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HAND SANITIZERS USE DURING COVID-19 PANDEMIC: KNOWLEDGE, PREFERENCE, AND ADHERENCE OF A SAMPLE OF THE LEBANESE POPULATION.

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HAND SANITIZERS USE DURING COVID-19 PANDEMIC: KNOWLEDGE, PREFERENCE, AND ADHERENCE OF A SAMPLE OF THE LEBANESE POPULATION.

Abstract

Purpose: Preventive measure has been a gold stone in reducing the spread of Coronavirus disease of 2019. These measures include quarantine, social distancing, face mask use, and most importantly hand hygiene. Consequently, alcohol-based hand sanitizers have been used abundantly. The current study aimed to assess the knowledge, preference, and practice toward hand sanitizers of the Lebanese community, during the pandemic period.

Method: A cross-sectional questionnaire-based study was carried out from mid of May to mid of June 2020. Adult Lebanese residents from the 5 main Lebanese districts were invited to participate in the study. The questionnaire included demographic data, 5 knowledge questions, practice during COVID-19, and preferred characteristics of hand sanitizers. Data was analysed using SPSS-version 20. Results were considered significant at p-value ≤ 0.05 with a confidence interval of 95%.

Results: Out of the 481 participants, 278 were unable to be quarantined, and accordingly 74.5% had to use hand sanitizers regularly. Gel form, fast-drying, and low price were the main factors behind the choice of hand sanitizers by percentages of 51.2%, 40.2%, and 36.2%, respectively. Nevertheless, all types of hand sanitizers have caused skin irritation in 43% of the respondents. The knowledge score revealed an average score of 2.56 ± 1.1 over 5 with a significantly higher means for medical workers and university degrees.

Conclusion: Consequently, educational campaigns should target common people for the proper choice and use of hand sanitizers.

Keywords

COVID-19, Hand sanitizers, Knowledge, Preference, Adherence, Lebanese

1. INTRODUCTION

Coronavirus disease of 2019 (COVID-19) outbreak has been declared by WHO as a global pandemic that outpaced the resources of health systems all over the world (Cucinotta, & Vanelli, 2020). As of 11 December 2020, a cumulative of 69,839,019 positive cases were confirmed worldwide with 1,578,948 deaths (WHO, 2021). Despite all ongoing research efforts to develop vaccines against COVID-19, such therapeutic agents were not available till 11 December 2020 when the Food and Drug Administration issued the first emergency authorization (Yuen, Ye, Fung, Chan, & Jin, 2020; FDA, 2020). Nevertheless, the number of positive cases continued to increase (WHO, 2021). In this context, preventive measures were adopted to prevent the transmission of the infection and reduce the spread of virus during the whole period (Hamid, Mir, & Rohela, 2020).

Over decades, non-pharmaceutical interventions have been recommended to mitigate pandemic outbreaks (CDC, 2007; Smith, 2006; Aiello et al., 2010). Such interventions include home quarantine, social distancing, use of face masks, and most importantly hand hygiene. The latter is considered a core element among the protective measures taken to minimize pandemic community health threats (Lau, Tsui, Lau, & Yang, 2004; Muller, & McGeer, 2006; Rothman et al., 2006). Earlier, hand washing with soap and water has been adopted as the standard hand hygiene method, especially in health care settings. Recently, waterless alcohol-based hand-rubs have been introduced to replace hand washing, unless hands are visibly soiled (Girard, Amazian, & Fabry, 2001). Alcoholic hand-rubs have a broader antimicrobial effect against bacteria and viruses (Fendler, Ali, Hammond, Lyons, Kelley, & Vowell, 2002), and the ease of its use was associated with better compliance when compared to soap and water (Pittet, & Boyce, 2001). Alcohol-based hand sanitizers contain either ethanol, 1- propanol, 2- propanol, or a combination of them. Their antimicrobial efficacy is mainly dependent on protein denaturation. They are most effective at an alcohol concentration ranging from 60 to 95% v/v concentration. At higher alcohol concentrations their anti-microbial efficacy is reduced due to the difficulty in denaturing proteins in the absence of water (Kampf, & Kramer, 2004; Bloomfield, Cookson, O'Boyle, & Larson, 2007). The use of these products depends on the consumers' skin tolerance and their preferences in terms of esthetic and physical characteristics of the hand sanitizer such as fragrance, drying time, and skin condition after application (Larson, Girard, Pessoa-Silva, Boyce, Donaldson, & Pittet, 2006). Hence, the users' knowledge about different hand sanitizers forms and their components' role is crucial in selecting an appropriate product. This selection would be the key factor in enhancing compliance to hand sanitizer's use that would contribute to mitigating the spread of the pandemic. Studies assessing the public understanding, preference, and practice of use of hand sanitizers during pandemic outbreak were not conclusive as studies conducted on health care providers in hospital settings (Traore, Hugonnet, Lübbe, Griffiths, & Pittet, 2007; Dyson, Lawton, Jackson, & Cheater, 2011; Meneguetti et al., 2019). Consequently, the current study aimed to investigate the knowledge, preference, and practice of a Lebanese sample regarding hand sanitizers during COVID-19.

