What are the current COVID-19 public awareness levels and practices in Saudi Arabia? Analysis of data from an online survey conducted in 2021

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Abstract

Background: The World Health Organization (WHO) designated the coronavirus disease (COVID-19) a pandemic in March 2020. Prevention and control measures were implemented worldwide to limit the spread of the disease, and the effectiveness of these measures depend on the degree of awareness and adherence of the populations. This study was conducted to determine the current awareness levels and health practices of the Saudi Arabian population and to assess how much the education programs had improved the public awareness levels and health practices.

Methods: This cross-sectional study was conducted in Saudi Arabia from November 2020 to May 2021 and enrolled 1062 participants. The current knowledge levels, attitudes, and practices of the Saudi Arabian population were assessed based on an online questionnaire survey.

Results: The mean knowledge score was 29.36 ± 3.80; and 53.7%, 45.2%, and 1.1% of the participants had high, moderate, and low knowledge levels, respectively. The knowledge score was significantly related to the education level ($p<0.001$). The mean attitude score was 10.28 ± 2.56 and 74.9% of the participants had a high attitude level. The mean practice score was 3.67 ± 0.595, with significant differences that were related to the female sex ($p=0.005$) and younger age groups ($p<0.05$) and between those aged 30–34 years and those aged 35–39 or 40 years and older

Conclusion: The participants exhibited a high level of public awareness in all sub-scales of knowledge, practices, and attitudes for the prevention of COVID-19.

The overall knowledge levels, attitudes, and practices of the Saudi Arabian population had considerably improved since the beginning of the pandemic.

Keywords: coronavirus; pandemic; prevention; control measures; practice

Introduction

The coronavirus disease (COVID-19) is a viral respiratory disease that is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was first identified in Wuhan, China, in late 2019 [1]. COVID-19 spread quickly, inflicting a plague across China that was followed by an expanding number of cases in different countries. In February 2020, the World Health Organization (WHO) designated COVID-19 as a public health outbreak of global concern [2]. Subsequently, the explosive spread of the virus was confirmed in many countries, including in the Middle East [3]. COVID-19 first appeared in Saudi Arabia in March 2020; by June 2020, the health authorities had reported more than 100,000 cases and 283 deaths, mostly in Riyadh, Jeddah, Mecca, and Medina [4]. The infection initially appeared to be zoonotically transmitted, as it was first noticed in individuals who were exposed to wet markets [5]; however, SARS-CoV-2 infection without exposure to the wet market made person-to-person transmission seem most likely [6].

The effectiveness of public health control measures depend on the public awareness of disease transmission and the presentation and commitment to these safety measures [7]. Citizens who complied with protective measures had excellent knowledge during the COVID-19 outbreak in China [8]. The awareness and practices with regard to COVID-19 were extensively studied in Saudi Arabia since the beginning of the pandemic. However, gaps in the knowledge, attitude, and practices persist, and researchers have suggested further studies and more educational programs to improve public awareness. A multinational cross-sectional study with participants from three Middle Eastern countries, including Saudi Arabia, reported low knowledge levels about COVID-19 transmission [9].

In March 2020, participants of a wide public awareness study in Saudi Arabia had high-level public knowledge of SARS-CoV-2 transmission routes and adherence to personal protective measures, but had lower practice scores that were linked to the age and regional variations [10]. In April 2020, Alahdal et al. conducted an analytical study in Riyadh, Saudi Arabia to assess the awareness, attitudes, and practices during the COVID-19 pandemic and reported moderate public awareness, but better attitudes and practices [11]. In May 2020, another community-based study showed satisfactory knowledge, attitudes, and practices towards COVID-19 in Saudi Arabia, despite sub-par knowledge of the transmission route and awareness of disease severity and complications in only a small proportion of the participants [12]. In June 2020, Almofada et al. undertook a population-based cross-sectional study in Saudi Arabia to assess the awareness of disease severity and incubation period as well as the adoption of preventive measures, and concluded that the Saudi population is aware of preventive attitudes and practices as well as the mode of transmission; however, the study did not explore all the subscales of knowledge and practices [13].

Considering the demonstrable increase in the total number of newly diagnosed COVID-19 cases despite the high number of prevention and control measures that have been implemented by the Saudi Arabian government, a gap in the awareness and practice can be inferred. Thus, there was a crucial need to update the knowledge of the current awareness levels and practices to assess the extent to which the efforts to improve awareness and preventive practices among the Saudi population had been successful. Therefore, the aim of this study was to determine the current knowledge, attitude and practice of COVID-19 among Saudi Arabian population and to assess how much the education programs had improved the public awareness levels and health practices.

Materials and Methods

1 Study design

This questionnaire-based cross-sectional survey was conducted among residents of Saudi Arabia from November 2020 to May 2021, to assess the current knowledge, attitudes, and practices among the Saudi population. The Kingdom of Saudi Arabia is located in the southwest region of Asia, with a total area of 2,149,690 km2 and a population of 34,813,871, according to the latest United Nations data in 2020. Saudi Arabia is abutted by Oman and Yemen to the south; Jordan, Kuwait, and Iraq to the north; the United Arab Emirates, the Arabian Gulf, and Qatar to the east; and the Red Sea to the west [14].

