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Knowledge and Practices of Disinfectants and Sanitizers Use during COVID-19 Pandemic in Jordan

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ABSTRACT

Background: The use of antimicrobials has been expanded during the COVID-19 pandemic. This study aims to assess the knowledge and practices of disinfectants and sanitizers use among Jordanian people during the (COVID-19) pandemic.

Methods*:* A web-based cross-sectional descriptive questionnaire was distributed across Jordan between August and September 2020. The questionnaire consisted of three sections inquiring about demographics and general characteristics of the surveyed sample, evaluating the respondents' knowledge about disinfectants, as well as respondents' practices. The questionnaire was completed by 403 literate adult respondents.

Results: Our results indicate that Jordanian adults have used disinfectants increasingly during the COVID-19 outbreak. Knowledge of our study sample was considerably affected by gender ($p=0.044$), income ($p=0.001$), and profession ($p<0.001$). 80.8% of those participants reported skin-related side effects due to disinfectant use during the pandemic. The most used disinfectants were ethanol, followed by soap and water. Generally, study respondents showed positive practices toward the use of disinfectants during the time of the pandemic with few high-risk practices reported. Interestingly, the positive practices applied by Jordanian adults were minimally and not significantly affected by the knowledge about antimicrobials' safe and effective use.

Conclusions: There is an urgent need for a structured effort to increase public awareness regarding the safe and effective use of disinfectants against SARS-CoV-2 transmission.

Keywords: COVID-19, disinfectants, side effects, practices, knowledge.

What is already known about this topic?

To our knowledge, this is the first report in the literature addressing the impact of COVID-19 pandemic on disinfectants and sanitizers (antimicrobials) use among people in a developing country in the Middle East.

What does this article add?

This study was designed to address the knowledge, attitudes, and opinions on disinfectants and sanitizers (antimicrobials) use in developing countries, with Jordan as an example. Our analysis show that structured efforts are urgently needed to increase public awareness regarding the safe and effective use of antimicrobials against SARS-CoV-2 transmission.

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BACKGROUND

Coronaviruses are members of the family Coronaviridae [1, 2]. The novel coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [3]. These viruses are zoonotic pathogens with high mutation rates that are present in humans and various animals [1]. Covid-19 disease could be presented in a wide range of clinical features ranging from an asymptomatic course the to requirement of hospitalization in the intensive care unit causing infections in respiratory, gastrointestinal, hepatic and neurologic systems [4, 5, 6].

SARS-CoV-2 can be transmitted through the air, feces, and soiled surfaces. Furthermore, it can arise on surfaces that are frequently touched [7]. It has been found that human coronaviruses can remain infectious on inanimate surfaces for up to 9 days [8]. Hence, the utmost priority in containing the disease is to prevent the further spread of the virus in public and healthcare settings [8-7.] There are several methods that are currently used to reduce the transmission of the virus, such as the use of masks, social distancing as well as the use of disinfecting and sanitizing agents [7].

Coronaviruses are positive-stranded RNA viruses with an envelope containing glycoprotein spikes, with the largest genomes among RNA viruses [9-10]. Disinfectants and biocides effective against coronaviruses may inactivate the enveloped virus because of their affinity for the lipid-containing viral envelope, the capsid, and the genome [11]. Thereby, the use of antimicrobials and biocides may reduce human- to human- transmission of the virus [12, 13, 14]. There are various types of biocidal agents such as hydrogen peroxide, alcohols, sodium hypochlorite, or benzalkonium chloride that are used worldwide for disinfection, mainly in healthcare settings [8].

According to the United States Environmental Protection Agency (EPA), disinfectants are substances, or mixtures of these substances, used to destroy or suppress the growth of harmful microorganisms, such as bacteria, viruses, or fungi on inanimate objects and surfaces. Several factors should be considered for disinfectants to be effective. For instance, the antimicrobial adequate concentration, and exposure time with the surface, as well as being extremely cautious regarding safety issues [8]. Safety should be a matter of high consideration when dealing with disinfectants in order to prevent hazardous events resulting from the misuse of these chemicals, which can be achieved by the selection of the appropriate disinfectants for its specific surface, minimizing their contact with any body parts, and properly following the manufacturer's instructions. Lack of awareness of using antimicrobials results in side effects. For example, inadequate use in poor ventilation may result in fire, explosion, gas poisoning, or equipment erosion [3]. Moreover, inadequate use of antimicrobials may cause or aggravate asthma in health care settings because of their sensitizing or irritant properties [15, 16, 17]. In addition, dermatitis and other adverse skin effects have been reported among hospital cleaning workers [18].

