


Perception and Attitude of Public about Hand Sanitizers and Disinfectants in Saudi Arabia

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ABSTRACT

Objectives: The public had malpractice and attitudes toward hand sanitizer and disinfectants during epidemic and pandemic situations. Even though there is evidence that sanitizers and disinfectants are efficacious and prevent disease transmission, the public's perception and attitude about their efficacy are still controversial. Therefore, in this study, we aimed to investigate the perception and attitude of hand sanitizers and disinfectants in the Kingdom of Saudi Arabia. **Design and Setting:** A self-administered, structured questionnaire was sent to the public via online mode. The survey collected demographic information and information about perception and attitude about using hand sanitizer or disinfectant during COVID-19. Data were analyzed with the SPSS program. **Results:** A total of 402 participants responded to the questionnaire. Of them, 32.58% were from the western region, and 25.76% were from the central region, with statistically significant differences between different regions ($p=0.000$). Most of the responders (90.88%) were Saudi nationals. In addition, the majority of the responders (65.17%) were females, with statistically significant differences between males and females ($p=0.000$). The average score for attitude was 2.65. The average score for the perception was obtained for the element "dedicate a specific place in the house to store hand sanitizer or disinfectant" (3.90). The responders accepted the sanitizer of disinfectant information from the health practitioners (3.75). The average score of perception was 3.18. The part with most perception by the patient was "the efficacy and safety of sanitizer and disinfectant is the best factor to get them" (4.01), and "there is a big difference between sanitizer and disinfectant in effectiveness and safety" (3.75). **Conclusion:** The public's perception of sanitizers and disinfectants was inadequate in the Kingdom of Saudi Arabia. The public had the perception of knowledge of sanitizers and disinfectants, appropriate storage conditions, non-usage of herbal medications, and use of sanitizers and disinfectants. However, they had a wrong perception of the benefits of sanitizer and disinfectant-related problems. Therefore, public awareness about sanitizer and disinfectants should be improved in the Kingdom of Saudi Arabia.

Key words: Public, Perception, Sanitizer, Disinfectants, Saudi Arabia.

INTRODUCTION

Sanitizers and disinfectants have become highly essential during the COVID-19 pandemic.¹⁻⁴ Various national and international organizations have recommended the use of sanitizers and disinfectants during this period.³⁻⁵ Although these products have multiple benefits, they can show adverse drug reactions;¹⁻⁴ for example, some sanitizers can cause allergic reactions.^{1-4,6} Furthermore, some disinfectants can induce asthma in individuals who have lung problems.^{1-4,6} That has caused some people to think about sanitizers and disinfectants negatively, and they will not use them in the future, even during a pandemic or emergency situation. In addition, some other individuals experience barriers that prevent them from using sanitizers and disinfectants. Some previous studies have discussed the perception of the public about infection control measures, including sanitizers and disinfectants during COVID-19.⁷⁻¹⁴ However, most of those studies have been conducted during the pre-COVID-19 period. Furthermore, previous research has discussed the practice of people in using sanitizers and disinfectants.¹⁴ To the best of our knowledge, there are no studies conducted on the perception and attitude of people about sanitizer and disinfectants in Saudi Arabia or the Middle Eastern countries.

Therefore, in this study, we assessed the public perception of sanitizer and disinfectants in Saudi Arabia.

MATERIALS AND METHODS

This quantitative cross-sectional survey was conducted in Saudi Arabia for four months through a self-administered electronic survey questionnaire. The study included all Saudi Arabian citizens. Any incomplete responses or responses from outside Saudi Arabia were excluded. An online self-developed questionnaire was distributed to the public across Saudi Arabia. The survey collected demographic data, such as location, gender, material status, age, qualification, occupational status, and monthly income. The second part collected information about people's attitudes toward hand sanitizer and disinfectant use and their perception during COVID-19. We used a 5-point Likert response scale system to obtain responses. The survey was distributed to a convenient sample of public responders via social media such as WhatsApp and Telegram and via face-to-face contact. A reminder message was sent once every 1-2 weeks. All completed surveys from Saudi nationals were included in the final analysis. According to the

