



Scaling up Egyptian community action for health towards COVID19

Eman Sameh Mohammed¹; Shimaa A. Emam¹; Ashraf A. Ewis^{1,2}; Eman Ramadan Ghazawy¹; Shaza Fadel Alkilany¹; Doaa M. Khalil³; Somaya A. Ewis⁴; Ahmed Arafa^{3,5}; Zeinab Mohammed³; Ehab Salah Eshak¹; Amira Gamal⁶; Ebtessam Esmail Hassan¹
Eman M. Mahfouz¹

¹ Department of Public Health, Faculty of Medicine, Minia University, El-Minia, Egypt

² Department of Public Health and Occupational Medicine, Faculty of Health Sciences – Al Qunfudah, Umm Al Qura University, Meccah, Saudi Arabia

³ Department of Public Health, Faculty of Medicine, Beni-Suef University, Beni-Suef, Egypt

⁴ Undergraduate Faculty of Medicine, Beni-Suef University, Beni-Suef, Egypt

⁵ Department of Public Health, Graduate School of Medicine, Osaka University, Osaka, Japan

⁶ Department of Psychology, Faculty of Arts, Minia University, and Deraya University El-Minia, Egypt

⁶ Department of Public Health and Occupational Medicine, Faculty of Medicine, Suez Canal University, Ismailia, Egypt.

ABSTRACT

Objectives to examine the Egyptians' behavioral changes with its determinants towards the COVID-19 pandemic and evaluate the Egyptians' perception of the governmental response to the COVID-19 pandemic and the consequent information, preventive and control measures applied by the Egyptian health authorities. **Study design:** Cross-sectional study. **Methods:** An online survey was sent to the Egyptian population via all available means of online communication. Beside the socio-demographic information, the questionnaire intended to assess the behavioral changes and participants' perception of the COVID-19 pandemic and the public health preventive and control measures towards it. **Results:** Frequent hand washing with soap and water was the most frequent preventive measure adopted by the participants (84.3%), followed by avoiding crowded public places (83.1%). Nearly two thirds of Egyptian participants (65.2%) stated that the role played by authorities is suboptimal in the containment process of COVID-19 pandemic and almost half of them (49.8%) perceived that the rates notified and declared by the health authority as inaccurate. Worries about the COVID-19 pandemic was the most important determinant for adopting protective behavior. **Conclusions:** The majority of Egyptian participants adopted and complied with certain specific protective measures against COVID-19 pandemic. Residence, having enough knowledge and worries about COVID19 and being in a potential exposure to COVID-19 infection were significantly and positively influencing the protective behavior of the participants

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INTRODUCTION:

The world is currently under pressure from the novel coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)¹ which revealed the extent to which governments are

unprepared to face unprecedented events. It started in the city of Wuhan, Republic of China in late December 2019, and then has spread around the world.² World Health Organization (WHO) declared COVID-19 as a global pandemic on March, 11th, 2020 as the number of the affected countries had tripled.³⁻

Corresponding Author: Shimaa Anwer Emam, Department of Public Health and Occupational Medicine, Faculty of Health Sciences – AlQunfudah, Umm AlQura University, Meccah, Saudi Arabia. Email: shimaa_anwer3@yahoo.com

The virus was confirmed to have reached Egypt on February, 14th, 2020.⁴ As in many countries, Egypt declared lockdown, where many cities are sealed off, schools and universities are closed nationwide, travel is banned and social activities have paralyzed [5, 6]. The COVID-19 pandemic has led to a massive global public health action to control the infections or at least to lower its speedy transmission. To achieve a successful implementation of such measures, the people's willingness and behavior play an important and decisive role and can fundamentally influence and alter the spread of the pandemic.^{7,8} Thus, encouraging the public to follow the recommended preventive actions is considered serious challenges and a crucial step in containment of the crisis. The social and behavioral sciences can provide valuable insights for managing the pandemic and its impacts. However, changing people's behaviors is a difficult task and a complex process.

