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Research 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 descriptive 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 coronavirus disease (COVID-19) as a pandemic [1]. The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2]. As of 17 June 2022, SARS-CoV-2 has infected over 535,248,141 people, with 6,313,229 deaths [3]. Due to devastating effect of COVID-19, achieving herd immunity to prevent onward transmission is crucial. Although obtaining herd immunity against COVID-19 through natural infection is theoretically possible but would place enormous burden on healthcare facilities and may result in over 30 million fatalities globally [4]. So, vaccines remain the most effective tool to prevent infectious diseases and improving the global health. Worldwide COVID-19 effective vaccination campaigns are the only solution to curtail the devastating effects of the disease.

Previously, Effective vaccination programs have helped to prevent millions of fatalities each year [5–7]. Vaccination programs have advanced greatly in this crucial times, despite widespread anti-vaccination attitudes and misinformation [8,9]. Pfizer, AstraZeneca, Janssen, Moderna, Sinopharm and Sinovac are among the vaccines currently authorized by the WHO. All these vaccines are safe and effective, however; some people may have mild side effects. 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 some countries and regions [10,11], which is described as the hesitation in accepting or refusing accessible vaccinations [12]. Concerns regarding COVID-19 vaccinations may be seen all around the world [13,14]. Different studies identified numerous associated factors promote 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 [14–18].

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 [18]. 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. On the other hand, beliefs and perceptions influencing vaccine acceptance come under attitudinal barriers [25,26]. Currently, Saudi health ministry has administered more than 66.6 million free doses. In June 2021, the country approved the Pfizer vaccine for children between 12 to 18 years of age [27]. 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. We hypothesize that the Saudi population doesn`t have significant vaccine hesitancy.

2. Materials and Methods

This was descriptive study carried out at three cities: Makkah, Jeddah, and Riyadh in The Kingdom of Saudi Arabia. The study conducted on June 25, 2021, to October 7, 2021. The criteria for inclusion in our study were all the participants of both genders, age over 18 years, and with permanent residential status in Saudi Arabia. Whereas the criteria for exclusion were all the participants with 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 participants by using validated and self-structured questionnaire. The questionnaire was printed in hard copy. Google forms was also generated which was shared with participants by using social applications such Twitter, WhatsApp, and Facebook. The participants were selected mainly from Makkah, Jeddah, and Riyadh cities. All participants were informed about the aim of the study. Inclusion and exclusion criteria have been followed strictly. The questionnaire was written in Arabic and English languages. To test the validity of the questionnaire, a pretest has been carried out before spreading the questionnaire, this pretest was done by all authors and some random residents. The questionnaire was categorized into three main parts, the first consists of socio-demographic information, the second consists of the questions regarding the knowledge of COVID-19 vaccine, while the third part consists of the questions concerning the barriers of COVID-19 vaccination. All the data was analyzed by using IBM SPSS version 24. Variables like ages, mean and standard deviation were computed, whereas variables like genders, job status, level of education, frequencies, and percentages were computed.

3. Results

In this study, a total of 565 respondents were enrolled. Three hundred and sixty responses (63.72%) were gathered by using hard copy questionnaires, whereas 205 (36.28%) responses were collected through Google forms. The males represent 122 (21.59%) and females 443 (78.41%). The mean age (SD) was 36 years (11.2). The minimum age was 18 years and maximum age was 71 years. Based on age distribution, 136 (24.07%) of respondents located in 18-24 years range, 118 (20.88%) in 25-34 years range, 130 (23%) in 35-44 years range, 77 (13.63%) in 45-54 years range, 71 (12.57%) in 55-64 years, while 33 (5.84%) respondents were ≥ 65 years. Based on education level, 123 (21.77%) of respondents were in the high school level, 353 (62.48%) were in the college level, 74 (13.10%) were in post-graduated level, while 15 (2.65%) were uneducated (helped by educated relatives to fulfill questionnaire). In the study, 220 (38.94%) of participants were employed, whereas 345 (61.06%) were unemployed (Table 1).

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%)
	Uneducated	15 (2.65%)

In the study, 436 (77.17%) respondents located Makkah, 80 (14.16%) in Jeddah, and 49 (8.67%) in Riyadh (Figure 1). Regarding chronic diseases, 124 (21.95%) of participants were suffering from chronic diseases, while 441 (78.05%) participants with no chronic diseases.

