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Assessment of Knowledge and Lifestyle Pattern during COVID-19 Pandemic in Al-Qunfudhah's Locality: In Saudi Arabia

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Abstract

BACKGROUND: The COVID-19 pandemic continues to pose significant challenges to nations. The Saudi Arabia government aimed to mitigate the spread of COVID-19 through different health strategies and policies that influence the population's health and lifestyle.

AIM: This study aimed to assess the knowledge and awareness of the adult Saudi Arabian people and residents on the coronavirus pandemic and examine their association with dietary habits.

METHODS: A cross-sectional study was conducted in Al-Qunfudhah's locality – Kingdom of Saudi Arabia from September 13 to October 15. Data collection was implemented using a questionnaire divided, into four sections: The first section was directed at the sociodemographic characteristics of the participants; the second was dedicated to assessing the individual's knowledge about COVID-19; the third section for assessing the lifestyle pattern of COVID-19; the fourth assessed the dietary intake using food frequency questionnaires.

RESULTS: A total of 400 respondents; Saudis (78%) and residential population (22%) were included in this study. Knowledge about COVID-19 was high (94%) among the participants, primarily obtained from the traditional media platforms and social media. The majority (91%) of the respondents have complied with regular usage of precautionary tools, in addition, physical activity and exposure to sunlight were practiced regularly during the lockdown, by (43%), (49.8%.), respectively. Approximately half of the participants (56.5 %) experienced a change in food habits during the period of confinement. The results revealed a correlation between nutritional awareness and food consumption style for fruits, dietary fibers, traditional drinks, fish, and nuts.

CONCLUSION: The respondents have adopted healthier dietary behaviors during the COVID-19 confinement through a closer approach toward the Med Diet. The knowledge of eating habits and the practice of physical activity should guide the authorities and educational agencies to propose strategies that could encourage a balanced and healthy diet (MD) and physical activity practice.

Introduction

The emergent coronavirus disease, COVID-19, has presented a critical threat to worldwide health since its outbreak in early December 2019 [1]. The global lockdown and measures carried out that aimed to decrease transmission of the disease within the population could alter the behavioral patterns of individuals, including changes in the dietary pattern around the world, which may be detrimental to the health and other environmental attributes impacts on the immune system [2]. Obviously, exposure to sunlight and physical activity habits may be decreased because of COVID-19 confinement. In addition, some studies have linked the period of confinement with an increase in unfavorable psychological states, such as stress and anxiety [3]. In addition, inappropriate sedentary lifestyle and changes in dietary patterns toward consuming unhealthy food and beverages might increase the risk of developing diseases such as obesity, diabetes, and cardiovascular disease [4]. These diseases may contribute as risk factors or predictors to mortality associated with COVID-19 [5]. Furthermore, dietary habits, food consumption patterns, and physical activity may be affected by knowledge [6]. The population needs to use information and communication technologies (ICTs). Regarding the adoption of a healthier diet during the COVID-19 pandemic.

Establishing healthy dietary habits are crucial to support the immune system during COVID-19. In this regard, the European Federation of the Association of Dieticians (EFAD) published COVID-19 information for nutritional support [7]. The World Health Organization (WHO) also offered several foods during self-quarantine [8]. Specifically, the Mediterranean diet (MD) as a healthy nutritional pattern has been recommended [2]. However, so far, fewer data regarding the actual dietary habits of the population during COVID-19 are available [9]. Reported that the dietary patterns, consumption, and physical activity of

the Spanish population before and during the period of confinement showed good adherence to the MD increment (8.0% vs. 4.7%; $p < 0.001$). Moreover, the number of subjects that practice physical activity and the time spent on it weekly decreases. The study carried out by [10] identified that the higher duration of sun exposure was associated with more recovery cases from COVID-19 among patients. Sun exposure triggers Vitamin D production, which functions as an immune booster [11]. On the other hand, information and awareness about COVID-19 primarily help the population to adopt a healthier diet from ICTs.

To support the immune system under situations like this, Agencia Española de Seguridad Alimentaria Nutrition [12] recommended establishing healthy dietary habits during this crucial period. In this regard, the EFAD published COVID-19 information for nutritional support. Furthermore, the WHO had offered several dietary and dietary tips during self-quarantine [13]. In contrast, the MD as a healthy dietary pattern to be followed in quarantine has been recommended [14]. In addition, the population needs to use ICTs.