Theoretical models such as Health Belief Model have shown that people will respond to health warnings if they believe that they are susceptible to the condition, perceive it as severe, perceive the protective behaviors as effective to lower the threat and they are able to perform these behaviors.^{5,9} At the beginning of the COVID-19 pandemic, the Egyptians considered that they were at low risk of acquiring the COVID-19 infection and they were uncertain about the seriousness of the condition. Therefore, the government was forced to apply measures such as imposing curfew to contain the spread of the virus and banning the large gatherings such as congregational prayer gatherings and large wedding ceremonies as happened in other societies.⁶ The WHO has also advised the public to follow some basic precautionary measures, i.e. wearing masks, washing hands, using hand sanitizers, maintaining physical distancing, and staying at home.^{10, 11} Applying social distancing, or more accurately physical (spatial) distancing, is one of the vital strategies for slowing the pandemic especially in the absence of a specific treatment or a vaccine. Another obvious behavioral change is switching to communication through the available digital means such as online meetings and e-learning platforms which need organizational support and sufficient digital skills.⁵ Parallel to this, a lot of myths and fake

Table 1: Socio-demographic characteristics of the Egyptian participants in the behavioral changes study during the COVID-19 pandemic

news arise by the public, and with the extensive use of social media, they prevail greatly causing more confusions, and worry among the world populations.^{12,13} Such misinformation-related confusions and worries can impose risk perception to the public, which was previously, reported as the main determinant of practicing protective.^{14,15} On the other hand, some socially irresponsible behaviors have appeared such as dysfunctional overrated stockpiling of foods and medicine to adapt with the expected long periods of lockdown and self-isolation, which reflects individualism and selfishness of some individuals.¹⁶

Tracking behavioral changes during the pandemic is considered to be much representative of people's response to the health authorities recommendations for disease prevention and control.

Therefore, this research was conducted aiming to study the Egyptians' behavioral changes with its determinants towards the COVID-19 pandemic.

Additionally, we evaluated the Egyptians' perception of the governmental response to the COVID-19 pandemic and the consequent information, preventive and control measures applied by the Egyptian health authorities.

METHOD

An online survey in Arabic was created and launched using Google Forms¹⁷, and was sent to the participants all over the country via the available social media channels (Facebook and WhatsApp, etc.). Researchers from Minia, Beni Suef and Suez Canal universities conducted the data collection stage as well as the analysis of the results. A total of 1507 participants who completed the questionnaires were included in the analysis. A consent form was attached as the first section of the questionnaire giving the participants the right to accept/decline sharing in the study and giving us the permission to use the collected data. Confidentiality and anonymity were thoroughly ensured, and no names, identity, phones or e-mail addresses were asked. The questionnaire was divided into four sections covering the following topics:

Section 1: Personal characteristics and socio-demographic details including gender, age, location in Egypt, socioeconomic standard (SES), job, marital status and educational level.

Egyptian participants variables	No.	%	
Age groups			
Less than 20 years	192	12.7	
20-29	844	56.0	
30-39	300	19.9	
40-49	77	5.1	
50-59	63	4.2	
More than 60 years	31	2.1	
Gender			
Male	484	32.1	
Female	1023	67.9	
Marital status			
Married	592	39.2	
Single	884	58.7	
Divorced	18	1.2	
Widowed	13	0.9	
Governorate			
North Egypt	207	13.7	
Central Egypt	560	37.2	
South Egypt	740	49.1	
Residence			
Urban	1027	68.1	
Rural	480	31.9	
Education			
University/post	1427	94.7	
Below university	80	5.3	
Socioeconomic standard			
Higher than average	390	25.9	
Average	1054	69.9	
Lower than average	63	4.2	
Position/Occupation of participant			
Member of public	304	20.2	
Healthcare professional	394	26.1	
Medical/Social researcher	34	2.3	
Medical student	666	44.2	
Non-medical student	53	3.5	
Community leader	56	3.7	
Source of information about COVID-19			
	Used to get knowledge	Used frequently	Trusted
Official websites	974 (64.6)	521 (34.6)	1103 (73.2)
TV/Radio	437 (29)	290 (19.2)	256 (17.0)
Social media	761 (50.5)	970 (64.4)	189 (12.5)
Doctor	210 (13.9)	93 (6.2)	247 (16.4)
Family	57 (3.8)	9 (0.2)	29 (1.90)
Work community/school	114 (7.6)	30 (2)	19 (1.30)
Others	103 (6.8)	45 (3)	57 (3.80)