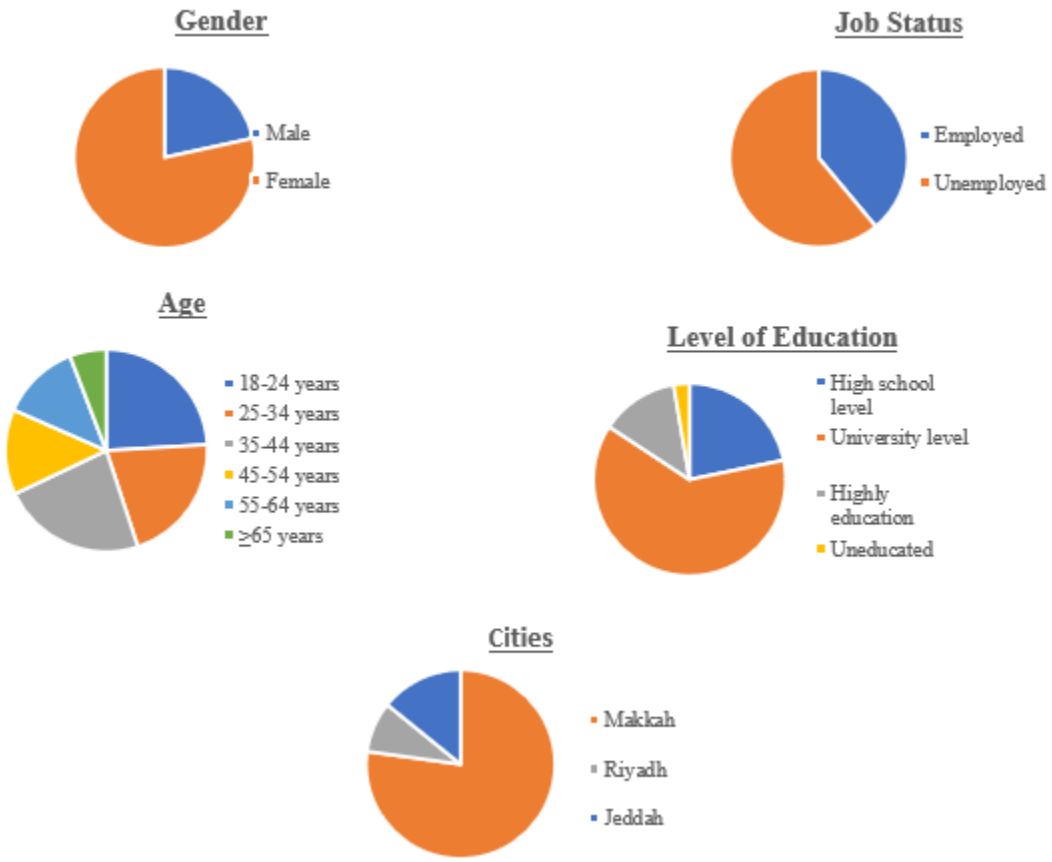

Figure 1. *Pie charts representing the demographic characteristics of the participants.*

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 two approved vaccines while 138 (24.42%) participants responded that there are three approved vaccines. In a response to question 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 are safer for pregnant women. On the other hand, 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 participants (17.70%) pointed other vaccines as having highest efficiency. A total number of 50 (8.85%) participants responded with uncertainty about the efficacy of COVID-19 vaccine. However, a majority of participants (72.04%) think that vaccines are 70-90% effective against COVID-19.

Two hundred and ninety participants (51.33%) think that having acute allergy is a contraindication for COVID-19 vaccinated while 250 participants (44.25%) think pregnancy and breastfeeding as contraindications for COVID-19 vaccination. In our study, 445 (78.76%) respondents think that different vaccines provide different levels of immunity. Nevertheless, 492 participants (87.08%) were vaccinated while 73 (12.92%) participants were not vaccinated against COVID-19. Most of the participants 79.47% (n=391) received vaccination at free will while 101 (20.53%) participants were forced by surrounding circumstances to get vaccinated. All in all, 357 (72.56%) participants were vaccinated with Pfizer vaccine while 135 (27.44%) were vaccinated with AstraZeneca. None of the participants of this study was vaccinated with Moderna vaccine. Four hundred and fifty participants (79.65%) considered COVID-19 vaccination as a necessary preventive measure against the disease. In response to a question regarding vaccination hesitancy among people, 135 participants (23.89%) answered short time for vaccine development, 90 participants (15.93%) answered fear of side effects as a factor for reluctance, 105 participants (18.58%) replied that people are waiting to check vaccines side effects on others, 90 (15.93%) participants answered that lack of knowledge regarding ingredients of vaccine, 50 participants (8.85%) considered COVID-19 vaccines as a political matter, while 95 participants (16.81%) responded that previous infection with COVID-19 as a factor for vaccination hesitancy (Table 2).