Limited information is available on the impact of the COVID-19 on dietary patterns and its link to the knowledge and awareness of the pandemic among the population in Saudi Arabia. The present study will provide a better understanding of the association between the knowledge and awareness about COVID-19 with the frequency of eating, dietary habits, and many other factors during the COVID-19. Therefore, the aim of the present study was to assess the knowledge and awareness of the adult Saudi population and residents regarding the coronavirus pandemic and examine their association with dietary habits.

Methods

A community-based cross-sectional study was conducted in Al-Qunfudhah's locality - Kingdom of Saudi Arabia. Data were collected through a direct interview during the period from September 13 to November 15, 2020. The questionnaire was examined; by three specialists then approved the local authorities.

The questionnaire was divided into four sections: The first section directed at the sociodemographic characteristics of the participants (variables of education, occupation, family economic status, area of residence, and gender). The second was dedicated to assessing the individual's knowledge about COVID-19 and source of Information about COVID-19. The third section was designed to assess the lifestyle pattern of COVID-19, including physical activity and sunbathe), the fourth assessing food consumption pattern. Data collection performed through a direct interview during the period September–November 2020.

The dietary intake was assessed using food frequency questionnaires consumed per day, per week, or month, then organized into food groups that have common nutrients together, for example, cereals, proteins, vegetables, and fruits groups. Values are given for the consumed food at least 1–3 times per day (high intake), 1–5 times per week (medium intake), and per month or never (low intake) [15]. This was demonstrated in tables of frequency and percentages.

For calculating appropriate sample size using a random sample, the following formula was used:

The total population was 194811 (Al-Qunfudhah's population 1431 AH = 194811).

$n = (z^2 P(1-P))/d^2$, [16]

Thus, the total population enrolled was (400) participants who completed the data and met the criteria.

Descriptive analysis, mean, percentages, and correlation were used within the Statistical Package for the Social Science [17] computer program. The findings presented in tables by Excel Microsoft Office Software program.

Statistical analysis (mean, standard deviation, and correlation using Chi-square) was produced with the use of the Statistical Package for the Social Science (SPSS V.23) computer program.

Results

Table 1 shows the distribution of the sample according to the gender; females represented 57.5% and males (42.5%). More than three-quarters of the participants are Saudis (78%) and (22%) are non-Saudis. According to their residential areas, (70.25%) are urban dwellers and (29.75%) village dwellers. Most of the participants (68.5%) were in the age

Table 1: Sociodemographic characteristics of participants (n= 400)

Variables	Gender		Home		Nationality		Total	Percent
	Male	Female	Town	Village	KSA	Non-KSA		
Age								
< 18	15	17	23	9	26	6	32	8.00
18–24	20	38	36	22	53	5	58	14.50
25–65	113	161	199	75	204	70	274	68.50
> 65	22	14	23	13	29	7	36	9.00
Education level								
Illiteracy	19	37	33	23	45	14	56	14.00
General education	63	46	77	32	82	27.25	109	27.25
University	67	127	140	54	162	48	194	48.50
Postgraduate	21	20	31	10	23	10.25	41	10.25
Occupation								
Employee	49	88	87	50	115	22	137	34.25
Free lance	17	19	32	4	20	16	36	9.00
Laborer	37	23	47	13	34	26	60	15.00
Without job	67	100	115	52	143	24	167	41.75
Income								
Very low	10	13	18	5	18	5	23	5.75
Low	26	24	31	19	32	18	50	12.50
Moderate	112	163	189	86	217	58	275	68.75
High	22	30	43	9	45	7	52	13.00

group 25–65 years. Concerning the educational level, university education was highest among the participants, 48.5%, followed by general education (27.25%). Illiterate and postgraduate were the least (14.0%) and (10.25%), respectively.

The above table also reflects the general socioeconomic status of the participants. Above-thirds of participants earned a moderate income (68.75%), and nearly similar percentages earned 12.5% and 13% for the low- and high-income participants.

Most of the participants (94%) had some information about COVID-19 that acquired from the media (57%), (30.0%) from social media and (11.3%) from their jobs, while 4% of the participants had none (Table 2).

