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# Perspectives toward covid-19 pandemic and conspiracy theories among adults attending primary healthcare centers in Jeddah city, Saudi Arabia

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**ABSTRACT**

**Background:** COVID-19 is one of the recent emerging infectious diseases that were progressively declared a pandemic affecting the whole globe. Such a disease encompassed several misconceptions and conspiracy theories. This study aimed to determine the prevalence and pattern of conspiracy theories and determine associated factors and compliance with preventive measures. **Methods:** We conducted an analytical cross-sectional study utilizing a self-administered questionnaire on conspiracy theories and ideas. We did data analysis with the IBM SPSS version 21 was u. A p-value of <0.05 was considered for statistical significance. Descriptive statistics were performed, and we analyzed the association between variables using the Chi-square test or Kruskal-Wallis test. **Results:** The current study got 399 responses. We found a 35.8% prevalence of conspiracy beliefs about COVID-19 among participants. The top 4 conspiracy theory beliefs were: COVID 19 was exaggerated to make significant changes in the world's social order, COVID-19 was a secret biological weapon, big pharmaceutical companies have known about COVID-19 for a while and COVID-19 was made up to keep people's attention so that special agencies could change the world economy. Believing in conspiracy theories was significantly associated with low acceptance and compliance with preventive measures and less COVID-19 vaccine adoption. There was no difference between conspiracy believers and non-believers in regard to sociodemographic factors. **Conclusion:** This study finding suggest that there is still a need for continuing efforts to raise awareness and education programs to educate people, burst myths and conspiracies, and incite vaccination adoption.

**Keywords:** COVID-19, Conspiracy beliefs, Conspiracy Theories, Trust, Preventive Measures

## 1. INTRODUCTION

The COVID-19 pandemic has seen a lot of myths and conspiracies exacerbating a problem that had already affected the people globally since its emergence in late 2019 (Li et al., 2020). Among this misinformation is a conspiracy theory, defined as “a theory discarding the standard explanation for an event and instead replacing it with a secret plot by covert group or organization”. The COVID-19 is mainly transmitted through droplets, such as cough, sneezes, and mucous (Dietz et al., 2020). Since nasal and throat COVID-19 viral load is higher before developing symptoms, the early detection and isolation of infected people remain a huge challenge this suggests that COVID-19 can be transmitted before the development of symptoms, making it harder to isolate and control people, thus leading to an increased number of new infections.

In the past decades, Saudi Arabia has experienced several epidemics caused by Coronaviruses since 2002 with Severe Respiratory Distress Syndrome Coronavirus (SARS-CoV), then Middle Eastern Respiratory Distress Syndrome-Coronavirus (MERS-CoV) in 2012. SARS-CoV-2 is the last virus from same family responsible for COVID-19 and the first case diagnosed as a COVID-19 in Saudi Arabia was on March 3<sup>rd</sup> 2020 (Alshammari et al., 2021). Remarkable actions were adopted to control COVID-19, necessitating complete lockdown (Dietz et al., 2020; Kelso et al., 2009). These actions have affected financial and economic status in general but also led to the emergency of conspiracies, including “Made in a lab” theory. Another study reported that around a third of the participants believed in one or more conspiracies (Earnshaw et al., 2020). Some studies showed that this could be owed to low access to accurate information, mistrust in accessible data or lack of information all together (Shahsavari et al., 2020).

Studies have indicated an association between believing in one or more conspiracies and relying on more social media than traditional media for information. Several studies have shown that conspiracy believers tend to increase during crises, wars and disasters (Oleksy et al., 2021) and made people feel safe in during those crises with threatened safety, which psychologically appease the believers (Earnshaw et al., 2020). Some of the conspiracy theories highlighted are; “the coronavirus creation as a biological weapon, or by the pharmaceutical companies to profit from its drugs and vaccines” (Romer & Jamieson, 2020) or “vaccine was kept secret and revealed to elite people only” (Oleksy et al., 2021).

Another study revealed that among theories investigated in that study, the most commonly believed conspiracy was a COVID-19 origin from the laboratory (Allington et al., 2021). Since compliance is affected by the people's positive perception of a health event, which is influenced by knowledge (Al Naam et al., 2021), psychological response remains critical to determine the compliance with preventive measures during the pandemic (AL-Shammari et al., 2021). Conspiracy beliefs are associated with the decrease in compliance with preventive actions, vaccination take-ups (Romer & Jamieson, 2020), and social distancing (AL-Shammari et al., 2021; Bierwiazzonek et al., 2020; Earnshaw et al., 2020), jeopardizing the success of the fight against the COVID-19 pandemic.