2. METHODOLOGY

A cross-sectional anonymous survey was designed in May 2020 targeting people living in all 5 districts of Lebanon, namely Beirut, North, South, Beqaa, and Mount Lebanon. The sample size was calculated using the online sample size "Raosoft®" calculator assuming the Lebanese population to account for 6.825 million. The results showed that a total of 384 participants and above provides a representative sample with a 5% margin error and a 95% confidence level. Data was collected from mid of May to mid of June.

The study was an observational one where participant's confidentiality and autonomy were respected. The participant had the choice to defer from submitting the filled form and by filling the survey the participants gave their informed consent. This survey also didn't require neither names nor emails and thus there was no traceability of the participants. Accordingly, the study was waived from ethical approval.

Due to lockdown, this study was conducted via a google link shared on WhatsApp. The survey questionnaire was designed in English and then translated to Arabic, the native language in Lebanon. Both surveys were available for the participant to choose between

them. The questionnaire validity was assessed in the first step by four experts who checked for readability, comprehension, and reflection of the study purpose. In a second step, a pilot study was conducted on 20 participants representative of the population studied. They took the survey in either language. Data collected served to check for clarity and comprehension of the questionnaire and was not included in the study. According to the feedback retrieved, the questionnaire was modified. The survey was divided into four sections. The first one consisted of the sociodemographic information of the participant. The second one included 6 multiple-choice knowledge questions concerning hand sanitizers requiring one single answer. Each right answer was given one point and a score of 5 was made. The third part included questions related to the participants' attitude during the COVID-19 pandemic while the last part comprised 6 questions reflecting the attitude of the sample studied on the use of hand sanitizers. Both in the third and fourth part, the participants had the choice to select more than one answer.

The results were analyzed using Statistical Package for the Social Science (SPSS®) software version 20 (IBM, New York-USA). Categorical data were expressed as frequencies (percentages) while continuous data as means \pm standard deviation (SD). Kruskal Wallis test was used to compare means since the Levene test was significant ($p < 0.05$). All results were considered "statistically significant" when the P-value was < 0.05 with a confidence interval (CI) of 95%.

3. RESULTS AND DISCUSSION

Preventive measures during pandemic outbreaks are essential to minimize the transmission of infectious diseases in the community setting. Face masks and hand hygiene are considered as the core elements of these measures as they have provided concrete evidence of their effectiveness in reducing the spread of infections (Aiello et al., 2010, Chiu et al., 2020). In many countries, several strategies have been implemented to mitigate the spread of Covid-19, including social distancing, use of face masks and hand hygiene (Chang, Tan, Chen, Su, & Lin, 2020; Almutairi, BaniMustafa, Alessa, Almutairi, & Almaleh, 2020; Yihang et al., 2020). In the current work, the adherence of the Lebanese population to such measures during COVID-19 pandemic was studied with an emphasis on the use of hand hygiene products and knowledge assessment of the latter.