Table 2: Assessment of knowledge about COVID-19 information

Variables	Frequency (%)
Information about COVID-19	
Yes	379 (94.8)
No	4 (1.0)
Few	17 (4.3)
Total	400 (100)
Using precautionary tools	
Yes	364 (91.0)
No	4 (1.0)
Some time	32 (8.0)
Total	400 (100.0)
Number of sleeping hours/day	
<6 h/day	99 (24.8)
6–8	240 (60)
9–11	57 (14.3)
>11	4 (1.0)
Total	400 (100.0)
Practicing physical activity	
Yes	175 (43.8)
No	81 (20.3)
Some time	144 (36.0)
Total	400 (100.0)
Sessions of sunshine/week	
Non	27 (6.8)
Daily	199 (49.8)
3 time	50 (12.5)
Two	49 (12.3)
Once	75 (18.8)
Total	400 (100.0)
Relation between COVID-19 and immunity	
Yes	315 (78.8)
No	20 (5.0)
Uncertain	65 (16.3)
Total	400 (100.0)
Changing the diet during the pandemic	
Yes	226 (56.5)
No	174 (43.5)
Total	400 (100.0)
Intake of cold drinks	
Yes	95 (23.8)
No	305 (76.3)
Total	400 (100.0)
Intake of fruits	
Yes	321 (80.3)
No	79 (19.8)
Total	400 (100.0)
Source of information	
Non	4 (1.0)
Media	228 (57.0)
Social media	123 (30.8)
My job	45 (11.3)
Total	400 (100)
Types of precautionary tools	
Non	4 (1.0)
Sterilizers	60 (15.0)
Mask	29 (7.3)
Together	306 (76.5)
Other	1 (0.3)
Total	400 (100.0)
Start sleeping	
At 8–9.55 PM	62 (15.5)
10–11.55 PM	121 (30.3)
12–1.55 AM	173 (43.3)
2–4 AM	44 (11.0)
Total	400 (100.0)
Types of physical activity	
No	81 (20.3)
Waking	250 (625)
Sport instrument	46 (11.5)
Acrobat	7 (1.8)
Other	16 (4.0)
Total	400 (100.0)
Time of exposure to sunshine	
Non	27 (6.8)
8–10 AM	181 (45.3)
11–1 mid-day	50 (12.5)
1–3 PM	27 (6.8)
4–6 PM	116 (29.0)
Total	400 (100.0)
Types of foods that raise immunity	
Yes	281 (70.3)
No	119 (27.7)
Total	400 (100.0)
Intake of hot drinks	
Yes	269 (67.3)
No	131 (32.8)
Total	400 (100.0)
Intake of vegetables	
Yes	310 (77.5)
No	90 (22.5)
Total	400 (100.0)
Intake of nutritional supplements	
Yes	171 (42.8)
No	229 (57.3)
Total	400 (1000)

(Contd...)

Table 2: *(Continued)*

Concerning the use of the precautionary tools, the result showed that (91%) were complied with regular the usage of precautionary tools, (8%) sometimes, and only (1%) never used any of the tools. On the other hand, the majority (76.5%) were complied with using both the mask and sterilizer, (15%) Sterilizers only and (7.3%) mask only.

Sleeping habits were high among the participants who sleep 6–8 h/day (60%), compared with both those who slept <6 h. daily (24.8%) or those who sleep more than 9 h/day (15.3%).

Regarding physical activity during the lockdown, participants who always practiced physical activity were the most prevalent in the sample (43%), compared with those who sometimes practiced (36%) and a fewer (20.3%) who never practiced any physical activity. However, walking was the most popular physical activity practiced by almost two-thirds of the participants (62.5%). The rest of the participants practiced different activities in fewer percentages.

Results revealed that (49.8%) of the subjects were exposed to sunlight daily during the confinement (18.8%) practiced once per week. A similarity was achieved for those who practiced 2 times/3 times per week, while (6.75%) never practiced regular sun exposure. Regarding the time of exposure to sunshine, participants exposed between 8 and 10 AM window (43.5%) were the most prevalent in the sample, which highly reduced to (29%) between 4 and 6 PM.

Awareness among the participants about the relation between COVID-19 and immunity was high presented by (77.8%), followed by (16.3%) for those who were uncertain about their knowledge.

However, (70.3%) reported that they know the diet that supports immunity during the

COVID-19 confinement, compared with ignorant participants (29.7%).