Conspiracy theories are prominent in communities where health illiteracy is dominant. The linkage between conspiracy theories and poor adherence to prevention measures has been well established (Bierwiazzonek et al., 2020). In Saudi Arabia, there is a lack of studies exploring conspiracies toward COVID-19 in a local context. Therefore, our study explored perspectives toward the COVID-19 pandemic and conspiracy theories and associated factors, as well as compliance with preventive measures among adults attending primary healthcare centers in Jeddah city, Saudi Arabia.

## 2. METHODS

### Study design

An analytical cross-sectional study was conducted at primary healthcare centers (PHC) in Jeddah City, Saudi Arabia, from 24<sup>th</sup> March 2022 to 19<sup>th</sup> May 2022

### Participation

This study enrolled all adult patients aged 18 years and above visiting the PHC in Jeddah city who were Arabic speakers. People with hearing and mental problems were excluded. We calculated the sample size by using Raosoft.com, an online sample calculator. Because there were no previous studies in Saudi Arabia investigating conspiracy theories among the public, a conservative choice of 50% beliefs was used. The minimum sample size to get a 95% confidence interval with a margin of error of 5% was 385. We used multistage stratified, cluster random, systematic random sampling techniques to recruit eligible participants. The PHC centers in Jeddah city were divided into five sectors according to geographic location. Then, in each sector, one PHC was selected randomly. In the selected primary health centers, by using systematic random sampling approach, we select ed subjects from each PHC. The selected participants were invited to take part in the questionnaire using a link to google forms through their smart phones, for those who did not have access to internet we offered a device with internet connectivity. This study was

conducted using a self-administered questionnaire adapted from a previously published study (Georgiou et al., 2020), the questionnaire was then modified to fit the objectives and scope of the current study. Furthermore, adjustments were carried on to align this tool to the local context. The questionnaire, initially in English, was translated to Arabic, then back-translated to English with consistency and similarity of >85% between the two English versions. The questionnaire was also face-validated for matching measuring items with our study concept.

The modified questionnaire consisted of 3 parts: the first part covered sociodemographic factors, i.e., age, gender, residence, job, and education, and the second part included COVID-19 conspiracy theories with a 5- points Likert scale. The themes of these beliefs were; the COVID-19 virus was accidentally released from a Chinese military laboratory, the COVID-19 virus was a secret biological weapon, COVID-19 has been exaggerated to facilitate significant changes in the world’s social order, COVID-19 will help to control population growth through inducing infertility, COVID-19 was patented for a vaccine in the past, but then infected people instead, The 5G emits electromagnetic waves that cause symptoms mimicking influenza, COVID-19 has been known about by big pharmaceutical companies for a period of time, COVID-19 was created to distract people so that special agency could change the world economy. The third part assessed compliance and adherence to COVID-19 control measures i.e., wearing medical or cloths face masks, applying physical distancing as per the ministry of health recommendations, and early adoption of the COVID-19 vaccine. “Strongly agree” and “agree” answers have been coded as 1, other answers were coded as 0. If participants have answered 1 (either strongly agree or agree) four times or more, then they have been considered as believer of conspiracy theories. All other participants who gave different answers were considered as conspiracy theory non-believer.

**Data analysis**

The data was extracted, cleaned and coded. The data was analyzed using IBM SPSS version 21 (SPSS version 21.0; IBM Corporation, Armonk, NY, USA) statistical software. Statistical significance was set at 0.05 levels. Continuous variables were presented in mean and standard deviation (SD). Frequency distribution was performed for categorical variables expressed in numbers and percentages. We analyzed the association between sociodemographic factors and conspiracy beliefs with the Chi-square test or Kruskal-Wallis test.

**3. RESULTS**

A total of 399 participants have taken part in this study. There were 219 males (54.9%) and 180 females (45.1%) with a mean age of 39.76 (SD 14.06). The participants’ residencies were almost evenly distributed across Jeddah’s five geographical regions. Fifty-six percent were employed, and 17 (4.3%) were working in medical fields. Regarding education level, 57.4% of participants had a college degree (Table 1).