Four hundred eighty-one participants responded to the survey. Out of which 69.0% were female. Age less than 44 years accounted for 73.6%. More than half of the participants were married (60.1%). The highest percentage of the respondents (57.2%) lived in the Beirut area, the capital of Lebanon. Most of the participants were educated with university degrees (83.6%), and 75.3 % work in a non-medical field (Table 1). The investigation about the medical condition of respondents has revealed that 37.8% of the studied sample had past medical history among which skin allergy or dryness was the highest (11.8%) (Table 2).

Table 1: Sociodemographic characteristics of the participants

Characteristic	Frequency (percentage)
Gender	
Female	332 (69.0)
Male	149 (31.0)
Age	
18-29 years	170 (35.3)
30-44 years	184 (38.3)
45-59 years	81 (16.8)
>60 years	46 (9.6)
Marital status	
Single	167 (34.7)
Married	289 (60.1)
Divorced or Widowed	25 (5.2)
Area of living	
Beirut	275 (57.2)
Mount Lebanon	84 (17.5)
North	61 (12.7)
South	45 (9.4)

	Beqaa	16 (3.3)
Education		
	Uneducated	7 (1.4)
	Elementary	5 (1.0)
	Middle school	19 (4.0)
	High school	44 (9.1)
	University	402 (83.6)
	Master/PhD	4 (0.8)
Employment status		
	Employed	269 (55.9)
	Housewife	82 (17.0)
	Retired	19 (4.0)
	Student	71 (14.8)
	Unemployed	40 (8.3)
Medical field		
	Medical	119 (24.7)
	Non-medical	362 (75.3)
Parent/Guardian of children less than 18 years		
	Yes	229 (47.6)
	No	252 (52.4)
Household income (monthly in L.L)		
	< 750,000	32 (6.7)
	751,000-1,500,000	102 (21.2)
	1,501,000-3,000,000	120 (24.9)
	3,001,000-4,500,000	60 (12.5)
	>4,500,000	113 (23.5)
	No income	54 (11.2)
Smoking status		
	Non-smoker	307 (63.8)
	Smoker	150 (31.2)
	Ex-smoker	24 (5.0)

N=481

Table 2: Past medical history of the participants

Disease History	<i>frequency</i>	<i>percent</i>
allergic rhinitis/chronic sinusitis	44	9.1
anemia	2	0.4
cancer	1	0.2
cholesterol	1	0.2
DM	22	4.6
seasonal allergy	1	0.2
heart disease	24	5.0
hypertension	5	1.0
lung disease	21	4.4
skin allergy or dryness	57	11.8
Other	27	5.6
No comorbidities	299	62.2

Participants may have more than one disease N=481

Several studies have suggested quarantine as one of the essential measures for mitigating the spread of COVID-19 (Anderson, Heesterbeek, Klinkenberg, & Hollingsworth, 2020; Saglietto, D’Ascenzo, Zoccai, & De Ferrari, 2020). Consequently, the commitment of the Lebanese population to quarantine has been investigated. Fifty-eight percent of participants have revealed their inability to adhere to lockdown. Among uncommitted participants, 36 % were going out on a daily basis, and 36% were breaking the quarantine a few days per week, where the purposes for such breach were mainly for buying food (67.3 %) and going to work (49.6%) (Table 3).

Table 3: Percentage and reasons for going out during lockdown period

Characteristics	Frequency (Percentage)
Going out during lockdown ^a	
Yes	278 (57.8)
No	203 (42.2)
Frequency of going out ^b	
On daily basis	100 (36)
Few days a week	100 (36)
Every week	50 (18)
Every 2 to 4 weeks	28 (10.1)
Reasons for going out ^{b, c}	
Buy food	187 (67.3)
Go to work	138 (49.6)
Get fresh air	57 (20.5)
Visit friends and relatives	36 (12.9)

^a n=481^b n=278^c participants had the choice to select more than one reason.