More than half of the respondents (56.5%) changed their diet during the period of confinement, while the rest (43.5%) sticked to their usual dietary habits. More than two-thirds of the respondents preferred hot drinks to cold ones (67.3% vs. 23.8%). In addition, similar percentages obtained for vegetables (77.3%) and fruits (80%). However, (57.3%) of the participants were using nutrition supplements.

Table 3 reflects the evaluation of food items consumed by the participant; concerning the vegetable group, onion was the highest consumed vegetable daily at least 3 times a day (47%), followed by similarity in percentages for potatoes and garlic (38.25% and 38.75). On the other hand, nearly one-third of the participants took lettuce, green pepper, and carrots, 34%, 34%, and 32%, respectively. Vegetables including pumpkin, broccoli, and cauliflower represented low intake by half of the participants (50%).

As for the fruits, orange was the only fruit consumed daily by (47%), whereas the consumption of other fruits reflected a medium pattern ranging by (38%–20%), while low intake ranged between (47% and 11%).

The sugar group revealed that black honey was consumed more than white honey.

The milk and milk products group indicated similar percentages (37.75%) for high consumption patterns. In addition, similar rates were noticed for medium intake in low-fat sour milk and full-fat butter (32.5%).

The meat group, the fish, was on the top of a protein food group taken daily by most participants (83.25%), followed by a medium intake of meat (31.75%). On the other hand, the participants consumed food eggs (29.25%) and lentils (33.5%) once per month.

For traditional drinks, lemon was taken by (42.25%) of the participants 3 times per day, followed by ginger (32.5%) and green tea (32.25%).

Table 3: Food frequently consumed by the participants during COVID-19

Intake evaluation	F (%)				
	High at least 3 times/day	Medium 1–5 times/week	Low once/month	Never	Total
Vegetables					
Arugula	136 (34.00)	151 (37.75)	96 (24.00)	17 (4.25)	400 (100)
Lettuce	117 (29.25)	171 (42.75)	84 (21.00)	28 (7.00)	400 (100)
Parsley	102 (25.50)	120 (30.00)	132 (33)	46 (11.50)	400 (100)
Onion	188 (47.00)	126 (31.50)	51 (12.75)	35 (8.75)	400 (100)
Carrot	128 (32.00)	157 (29.25)	74 (18.50)	41 (10.25)	400 (100)
Sweet potato	57 (14.25)	69 (17.25)	191 (47.75)	83 (20.75)	400 (100)
Broccoli	38 (9.50)	58 (14.50)	200 (50.00)	84 (21.00)	400 (100)
Cauliflower	42 (10.50)	52 (13.00)	217 (54.25)	89 (22.25)	400 (100)
Pumpkin	43 (10.75)	62 (15.50)	200 (50.00)	95 (23.75)	400 (100)
Potato	154 (38.25)	155 (38.75)	52 (13.00)	39 (9.75)	400 (100)
Green bell pepper	136 (34.00)	160 (40.00)	61 (15.25)	43 (10.75)	400 (100)
Colure bell pepper	97 (24.25)	123 (30.75)	130 (32.50)	50 (12.50)	400 (100)
Garlic	155 (38.75)	131 (32.75)	67 (16.75)	47 (11.75)	400 (100)
Fruits					
Oranges	188 (47.00)	147 (36.75)	44 (11.00)	21 (5.25)	400 (100)
Mangoes	109 (27.25)	152 (38.00)	94 (23.50)	45 (11.25)	400 (100)
Apples	142 (35.50)	154 (38.50)	77 (19.25)	27 (6.75)	400 (100)
Strawberries	93 (23.25)	100 (25.00)	154 (38.50)	53 (23.25)	400 (100)
Berries	75 (18.75)	80 (20.00)	181 (45.25)	64 (16.00)	400 (100)
Guava	50 (12.50)	88 (22.00)	171 (42.75)	91 (22.75)	400 (100)
Apricots	57 (14.25)	90 (22.50)	176 (44.00)	77 (19.25)	400 (100)
Sugar					
Black honey	120 (30.00)	119 (29.75)	114 (28.50)	47 (11.75)	400 (100)
White honey	63 (15.75)	67 (16.75)	147 (43.50)	96 (24.00)	400 (100)
Milk and milk products					
Full cream yogurt	151 (37.75)	116 (29.00)	81 (20.25)	52 (13.00)	400 (100)
Low – fat sour milk	151 (37.75)	130 (32.50)	67 (16.75)	52 (13.00)	400 (100)
Full – fat butter	151 (37.75)	130 (32.50)	67 (16.75)	52 (13.00)	400 (100)
Low – fat butter	119 (29.75)	118 (29.50)	102 (25.50)	61 (15.25)	400 (100)
Milk	126 (31.50)	83 (20.75)	118 (29.50)	73 (18.25)	400 (100)
Meat groups, eggs, and legumes					
Fishes	333 (83.25)	30 (7.5)	20 (5)	17 (4.25)	400 (100)
Meat	105 (26.25)	125 (31.25)	127 (31.75)	43 (10.75)	400 (100)
Eggs	98 (24.50)	115 (28.75)	117 (29.25)	70 (17.50)	400 (100)
Lentil soup	102 (25.50)	99 (24.75)	134 (33.50)	65 (16.25)	400 (100)
Traditional drinks					
Green tea	129 (32.25)	92 (23.00)	129 (32.25)	50 (12.50)	400 (100)
Hibiscus	71 (17.75)	81 (20.25)	177 (44.25)	71 (17.75)	400 (100)
Cinnamon	79 (19.75)	88 (22.00)	154 (38.50)	79 (19.75)	400 (100)
Ginger	130 (32.50)	127 (31.75)	96 (24.00)	47 (11.75)	400 (100)
Lemon	171 (42.75)	115 (28.75)	72 (18.00)	42 (10.50)	400 (100)
Spices, herbs, and starters					
Spices					
Turmeric	125 (31.25)	98 (24.50)	124 (31.00)	53 (13.25)	400 (100)
Black pepper	156 (39.00)	132 (33.00)	82 (20.50)	30 (7.50)	400 (100)
Herbs					
Cardamom	144 (36.00)	110 (27.50)	98 (24.50)	48 (12.00)	400 (100)
Nigella	80 (20.00)	117 (29.25)	125 (31.25)	78 (19.50)	400 (100)
Sage	45 (11.25)	61 (15.25)	197 (49.25)	97 (24.25)	400 (100)
Rosemary	44 (11.00)	47 (11.75)	207 (51.75)	102 (25.50)	400 (100)
Starters					
Peanuts	126 (31.50)	131 (32.75)	123 (30.75)	19 (4.75)	400 (100)
Almonds	108 (27.00)	134 (33.50)	130 (32.50)	28 (7.00)	400 (100)
Cashews	106 (26.50)	94 (23.50)	166 (41.50)	34 (8.50)	400 (100)