previous literature, the sample was calculated with unlimited population size, a population percentage of 50%, a confidence level of 95%, a z score of 1.96, a margin of error of 5%, and a drop-out rate of 5%. Consequently, the sample size was calculated as 399 with the power of study of 80%.¹⁵⁻¹⁷ The response rate required for the estimated sample size was at least 60–70%.^{17,18} Expert reviewers and pilot testing validated the survey data. The data's reliability was tested by McDonald's ω , Cronbach's α , Guttman's λ_2 , and Guttman's λ_6 . The data were collected through the Survey Monkey system and analyzed using Statistical Package of Social Sciences (SPSS), Jeffery's Amazing Statistics Program (JASP), and Microsoft Excel (version 16) software. We performed descriptive and frequency analysis, the goodness of fit analysis, correlation analysis, and inferential analysis between independent variables. The STROBE (Strengthening the reporting of observational studies in epidemiology statement: guidelines for reporting observational studies) guided the reporting of this study.^{19,21}

RESULTS

A total of 402 participants responded to the questionnaire. Only participants who completed all the sections in the questionnaire were included in the analysis. The scores for reliability tests were as follows: McDonald's ω was (0.903), Cronbach's α was (0.893), Guttman's λ_2 was (0.906), Guttman's λ_6 was (0.925), Greatest Lower Bound was (0.962). Socio-demographics of the responders and analysis of the questionnaire are shown below. Out of 402 participants, 32.58% were from the western region, 25.76% were from the central region, with statistically significant differences between all regions ($p < 0.001$). Most of the responders were Saudi Nationals (90.88%). Furthermore, the majority of the responders were females (65.17%), with statistically significant differences between both genders ($p < 0.001$). Based on the age of the responders, there were five sub-categories. The majority of the responders belonged to the age group of 18–29 years (50.25%), with statistically significant differences between all age groups ($p < 0.001$). Table 1 shows all socio-demographic

Nationality	Response Count	Response Percent	p-value
Central area	102	25.76%	0.000
North area	54	13.64%	
South area	76	19.19%	
East area	35	8.84%	
West area	129	32.58%	
Answered question	396		
Skipped question	6		
Nationality	Response Count	Response Percent	
Saudi	339	90.88%	0.000
Non-Saudi	34	9.12%	
Answered question	373		
Skipped question	29		
Gender	Response Count	Response Percent	
Male	140	80.45%	0.000
Female	262	19.55%	
Answered question	402		
Skipped question	0		
Age	Response Count	Response Percent	
<18	35	8.71%	0.000
18 - 29	202	50.25%	
30 - 44	110	27.36%	
45 - 60	41	10.20%	
> 60	14	3.48%	
Answered question	402		
Skipped question	0		

Responder Qualifications	Response Count	Response Percent	p-value
Doctorate	8	1.99%	0.000
Master's degree	37	9.20%	
Bachelor's degree	264	65.67%	
Diploma	32	7.96%	
High school	48	11.94%	
Intermediate School	10	2.49%	
Primary School	2	0.50%	
Not educated	1	0.25%	
Answered question	402		
Skipped question	0		
Occupational status	Response Count	Response Percent	
Employee	140	34.91%	0.000
Non-employee	105	26.18%	
Student	137	34.16%	
Retried	19	4.74%	
Answered question	401		
Skipped question	1		
Are you a health care practitioner (Medical Doctor- Dentist- Pharmacist- Nurse- Others?)	Response Count	Response Percent	
Yes	148	36.82%	0.000
No	254	63.18%	
Answered question	402		
Skipped question	0		
If you are a health care practitioner, you are a	Response Count	Response Percent	
Physician	11	7.43%	0.000
Dentist	9	6.08%	
Pharmacist	116	78.38%	
Nurse	4	2.70%	
Other (please specify)	8	5.41%	
Answered question	148		
Skipped question	254		

data. With respect to the education level, the majority of the responders (65.67%) had a bachelor's degree, followed by employed (34.91%), students (34.16%), and non-employees (26.18%), with statistically significant differences between all levels ($p < 0.001$). Participants were also asked if they were working in the medical field. Only 36.82% were healthcare practitioners, whereas 78.38 % of these practitioners were pharmacists with statistically significant differences between specialties ($p < 0.001$) (Table 2).

Responders were asked to choose a level of perception among Publics acts toward hand sanitizer and disinfectant during COVID-19. The average score was 2.65. The question that received most of the response was "dedicate a specific place in the house to store hand sanitizer or disinfectant" (3.90), and "to what extent do you accept the sanitizer of disinfectant information provided by health practitioners" (3.75).

