved vaccine in Saudi Arabia, 72 (12.74%) participants responded that there are 2 approved vaccines while 138 (24.42%) participants responded that there are three approved vaccines in Saudi Arabia. In a response to questions regarding safety of vaccine, 512 (90.62%) respondents think that Pfizer is safest vaccine, 42 (7.43%) considered AstraZeneca as safest vaccine whereas 11 (1.95%) participants consider Moderna as safest vaccine. In case of pregnant women, 512(90.62%) participants consider Pfizer as safest vaccine while 53 (9.38%) respondents consider other vaccines safer for pregnant women. In our study 513 (90.80%) participants considered that Pfizer vaccine have fewer side effects. Majority of the participants 82.30% (n=465) think that Pfizer vaccine has the highest efficiency in the protection against COVID-19 while 100 (17.70%) other vaccines as having highest efficiency. In our study, 19 (3.36%), 89 (15.75%), 234 (41.42%), 173 (30.62%) and 50 (8.85%) participants think that 40%, 50%, 70%, 90% and unknown immunity will be gained against COVID-19 respectively. Two hundred and ninety participants (51.33%) think that acute allergy prevent you from getting vaccinated while 250 (44.25%) think that pregnancy and breastfeeding prevent you from getting vaccinated. In our study, 445 (78.76%) subjects think that there is difference between the different approved vaccines and 492 (87.08%) participants are vaccinated while 73 (12.92%) participants are not vaccinated. The majority of the participants 79.65% (n=450) get the vaccine on their desire while 115 (20.35%) participants were forced by surrounding circumstances to get vaccinated. In our study, 450 (79.65%) participants were vaccinated with Pfizer vaccine while 115 (20.35%) were vaccinated with AstraZeneca. Four hundred and fifty (79.65%) participants considered COVID-19 as necessary preventive measure. In response to a question of not getting vaccinated, 125 (22.12%) participants answered short time of making vaccine, 90 (15.93%) participants answered fear of side effects, 105 (18.58%) participants replied that they are waiting to check their effects on others, 90(15.93%) participants answered that they don't know the ingredients of vaccine, 50 (8.85%) participants considered COVID-19 vaccines as political matter while 95 (16.81%) participants were infected with COVID-19 previously Table 2.

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Table 2. Knowledge and hesitancy of the respondent about COVID-19 vaccine.

Questions	Category	Frequency (%)
Do you suffer from any chronic disease?	Yes	124 (21.95%)
	No	441 (78.05%)
How many approved vaccines are available in Saudi Arabia?	1	355 (62.83%)
	2	72 (12.74%)
	3	138 (24.42%)
In your opinion, what is the safest vaccine among the approved vaccines in the Kingdome?	Pfizer	512 (90.62%)
	AstraZeneca	42 (7.43%)
	Moderna	11 (1.95%)
In your opinion, which vaccine is the safest vaccine for pregnant women?	Pfizer	512 (90.62%)
	Other vaccines	53 (9.38%)
In your opinion, which vaccine has the least side effects?	Pfizer	513 (90.80%)
	Others	52(9.20%)
In your opinion, which vaccine has the highest efficiency in the protection against COVID-19	Pfizer	465(82.30%)
	Others	100(17.70%)
What do you think about vaccine efficacy?	40%	19 (3.36%)
	50%	89 (15.75%)
	70%	234 (41.42%)
	90%	173 (30.62%)
	Unknown	50 (8.85%)
What are the preventions of getting vaccinated?	Acute allergy	290(51.33%)
	pregnancy and breastfeeding	250 (44.25%)
	all above	25 (4.42%)
Are these differences between the vaccines?	Yes	445 (78.76%)
	No	120 (21.24%)
Did you get the COVID-19 vaccine?	Yes	492 (87.08%)
	No	73 (12.92%)
Did you get the vaccine on your desire or forced by surrounding circumstances?	On my desire	450 (79.65%)
	forced by surrounding circumstances	115 (20.35%)
What kind of vaccine did you get? (company)	Pfizer	450 (79.65%)
	AstraZeneca	115 (20.35%)
Do you think COVID-19 vaccine is necessary	Yes	450 (79.65%)
	No	115 (20.35%)
Why you did not get the COVID-19 vaccination?	short time of making the vaccine	125 (22.12%)
	fear of side effects	90 (15.93%)
	I am not against the vaccine but I will wait to see its effect on others	105 (18.58%)
	I don't know the ingredients of the vaccine	90(15.93%)
	I think it is all political matter	50 (8.85%)
	because I got Corona previously	95 (16.81%)

4. Discussion

Vaccines have a critical role in limiting the spread of infectious illnesses. Despite this, there is still limited accessibility to these vaccines. It is possible to raise vaccination rates by developing the public's desire and hurdles to immunization once vaccines are widely accessible. Before the COVID-19 pandemic, public aversion to receiving safe and recommended vaccinations, described as "vaccine hesitancy," was already a growing problem

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[13]. Vaccine reluctance has already been identified by the WHO as a world health concern [27] and in the wake of the COVID-19 pandemic, the topic has gained even greater prominence [28]. Numerous COVID-19 vaccines, particularly AstraZeneca and Pfizer were authorized and used by Saudi health officials [29]. All people, including Saudis and non-Saudis, have free access to these vaccines [30].