**Table 1** Participants’ Demographics

Demographic characteristics	N (%)	Mean (SD)
Age		39.76 (14.06)
<i>Gender</i>		
Female	180 (45.1)	
Male	219 (54.9)	
<i>Residence</i>		
Central Jeddah	80 (20.1)	
East Jeddah	77 (19.3)	
North Jeddah	81 (20.3)	
South Jeddah	80 (20.1)	
West Jeddah	81 (20.3)	
<i>PHC</i>		
Almajed	77 (19.3)	
Alnaseem	80 (20.1)	
Alsalamah	81 (20.3)	
Alsheraa	81 (20.3)	
Prince Abdulmajeed	80 (20.1)	
<i>Job</i>		

Employed	223 (55.9)
Health care provider	17 (4.3)
Non-employed	90 (22.6)
Student	69 (17.3)
<i>Education</i>	
College	229 (57.4)
High school or less	135 (33.8)
Postgraduate	35 (8.8)

The prevalence of conspiracy theory beliefs among PHC patients in Jeddah, Saudi Arabia, was 35.8% (Figure 1). Table 2 shows that the top 4 conspiracy theories most people believe in are: that COVID 19 was exaggerated to make big changes in the world's social order (45.4%), followed by the idea that COVID-19 was a secret biological weapon (44.6%), that big pharmaceutical companies have known about COVID-19 for a while (44.4%), and that COVID-19 was made up to keep people's attention so that special agencies could change the world economy (34.8%).

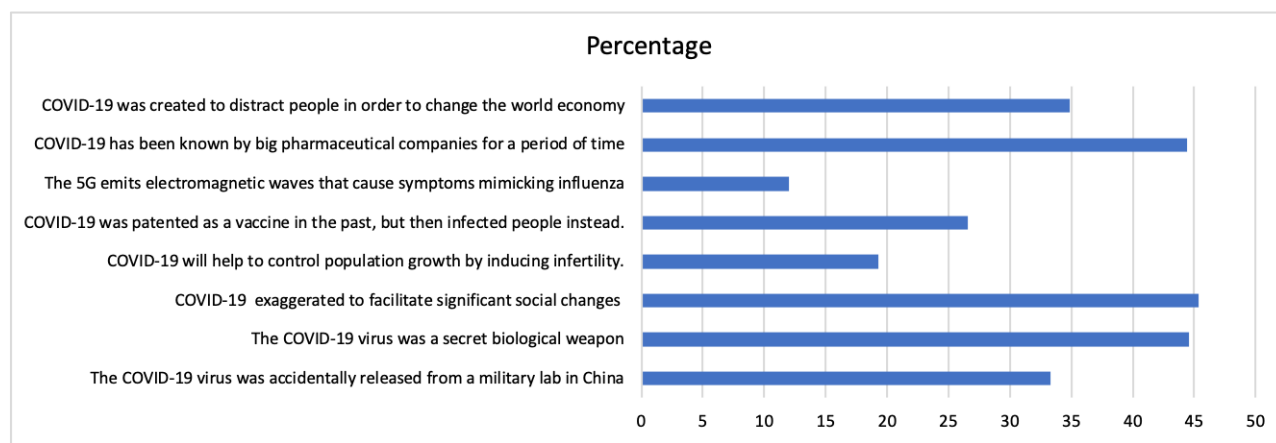


Figure 1 Prevalence of conspiracy theory beliefs among study participants

Table 2 Patterns of conspiracy theory among those holding conspiracy theory beliefs

Order	Most common	Agree and Strongly Agree N (%)
1	COVID-19 has been exaggerated to facilitate significant changes in the world's social order	181 (45.4)
2	The COVID-19 virus was a secret biological weapon	178 (44.6)
3	COVID-19 has been known about by big pharmaceutical companies for a period of time	177 (44.4)
4	COVID-19 was created to distract people so special agency could change the world economy	139 (34.9)
5	The COVID-19 virus was accidentally released from a Chinese military lab.	133 (33.3)
6	COVID-19 was patented as a vaccine in the past, but then infected people instead.	106 (26.6)
7	COVID-19 will help to control population growth by inducing infertility.	77 (19.3)
8	The 5G emits electromagnetic waves that cause symptoms mimicking influenza	48 (12.0)

Table 3 shows a relationship between believers and non-believers of conspiracy theories with sociodemographic characteristics without a statistical significance. The association between the previous infection with COVID-19 and conspiracy theory beliefs has shown no statistical significance (p-value>0.05). Similarly, association between family members affected with COVID-19 and conspiracy theories was also not statistically significant (p-value>0.05) (Table 4).