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 the Kingdom?	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 Kingdom?	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%)
	Uncertain	50 (8.85%)
What are the contraindications and preventions for getting vaccination?	Acute allergy	290(51.33%)
	Pregnancy and breastfeeding	250 (44.25%)
	Acute allergy, pregnancy & breastfeeding	25 (4.42%)
Different vaccines provide different level of protection?	Yes	445 (78.76%)
	No	120 (21.24%)
Have you got vaccinated for COVID-19?	Yes	492 (87.08%)
	No	73 (12.92%)
Did you get the vaccine on your desire or forced by surrounding circumstances?	On my desire	391 (79.47%)
	Forced by surrounding circumstances	101 (20.53%)
What kind of vaccine did you get? (company)	Pfizer	357 (72.56%)
	AstraZeneca Moderna	135 (27.44%) 0 (0%)
Do you think COVID-19 vaccine is necessary	Yes	450 (79.65%)
	No	115 (20.35%)
Reason for vaccination hesitancy?	Short duration for vaccination development	135 (23.89%)
	Fear of side effects	90 (15.93%)
	People are not against vaccination but are waiting to see side effects on already vaccinated people	105 (18.58%)
	Lack of knowledge about ingredients of the vaccine	90(15.93%)
	I think it is all political matter	50 (8.85%)
	Because of previous COVID-19 infection	95 (16.81%)

4. Discussion

Vaccines have a critical role in limiting the spread of infectious diseases. Despite this, there is still limited accessibility to the vaccines worldwide. It is possible to raise vaccination rates by developing the public's desire to get immunized once vaccines are widely accessible. Prior to the COVID-19 pandemic, public aversion of receiving safe and recommended vaccinations; which described as "vaccine hesitancy," was already a growing problem [12]. Vaccine reluctance has already been identified by the WHO as a world health concern [28] and in the wake of the COVID-19 pandemic, the topic has gained even greater prominence [29]. Three COVID-19 vaccines, Pfizer, AstraZeneca, and Moderna were authorized and used by Saudi health officials [30,31]. All residents of Saudi Arabia; including Saudis and non-Saudis, have free access to these vaccines [32]. Despite this, there haven't been many surveys conducted in Saudi Arabia to gauge the level of vaccination hesitancy.

COVID-19 vaccination rejection and hesitancy pose a significant obstacle to worldwide efforts to contain the pandemic [33]. Present study was conducted to determine the knowledge and hesitancy of Saudi Arabia`s residents 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 72% of the participants think that vaccines are effective against COVID-19. Furthermore, 79.65% participants considered COVID-19 vaccines as necessary preventive measure in controlling the disease. These findings are in line with the previous study which also reported good knowledge of the participants about COVID-19 vaccination [34]. This good level of knowledge might be due to majority of educated participants in our study.

Vaccination is seen as a public-health marvel of the twenty-first century [35]. Vaccination not only protects the inoculated person, but it may also protect the whole society *via* herd immunity. Vaccinating most healthy

people in a community helps safeguard those who cannot be vaccinated. However, a considerable fraction of the population must be vaccinated to accomplish this population-level impact [4]. Based on presently available data, experts believe that immunizing 70-80% of total population will resulted in herd immunity against COVID-19 [36,37]. In our study, 492 participants (87.08%) were vaccinated while 73 (12.92%) were not vaccinated. Accordingly, the vaccination rate is higher than previous studies from Saudi Arabia [38,39]. 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 social media and the distribution of vaccines for free all have 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 low compare to our study [16,40].

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 to overcome vaccination obstacles. In the current study, in response to a question of vaccination hesitancy among people, 22.12% of participants answered short time of making vaccine, 15.93% of participants answered fear of side effects, 18.58% of participants replied that they are waiting to check their effects on others, 15.93% of participants answered that they don't know the ingredients of vaccine and 8.85% of participants considered COVID-19 vaccines as political matter. Historically, the failure of vaccination campaigns against polio in remote parts of Afghanistan, Pakistan and Nigeria were largely attributable to religious resistance from clerics with little scientific knowledge [41]. 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 misinformation regarding COVID-19 vaccination. Social media serves a key role in misleading people regarding vaccine knowledge [42]. Previous vaccination initiatives in Pakistan have failed as a result of such misinformation [15]. 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 educated. 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 descriptive study 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. Nevertheless, it is strongly suggested that surveys of COVID-19 vaccination hesitancy in Saudi Arabia be expanded to include the whole population, as this survey limited to small sample of population.

5. Conclusions

Our study concludes that majority of the participants have good knowledge about COVID-19 vaccination. Concerns over vaccine components are among the key causes for vaccination apprehension. Moreover, many people expressed concerns about the vaccine's effectiveness as well as its possible immediate and long-term side effects. 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; regrettably, may result in failure to reach herd immunity in near future.

Author Contributions:

Conceptualization, B.S.; methodology, B.S.; software, A. Z.; validation, A.Z., B. S. and W. A.; formal analysis, A. Z.; investigation, F. A., A. A. and L. F.; resources, F. A., A. A. and L. F.; data curation, B. S.; writing—original draft preparation, B. S., F. A., A. A. and L. F.; writing—review and editing, A. Z.; visualization, A. Z. and B. S.; supervision, B. S., A. Z. and W. A.; project administration, B. S.; funding acquisition, None. All authors have read and agreed to the published version of the manuscript."

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Institutional Review Board Statement:

Ethical review and approval were waived for this study due to participants in the survey were given the choice either to take part in the survey or not. Participants were not asked to give their names, addresses, phone numbers or any personal information except for their genders, regions and ages.

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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