Section 2: Assessment of the behavioral changes among the participants pertaining to the COVID-19 pandemic; whether they avoided visiting the healthcare facilities and crowded public places and started to work from home. Additionally, it assessed the participant's hygienic practices, which included hand washing, applying physical distancing, using

hand sanitizers, wearing masks, and coughing or sneezing into elbow. Each question had a 'Yes' or 'No' response.

Table 2: Adoption of hygiene-related and avoidance-related behaviors in response to COVID-19 pandemic among the Egyptian participants

Actions taken by the Egyptian participants	No (%)
Frequent hand washing with soap and water	1271 (84.3)
Using alcohol hand gel or hand sanitizer	1031 (68.4)
Increasing the time spent in cleaning or disinfecting surfaces	668 (44.3)
Avoiding touching face and eyes with unclean hands	995 (66)
Sneezing or coughing into elbow	906 (60.1)
Wearing face masks	641 (42.5)

Section 3: Evaluation of the impacts of COVID-19 on the participants such as work affection, cancellation of travel or social events, unable to buy essential items and feeling worried/anxious.

Section 4: Participants' perception towards the governmental response towards the COVID-19 pandemic. It inquired about the participants' opinion regarding the measures taken by the government whether they are sufficient or not; satisfaction with the hospital services; Perception towards action of the Egyptian health authority and the importance to share in the response activities to COVID-19.

Finally, reported practices of the participants were categorized into good- if participants use face masks, wash hands frequently and apply social distancing and; poor- if participants did not practice previously defined activities.

The data were analyzed using Statistical Package for the Social Sciences software (SPSS version 21.0; IBM Corporation, Armonk, NY, USA). Chi-squared test was performed to compare responses. Logistic regression was performed to determine the associations with behavioral changes among the participants. The level of statistical significance was set at $P < 0.05$.

RESULTS

This study included 1507 Egyptian respondents (67.9%) females and 39.2% were married and (56%) of them belonged to the age group of 20-29 years. Half of respondents were from South Egypt, 37.2% from Central Egypt and 13.7% from North Egypt. The majority of the respondents (97.4%) had University and above education and 68% were urban residents. Social media was the most frequent method to get health information about COVID-19

Table 3: Association between demographic characteristics and reported behaviors of the Egyptian participants during the COVID-19 pandemic.

(64.4%) and 73.2% of respondents stated that they trusted the official websites (Table 1).

Table (2) showed the adoption of hygiene-related and avoidance-related behaviors in response to COVID-19 pandemic among the Egyptian participants. Frequent hand washing with soap and water was the most frequent preventive measure to be practiced by 84.3%, followed by avoiding the crowded public places by 83.1%, and almost two thirds of respondents (68.4%) adhered to the use of alcohol-based hand sanitizer. In addition, 66% of them complied with the message of avoiding touching their face and eyes with unclean hands. More than half of participants avoided the use of public transport and cancelled or postponed family or social events, 55.9% and 53.1%, respectively.

The association between demographic characteristics and reported behaviors during COVID-19 pandemic has been shown in table "3", where a Significant difference in adopting certain behaviors were found in relation to sex as Females were found to be more likely to apply physical distancing and to avoid crowded public places ($p < 0.001$), be more worried from cough and practice sneezing into elbow ($p < 0.001$), and avoid the use of public transport ($p < 0.001$). In addition, females reported that with COVID-19 pandemic, they had avoided visiting hospitals and postponed social events ($p < 0.001$ and $p = 0.004$, respectively). On comparing urban and rural residents, a significant higher tendency among urban residents to apply physical distancing, using face mask, frequent washing of hands, applying hand sanitizers, practicing cough or sneeze into elbow ($p < 0.001$). Moreover, they avoided crowded public places ($p = 0.008$) and cleaned surfaces more frequently ($p = 0.001$) than rural residents who were more likely to stock up on food ($p < 0.001$).