All adult citizens and expatriates (age ≥18 years) residing in Saudi Arabia were invited to participate in the study. Given the current situation of the COVID-19 pandemic and the recommended physical distancing measures, the questionnaire was distributed online, through social media (Twitter and Whats App groups), and the survey link was posted on the websites of different universities and colleges. A total of 1092 participants were included in the study, based on the Epi Info formula [15]. The sample size was calculated based on the confidence level (95%), margin of error (3%), a 10% non-response rate, and a total population of 34,813,871.

Given the unavailability of a standard questionnaire, the authors developed a self-reported questionnaire in accordance with the Center for Disease Control and Prevention (CDC) guidelines for the COVID-19 community. The questionnaire was drafted in English and translated into Arabic and back-translated to validate the accuracy of the translation prior to validation in a pilot study with 15 participants. Accordingly, ambiguous words or phrases were modified; for example, “I don’t know” was replaced by a dichotomous yes/no answer. The pilot group’s feedback was incorporated and the final questionnaire was developed.

The first page of the online questionnaire comprised clear information about the study’s background and objectives and clarified information about participation, withdrawal, confidentiality, and informed consent. The questionnaire comprised four primary sections: the first gathered

information on the respondents' sociodemographic characteristics, including age, sex, marital status, education level, work status, and region of residence; the second assessed the participants' knowledge of COVID-19, including modes of transmission, clinical symptoms, treatment, risk groups, isolation, prevention, and control; and the third and fourth sections assessed the participants' attitudes and practices with regard to COVID-19, respectively.

2 Ethics

Ethical approval for this study was obtained from the Institutional Review Board of Jazan University (Reference No.: REC42/1/015). The purpose of the study was explained to the participants. Data privacy and confidentiality were maintained throughout the research.

3 Scoring of the answers

Participants marked knowledge items as either true or false statements, and incorrect and correct responses were scored 0 and 1, respectively, with high scores indicating better knowledge of COVID-19. Cronbach's α was used to evaluate items for internal reliability (indicated by a coefficient of 0.70) [16]. For the attitudes, scores were calculated based on the participants' answers to each attitudinal statement as follows: 1, strongly disagree; 2, disagree; 3, undecided; 4, agree; and 5, strongly agree by obtaining the average of the answers to six statements; high scores indicate positive attitudes. The Likert scales were assessed for internal reliability (Cronbach's α coefficient 0.81). With regard to practices, participants responded "yes" or "no" to the items, and answers that reflected good and bad practices were given a score of 1 and 0, respectively, with high scores indicating better practices.

The survey data were coded, reviewed, and entered into a computerized data base and analysed using Statistical Package for the Social Sciences (SPSS) version 25. Frequencies and percentages (descriptive statistics) were used to analyse the selected sociodemographic variables. The chi-square test was used to determine the significance of the relationship between sociodemographic characteristics and knowledge about COVID-19 and to assess the attitudes and practices towards COVID-19 prevention; $P \leq 0.05$ was considered statistically significant.

List of Abbreviations

WHO	World Health Organization
COVID-19	Coronavirus disease 19
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
CDC	Center for Disease Control and Prevention
MOH	Ministry of Health

Results

Table 1 shows the participants' sociodemographic profile; 697 (63.8%) and 395 (36.2%) of the participants were male and female, respectively; 489 (44.8%), 159 (14.6%), 126 (11.5%), 133 (12.2%), and 185 (16.9%) were <25, 25–29, 30–34, 35–39, and ≥40 years, respectively. The majority of participants (n=1037, 95%) were Saudis and 55 (5%) were non-Saudi. Furthermore, 160 (14.7%), 70 (6.4%), 13 (1.2%), 106 (9.7%), and 743 (68%) participants were from the central, eastern, northern, western, and southern regions, respectively; 281 (25.7%), 468 (42.9%), 245 (22.4%), 95 (8.7%), and 3 (0.3%) were living in an apartment, private house, villa, traditional house, and hotel, respectively. With regard to the level of education, 1 (0.1%), 9 (0.8%), 280 (25.6%), 723 (66.2%), and 79 (7.2%) had a primary school, intermediate school, high school, bachelor, and postgraduate (masters/doctorate), respectively. The commonest occupation listed among the participants was student (n=245, 22.4%), followed by medical student (n=170, 15.6%), educational sector (n=155, 14.2%), and health worker (n=256, 23.4%).

Table 2 presents the participants' responses towards the knowledge assessment questions; 90.20%, 98.90%, and 99.5% of the participants considered that COVID-19 was a respiratory tract infection, that virus transmission occurred by touching contaminated hands, and that the virus spreads in crowded places.