Concerning spices, herbs, and starter, black pepper was on the top (39%), followed by cardamom (36%) and peanuts (31.5%) in the herbs and starter group, respectively.

Table 4 shows a positive correlation between health awareness and consumption of fruits, sugar, traditional drinks, plants proteins, and nuts. At the same time, there is no correlation with the other food consumption styles. There is a correlation between nutritional awareness and food consumption style for fruits, dietary fibers, traditional drinks, fish, and nuts. At the same time, there is no correlation with the other food consumption styles.

Table 4: Relationship between daily food consumption pattern and health practices and awareness

Type of initiation	n	Health practice		Health awareness	
		Correlation	p	Correlation	p
Vegetable	400	0.04	0.20	0.03	0.27
Fruits	400	0.13*	0.01	0.09*	0.03
Toffee	400	0.11	0.02	0.01	0.43
Dietary fiber	400	0.05	0.15	0.13**	0.01
Traditional drinking	400	0.19**	0.01	0.14**	0.01
Proteins (meat)	400	0.07	0.10	0.12**	0.01
Proteins (fish)	400	−0.04	0.47	0.01	0.48
Plant proteins	400	0.11*	0.02	0.03	0.29
Spices	400	−0.02	0.37	0.03	0.30
Herbs	400	0.04	0.23	0.04	0.23
Nuts	400	0.14**	0.01	0.22**	0.01

From Table 5, it appears that there is a high consumption of vegetables, fruits, dietary fibers, traditional drinks, proteins, fish, meats, plants, proteins, spices, and nuts. At the same time, there is a moderate consumption of sugar. There is a low consumption of herbs.