Regarding the socioeconomic status, high social class respondents reported frequent use of face masks and hand sanitizers ($p < 0.001$). Meanwhile, they had a higher tendency to work from home and stock up on food ($p = 0.001$ and $p = 0.03$, respectively). This study highlighted that older participant (≥ 30 years) were more likely to adopt protective behaviors such as using face masks, avoiding touching face and eyes with unclean hands, cleaning surfaces frequently ($p < 0.001$). However,

Behavior of the participants towards COVID-19 pandemic	Sex		X ² P value	Residence		X ² P value	Socioeconomic class		X ² P value	Age groups		X ² P value
	Male n=484	Female n=1023		Urban n=1027	Rural n= 480		High n=390	Average/ low n=1117		<30 yrs n=1036	≥30 yrs n= 471	
	n (%)	n (%)		n (%)	n (%)		n (%)	n (%)		n (%)	n (%)	
Frequent hand washing	408 (84.3)	863 (84.4)	0.001 (0.9)	893 (87)	378 (78.8)	16.7 <0.001*	323 (82.8)	948 (84.9)	0.9 0.3	862 (83.2)	409 (86.8)	3.2 0.07
Using hand sanitizers	330 (68.2)	701 (68.5)	0.02 0.9	772 (75.2)	259 (54)	68.1 <0.001*	302 (77.4)	729 (65.3)	19.8 <0.001*	643 (62.1)	388 (82.4)	61.8 <0.001
Cleaning surfaces frequently	184 (38)	484 (47.3)	11.5 <0.001*	486 (47.3)	182 (37.9)	11.7 0.001	205 (52.6)	463 (41.5)	14.5 <0.001*	425 (41)	243 (51.6)	14.7 <0.001
Avoiding touching face/ eyes with unclean hands	333 (68.8)	662 (64.7)	2.5 0.1	713 (69.4)	282 (58.8)	16.6 <0.001*	251 (64.4)	744 (66.6)	0.7 0.4	657 (63.4)	338 (71.8)	10.1 <0.001
Sneezing or coughing into elbow	249 (51.4)	657 (64.2)	22.4 <0.001*	657 (64)	249 (51.9)	19.9 <0.001*	222 (56.9)	684 (61.2)	2.2 0.1	599 (57.8)	307 (65.2)	7.3 0.007
Using face mask	211 (43.6)	430 (42)	0.3 0.6	485 (47.2)	156 (32.5)	29 <0.001*	210 (53.8)	431 (38.6)	27.5 <0.001*	373 (36)	268 (56.9)	57.8 <0.001
Physical distancing	284 (58.7)	700 (68.4)	13.8 <0.001*	727 (70.8)	257 (53.5)	42.9 <0.001*	253 (64.9)	731 (65.4)	0.8 0.8	668 (64.5)	316 (67.1)	0.9 0.3
Avoiding crowded public places	378 (78.1)	875 (85.5)	12.9 <0.001*	872 (84.9)	381 (79.4)	7.1 0.008	323 (82.8)	930 (83.3)	0.4 0.8	851 (82.1)	402 (85.4)	2.4 0.1
Avoiding the use of public transport	239 (49.4)	603 (58.9)	12.2 <0.001*	587 (57.2)	255 (53.1)	2.2 0.1	207 (53.1)	635 (56.8)	1.7 0.2	595 (57.4)	247 (52.4)	3.3 0.07
Avoiding hospitals	177 (36.6)	474 (46.3)	12.8 <0.001*	459 (44.7)	192 (40)	2.9 0.09	148 (37.9)	503 (45)	5.9 0.01	463 (44.7)	188 (39.9)	3 0.08
Cancellation/postponing of social events	231 (47.7)	569 (55.6)	8.2 0.004	598 (58.2)	202 (42.1)	34.2 <0.001*	220 (56.4)	580 (51.9)	2.3 0.1	500 (48.3)	300 (63.7)	30.9 <0.001
Working from home	138 (28.5)	325 (31.8)	1.6 0.2	317 (30.9)	146 (30.4)	0.03 0.9	145 (37.2)	318 (28.5)	10.3 0.001	296 (28.6)	167 (35.5)	7.2 0.007
Stocking up on food	64 (13.2)	127 (12.4)	0.2 0.7	152 (14.8)	39 (8.1)	13.2 <0.001*	62 (15.9)	129 (11.5)	4.9 0.03	113 (10.9)	78 (16.6)	9.4 0.002
Stocking up on medications	22 (4.5)	42 (4.1)	0.2 0.7	47 (4.6)	17 (3.5)	0.8 0.4	20 (5.1)	44 (3.9)	1 0.3	44 (4.2)	20 (4.2)	0 0.9