Consequently, participants' adherence to safety measures outside home was studied which revealed that the use of gloves has been an uncommon practice among the Lebanese community (28.8%). Gloving was not considered an essential part of the preventive measures during pandemic outbreaks in many countries due to the association between gloving and poor compliance with hand antisepsis which may facilitate the transmission of infections (Fuller et al., 2011). On the other hand, the use of face masks and hand hygiene products were more common among the Lebanese population (71.2 % and 74.5 %, respectively) (Table 4). In a similar study conducted in Italy, adherence to face mask use and hand hygiene was less pronounced since it represented only 35.7% and 40.8% of the population, respectively (Carlucci, D'Ambrosio, & Balsamo, 2020).

Table 4: Safety measures taken outside home

Characteristics	Frequency (Percentage)
Wear a mask	
Yes	198 (71.2)
No	27 (9.7)
Sometimes	53 (19.1)
Wear gloves	
Yes	80 (28.8)
No	122 (43.9)
Sometimes	76 (27.3)
Use hand sanitizers	
Yes	207 (74.5)
No	24 (8.6)
Sometimes	47 (16.9)

N=278

Regarding the types of hand sanitizers commonly used by the Lebanese community, the gel form was the most likely used (51.2 %) when compared to alcohol (30.7 %), liquid form (17.3 %), or wet wipes (0.8 %). Such finding was consistent with an earlier report from a hospital setting, where health workers have shown a preference to hand gels which was reflected by a trend toward better compliance when compared to liquid sanitizers (Traore, Hugonnet, Lübke, Griffiths, & Pittet, 2007). Owing to its higher consistency, gels are less

likely to drip from hands and may offer to consumers the emollient feeling they desire. On the other hand, few consumers may perceive this negatively as a slippery feeling, and alternatively use liquid hand-rubs (Larson, Girard, Pessoa-Silva, Boyce, Donaldson, & Pittet, 2006). As for its application, half of hand sanitizer’s users apply it more than two times/hour which may contribute to a higher risk of dryness and allergy (Table 5).

Table 5: Practice of the respondents regarding hand sanitizers uses

Characteristics	Frequency (percentage)
Use of hand sanitizers on gloves	
Yes	56 (22.0)
No	163 (64.2)
Sometimes	35 (13.8)
Type of hand sanitizers used	
Alcohol	78 (30.7)
Hand gel	130 (51.2)
Liquid	44 (17.3)
Wet wipes	2 (0.8)
Frequency of hand sanitizer use per hour	
1 to 2 times	129 (50.8)
3 to 4 times	54 (21.3)
5 to 6 times	33 (13.0)
>6 times	38 (15.0)

N=254

Concerning the preferred characteristics of hand sanitizers, 40.2 % prefer the ones that dry fast (Table 6). Such a feature is unfavorable as it may not provide the optimum antimicrobial efficacy; according to the European Norm EN 1500, a standard test method that evaluates the efficacy of a hygienic hand-rub by measuring the number of viable bacteria remaining on the fingertips after contamination and hand-rub exposure, the contact duration of a tested hand sanitizer should be longer than or at least equal to 30 seconds (Rotter, 2004). Nevertheless, the main factor that influenced the participants choice of buying a hand sanitizer was the price (36.2%) (Table 7).

Table 6: Preferred characteristics of the hand sanitizer used

Characteristics	Frequency (Percentage)
Dry fast	102 (40.2)
Fragrance	74 (29.1)
Soft on hand	140 (29.1)
Color	4 (0.8)
No preferences	54 (21.3)

The participants had the choice to select more than one answer

N=254

Table 7: Factors that influence the choice of a hand sanitizer

Characteristics	Frequency (Percentage)
Manufacturing origin	56 (22.0)
Brand name	69 (27.2)
Composition	98 (38.6)
Price	92 (36.2)
No influence	54 (21.3)

The participants had the choice to select more than one answer

N=254

Different types of hand sanitizers have resulted in skin irritation in more than third of users (Figure 1).