Table 1. Sociodemographic profile of the participants (n=1092)

Demographics	Number (N)	Percentage (%)
Sex		
Male	697	63.8
Female	395	36.2
Age, years		
<25	489	44.8
25–29	159	14.6
30–34	126	11.5
35–40	133	12.2
>40	185	16.9
Nationality		
Saudi	1037	95
Non-Saudi	55	5
Region		
Central	160	14.70
Eastern	70	6.40
Northern	13	1.20
Western	106	9.70
Southern	743	68.00
Level of education		
Primary	10	0.90
Secondary	280	25.60
University	723	66.20
Postgraduate (masters/doctorate)	79	7.20
Occupation		
Health sector	256	23.40
Non-health sector	836	76.60

Table 2. Participants' responses to the knowledge-assessment questions (n=1092)

Questions	Number (N)	Percentage (%)
Q1: COVID-19 affects the respiratory system.		
• Yes	1083	99.20
• No	9	0.80
Q2: The coronavirus is transmitted by touching a hand contaminated with the virus to the nose, mouth, or eyes.		
• Yes	1080	98.90
• No	12	01.10
Q3: A person infected with the virus does not show symptoms until after a period of 14 days.		
• Yes	570	52.20
• No	522	47.80
Q4: The virus can be transmitted from person to person even if the virus is still in the incubation period.		
• Yes	992	90.80
• No	100	9.20
Q5: The virus spreads in crowded and gathering places.		
• Yes	1087	99.50
• No	5	0.50
Q6: The symptoms of COVID-19 are similar to those of seasonal influenza.		
• Yes	977	89.50
• No	115	10.50
Q7: The virus affects all age groups.		
• Yes	1072	98.20
• No	20	1.80
Q8: Every person infected with the coronavirus needs to be hospitalised.		
• Yes	97	8.90
• No	995	91.10
Q9: The disease cure rate is very high.		
• Yes	1014	92.90
• No	78	7.10
Q10: The death rate due to the coronavirus is low.		
• Yes	882	80.90
• No	209	19.10
Q11: Elderly people and those with chronic diseases are more susceptible to being infected by the coronavirus.		
• Yes	1074	98.40
• No	18	1.60
Q12: Is there currently a proven cure?		
• Yes	54	4.90
• No	1038	95.10

Figure 1 depicts the participants' responses on the mode of transmission; the most commonly identified means of transmission were spray from the infected person's sneeze or cough (n=1043, 95.5%), contact with a person infected by SARS-CoV-2 (n=1014, 92.9%), contact with surfaces contaminated with the oronasal secretions of an infected individual (n=951, 87.1%).

Figure 1. Participants' responses about the mode of transmission of SARS-CoV-2.