The aim of this study is to investigate the knowledge and practices of disinfectants and sanitizers use among Jordanian people during the COVID-19 pandemic. To the best of our knowledge, this is the first report from a Middle Eastern country that discusses and investigates deeper factors affecting the knowledge and practices of the Jordanian people when dealing with disinfectants and sanitizers, especially during the COVID-19 pandemic.

METHODS

Instrument and Data Collection

Responses for this study were collected using a web-based cross-sectional questionnaire. A three-section questionnaire was developed by the authors based on the careful and precise observation of the community and a review of recent available literature [19- 31]. The first section of the questionnaire is composed of items related to demographics and general characteristics of the surveyed sample, including gender, age, marital status, governorate of residence, education, monthly income, and profession.

The second section was used to evaluate the respondents' knowledge of disinfectants, including surface disinfectants and sanitizers. In the third section, respondents' practices were investigated.

The knowledge section (section two) consisted of eleven items on a 3-point Likert scale ranging from 1 (disagree) to 3 (agree) and was scored accordingly. The total score of participants' knowledge about disinfectants ranged from 11-33; based on this, participants were divided into poor to moderate knowledge participants (score range 11-28) and high knowledge participants (score range 29-33).

The questionnaire was administered in modern standard Arabic (the official national language in Jordan) utilizing Google form ™ to design the survey which was disseminated to the Jordanian people using emails, personal contact restricted only to relatives and family members, and various social media platforms (e.g., Facebook® Groups, Facebook® Messenger, and WhatsApp) to allow ease of access and reach during the lockdown to the various layers of the Jordanian community.

The questionnaire was supplemented with a protocol, a short introduction, and instructions to participants. Participants who were interested to enroll in this study signed informed consent (electronically) before responding to the questionnaire. The inclusion criteria were age ≥ 18 years, capable of reading and understanding Arabic (literate), and willingness to participate voluntarily. Data collection took place over one month in August and September 2020.

The data collection tool was evaluated, initially, by an expert in the field of pharmaceutical microbiology, based on which the tool was extensively reviewed, this was followed by a pilot testing where 18 responses from randomly selected participants were collected, and the tool was modified accordingly.

Statistical confirmation of validity and reliability was achieved through the calculation of Cronbach' Alpha value which was found to be 0.741 consistency of the tool and Intraclass correlation (ICC) coefficient of 0.732 (95% CI: 0.683-0.760). Sampling adequacy was also confirmed using Principal Components Analysis (PCA) with Kaiser-Meyer-Olkin (KMO) equal to 0.708 and a significant Bartlett's Test ($p<0.000$).

To minimize social desirability bias, assurance was given to participants that the information they provide will be confidential and their identity will stay anonymous. The collected data were encrypted and stored with the corresponding author and further analysis was done anonymously.

Statistical evaluation

Sample size calculation was based on Raosoft™ sample size calculator with a 95% Confidence level, showing a sample size of 385 respondents would be enough. Categorical variables were presented as frequency and percentage and continuous variables as mean and standard deviation, then the Chi-square test was used to test factors that may affect being part of high-knowledge or low-knowledge participants. Further testing of significant factors was done using logistic regression. All hypothesis testing was two-sided. A p-value of < 0.05 was considered significant. Data analysis was performed using SPSS® 23.0 (IBM, Armonk, NY).

RESULTS

A total of 403 Jordanians participated in the present study; 62.5% were females and 37.5% were males. The mean age was 30.1±10.9 years. More than 90% of respondents were residents of the central and northern regions where most COVID-19 virus cases were reported. The majority of the respondents (85.3%) had at least a bachelor's degree. The income of more than half of the respondents was less than 400 JD and 32.3% of the respondents were health sector professionals. Interestingly, 60% of the respondents used governmental sources also 60% of them used social media to get updates about the COVID-19 virus. Only 18.1% of the respondents

stated that they experienced side effects due to disinfectant use during the pandemic, with 80.8% of those participants reporting skin-related side effects (Table 1).