**Table 3** Association between socio demographic factors and holding beliefs of conspiracy theory

Variables	N	Conspiracy theories beliefs		$\chi^2$	P-value	
		No beliefs N (%)	Beliefs N (%)			
Gender	Male	219	134 (52.3)	85 (59.4)	1.866	0.175
	Female	180	122 (47.7)	58 (40.6)		
Residence	West Jeddah	81	58 (22.7)	23 (16.1)	5.319	0.256
	South Jeddah	80	44 (17.2)	36 (25.2)		
	Central Jeddah	80	54 (21.1)	26 (18.2)		
	North Jeddah	81	51 (19.9)	30 (21)		
Job	Employed	223	145 (56.6)	78 (54.5)	2.042	0.728
	Non employed	90	61 (23.8)	29 (20.3)		
	Student	69	40 (15.6)	29 (20.3)		
	Health care provider	17	10 (3.9)	7 (4.9)		
Education	College	229	155 (60.5)	74 (51.7)	5.157	0.076
	High school or less	135	84 (32.8)	51 (35.7)		
	Postgraduate	35	17 (6.6)	18 (12.6)		

**Table 4** Associations between previous infection with COVID-19 and beliefs of conspiracy theory

Experienced COVID 19 infection	Conspiracy theories beliefs		Chi-square	P-value
	No beliefs N (%)	Beliefs N (%)		
No	155(65.4)	82(34.6)	0.391	0.595
Yes	101(62.3)	61(37.7)		
Familymembers experienced COVID19 infection				
No	76(65)	41(35)	0.046	0.831
Yes	180(63.8)	102(36.2)		

Regarding examination of the correlation between conspiracy theorybeliefs and adherence to prevention and controlmeasures, including vaccination, among conspiracy theory believers (143 people), 77(53.8%) of them reported always wearing medical or cloth face masks. Among the non-believers (256), 169 (68.7%) reported wearing medical or cloth face mask. Maintaining physical distancing as per the ministry of health recommendations and early adoption of the COVID-19 vaccine were significantly associated with more conspiracy theory non-believers (0.004 and 0.038, respectively) (Table 5).

**Table 5** Relationship between beliefs of conspiracy theory and adherence to control measures

Adherence to control measures items		Conspiracy theories beliefs		Chi-square	P-value
		No beliefs N (%)	Beliefs N (%)		
Wearing medical or cloths facemask	Always	169(68.7)	77(31.3)	6.623	0.085
	Frequently	57(55.3)	46(44.7)		
	Occasionally	21(63.6)	12(36.4)		
	Never	1(100)	0		
	Rarely	9(52.9)	8(47.1)		
Applying physical distancing as per ministry of health recommended	Always	165(69.3)	73(30.7)	15.658	0.004*
	Frequently	59(53.2)	52(46.8)		
	Never	1(100)	0		
	Occasionally	22(55)	18(45)		
	Rarely	9(100)	0		
Early adoption of COVID-19 vaccine	Always	170(60.5)	111(39.5)	11.139	0.025*
	Frequently	49(65.3)	26(34.7)		
	Never	4(100)	0		
	Occasionally	25(86.2)	4(13.8)		
	Rarely	8(80)	2(20)		

\*Statistically significant at 0.05

#### 4. DISCUSSION

Our study evaluated perspectives toward the COVID-19 pandemic and conspiracy theories among adults attending primary healthcare centers in Jeddah city, Saudi Arabia. Our study was the first to explore the conspiracy beliefs related to COVID-19 and their associations with the implementation of preventive measures and vaccine adoption in Jeddah. Our findings will help establish strategies to burst myths and improve the success towards the fight against the COVID-19 pandemic. We found that almost 35% of participants believed in conspiracy theories. This percentage is lower than the 42.2% prevalence of conspiracy beliefs found in Croatia (Tonković et al., 2021), but it's close to the one (33%) found by another study conducted in the USA (Earnshaw et al., 2020). This means that the majority of our participants were COVID-19 related conspiracy non-believers. However, almost a third of our participants believed in conspiracies, which might undermine the efforts of fighting against the pandemic. These beliefs could be caused by the frequent changes in the scientific information that comes out as science uncovers more about the COVID-19, which can lead to mistrust in science, scientists, and scientific institutions.