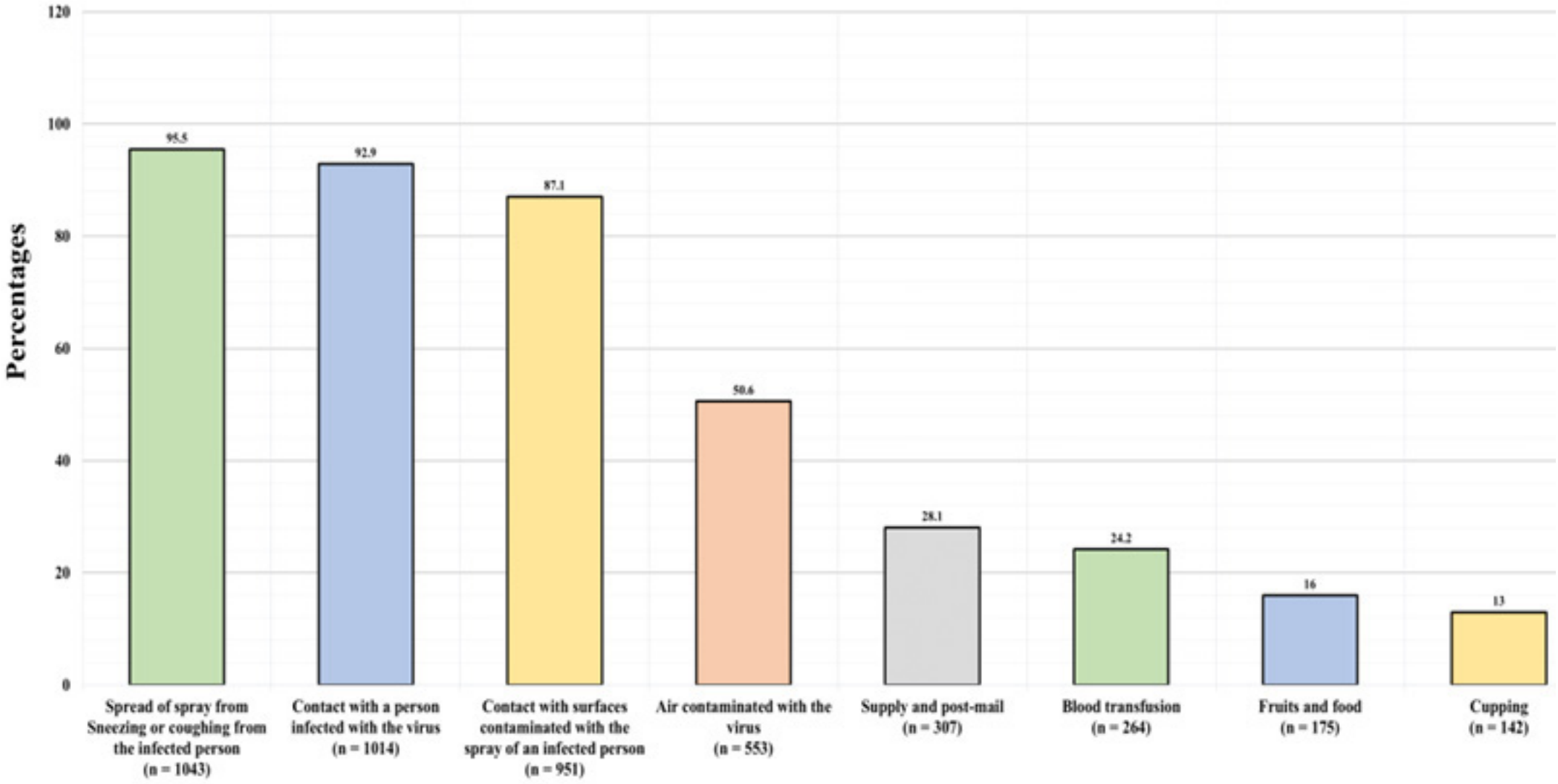

Figure 2 illustrates the participants' responses to questions about the signs and symptoms of COVID-19. The most frequently identified signs and symptoms of COVID-19 were dyspnoea (n=1002, 91.8%), dry or productive cough (n=953, 87.3%), and high fever (≥37.3°C; n=889, 81.4%).

Figure 2. Participants' responses about the signs and symptoms of COVID-19.