Table 1: Sample Characteristic, N=403

Variable		mean±SD
Age (mean±SD)		30.1±10.9
		N(%)
Gender	Female	252 (62.5)
	Male	151 (37.5)
Marital Status	Single	253 (62.8)
	Married and others	150 (35.2)
Residency	North region	29 (7.2)
	Central region	335 (83.1)
	South region	39 (9.7)
Education	School degree	24 (6)
	Diploma	35 (8.7)
	Bachelor	279 (69.2)
	Postgraduate	65 (16.1)
Income (JD)	<400	217 (53.8)
	400 – 800	108 (26.8)
	>800	78 (19.4)
Employment	Student	149 (37)
	Employed	176 (43.6)
	Unemployed	78 (19.4)
	Unemployed	33 (8.2)
	Housewife	30 (7.4)
	Retired	15 (3.7)
Profession	Non-health Sector	273 (67.7)
	Health Sector	130 (32.3)
	Pharmacist	70 (53.8)
	Physician	17 (13.1)
	Others	43 (33.1)
Where do respondent stay updated with COVID-19 news[@]	Governmental sources	242 (60)
	International sources (e.g WHO, CDC, …)	125 (31)
	Trusted websites and published studies	186 (46.2)
	Social media	242 (60)
	Not interested in updates	33 (8.2)
Respondents who have experienced side effects due to disinfectants use during COVID-19 pandemic		73 (18.1)
Most frequently reported side effects[$] (N=73)	Hands related side effects (skin dryness, itching, redness, wounds, ..)	59 (80.8)

Variable		mean±SD
	Eczema	25 (34.2)
	Asthma	10 (13.7)
	Respiratory tract infection	5 (6.8)
	Others (Nasal congestion, Thyroid gland problems,..)	7 (9.6)
[@]Valid percent (Values don't sum up to 100%)		
[$]Valid percent		

Respondents had a respected level of knowledge about disinfectants and sanitizers use during the COVID-19 pandemic. The mean knowledge score was 27.5±3.2 with scores range 20-33 points and 50% of respondents had scores of 28 or above out of 33. The most alarming outcomes with regard to respondents' knowledge about disinfectants and sanitizers use were that almost one-quarter of respondents believed that these antimicrobials can increase the immunity against SARS-CoV2, 18.1% of respondents thought that disinfectants and sanitizers were able to cure COVID-19 disease and 73% of respondents stated that all types of disinfectants and sanitizers were ineffective against SARS-CoV2. Comparable percentages (36% and 40.6%) of respondents supposed that both the frequent and excessive use of disinfectants and sanitizers will not reduce effectiveness against SARS-CoV2 (Table 2).

Table 2: Respondents' General Knowledge about Antimicrobials, N=403

	Agree	Neutral	Disagree
1. The main purpose of using disinfectant is to prevent the transmission of COVID-19 virus	331 (82.1)	52 (12.9)	20 (5)
2. The main purpose of using disinfectant is to treat COVID-19 virus infection	73 (18.1)	51 (12.7)	279 (69.2)
3. The main purpose of using disinfectant is to increase immunity toward of COVID-19 virus	94 (23.3)	74 (18.4)	235 (58.3)
4. All disinfectants are effective against COVID-19	45 (45)	101 (25.1)	257 (63.8)
5. Some disinfectants are effective against COVID-19	251 (62.3)	105 (26.1)	47 (11.7)
6. All disinfectants are (not) effective against COVID-19*	30 (7.4)	79 (19.6)	294 (73)
7. It is safe to mix all types of disinfectants	14 (3.5)	40 (9.9)	349 (86.6)
8. It is safe to mix some types of disinfectants	63 (15.6)	127 (31.5)	213 (52.9)
9. All types of disinfectants are safe for kids/children	18 (4.5)	61 (15.1)	324 (80.4)
10. Some types of disinfectants are safe for kids/children	243 (60.3)	106 (26.3)	54 (13.4)
11. The frequent use of disinfectants can lead to reduced effectiveness against viruses especially COVID-19 virus[#]	103 (25.6)	155 (38.5)	145 (36)
12. The excessive use of disinfectants can lead to reduced effectiveness against viruses especially COVID-19 virus[#]	85 (6.2)	154 (38.2)	164 (40.7)
13. All disinfectants have similar effectiveness	25 (6.2)	70 (17.4)	308 (76.4)
14. Some disinfectants have similar effectiveness	243 (60.3)	110 (27.3)	50 (12.4)
* This item was used to measure the internal consistency of the scale			
[#]wasn't included in the scale			

The specific knowledge of respondents about antimicrobials' use-related side effects was also analyzed (Figure 1). As expected, respondents assumed that skin-related side effects (92.8%) and respiratory system-related problems (70%) may be consequences of disinfectants and sanitizers use, with little knowledge about other reported side effects.