However, the element with the lowest perception was “the poor understanding of hand sanitizer or disinfectant cause the critical care admissions” (1.87). Followed by the elements “the poor knowledge of hand sanitizer or disinfectant causes you to visit the emergency section” (1.89) and “the poor understanding of hand sanitizer or disinfectant causes you to hospital admission” (1.89), with statistically significant differences between responses ($p < 0.001$) (Table 3).

Next, the average score for the “perceptions of public towards using hand sanitizer and disinfectants during COVID-19” was 3.18. Patients responded the most for “the efficacy and safety of sanitizer and disinfectant is the best factor to get them” (4.01), “there is a big difference between sanitizer and disinfectant in effectiveness and safety” (3.75), and “you can find the sanitizer and disinfectant at most places at my house” (3.51). However, the element with the lowest perception was “sanitizer and disinfectant have no significant benefit” (2.40), and “herbal medicines used as sanitizers and disinfectants are much better than regular sanitizer and disinfectants” (2.54). Besides, the statement “there are no side effects for sanitizer and disinfectant” (2.7), with statistically significant differences between responses ($p < 0.001$) (Table 4).

Factors affecting the acts and performances toward the public toward the sanitizer and disinfectant during the COVID-19 pandemic

Several factors affected the public acts and performances toward hand sanitizer and disinfectant during COVID-19. Using independent samples Kruskal–Wallis test and the Bonferroni correction for multiple tests, we adjusted the significant values. The factors that affected the public’s attitude toward hand sanitizer and disinfectants were location, nationality, gender, age, qualification, occupational status, and whether the responder was a healthcare practitioner (e.g., doctor, dentist, pharmacist, and nurse). Most of the factors (e.g., nationality and worksite) did not affect the knowledge of storage, with a non-statistically significant difference ($p > 0.05$). Five locations affected the attitude of the public toward hand sanitizer and disinfectant. The highest score (3.4930) was obtained for the western region, and the lowest score (3.1772) was obtained for the southern region, with a statistically significant difference between all regions ($p = 0.003$). Gender affected the attitude of the public toward hand sanitizer and disinfectants. Females obtained a higher score (3.4102) than males (3.2379), with a statistically significant difference between them ($p = 0.025$). Five different age groups affected the attitude of the public toward hand sanitizer and disinfectant use. The lowest score (2.8841) was obtained for the age group of <18 years, with a statistically significant difference between the age groups ($p = 0.000$). Eight different educational levels affected the attitude of the public toward hand sanitizer and disinfectant use. The lowest (3.0523) score was obtained for the responders who completed high school, with a statistically significant difference between all levels ($p = 0.004$). Responders who were healthcare professionals received higher scores (3.4620) than those who were non-healthcare professionals (3.2865), with a statistically significant difference between them ($p = 0.000$).

The relationship between public the public acts and performances toward hand sanitizer and disinfectant during the COVID-19 pandemic and its factors were studied. The multiple regression analysis revealed a weak relationship ($R = 0.247$ with $p = 0.003$) between the attitude of the public toward hand sanitizer and disinfectant and factors affecting it. According to the results, five out of seven factors showed non-significant differences ($p > 0.05$). However, age and gender explained 15.9% and 12.9% of the positive relationship, with a statistically significant ($p = 0.004$ and 0.022 , respectively) difference. The bootstrap model confirmed the results. And it was verified by the non-existence of multi-collinearity with the current position factor with Variance Inflation Factor (VIF) of 1.103 and 1.173),

respectively, which is less than 3 or 5^{22-24} (Table 5).

Factors affecting the attitude of the public toward hand sanitizer and disinfectant during COVID-19

Several factors affected the perception of the public about the use of hand sanitizer and disinfectants during COVID-19. Using independent samples Kruskal–Wallis test and the Bonferroni correction for multiple tests, we adjusted the significant values. The factors that affected the perception of hand sanitizer and disinfectants during COVID-19 were locations, nationality, gender, age, qualification, occupational status, and whether the responders were healthcare practitioners (e.g., doctor, dentist, pharmacist, and nurse-). However, all these factors mentioned above did not affect the perception significantly ($p > 0.05$).