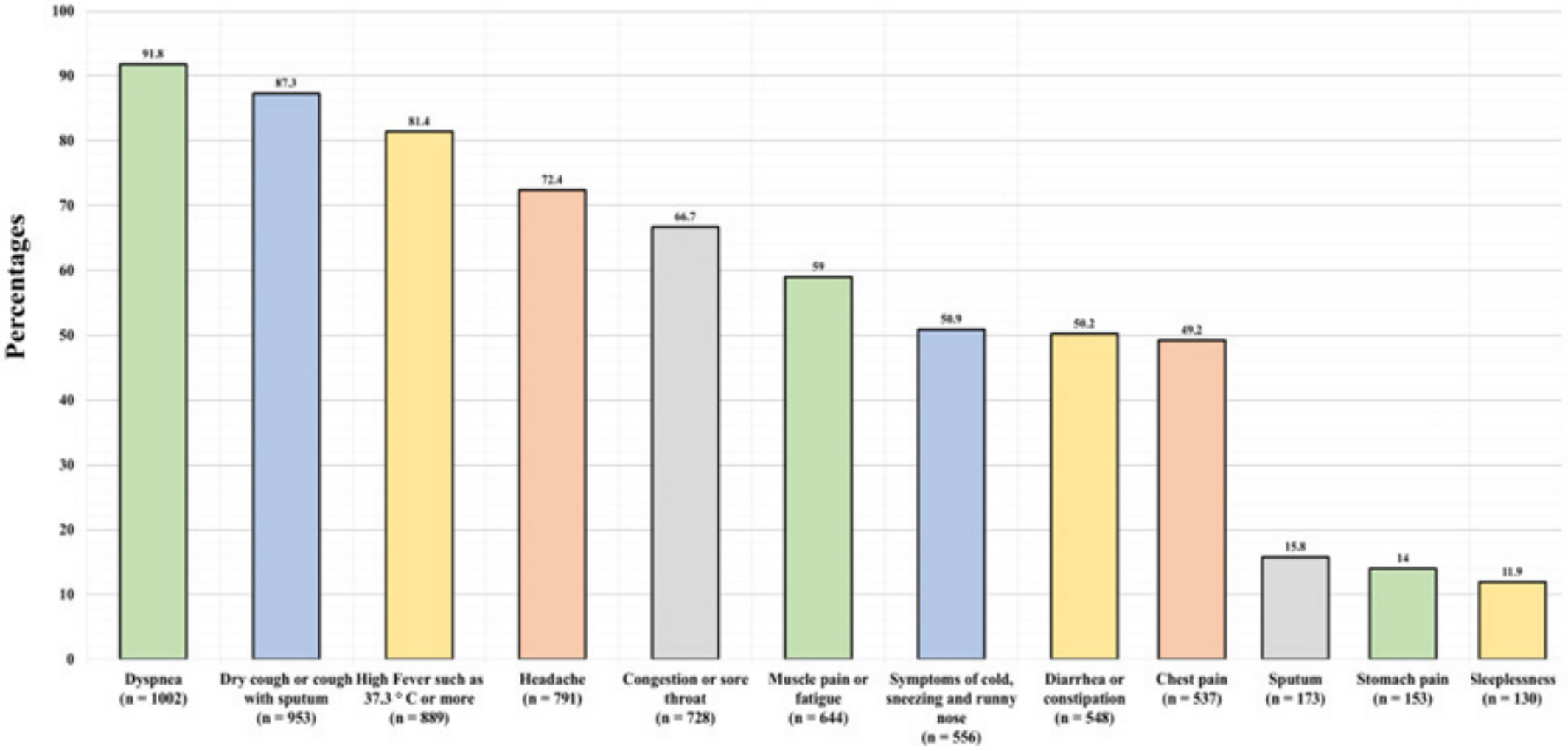

Figure 3 shows the participants' responses to questions about methods of preventing COVID-19, which included "blowing one's nose" and gargling with water, salt, vinegar, and lemon (n=222, 20.3%), spraying the body with sanitizer or chlorine (n=221 (20.2%), and sun exposure (n=126, 11.5%); however, 809 (74.1%) respondents opined that all of the abovementioned methods are not scientifically approved.

Figure 3. Participants' responses about methods for preventing COVID-19

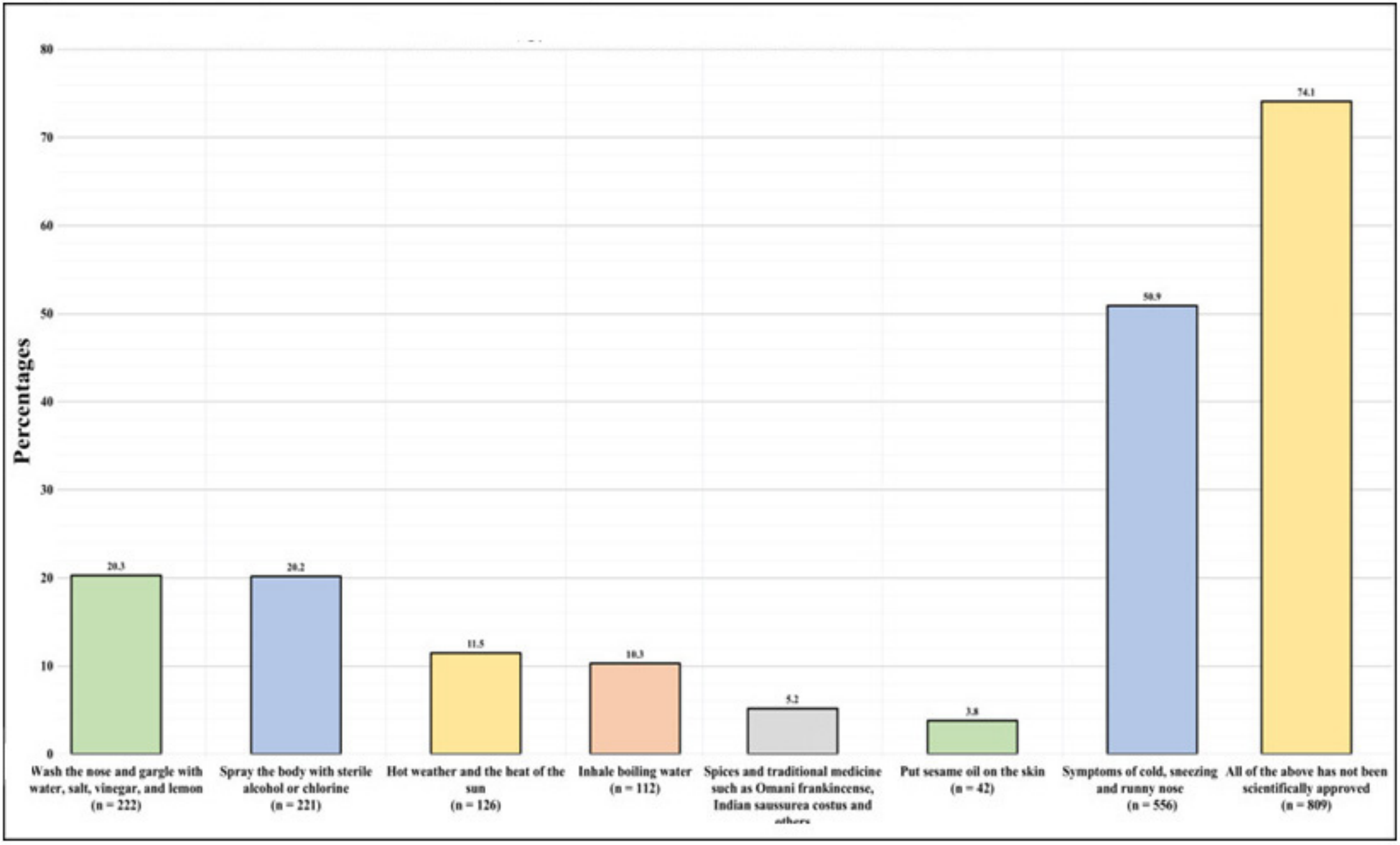

Figure 4 shows the participants' sources of information about COVID-19, which included the official social media accounts (e.g., Twitter) of the Ministry of Health, official news channels, the WHO website, WhatsApp, celebrity's social media accounts (Twitter, Snapchat, Instagram, YouTube, etc.), and other sources for 909 (83.2%), 624 (57.1%), 552 (50.5%), 186 (17%), 63 (5.8%), and 31 (2.8%) respondents, respectively.