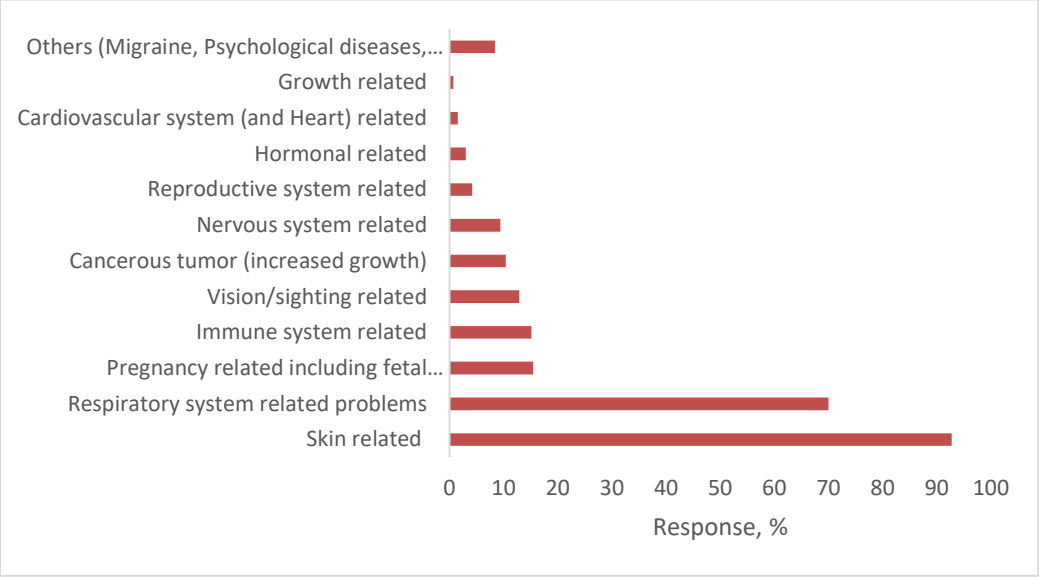

Figure1: Respondents' specific knowledge about disinfectants and sanitizers related side effects

(Table 3) illustrates factors that affect the level of respondents' knowledge about disinfectants and sanitizers use amid the COVID-19 pandemic. Generally, respondents who were female, single, employed, health-care professionals, had a bachelor's degree or more, had relatively low income, are significantly ($p<0.05$) more knowledgeable with regard to the disinfectants and sanitizers use. Further investigation revealed a significant model of the dependent variable (knowledge score) that is considerably affected by gender ($p=0.044$), income ($p=0.001$) and profession ($p<0.001$) (Table 4).

Table 3: Factors that affect Respondents' General Knowledge about Antimicrobials

Variable		Poor to Moderate Knowledge Level, N=280	High Knowledge Level, N=123	*p-value#*
Age		30±11.2	28.8±10.3	0.131
Gender	Female	168 (60)	84 (68.3)	
	Male	112 (40)	39 (31.7)	0.046
Marital Status	Single	167 (59.6)	86 (69.9)	
	Married and others	113 (40.4)	37 (30.1)	0.031
Residency	North region	18 (6.4)	11 (8.9)	
	Central region	229 (81.8)	106 (86.2)	
	South region	33 (11.8)	6 (4.9)	0.076
Education	School degree	19 (6.8)	5 (4.1)	

Variable		Poor to Moderate Knowledge Level, N=280	High Knowledge Level, N=123	*p-value#*
	Diploma	29 (10.4)	6 (4.9)	
	Bachelor	198 (70.70	81 (65.9)	
	Postgraduate	34 (12.1)	31 (25.2)	0.016
Income (JD)	<400	158 (56.4)	59 (48)	
	400 – 800	80 (28.6)	28 (22.8)	
	>800	42 (15)	36 (29.3)	0.004
Employment	Student	96 (34.3)	53 (43.1)	
	Employed	120 (42.9)	56 (45.5)	
	Unemployed	64 (22.9)	14 (14)	0.021
Profession	Non-health Sector	213 (76.1)	61 (49.6)	
	Health Sector	67 (23.9)	62 (50.4)	0.000
# Chi-square test				