The relationship between the public’s perception towards the usage of hand sanitizer and disinfectants during the COVID-19 and factors. The multiple regression analysis revealed a weak relationship ($R = 0.153$ with $p = 0.315$) between the public’s perception toward hand sanitizer and disinfectants and factors affecting it. Six out of seven factors showed non-significant differences ($p > 0.05$). However, age alone explained a 12.4% positive relationship with a statistically significant difference ($p = 0.027$). The non-existence of multi-collinearity verified the relationship with the current position factor with VIF of 1.105, which is less than 3 or 5^{22-24} (Table 6).

DISCUSSION

Over the past two years, the COVID-19 pandemic has created tough and challenging situations worldwide.^{25,26} Various international organizations released medical guidelines and recommendations for the prevention and management.^{27,5,28} Sanitizers and disinfectants were one of the highly recommended measures to be strictly followed for the prevention of the spread of the disease.¹⁻⁴ However, these aforementioned products might have been underused or overused, which could be related to misunderstanding or misconception among the public and patients.^{29,30} Moreover, some malpractice acts of the sanitizer or disinfectant.^{29,30} The assessment of the public’s perception about sanitizer and disinfectant use will encourage healthcare organizations to deal with the public during the pandemic. Therefore, this study was conducted to explore the attitudes and perceptions of the people about sanitizers and disinfectants. The self-administered electronic questionnaire was validated with a high-reliability score. It was distributed to various regions, working sites, age groups, occupational status, and whether the responders were healthcare professionals or not.¹⁴ Therefore, it was reasonable to discover all perceptions through different populations and various types and society levels. The finding showed that public attitude toward the sanitizer and disinfectant was inadequate. People showed a more positive attitude to the storage of the sanitizer and disinfectant in proper places in the houses. The public might put high proprieties for sanitizer and disinfectant to prevent any accidental injury that may have occurred at home and consider them like any regular medication. Thus, they thought that they should prescribe or dispense sanitizer and disinfectant through healthcare providers. The responders believed that poor knowledge and understanding of sanitizer and disinfectants might lead them to emergency or hospital and critical care admission. They thought that some of the sanitizers and disinfectants might contain methanol, and if mistakenly ingested, might lead them to an emergency.

Moreover, asthma patients might be allergic to certain chemicals used in disinfectants, which might cause an emergency situation. The study results showed the public’s inadequate perception of the use of sanitizers and disinfectants. Some responders had a positive, whereas others had a negative perception. The elements which say “people considered the efficacy and safety of the essential factor in choosing the sanitizer

Table 3: Publics acts toward hand sanitizer and disinfectant.													
	Strongly agree		Agree		Uncertain		Disagree		Strongly disagree		Total	Weighted Average	p-value
Are you having difficulty reading the name of your medicine?	40	10.28%	70	17.99%	92	23.65%	78	20.05%	109	28.02%	389	2.62	0.000
Can you read the expiration date printed on the medication?	34	8.72%	53	13.59%	94	24.10%	74	18.97%	135	34.62%	390	2.43	0.000
Do you feel that your knowledge of sanitizer or disinfectant for you is good enough?	71	18.30%	90	23.20%	144	37.11%	50	12.89%	33	8.51%	388	3.30	0.000
Have you ever tackled a sanitizer or disinfectant you do not have any prior information about?	40	10.31%	81	20.88%	148	38.14%	66	17.01%	53	13.66%	388	2.97	0.000
Is it possible to describe another sanitizer or disinfectant to a person suffering from the same illness?	45	11.69%	46	11.95%	111	28.83%	74	19.22%	109	28.31%	385	2.59	0.000
Do you believe that the sanitizer or disinfectant information given by healthcare professionals enough?	43	11.23%	73	19.06%	110	28.72%	69	18.02%	88	22.98%	383	2.78	0.000
Did the poor knowledge of hand sanitizer and disinfectant cause you to visit medical clinic?	28	7.27%	41	10.65%	53	13.77%	43	11.17%	220	57.14%	385	2.00	0.000
Did the poor knowledge of hand sanitizer or disinfectant cause you to visit hospital or community pharmacy?	24	6.25%	33	8.59%	66	17.19%	44	11.46%	217	56.51%	384	1.97	0.000
Did the poor knowledge of hand sanitizer or disinfectant cause you to visit emergency section?	26	6.74%	31	8.03%	54	13.99%	37	9.59%	238	61.66%	386	1.89	0.000
Did the poor knowledge of hand sanitizer or disinfectant cause you to hospital admission?	25	6.46%	34	8.79%	57	14.73%	28	7.24%	243	62.79%	387	1.89	0.000
Did the poor knowledge of hand sanitizer or disinfectant cause you to critical care admissions?	20	5.18%	46	11.92%	46	11.92%	26	6.74%	248	64.25%	386	1.87	0.000
Do you mix some of disinfectant with other disinfectant to potentiate the effect?	40	10.44%	50	13.05%	92	24.02%	55	14.36%	146	38.12%	383	2.43	0.000
To what extent do you accept the sanitizer or disinfectant information provided by health practitioners?	149	38.50%	87	22.48%	87	22.48%	32	8.27%	32	8.27%	387	3.75	0.000
Will you check with your pharmacist before taking hand sanitizer or disinfectant that you have never used before?	39	10.18%	52	13.58%	93	24.28%	63	16.45%	136	35.51%	383	2.46	0.000
Dedicate a specific place in the house to store hand sanitizer or disinfectant	176	45.36%	79	20.36%	76	19.59%	34	8.76%	23	5.93%	388	3.90	0.000
Dispose of expired hand sanitizer or disinfectant in regular garbage locations	126	32.81%	94	24.48%	80	20.83%	40	10.42%	44	11.46%	384	3.57	0.000
I regularly check for expired hand sanitizer or disinfectant to dispose of them	87	22.60%	78	20.26%	108	28.05%	58	15.06%	54	14.03%	385	3.22	0.000
I take educational course about sanitizer and disinfectant	29	7.51%	45	11.66%	84	21.76%	62	16.06%	166	43.01%	386	2.25	0.000
I used sanitizer or disinfectant when I become sick only	40	10.47%	58	15.18%	80	20.94%	63	16.49%	141	36.91%	382	2.46	0.000
Answered												392	
Skipped												10	