they had more tendency to stock up on food in comparison with younger respondents (p=0.002). Participants' perception of the governmental response to the COVID-19 pandemic is presented in table 4. About two-thirds (65.2%) of Egyptians perceived authorities' efforts of containment COVID19 pandemic as insufficient and nearly half of them (49.8%) did believe that figures/numbers declared by Egyptian health authorities are inaccurate. Three-quarters of Egyptians thought that the health system capacity cannot cope with the COVID-19 pandemic, and only 9% were satisfied with the current hospital services. Out of total, 38.8% highlighted the importance of community participation in combating COVID-19 pandemic. Reported practices of the participants were categorized into good i.e. if participants use face masks, wash hands frequently and apply physical distancing and; poor i.e. if participants did not practice previously defined activities. It was found that 405 (26.9%) of participants were categorized as good since they practiced at least three or more protective behaviors to prevent COVID-19 (Table 5). Among the participants, urban residents were significantly more likely to adopt protective behaviors more than rural residents, (81.5% VS 18.5%, respectively). Moreover, poor behavioral change significantly decreased as we

head north to Egypt (53.2% in south Egypt, 35.8% in central Egypt and 11% in north Egypt). About 78% and 73.6% of those who were categorized as having good practice showed more anxiousness and had a feeling of fear due to COVID-19, respectively. Almost all the participants with good behavioral change were aware about the seriousness of the COVID-19 disease (99.5%). Additionally, about 59.3% of the respondents who were classified as having protective behaviors reported that they may have potential exposure to COVID-19 infection versus (40.7%) who did not (p < 0.05).

Multivariable binary logistic regression analysis was performed to identify the factors influencing the protective behavior of the Egyptian participants against COVID-19 and the results were presented by adjusted odds ratio (aOR) with 95% confidence interval (95% CI), (Table 6).

Our findings showed that being an urban resident (aOR=2.05, 95% CI 1.52-2.77), living in a southern or a central governorate (aOR of central Egypt=1.98, 95%CI 1.38-2.86; aOR of north Egypt=1.46, 95%CI 1.11-1.92), having enough knowledge about the

Table 4: Egyptian participants' perception of their governmental response to the COVID-19 pandemic

Item	N (%)
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Avoidance-related behaviors:	
Actions taken by the participant over the last month due to COVID-19	
Applying physical distancing	984 (65.3)
Avoiding crowded public places	1253 (83.1)
Avoid using of public transport	842 (55.9)
Avoid visiting healthcare facilities	651 (43.2)
Cancellation or postponing family or social events	800 (53.1)
Avoid going to the workplace (working from home)	463 (30.7)
Increasing the amount of household groceries purchased	191 (12.7)
Participants perception towards governmental response to COVID-19	
Are the measures taken by the Egyptian government sufficient?	
No	982 (65.2)
Yes	291 (19.3)
Don't know	234 (15.5)
Do you think that the Egyptian health system capacity can cope with the COVID-19 pandemic?	
No	1133 (75.2)
Yes	89 (5.9)
Don't know	285 (18.9)
Are you satisfied with the current Egyptian hospital services?	
Unsatisfied	760 (50.4)
Satisfied	135 (9.0)
Neutral	612 (40.6)
Importance to share in the response and activities against COVID-19	
Yes	584 (38.8)
No	537 (35.6)
Don't know	386 (25.6)
Willingness to cope with the measures of staying/self-isolation at home	
Yes	1020 (67.7)
No	91 (6.0)
Don't know	396 (26.3)

COVID-19 pandemic (aOR=1.57, 95%CI 1.21-2.02), worries about the COVID-19 pandemic (aOR=2.28, 95%CI 1.71-3.03) and being in a potential exposure to COVID-19 infection (aOR=1.52, 95%CI 1.18-1.95) were significantly and positively influencing the protective behavior of the participants.