Table 5: T-test division for the consumption of foods related to rising immunity

Type of initiation	*n*	Mean	St	Value	*t*	df	Significant
Vegetable	400	37.87	7.17	35.0	7.99	399	0.01
Fruits	400	18.65	4.11	17.5	5.60	399	0.01
Toffee	400	5.02	1.47	5.0	0.31	399	0.76
Dietary fiber	400	13.81	3.50	12.5	7.49	399	0.01
Traditional drinking	400	13.44	3.25	12.5	5.80	399	0.01
Proteins (meat)	400	8.13	1.82	7.5	6.86	399	0.01
Proteins (fish)	400	5.39	1.50	5.0	5.12	399	0.01
Plant proteins	400	2.60	0.1.05	2.5	1.96	399	0.05
Spices	400	5.77	1.49	5.0	10.40	399	0.01
Herbs	400	9.60	2.63	10.0	3.06	399	0.01
Nuts	400	8.40	2.21	7.5	8.17	399	0.01

Table 6 shows that the value of the nutritional ratio in healthy practice and the nutritional knowledge based on level of education is 2.145 and 0.790, respectively, signifying statistical insignificance. This indicates that education does not affect health practices and health awareness.

Table 6: Relationship between education and health practice and health awareness

Source of Variation	Sum of squares	Df	Mean square	*F*	Significant
Healthy practice					
Between groups	23.598	3	7.866	2.145	0.094
Within groups	1448.392	395	3.667		
Total	1471.990	398			
Nutritional awareness					
Between groups	6.762	3	2.254	0.790	0.500
Within groups	1129.798	396	2.853		
Total	1136.560	399			

From Table 7, the correlation coefficient between age and health practices and health awareness is −0.012 and −0.16, indicating less correlation between health practice and health awareness directed toward old ages.

Table 7: Relationship between age, health Practices, and health awareness

Source of Variation	n	Correlation coefficient	Significant	Result
Health	400	−0.12*	0.001	There is a negative relationship
Awareness	400	−0.16*	0.001	There is a negative relationship

*Correlation is significant at the p-value 0.001 level (1 level tailed).

Discussion

This population-based study provides a snapshot of Saudi and residents' eating habits and lifestyles, who participated in the survey between (September 13 and November 15) of 2020, after 9 weeks of lockdown. Saudis were dominant in the study (78%). Most were urban dwellers with slight sex differences (females represented 57.5% and males (42.5%). More than two-thirds of the participants (68.5%) were in the age group 25–65 years. Concerning the educational level, high education was prevalent among the participants (university (48.50%) and 10, 25% for the postgraduates. Above one-third of participants earned a moderate income (68.75%), and nearly similar percentages earned 12.5%, 13%, for low and high incomes, respectively. Surprisingly, a higher rates (41.75%) of the participants were unemployed, women who represented one-quarter in comparison with the sample s characteristics in [18], where the majority fell between the ages 16 and 30 years old and completed the general education level (42.93%), (35.08%) university level, and only (12.57%) postgraduates. Age and education are the cornerstones that significantly influence the impact of knowledge in daily behavior, especially health. Thus, the higher education level found in this study will support the understanding of environmental health knowledge and awareness of maintaining a healthy lifestyle. On the other hand, [18], specified that lower education is related to attitudes and actions in dealing with health problems, the correlation coefficient between age and health practice and health awareness is −0.012 and −0.16 which indicates that there is a less correlation between health practice and health awareness directed toward old ages.

Most of the participants (94%) had some information about COVID-19. This result is consistent with other findings reported by [18]. However, it differs from the findings of a study [19], among the population in Jazan Area, KSA COVID-19 as they found to be moderately aware of the COVID-19 pandemic. The high rate is undoubtedly due to their adult ages and the high education levels. Even literate people may acquire information from their family's knowledge of people, which varies based on the feature of the target population.

In contrast, other studies obtained a higher awareness rate within their populations. The relationship between healthy practice and nutritional knowledge based on level of education was 2.145 and 0.790, respectively, which is statistically insignificant. This indicates that the level of education does not affect the health practices and nutritional awareness, while the correlation between age and health practice and health awareness is −0.012 and −0.16, which indicates that there is a less correlation between health practice and health awareness directed toward old ages (Table 6).

Media and social media play an important role in transferring information and awareness about COVID-19, with 87% of the participants obtaining the information from the media and social media. Similar sources in a lower rate (71.2%) were reported by other results [18], and [19].