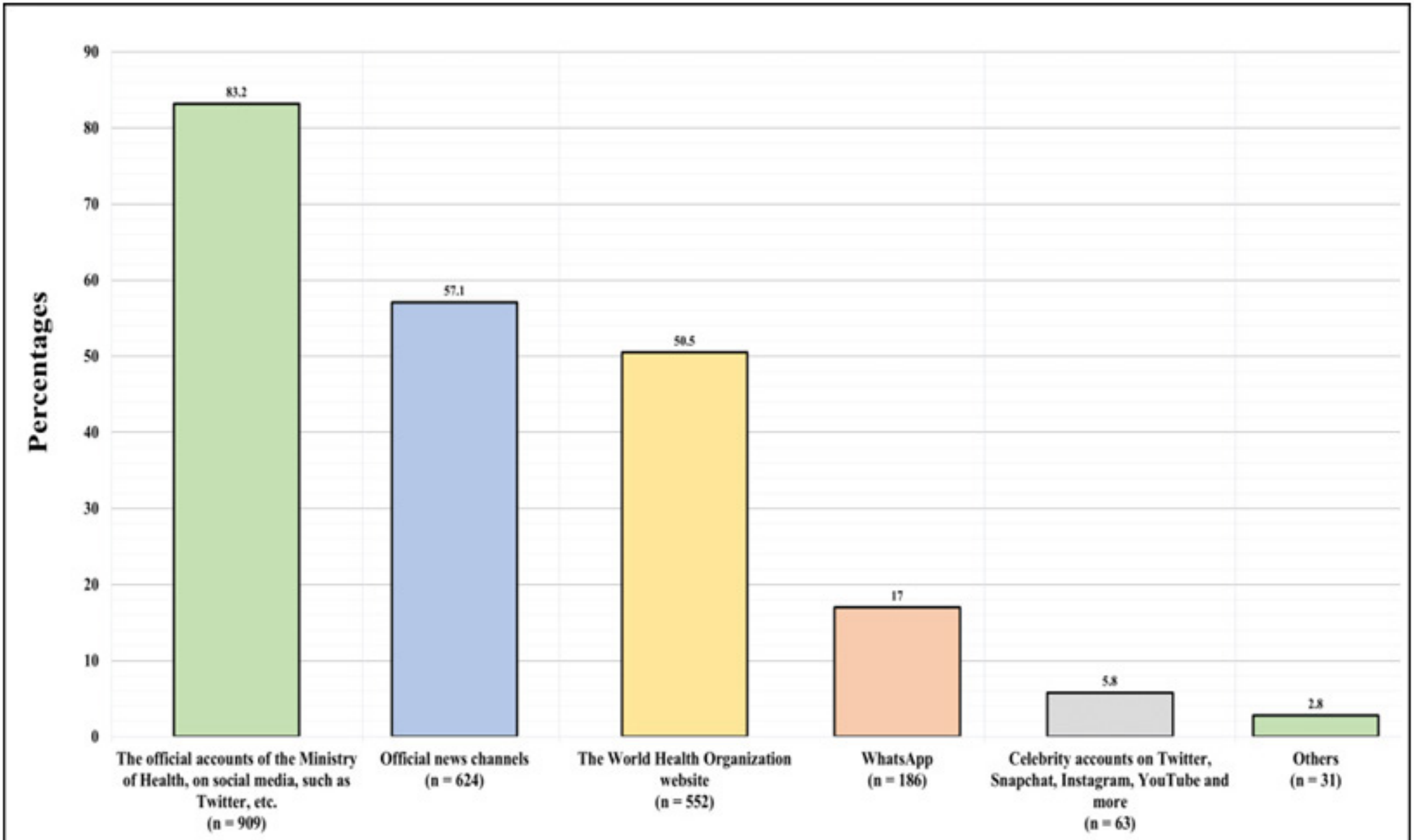

Figure 4, Participants Responses Toward "What is The Source of your Information About COVID-19 ?"

Table 3 displays the participants' attitude towards health-related habits to prevent COVID-19 and their reasons for leaving home; 1040 (95.2%) respondents ensured that they washed their hands appropriately, 1018 (93.2%) avoided shaking hands, 1005 (92%) used masks in crowded places, 988 (90.5%) put a distance of at least a meter between themselves and other people, 973 (89.1%) covered their noses before sneezing, and 966 (88.5%) committed to stay at home. Shopping was the commonest reason for leaving home (Table 3).