Table 4: Perception of patients towards the use of hand sanitizer and disinfectants Saudi Arabia.

	Strongly agree		Agree		Uncertain		Disagree		Strongly disagree		Total	Weighted Average	p-value
	%	n	%	n	%	n	%	n	%	n			
There is a difference between healthcare professionals about sanitizer and disinfectant information provided to patients	15.58%	60	26.23%	101	39.48%	152	13.51%	52	5.19%	20	385	3.34	0.000
Some pharmacists prescribe expensive medicines and some prescribe cheap	14.51%	56	27.20%	105	41.45%	160	10.62%	41	6.22%	24	386	3.33	0.000
The pharmacists provide very useful information about sanitizer and disinfectant	17.31%	67	31.27%	121	37.21%	144	10.08%	39	4.13%	16	387	3.48	0.000
I benefit more from the information the pharmacist provides about sanitizer and disinfectant than physicians	14.77%	57	27.72%	107	41.45%	160	11.40%	44	4.66%	18	386	3.37	0.000
Often there is coordination between physicians and the pharmacies neighboring them in sanitizer and disinfectant	9.33%	36	31.87%	123	39.64%	153	14.77%	57	4.40%	17	386	3.27	0.000
I think there is no great benefit from sanitizer and disinfectant	5.70%	22	11.14%	43	26.17%	101	31.61%	122	25.39%	98	386	2.40	0.000
Herbal medicines used as sanitizers and disinfectant are much better than regular sanitizer and disinfectant	5.45%	21	13.25%	51	30.91%	119	30.39%	117	20.00%	77	385	2.54	0.000
Medicines for oral and dental treatment not covered by medical insurance	13.58%	52	21.67%	83	51.44%	197	8.62%	33	4.70%	18	383	3.31	0.000
Sanitizer and disinfectant do not conflict with other medicines, such as heart disease or diabetes	7.01%	27	16.10%	62	51.69%	199	16.88%	65	8.31%	32	385	2.97	0.000
There are no side effects for sanitizer and disinfectant	7.29%	28	14.84%	57	32.29%	124	31.77%	122	13.80%	53	384	2.70	0.000
The over usage of sanitizer and disinfectant cause us a lot of accidents	9.07%	35	30.83%	119	29.02%	112	22.28%	86	8.81%	34	386	3.09	0.000
here is a big difference between sanitizer and disinfectant in efficacy and safety	24.74%	95	36.98%	142	29.43%	113	5.99%	23	2.86%	11	384	3.75	0.000
The prices of sanitizer and disinfectant is the best factor to get them	9.79%	38	24.74%	96	30.67%	119	28.09%	109	6.70%	26	388	3.03	0.000
The efficacy and safety of sanitizer and disinfectant is the best factor to get them	37.56%	145	35.75%	138	19.17%	74	4.92%	19	2.59%	10	386	4.01	0.000
You can find The sanitizer and disinfectant at most places at my house	21.45%	83	31.27%	121	27.39%	106	16.54%	64	3.36%	13	387	3.51	0.000
I prefer to use the sanitizer and disinfectant more than water and soap	11.14%	43	18.13%	70	29.02%	112	29.79%	115	11.92%	46	386	2.87	0.000
Answered											389		
Skipped											13		