The use of precautionary tools is one of the crucial elements that have been investigated in most of the COVID-19 studies. The present study showed that (91%) were compliant with the regular use of precautionary tools; most of them (76.5%) were using both the mask and sterilization. This is a positive behavior displayed by the community. However, some factors influence knowledge, motivation, perceptions, and beliefs in disease control and prevention efforts, instructional quality, and access to available resources [20].

Nearly half of the total number of participants (49.8%.) exposed to sunlight daily during the confinement (18.8%) practiced once per week, the similarity was achieved for those who practiced 2 times–3 times per week. Regarding the time of exposure to sunshine, participants exposed between the 8 and 10 AM (45.3%) were the most prevalent in the sample, which highly reduced to (29%) between the time 4 and 6 PM. This result is in line with the previous evidence; the time of the day, season, and the area has a significant influence in Vitamin D3 production. In Saudi Arabia, during summer, pre-Vitamin D3 was observed to be increased between 9:00 AM and 3:00 PM, with peak hours between 10:00 AM and 12:00 PM. However, conversion begins at around 9:30 AM until 2:00 PM, with peak hours around 11:00 AM. Therefore, during the summer months in Riyadh, the optimal time for sun exposure is from 9:00 AM to before 10:30 AM, and after 2:00 PM until 3:00 PM [21]. The present study was conducted during summer in September. Thus, the participants were expected to benefit from time, season, and area. The study carried out by [10] mentioned that the higher duration of sun exposure was associated with more recovery cases from COVID-19 among the patients. Sunlight can maintain the health condition of COVID-19 patients, enhancing the immune system, thus slowing the development of influenza and SARS agents in the human body; [18].

Meanwhile, sleeping habits were high among the participants who slept 6–8 h daily (60%), compared with those who slept <6 h. daily (24.8%) or those who sleep more than 9 h/day (15.3%). Unfortunately, (54.4%) start sleeping after 12 AM. Results from research [22] suggest that altered sleep patterns could shift the coincidence with light and dark disrupting circadian rhythms.

Regarding physical activity during the confinement, participants who always practiced physical activity were the most prevalent in the sample (43.8%), compared with those who sometimes practiced (36%) and fewer (20.3%) who never practiced any physical activity. These results are closer to those reported by [6], where (70%) practiced physical activity in different sessions. However, the number of subjects that practiced physical activity was higher (79.7 vs. 20.3%) than those reported by other studies. Furthermore, subjects who practiced daily sessions per week were the most prevalent in the sample. Walking was on the top of sports, which practiced by almost two-thirds of the participants (62.5%). The rest of the participants practiced different activities in fewer percentages. Physical activity plays an essential role in achieving the beneficial effects of health. All age groups can adhere to the WHO recommendations for physical activity [23] during the lockdown.

Awareness among the participants regarding the relation between COVID-19 and immunity was high presented by (78.8%), followed by (16.3%) for those uncertain about their knowledge. However, (70.3%) reported that they know the diet that supports immunity during the COVID-19 confinement.

About 56.5% of the respondents altered their diet toward a healthy diet during the period of confinement. This was certified because more than – thirds of the respondents preferred hot drinks to cold ones (67.3% vs. 23.8%). In addition, vegetables (77.5) and fruits (80%) were high. This indicates that some of those who stick to their usual dietary habits (43.5%) consumed a healthy diet rich in fruits and vegetables. Another interesting finding was that (42.8%) of the participants used nutrition supplements during the confinement. This habit was the main reason behind changes in consumption of pro-healthy foods for enhancing immunity with Vitamins C and D, zinc, and omega 3. Dietary supplements intake during the pandemic is appraised, focusing on Vitamin D [24]. People should be aware of misinformation and unsubstantiated promises for following a balanced and healthy diet and physical activity, which plays an essential role in maintaining health in a population.

Regarding food consumption pattern of participants during the confinement, the data showed that food items which presented a higher consumption on a daily basis at least 3 times a day were: fish was on the top of the groups (83.25%), followed by onion and orange (47%), for lemon drink (42.75%). Potatoes and garlic almost achieved similar percentages (38.25%

and 38.75), respectively, while milk and milk product came on the bottom of list (37.75%).