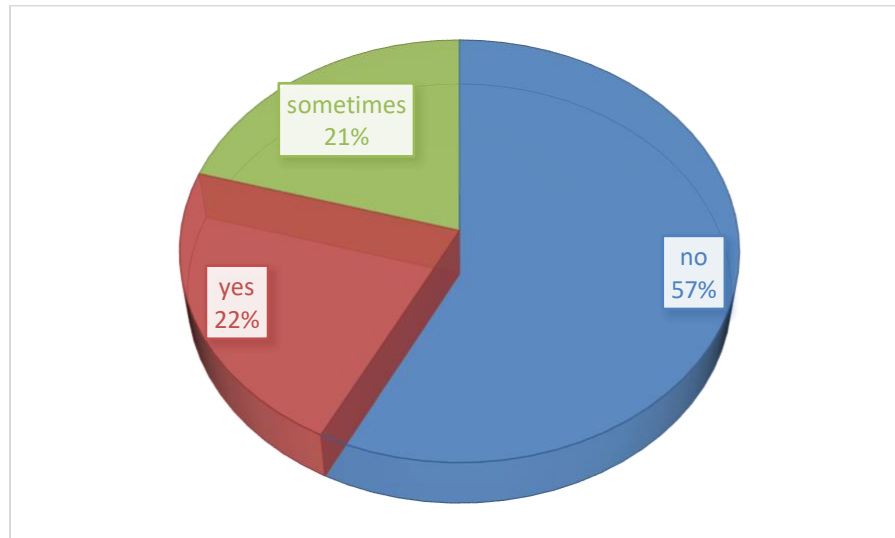


Fig.1: Skin irritation caused by the use of hand sanitizers
N=254

However, it should be noted that multinomial regression analysis has shown no correlation between either the type of hand sanitizer or the frequency of its application and the emergence of skin irritation with a p -value > 0.05 (Table 8). In contrast, previous studies have shown an association between the use of hand gels and a better skin tolerance when compared to liquid formulations (Traore, Hugonnet, Lübke, Griffiths, & Pittet, 2007; Massey, 2002). Moreover, earlier reports have revealed that frequent application of alcohol-based hand sanitizers were associated with more skin irritation that was manifested by skin dryness, burning sensation, scaling, and fissures (Larson, Girard, Pessoa-Silva, Boyce, Donaldson, & Pittet, 2006; Larson, Friedman, Cohran, Treston-Aurand, & Green, 1997). The fact that all forms of hand-sanitizers may have a similar irritating effect regardless of the frequency of application (up to 6 times/hour) as shown by the current results, may be attributed to the high alcohol content and/or the absence of emollients in the Lebanese product. Moreover, another potential attribution to this finding is that skin allergy or dryness is the highest recorded comorbidity among respondents (11.8%) which may have affected the outcome, resulting in a comparable irritating effect among users of various types of hand sanitizers and at different frequency of application.

Table 8: correlation between skin irritation and type of hand sanitizers and frequency

		Skin Irritation	
		No Frequency (%)	yes Frequency (%)
Type of hand sanitizer	alcohol	45 (57.7%)	33 (42.3%)
	hand gel	72 (55.4%)	58 (44.6%)
	liquid	27 (61.4%)	17 (38.6%)
	wet wipes	2 (100%)	0 (0%)
frequency	1 to 2 times	78 (60.5%)	51 (39.5%)
	3 to 4 times	32 (59.3%)	22 (40.7%)
	5 to 6 times	19 (57.6%)	14 (42.4%)
	>6 times	17 (44.7%)	21 (55.3%)

Multi-nominal regression revealed no correlation ($p > 0.05$)

Regarding the level of knowledge of participants about hand sanitizers, the majority of respondents (74.2 %) knew that a concentration between 60 and 80% alcohol was satisfactory for an effective hand sanitization; high concentrations of alcohol are less likely to kill microorganisms as the absence of water would prevent proteins denaturation (Bloomfield, Aiello, Cookson, O'Boyle, & Larson, 2007). The awareness of the Lebanese population about the appropriate alcohol concentration would be attributed to the role of the local media that has contributed to the educational campaigns. Many participants (57.2 %) knew that glycerol is a humectant that serves to maintain the hydrated state of the skin. Such a positive effect may improve consumer's acceptability which has been demonstrated in previous studies (Kampf, Wigger-Alberti, Schoder, & Wilhelm, 2005; Houben, De Paepe, & Rogiers, 2006).