Table 4: Logistic Regression Analysis of Factors that Affect Respondents' Knowledge about Antimicrobials - (74.4% Prediction)

Parameter		*p-value*
Model	55.663	0.000
	ExpoB	
Gender (Female/Male)	1.667	0.044
Marital Status	0.604	0.088
Education	1.397	0.100
Income (JD)	1.769	0.001
Employment Status	1.372	0.095
Profession	2.825	0.000

As shown in Figure 2, the vast majority of respondents (94.5%) used ethanol as a disinfectant, followed by soup and water as used by more than 75% of the respondents. However, considerable percentages of the respondents used chloroxylenol, sodium hypochlorite, and acetic acid. Study respondents showed positive practices toward the use of disinfectants and sanitizers during the time of the pandemic (Table 5). In one hand, more than 90% of respondents stated that (1) their consumption of antimicrobials increased during the pandemic, (2) they did encourage others to use antimicrobials, (3) they did ventilate closed places after using antimicrobials, (4) they stored antimicrobial away from children reach and (5) they didn't mix antimicrobials. The good practices continue as more than 80% of the respondents confirmed that they didn't dilute antimicrobials with hot water. On the other hand, only 40.7% of respondents washed vegetables and fruits with antimicrobials and 83.5% of them used vinegar to do so. In the same context, around two-thirds of the respondents read the instructions including storage provided on the package of the antimicrobials. One important outcome of the study is the fact that these positive practices were minimally and not significantly affected by the knowledge about disinfectants and sanitizers.

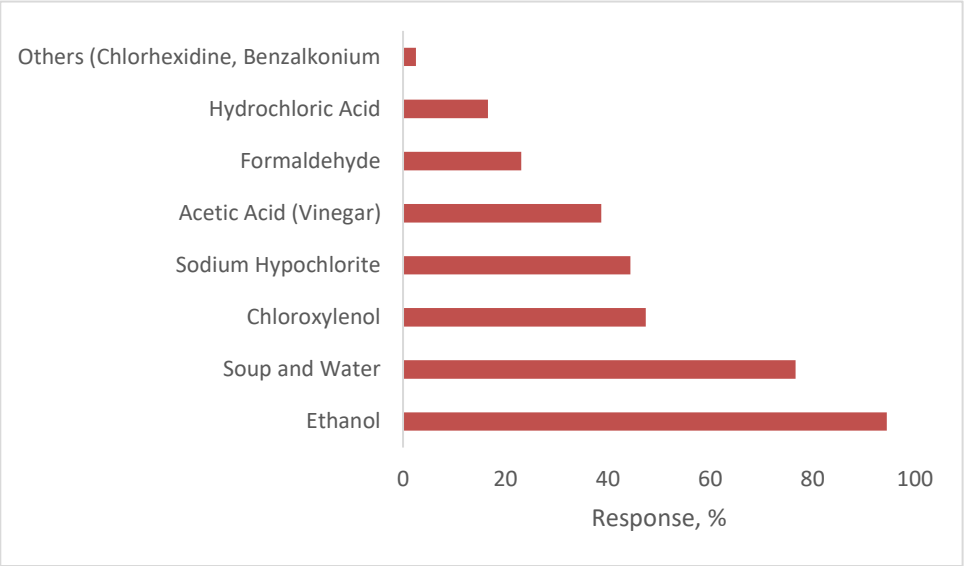

Figure 2: Respondents' most frequently used type of Antimicrobials

Table 5: General Practices of Respondents toward the Safe use of Antimicrobials, N=403