Medium intake 1–5 times a week-illustrated that lettuce, green pepper, potato, arugula, and parsley were taken by nearly almost one-third of the participants (42.75%, 40%, 38.75%, and 37.75%), respectively, followed by meat (31.25%). While eggs (29.25%) and lentils (33.5 %) were consumed once per month. Vegetables including pumpkin, broccoli, and cauliflower represented low intake by half of the participants (50%). Proved (27) that broccoli seeds contain glucoraphanin, which works to reduce many symptoms of COVID-19. Garlic and onions have effective natural compounds that work against the COVID-19 protein [25].

Fruits and vegetables have been recommended by [26] to be taken at least five servings per day. The evaluated food items play an important role in strengthening the immunity of the human body and as an antiviral, because it contains antioxidants such a Vitamin (C and A), carotenoids, flavonoids, and some mineral salts (magnesium, calcium, potassium, zinc, and phosphorous), as well as the presence of fiber in some of them that prevent free radical formation [26].

Nuts were also included in the food pattern, representing moderate values for peanuts, almonds, and cashews. Thus, one can say that food consumption pattern for the participants indicates that there is a similarity toward the MD diet. This finding is consistent with the theory that states adherence to the MD is associated with a higher intake of fruits, vegetables, nuts, legumes, and fish. Furthermore, the MD diet-related foods have been recently recommended to be included in our diet during the COVID-19 confinement due to their capacity to strengthen the immune system [2], [6]. Comparison with other studies, although the evaluation is different from those taken as reference. Nevertheless, it leads to the same results except for the consumption of olive oil, which was not included in the present study because olive oil is not used for cooking by most Saudis, only for salad dressing [6]. Concluded that most of the Spanish population present a high adherence to the MD; during confinement, 21.7% of people had a low adherence and 63.1% of people had a medium adherence. Another study done by [18] in East Nusa Tenggara Indonesia showed that the consumption of fruit and vegetable presented (50.26%) sometimes and (39.27%) for others who consumed it daily. In the other study done by(18) , items that had a higher adherence, during confinement, were Sausages, or cold meats, and the intake of carbonated beverages, at (97.6%, 91.7%, 82.7%, and 81.7%, respectively). Items with low adherence during the confinement were the consumption of wine, fish or seafood, and legumes, at 3.1%, 23.9%, and 25.4%, respectively.

The results in these two mentioned studies were lower than those reported in the present study, which obtained a noticeable increase in fruits, vegetables, and fish consumption. This might be due to the difference between samples concerning the awareness or the fact that the government has taken major steps and efforts to reduce the spread of the disease. These findings illustrate how the Saudis and residential population have adopted healthier dietary behaviors during the COVID-19 confinement using a closer approach toward the Med diet-style eating patterns. There is a positive correlation between health awareness and the consumption of fruits, sugar, traditional drinks, plants proteins, and nuts. Simultaneously, there is no correlation with the other food consumption styles. There is a correlation between nutritional awareness and food consumption style for fruits, dietary fibers, traditional drinks, fish, and nuts. At the same time, there is no correlation with the other food consumption styles.

The participants have used some natural materials plants in an unofficial way as medicinal plants to prevent COVID-19 disease, for example, (honey, green tea, 3 times per day, followed by ginger (32.5%), green tea (32.25%), and black pepper(39%), followed by cardamom (36%) (31.5%) in herbs. These materials are rich in antiviral compounds with antiviral properties, especially respiratory viruses, which positively contribute to the treatment of COVID-19 [27].

Although the study has assessed the knowledge and awareness of the adult Saudi Arabian population and residents on the coronavirus pandemic and examined their association with dietary habits, several limitations exist based on the analysis of this study. First, the lack of homogeneity among the participants of different nationalities may hinder the generalization of the results. In addition, recall bias, commonly seen in cross-sectional studies, may be an issue in this study. Thus, research is needed to overcome these limitations.

The strength of this study is the fact that the survey was conducted during the most critical period of the pandemic, 9 weeks after the start of lockdown. In addition, according to the authors' knowledge, this study may be the first study done during confinement regarding the food pattern in Saudi Arabia.

Conclusion

This study provided novel data on knowledge and lifestyle patterns, including dietary habits and physical activity during the COVID-19 pandemic Saudi Arabia population in Al-Qunfudhah's – locality. The findings illustrate that the Saudis and residential population have adopted healthier dietary behaviors during the COVID-19 confinement through a closer approach toward the Med diet-even that the pandemic is still ongoing; these findings may have crucial public health implications and provide evidence for the future intervention studies.

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