Table 5: Multiple regression of Factors with Publics acts toward hand sanitizer and disinfectant during COVID-19.^a

Model	R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
					B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	.247 ^b	.061	3.218	.003 ^b	2.952	0.307		9.609	0.000	2.348	3.557		
Locations					0.022	0.025	0.048	0.888	0.375	-0.027	0.071	0.908	1.102
Sector of work					0.003	0.044	0.004	0.061	0.951	-0.085	0.090	0.823	1.216
Age (years)					0.125	0.043	0.159	2.912	0.004	0.041	0.209	0.907	1.103
Nationality					0.080	0.133	0.032	0.602	0.547	-0.181	0.341	0.969	1.032
Gender					0.197	0.086	0.129	2.297	0.022	0.028	0.365	0.852	1.173
Educational level					-0.045	0.042	-0.060	-1.053	0.293	-0.128	0.039	0.822	1.216
Are you from a health care professional					-0.146	0.083	-0.097	-1.757	0.080	-0.310	0.017	0.893	1.120

a. Dependent Variable: **the Publics acts toward hand sanitizer and disinfectant during covid-19^a**, Predictors: (Constant), Location, Site of work, Age, Nationality, Gender, Educational level, Are you from the health care professional (Medical Doctor- Dentist- Pharmacist- Nurse- Others),

Bootstrap for Coefficients

Model	B	Bootstrap ^a					
		Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval		
					Lower	Upper	
1 (Constant)	2.952	0.006	0.280	0.001	2.386	3.504	
Locations	0.022	0.001	0.024	0.365	-0.022	0.070	
Sector of work	0.003	0.002	0.051	0.961	-0.098	0.108	
Age (years)	0.125	0.000	0.045	0.004	0.038	0.215	
Nationality	0.080	0.002	0.127	0.527	-0.187	0.309	
Gender	0.197	-0.006	0.084	0.017	0.029	0.364	
Practice area	-0.045	-0.002	0.037	0.220	-0.122	0.022	
Are you from a health care professional	-0.146	0.001	0.086	0.091	-0.310	0.019	

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

and disinfectant” received the highest responses. That shows that the perception is good, but misunderstanding usage in the practice because the patients could not differentiate among sanitizer and disinfectant types. The national and international registration agencies should emphasize the public perception during sanitizer and disinfectant registration with public education and awareness sessions. According to our results, the responders thought there was a big difference in safety and efficacy between generic sanitizer and disinfectant brands. Moreover, the misuse of sanitizer and disinfectants in terms of indication, use, and frequency of usage might cause negative perceptions. The responders might have these problems in practice, emphasizing awareness of the sanitizer and disinfectant. Most disinfectants are not required to be officially registered by the registration body or through the Ministry of Trade. The responders agreed that the sanitizer and disinfectant should be stored in appropriate places in the house to prevent any child accidents. The majority of responders believed that the sanitizer or disinfectant is effective in disease prevention and transmission, which led them to use the disinfectants properly. The responders agreed that chemical-based sanitizers and disinfectants were better than those made of herbal origin, which leads to appropriate usage prevents misuse of herbal medications. The responders disagreed that there are no side effects to the use of

sanitizers and disinfectants, which is expected because the responders deal with sanitizers and disinfectants as regular medications with a positive attitude and perception.