Table 3. Participants' attitude towards health-related habits against COVID-19 and their reasons for leaving home

Question	Number (N)	Percentage (%)
Which of the following health-related habits against COVID-19 do you follow?		
• Washing hands with soap and water for at least 40 seconds on returning home and after touching things or others	1040	95.2
• Avoid shaking hands with others	1018	93.2
• Using a mask in crowded places	1005	92
• Keeping distance of at least a meter between oneself and others when talking	988	90.5
• Covering the nose and mouth with a tissue before sneezing or sneezing into the upper arm	973	89.1
• Avoiding use of other people's personal items	951	87.1
• Ensuring that food is very well-cooked	558	51.1
Which of the following reasons are usually responsible for leaving home?		
• "Going out for a picnic"	370	33.9
• "Going out for shopping"	595	54.5
• "Attending a meeting or events"	165	12.2

Table 4 lists the participants' scores of the knowledge levels, attitudes, and practices. The mean knowledge-level score was 29.36 ± 3.8, and 12 (1.1%), 494 (45.2%), and 586 (53.7%) respondents had low, moderate, and high knowledge levels, respectively. The mean attitude score was 10.28 ± 2.56, and 94 (8.6%), 180 (16.5%), and 818 (74.9%) respondents had low, moderate, and high attitude levels, respectively. The mean practice score was 3.67 ± 0.595.

Table 4. Participants' scores for knowledge levels, attitudes, and practices

Knowledge score (Total = 39)		
Mean		29.36
Standard deviation		3.8
Knowledge level	Number	Percentage
Low (0–19), <50%	12	1.1
Moderate (20–29), 50–75%	494	45.2
High (30–39), >75%	586	53.7
Attitude score (Total = 13)		
Mean		10.28
Standard deviation		2.56
Attitude level	Number	Percentage
Low (0–6), <50%	94	8.6
Moderate (7–9), 50–75%	180	16.5
High (10–13), >75%	818	74.9
Practice score (Total = 4)		
Mean		3.67
Standard deviation		0.595

Table 5 shows the relationship between sociodemographic variables and knowledge, attitude, and practice scores. We found a significant relationship between the knowledge score and education ($p<0.001$), wherein a higher education level was associated with a higher mean score of knowledge. Tukey's post hoc test revealed a significant difference between the group of respondents who had high school education and those with a bachelor's degree and with higher education ($p<0.05$). No significant relationship was found between knowledge and sex, age, nationality, or region.

With regard to the attitude, we found a significant difference between the attitude score and sex ($p=0.005$), wherein the mean attitude score of female respondents was higher than that of male respondents (10.56 ± 2.31 vs. 10.11 ± 2.68). Moreover, we found a significant difference in attitude scores across age groups ($p<0.001$); Tukey's post hoc test revealed a significant difference between respondents who were younger than 25 years and those aged 35–39 and 40 years or older ($p<0.05$). Moreover, we found a significant difference between those aged 30–34 years and those aged 35–39 and 40 years or older ($p<0.05$). Furthermore, we found a significant difference between Saudi and non-Saudi respondents ($p=0.015$), wherein a higher score of attitudes was noted in non-Saudis compared to Saudis (11.09 ± 1.74 vs. 10.23 ± 2.59)

For the practices adopted, we found a significant relationship with regard to the age groups ($p=0.006$). Tukey's post hoc test revealed a significant difference between those aged 30–34 years and those aged 35–39 or 40 years and older ($p<0.05$).

Table 5. The relationship between sociodemographic variables and knowledge level, attitude, and practice scores

	Knowledge Score (Total =4)			Attitude Score (Total =4)			Practice Score (Total =4)		
	Mean	SD	*p*-value	Mean	SD	*p*-value	Mean	SD	*p*-value
Sex									
Male	29.23	3.88	0.126	10.11	2.68	0.005*	3.65	0.59	0.130
Female	29.6	3.65		10.56	2.31		3.70	0.60	
Age, years									
<25	29.4	3.57		10.04	2.45		3.64	0.59	
25–29	29.8	3.93	0.159	10.31	2.54	<0.001*	3.62	0.68	0.006*
30–34	28.65	4.14		9.72	3.35		3.56	0.71	
35–40	29.33	3.70		10.91	2.23		3.77	0.44	
>40	29.39	4.09		10.8	2.28		3.76	0.53	
Nationality									
Saudi	29.31	3.71	0.063	10.23	2.59	0.015*	3.67	0.60	0.868
Non-Saudi	30.29	5.22		11.09	1.74		3.56	0.58	
Region									
Central	29.59	4.07		10.41	2.36		3.72	0.49	
Eastern	29.41	3.36	0.350	10.50	2.20	0.800	3.51	0.63	0.071
Northern	31.31	2.39		10.62	1.94		3.92	0.28	
Western	29.42	3.96		10.32	2.98		3.63	0.70	
Southern	29.27	3.78		10.21	2.58		3.67	0.60	
Level of education			< 0.001*						
Primary	27.90	4.33		11.20	1.62		3.40	0.52	
Secondary	28.40	3.86		10.32	2.57	0.445	3.71	0.60	0.116
University	29.64	3.48		10.28	2.48		3.66	0.60	
Postgraduate (masters/doctorate)	30.44	5.37		9.95	3.19		3.57	0.57	

Discussion

Health authorities in the Saudi Arabian Ministry of Health (MOH) have conducted intensive awareness campaigns that were communicated via their website, television (TV), and various social media platforms [17]. Compliance with preventive measures is strongly related to people's awareness and practices [18–21]. A systematic review and meta-analysis of different studies that were published worldwide showed that the overall knowledge level, attitudes, and practice components were at an acceptable level [22].