Some studies reported low education levels associated with more conspiracy beliefs (Earnshaw et al., 2020; Freeman et al., 2022) but our findings didn't show any significant difference between believers and non-believers of conspiracy theories based on education levels, gender, and employment status. On the other hand, research has found ambiguous evidence of gender impact on believing in conspiracies because some studies reported that women tended to believe in conspiracies more than men, while other studies reported that men were more COVID-19 related believers (Alper et al., 2021; Cassese et al., 2020; Freeman et al., 2022). Most conspiracies spread via social media, particularly among young people. Therefore, the high popularity of social media might explain our finding of the prevalence of 35% conspiracy believers. However, we didn't find any statistically significant difference based on age.

This study's most popular theories among conspiracy believers were related to governance and mistrust in government, institutions, and science. For example, COVID-19 was exaggerated to enable social order and economy changes, or COVID-19 is a secret weapon. Our findings agree with other studies' findings. Tonković et al., (2021) found that some people believed that real numbers of infected were being kept secret, vaccines were available from the beginning but never revealed, and scientists leaked the infection from the laboratory. Another study from Pakistan found similar reasons given by participants that COVID-19 was created to enable financial gains among politicians and super-rich individuals or wealth transfer controlled by governments and hide economic crisis (Ejaz et al., 2021). It was revealed that measures imposed by authorities like lockdowns could lead to skepticism and discontent when prolonged. That might lead to more conspiracy beliefs, especially among those significantly impacted and whose financial status was negatively affected (Agly & Xiao, 2021; Ejaz et al., 2021; Tonković et al., 2021).

Previous studies indicated that conspiracy theories and mistrust of science could impede the success of preventive measures (Dohle et al., 2020; Ejaz et al., 2021). Earnshaw et al., (2020) found that conspiracy believers were 3.9 times less willing to receive vaccines of COVID-19, and the support for public health recommendations was lower among believers of conspiracy theories about COVID-19. These findings could lead to fewer acceptances of measures recommended by the Ministry of Health but Earnshaw et al., (2020) didn't find any significant impact of conspiracies on cooperation with recommended measures. In contrast, we found that believing in conspiracies was related to low compliance with preventive measures and less COVID-19 vaccine adoption, aligning with other previous studies that reported a positive prediction of non-compliance to preventive measures associated with conspiracy beliefs (Ejaz et al., 2021; Farias & Pilati, 2021). COVID-19 containment is negatively affected by these beliefs, resulting in false attitudes and misbehavior toward vaccination and other protective measures (Hakim, 2021).

There are some limitations to consider. This study didn't use established scoring system to define holder of conspiracy beliefs, which might cause under- or overestimation of our results.

## 5. CONCLUSION

Our study found a 35.8% prevalence of COVID-19-related conspiracy theory beliefs among patients attending Primary Health Centers (PHC) in Jeddah. The top 4 conspiracy theory beliefs were: COVID 19 was exaggerated to make big changes in the world's social order, COVID-19 was a secret biological weapon, big pharmaceutical companies have known about COVID-19 for a while and COVID-19 was made up to keep people's attention so that special agencies could change the world economy. Conspiracy theory Believers were significantly less likely to accept and be compliant with preventive measures and less COVID-19 vaccine adoption. Our findings suggest that there is still a need to continue raising awareness and education programs to educate people, burst myths and conspiracies, and incite vaccination adoption. This is indicated by almost a third of our participants being conspiracy theory believers, despite this study being conducted very recently when relatively more scientific information is available about the COVID-19.

### Ethical considerations

This study as approved by the Ministry of Health Institutional Review Board IRB (Ref. No: A01311), Jeddah, Saudi Arabia. All respondents consented before data collection after receiving information about the study and objectives.

### Author's contributions

Ahmad Y. Alzahrani designed the study's conceptual framework and drafted the research proposal also did data collection and analysis. Then he wrote the manuscript draft. Najlaa A. Mandoura revised and contributed to the research proposal and manuscript writing and supervised the research conduction.

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### Conflicts of interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are present in the paper.

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