Various factors affected the attitude and perception of using sanitizer and disinfectant during COVID-19. However, only two factors (i.e., nationality and occupational status) did not affect the attitude and perception toward sanitizer and disinfectant. The location also affected the attitude toward sanitizer and disinfectant. For example, the responders from the western region had a positive attitude toward sanitizer and disinfectant use, which might be related to the increased awareness compared to other regions. Males showed a positive attitude toward sanitizer and disinfectant use than females. Young age and low academic qualifications showed a lower attitude toward sanitizer and disinfectant use due to insufficient knowledge of their importance during the COVID-19 pandemic. In addition, the healthcare providers showed a positive attitude toward sanitizer and disinfectant use than that of non-healthcare professionals, which is expected because of their knowledge and practice. The age and gender factors had dependent on the positive increase of perception toward the sanitizer and disinfectant. If those factors existed, the perceptions increased by 12–15%. Thus, no factors affect public perception of using sanitizers and disinfectants,

Table 6: Multiple regression of Factors with Perception of public towards the use of hand sanitizer and disinfectants during COVID-19.^a

Model	R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
					B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	.153 ^b	.023	1.177	.315 ^b	2.731	0.222		12.325	0.000	2.295	3.167		
Locations					0.025	0.018	0.077	1.385	0.167	-0.010	0.060	0.911	1.098
Sector of work					0.003	0.032	0.005	0.079	0.937	-0.061	0.066	0.821	1.218
Age (years)					0.068	0.031	0.124	2.216	0.027	0.008	0.129	0.905	1.105
Nationality					-0.098	0.097	-0.055	-1.014	0.311	-0.289	0.092	0.968	1.033
Gender					-0.016	0.062	-0.015	-0.253	0.801	-0.137	0.106	0.854	1.171
Educational level					-0.010	0.031	-0.020	-0.341	0.734	-0.070	0.050	0.824	1.214
Are you from a health care professional					-0.001	0.060	-0.001	-0.021	0.983	-0.119	0.117	0.894	1.119

a. Dependent Variable: **the perception of public towards the use of hand sanitizer and disinfectants during COVID-19^a**, Predictors: (Constant), Location, Site of work, Age, Nationality, Gender, Educational level, Are you from the health care professional (Medical Doctor- Dentist- Pharmacist- Nurse- Others),

Bootstrap for Coefficients

Model	B	Bootstrap ^a					
		Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval		
					Lower	Upper	
1 (Constant)	2.731	-0.010	0.215	0.001	2.298	3.136	
Locations	0.025	0.001	0.018	0.159	-0.008	0.061	
Sector of work	0.003	0.001	0.045	0.963	-0.087	0.091	
Age (years)	0.068	0.001	0.040	0.091	-0.013	0.150	
Nationality	-0.098	0.001	0.090	0.279	-0.280	0.075	
Gender	-0.016	-9.236E-05	0.064	0.820	-0.141	0.105	
Practice area	-0.010	0.000	0.029	0.715	-0.070	0.046	
Are you from a health care professional	-0.001	0.002	0.057	0.976	-0.119	0.112	

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

including positive or negative attitudes. However, a single factor (age) was a dependent factor toward a positive direction. If the age increases, the positive perception will increase by 12% because of maturity and more knowledge than young age.

Limitation

The results of this study provided a lot of information about the public's perception of sanitizer and disinfectants. Expert reviewers validated the results with a high-reliability survey. In addition, the study had an appropriate sample size. However, there were limitations such as different ages, educational levels, occupational status, and an unequal number of membership of healthcare professionals. Moreover, there were only a few studies about public knowledge of sanitizer and disinfectants for comparing results. Therefore, further studies with comparable demographic data are suggested to overcome the limitations mentioned above.

CONCLUSION

In conclusion, the level of perception of the public about sanitizer and disinfectants was insufficient in the Kingdom of Saudi Arabia. The public obtained appropriate scientific information about sanitizers and

disinfectants from healthcare professionals. They agreed with the proper storage of sanitizer and disinfectant. On the contrary, the perception of the benefits of sanitizer and disinfectant and contraindications related to their use was insufficient. The majority of the factors did not affect the perception of the public about sanitizers and disinfectants. However, age plays an essential role in a positive change of perception. Therefore, a comprehensive campaign of education and training to the public about sanitizer and disinfectants is highly recommended³¹ to improve the perception, knowledge, and utilization of sanitizers and disinfectants.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Consent for Publications

Informed consent was obtained from all the participants

Ethical Approval


This research is exempted from research and ethical committee or an institutional review board (IRB) approval.

<https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html>

ABBREVIATIONS

COVID-19: Coronavirus; **MOH:** Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **SPSS:** Statistical package of social sciences; **JASP:** Jeffery's Amazing Statistics Program; **STROBE:** Strengthening the reporting of observational studies epidemiology.

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