The 5-questions knowledge score on hand sanitizer properties showed a mean score of 2.56 ± 1.10 ($SD=1.67$) with a minimum of one and a maximum of five. The knowledge score of participants with different demographic data did not vary significantly, except for the educational level and the field of education. Unsurprisingly, participants with a university degree and belonging to the medical field have recorded a significantly higher score ($p= 0.002$ and 0.0001 , respectively) when compared to those with a high school degree and belonging to non-medical field, respectively (Table 9). Such findings would suggest that the national educational campaigns about hand sanitizers have not covered all aspects of information about the latter and respondents with the highest scores relied on the information that has been acquired from university and their medical background.

Table 9: Correlation between knowledge scores and demographic characteristics

Characteristic	SCORE mean \pm SD	P value
Gender		
Female	2.56 \pm 1.06	0.876
Male	2.58 \pm 1.18	
Age		
18-29 years	2.45 \pm 1.09	
30-44 years	2.65 \pm 1.01	0.295
45-59 years	2.67 \pm 1.19	0.448
>60 years	2.48 \pm 1.26	0.998
Marital status		
Single	2.46 \pm 1.03	
Married	2.61 \pm 1.14	0.365
Divorced or Widowed	2.80 \pm 0.91	0.320
Area of living		
Beirut	2.60 \pm 1.10	
Mount Lebanon	2.43 \pm 1.18	0.701
North	2.38 \pm 1.13	0.586
South	2.89 \pm 0.88	0.484
Beqaa	2.44 \pm 0.81	0.976
Education		
Less than middle school	2.2 \pm 0.45	0.995
Middle school	2.26 \pm 1.10	0.904
High school	2.00 \pm 1.08	
University	2.64 \pm 1.08	0.002
Master/PhD	3.00 \pm 2.45	0.400
Employment status		
Employed	2.67 \pm 1.09	
Housewife	2.56 \pm 1.07	0.926
Retired	2.00 \pm 1.10	0.072
Student	2.35 \pm 1.07	0.179
Unemployed	2.50 \pm 1.18	0.883
Medical field		
Medical	3.09 \pm 0.96	0.000
Non-medical	2.39 \pm 1.08	
Parent/Guardian of children less than 18 years		
Yes	2.65 \pm 1.06	0.105

No	2.49±1.12	
Household income (monthly in L.L)		
< 750,000	2.44±0.91	
751,000-1,500,000	2.55±1.08	0.998
1,501,000-3,000,000	2.56±1.15	0.994
3,001,000-4,500,000	2.53±0.91	0.999
>4,500,000	2.73±1.11	0.779
No income	2.39±1.26	1.000
Smoking status		
Non-smoker	2.64±1.11	
Smoker	2.45±1.02	0.208
Ex-smoker	2.33±1.24	0.388

Kruskall-Wallis test done

4. CONCLUSION

In a nutshell, awareness campaigns should be conducted to educate Lebanese consumers on the appropriate selection of hand sanitizer. The campaign should emphasize not only on the adequate alcohol content but also on the characteristics that provide sufficient skin contact duration and the suitable added emollient. These factors are essential to attain an optimum efficacy with high dermal tolerance that improves consumers' compliance. In this context, community pharmacists may play a vital educational role, owing to the ease of communication with community patients, as they are more available and reachable than any other health care provider.

5. LIMITATIONS

Due to lockdown, the questionnaire was filled through google survey form and circulated through WhatsApp. Accordingly, the sample studied selection may be affected.

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