Practice	N (%)	*p-value**
1. Do you encourage others to use disinfectants	377 (93.5)	0.555
2. Do you mix disinfectants	26 (6.5)	0.304
3. Do you dilute disinfectants with hot water	79 (19.6)	0.279
4. Do you ventilate closed places (house, office) after using chemical disinfectants	364 (90.3)	0.792
5. Do you read use instructions (and guide) written on the disinfectant package sticker	278 (69)	0.761
6. Do you read storage instructions (and guide) written on the disinfectant package sticker	262 (65)	0.345
7. Did your consumptions of disinfectant increased because of COVID-19 pandemic	371 (92.1)	0.093
8. Do you use gloves or eye goggles when dealing with/using disinfectants	104 (25.8)	0.298
9. Do you add any type of disinfectants to your water supply to prevent or treat COVID-19	24 (6)	0.005
10. Do you place Disinfectants and leave them to do their action for an enough period of time	280 (69.5)	0.434
11. Do you wash Vegetables or Fruits with any type of Disinfectants	164 (40.7)	0.148
Vinegar	137 (83.5)	0.296
Soup	32 (19.5)	
Others (Ethanol, Hypochlorite, Diluted Chloroxylenol, Special pills)	21 (12.8)	
12. Do you use or have used any Drugs to treat any side effects resulting from the use of Disinfectants	73 (18.1)	0.039
13. Do you use Moisturizers or Creams after using Disinfectants	250 (62)	0.709
14. Do you keep Disinfectants far from the Children upon Storage	376 (93.3)	0.430
*chi-square test of the effect of knowledge on respondents' practices		

More in-depth search uncovered that only 57.8% and 30.5% of the respondents used hand sanitizers when eating and using the mobile phone, respectively. The most preferred type of hand sanitizers was gels and liquids (spreadable forms) and the most frequently reported destination to buy these disinfectants was from large stores (Table 6).

Table 6: Respondents' Specific Practices toward the use of Antimicrobials, N=403

Practice	N	%
When do you/I use disinfectants		
When being in public or using public services	335	83.1
When entering/getting house or workplace/ office	318	78.9
When touching/using door handles	268	66.5
When using any tool or touching any surface	237	58.8
When eating	233	57.8
Before and after wearing gloves	183	45.4
When touching my body or others	176	43.7
When touching/holding/dealing with pets	150	37.2
When using my mobile	123	30.5
Others	27	6.7
Most preferred type(s)/form(s) of disinfectant		
Spreadable Forms (Liquid or Gel)	359	89.1
Sprayable Forms (mists)	229	56.8
Solid Form (like soup bars)	225	55.8
Tissue Form (wipes)	204	50.6
Powder	77	19.1
Others	10	2.5
Where do you buy disinfectants		
Large stores (like hypermarkets)	341	84.6
Small stores (like supermarkets)	173	42.9
Pharmacy	258	64
Others (warehouses, home-made by local producers, …)	17	4.2

DISCUSSION

This analysis show that Jordanian adults have taken major precautions during the outbreak and responded by using increasing amounts of antimicrobials compared to their usual consumption as reported by 92.1% of the respondents. Consistent with the general recommendation for regular disinfection of inanimate surfaces and objects, the majority of respondents in this study reported increased use of disinfectants in their houses and workplaces. However, significant percent of the respondents reported high-risk practices such as using ethanol, hypochlorite, and diluted chloroxylenol to wash fruits and vegetables,

mixing disinfectants, diluting disinfectants with hot water, and applying disinfectants and cleaning products to bare skin. Nonetheless, such poor practices may yield hazardous effects, such as tissue damage and injuries [32-35]. and should be firmly eluded.

While the undesirable health effects that were reported by most respondents could not be attributed to their engaging in high-risk practices, the potential association between these hazardous practices and severe health consequences designate the necessity for structured efforts to increase public awareness regarding the safe and effective use of disinfectants and sanitizers against SARS-CoV-2 transmission.

In addition, crucial knowledge gaps in the use of disinfectants and sanitizers among Jordanian adults during the COVID-19 pandemic were also revealed in this report. The prime gaps were apparent in knowledge about the effectiveness of disinfectants and sanitizers to protect against SARS-CoV-2 transmission. Besides, major gaps were found in the knowledge about potential side effects that may be associated with antimicrobial use.

Despite the identified knowledge gaps among Jordanian adults, most study participants demonstrated positive practices that were minimally and not significantly affected by their knowledge about antimicrobials' safe and effective use. This observation may be attributed to the fact that most respondents reported that they tend to read the instruction labels for antimicrobials and disinfectants before use. Thus, filling the knowledge gaps with awareness messages regarding the safe and effective use of disinfectants and sanitizers should promote proper use, reduce side effects, and result in more effective inhibition of SARS-CoV-2 transmission among the Jordanian population.