In this study, two-thirds of the participants were within the age group of less than 30 years, and similar results were reported by Alhazmi et al. and Almofada et al. in two different cross-sectional studies conducted in Saudi Arabia. This could be related to the distribution of the questionnaire through the universities and to the wide use of social media by this age group. In concordance with previous studies [12, 13], the majority of the participants were Saudis and, again, this could be attributed to the distribution of the survey questionnaire through the universities.

Knowledge levels were found to be satisfactory in this study. The majority of the participants had high to moderate knowledge levels, and this finding is in agreement with the results of Zhong et al., in China and Azlan et al., in Malaysia [8, 19]. Al-Hanawi et al, in a recent community-based study that was conducted in Saudi Arabia, reported high knowledge levels among their participants though less knowledge was reported among male and younger participants in the same study [18]. On the other hand, our findings contradict those of multinational cross-sectional studies, from three Middle Eastern Countries (Saudi Arabia, Jordan, and Kuwait), that reported a low level of knowledge about SARS-CoV-2 transmission [8]. This could be explained by the effective widespread communication and awareness programs that have been launched since the beginning of the COVID-19 pandemic. Though the overall levels of knowledge were found to be satisfactory in many different studies, the sub-scales of knowledge were found to be variable. In our study, the participants showed excellent knowledge levels with regard to the disease transmission, causative agent, and clinical presentation sub-scales of knowledge. Alhazmi et al. reported average knowledge levels on the transmission sub-scale and low knowledge levels on the disease severity and complications [12]. Mabrouk et al., in a regional study undertaken in the Qassim region of Saudi Arabia, reported adequate awareness of COVID-19; however, the result was limited by the regional nature of the study [23].

In this study, the knowledge levels were significantly related to degree of education and were unaffected by the nationality, age group, or sex. Most of the previous studies supported a correlation between the level of knowledge and the degree of education [8, 12] and attributed this to the fact that education facilitates widespread communication and delivery of education programs. A similar study that was conducted in the USA reported better awareness in women compared to men [24].

The attitude sub-scales of washing hands appropriately, avoiding shaking hands, using masks in crowded places, and physical distancing were not satisfactory in this study. These findings are consistent with those of other studies that were previously conducted in Saudi Arabia by Alhanofa et al. and Al-Hanawi et al. Interestingly, in this study, the attitude was significantly correlated with the sex and the age group, with a higher score in female rather than male respondents and in the age group of participants who were younger than 25 years than in any other age group. Theoretically, participants' knowledge levels, attitudes, and even the practices are supposed to be linearly correlated with their educational levels; however, the mechanisms by which different sex and age groups affect this relationship need to be investigated in large cross-sectional and quantitative studies.

The overall practices with regard to preventing COVID-19 in Saudi Arabia have significantly improved since the emergence of the pandemic. Al-Hanawi et al. reported that the participants' score for practices related to COVID-19 was 4.34 out of 5, and Alhazmi et al. reported a score of 81.9 out of 100. In this study, the overall practice score was 3.8 out of 4 which was even better than the outcomes of previous studies and indicates an overall improvement in the practices associated with COVID-19 awareness and prevention. The knowledge level, attitudes, and practice scores were linearly correlated in this study, similarly as in previous studies that were conducted in Saudi Arabia, and possibly reflect a high impact of the implementation of preventive services and education programs [12, 13].

This study reflected the overall progression and improvement in the participant's awareness since the beginning of the COVID-19 pandemic in March 2020 in Saudi Arabia and is an indicator of the effectiveness of the preventive measures implemented by the health authorities. However, this study is not without limitations. The cross-sectional design and the small sample size are limitations that preclude the generalization of the results. Due to the lockdown and the difficulties in the distribution of the online survey questionnaire, the results appear to be restricted to individuals who are in contact with social media and universities and are not representative of the general community.

Conclusion

The preventive measures and awareness programs implemented by health authorities in Saudi Arabia have successfully controlled the spread of SARS-CoV-2, limited the emergence of new COVID-19 cases, and increased the public awareness about disease transmission and prevention. The overall awareness and practices of the Saudi population have been considerably improved since the beginning of the COVID-19 pandemic. A greater emphasis should be directed towards education programs among individuals with poor access to social media and those with low education to ensure a whole-community representative public awareness about COVID-19.

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