COVID-19 vaccination rejection and hesitancy pose a significant obstacle to worldwide efforts to contain the pandemic [31]. Our study was conducted to determine the knowledge and hesitancy of people of Saudi Arabia about COVID-19 vaccination.

Based on the overall knowledge and awareness of the respondents, our study shows that majority of the participants have good knowledge about COVID-19 vaccination. About 71% of the participants think that COVID-19 vaccine will give more than 70% immunity against COVID-19. While 79.65%) participants considered COVID-19 as necessary preventive measure. These findings are in line with the previous study who also reported good knowledge of the participants about COVID-19 vaccination [32]. This good level of knowledge in our study might be due to majority of educated participants in our study.

Vaccination is seen as a public-health marvel of the twenty-first century [33]. Vaccination not only protects the inoculated person, but it may also protect the whole society via herd immunity. Vaccinating the majority of healthy people in a community helps safeguard those who are unable to be vaccinated. However, a considerable fraction of the population must be vaccinated to accomplish this population-level impact [5]. Based on presently available data, experts believe that immunizing 71% of total population will resulted in herd immunity against COVID-19 [34]. In our study, 492 (87.08%) participants are vaccinated while 73 (12.92%) participants are not vaccinated. In our study the vaccination rate is higher than previous studies from Saudi Arabia [35,36]. The good impacts of advertisements established by the Ministry of Health in Saudi Arabia to urge people to get the vaccination, the actions made by many high officials to receive the immunizations in front of cameras and the distribution of vaccines for free have all contributed to the considerable rise in the COVID-19 vaccine acceptability rate over the last few months. In contrary to our study, a recent study from Jordan and United States reported 37% and 57% vaccine acceptance rate respectively which is very lower than our study [17,37].

Uncovering the causes for vaccine apprehension might aid experts in increasing public vaccination intentions. It is vital to understand and address the public's perceptions in order to overcome vaccination obstacles. In the current study, in response to a question of not getting vaccinated, 22.12% participants answered short time of making vaccine, 15.93% participants answered fear of side effects, 18.58% participants replied that they are waiting to check their effects on others, 15.93% participants answered that they don't know the ingredients of vaccine, 8.85% participants considered COVID-19 vaccines as political matter while 16.81% participants were infected with COVID-19 previously. Historically, the failure of vaccination campaigns against polio in remote parts of Afghanistan, Pakistan and Nigeria was largely attributable to religious resistance from clerics with little scientific knowledge [38]. Since the bulk of Saudi Arabia's people trusts Islamic clerics' advice. The public's inaccurate impressions may be addressed by bringing in well-educated religious scholars to participate in public health education and promotion programs, where these false notions can be corrected using Sharia law and scientific findings. Social media is the main source of spreading false information about the COVID-19 vaccination. According to a worldwide research, social media serves a key role in distributing misleading vaccine knowledge, leading to the belief that vaccines are dangerous and has role in conspiracy [39]. Conspiracy theories about COVID-19 immunization were also prevalent among the participants in this research. A Jordanian investigation confirmed such sentiments [40]. Previous vaccination initiatives in Pakistan have failed as a result of such assumptions [16]. In these situations, it is critical for the Saudi Arabian Electronic Media Regulatory Authority to emphasize the seriousness of this topic and anybody propagating false information should be prosecuted. Potential strengths of the current research include a large number of participants and involvement from people of varying ages and geographic locations. The present research, however, has a few drawbacks. This is cross-

sectional research that used a non-probability convenience sampling approach. Moreover, Google doc was used to document 36.28 % responses, which might contribute to bias. To get a better understanding of the possible hurdles and their motivations, our research suggests performing a qualitative assessment of the public's perspective of COVID-19 immunization reluctance.

5. Conclusions

Our study concludes that majority of the participants have good knowledge about COVID-19 vaccination. Concerns over vaccine components, since a majority of the populace believes the COVID-19 vaccine is not Halal, are among the key causes for vaccination apprehension. Moreover, many people expressed worries about the vaccine's effectiveness as well as its possible immediate and long-term side effects, like infertility. It is critical to enhance public knowledge about the seriousness of COVID-19 infection, the significance of immunization, its safety and effectiveness. To achieve public confidence and solve public issues, the authorities should bring together religious and social aspects. Failure to do so will, regrettably, result in failure herd immunization program.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

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