The findings reported in this study are subject to several limitations. First, although responses were collected from northern, central, and southern districts to be nationally representative of Jordan's demographics, responses of our sample may not be truthfully representative of knowledge and practices shared by the Jordanian population. Second, cross-sectional studies do not permit a direct correlation of specific outcomes, such as hazardous health consequences, to definite knowledge gaps or practices. Lastly, responses were collected at a particular time point and might not reflect the continuing changes in public knowledge and practices throughout the pandemic. Thus, ongoing efforts to collect data over a longer time span should characterize the differences in the knowledge gaps and practices among the Jordanian public.

CONCLUSION

Jordanian adults reported increased use of antimicrobials amid the COVID-19 pandemic with fair knowledge and positive practices reported by most of the study participants. While the level of knowledge was significantly affected by gender, income, and profession, the positive practices reported by Jordanian adults were minimally affected by their knowledge about antimicrobials' safe and effective use. The ability of Jordanian adults to apply positive practices of antimicrobials' use during the pandemic regardless of their knowledge may indicate the value of sending proper awareness messages to emphasize evidence-based and safe practices concerning the use of antimicrobials for COVID-19 prevention.

Lists of Abbreviations

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

EPA: Environmental Protection Agency

ICC: Intraclass correlation

PCA: Principal Components Analysis

KMO: Kaiser-Meyer-Olkin

Declarations

Ethics approval and consent to participate

All participants provided written informed consent.

Consent for publication

Not applicable.

Availability of data and material

Access to the data can be requested by sending an e-mail to S.bardaweel@ju.edu.jo

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SB conceived and designed the study. QM and HM performed the data collection under SA supervision. SM conducted the data analysis. AA prepared the first draft of the manuscript. SB and SA undertook a critical review of the manuscript. All authors provided comments on subsequent drafts and approved the final version of the manuscript.

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المعرفة والممارسات المتعلقة باستخدام المطهرات والمعقمات أثناء جائحة كوفيد-19 في الأردن

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ملخص

الخلفية: تم التوسع في استخدام مضادات الميكروبات خلال جائحة كوفيد-19. تهدف هذه الدراسة إلى تقييم معرفة وممارسات استخدام المطهرات والمعقمات بين الأردنيين خلال جائحة (كوفيد-19).

الطُرق: تم توزيع استبيان وصفي مقطعي على شبكة الإنترنت في جميع أنحاء الأردن خلال شهري أغسطس وسبتمبر من عام 2020. يتكون الاستبيان من ثلاثة أقسام تستفسر عن التركيبة السكانية والخصائص العامة للعينة التي تم مسحها، وتقييم معرفة المستجيبين حول المطهرات، والمعقمات وكذلك ممارسات المستجيبين. تم إكمال الاستبيان من قبل 403 شخصاً بالغاً متعلماً.

النتائج: تشير نتائجنا إلى أن البالغين الأردنيين استخدموا المطهرات بشكل متزايد أثناء تفشي كوفيد-19. تأثرت المعرفة في عينة الدراسة بشكل كبير بالجنس والدخل والمهنة. أبلغ 80.8٪ من المشاركين في الدراسة عن آثار جانبية مرتبطة بالجلد بسبب استخدام المطهرات أثناء الجائحة. وكانت أكثر المطهرات استخدامًا هي الإيثانول، يليه الصابون والماء. بشكل عام، أظهر المشاركون في الدراسة ممارسات إيجابية تجاه استخدام المطهرات خلال وقت الجائحة مع الإبلاغ عن عدد قليل من الممارسات عالية الخطورة. ومن المثير للاهتمام، أن الممارسات الإيجابية التي طبقها الأردنيون لم تتأثر بشكل كبير بمعرفتهم حول الاستخدام الآمن والفعال لمضادات الميكروبات.

الخاتمة: في الختام ، هناك حاجة ملحة لبذل جهود منظمة لزيادة الوعي العام بشأن الاستخدام الآمن والفعال للمطهرات ضد انتقال فيرويس سارس كوف-2.

الكلمات الدالة: كوفيد-19، المطهرات، الآثار الجانبية، الممارسات، المعرفة.

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