Table 5: Relationship between the sociodemographic variables and the good and poor behavioral changes of the Egyptian participants during the COVID-19 pandemic

Our study spotted worries about COVID-19 pandemic as the most important determinant for the participants to adopt a good protective behavior. Worried participants were two times more likely to adopt protective behaviors than the non-anxious individuals were.

The protective behaviors of the participants towards the COVID-19 pandemic were not influenced by other variables e.g., SES, age of the participant and responsibility of looking after one's family (Table 6).

DISCUSSION

In the face of COVID-19 pandemic, it is crucial to assess the public's behavioral responses to the situation and it is important to understand the factors that influence how people behave to minimize the impacts and the spread of the disease. However, a literature search yielded no significant survey conducted to assess the behavioral impacts of the COVID-19 on Egyptians. Therefore, our research that included 1507 Egyptian respondents, aimed to cover this gap by assessing the COVID-19-related behavioral repercussions on the Egyptian people and the correlated factors.

Nearly, 64.4% of the Egyptian participants reported that social media such as Facebook was the most frequent method to get health information about COVID-19. This result was in agreement with a study conducted in Hong Kong in which social platforms and websites were the common sources of the people's knowledge about the COVID-19 pandemic.¹⁸ However, sharing news through social media without verifying its source and precision might spread rumors and misinformation, which consequently might cause panic and unnecessary stress in the community.

Our results showed that a large proportion of the study sample carried out one or more of the protective behaviors in response to COVID-19 pandemic. The most common hygiene-related behavior adopted was washing hands with soap and water (84.3%), whereas keeping away from crowded places generally was the most common avoidance behavior (83.1%). Seale *et al.* (2020) reported similar findings among Australian population.¹⁹ Another study conducted by Wang *et al.* (2020) found that the Chinese respondents

Participants' sociodemographic variables and perception of the measures taken by authorities against the COVID-19 pandemic	Behavioral change		Total N=1507	X ² P-value
	Good behavioral change n=405	Poor behavioral change n=1102		
Residence				
Urban	330 (81.5)	697 (63.2)	1027 (68.1)	45.4
Rural	75 (18.5)	405 (36.8)	480 (31.9)	<0.001
Age				
Less than 30 years old	228 (56.3)	808 (73.3)	1036 (68.7)	39.9
30 years or more	177 (43.7)	294 (26.7)	471 (31.3)	<0.001
Sex				
Male	123 (30.4)	361 (32.8)	484 (32.1)	0.8
Female	282 (69.6)	741 (67.2)	1023 (67.9)	0.4
Specialty				
Medical	286 (70.6)	808 (73.3)	1094 (72.6)	1.09
Non-medical	119 (29.4)	294 (26.7)	413 (27.4)	0.3
Governorate				
North Egypt	86 (21.2)	121 (11)	207 (13.7)	
Central Egypt	165 (40.7)	395 (35.8)	560 (37.2)	38.4
South Egypt	154 (38)	586 (53.2)	740 (49.1)	<0.001
Socioeconomic standards (SES)				
High SES	131 (32.3)	259 (23.5)	390 (25.9)	12.1
Average or low SES	274 (67.7)	843 (76.5)	1117 (74.1)	0.001
Education				
University or higher	389 (96)	1038 (94.2)	1427 (94.7)	2.03
Below university level	16 (4)	64 (5.8)	80 (5.3)	0.2
Looking after the family				
No	215 (53.1)	751 (68.1)	966 (64.1)	29.2
Yes	190 (46.9)	351 (31.9)	541 (35.9)	<0.001
Feeling worried about COVID-19				
No	91 (22.5)	445 (40.4)	536 (35.6)	41.5
Yes	314 (77.5)	657 (59.6)	971 (64.4)	<0.001
Enough knowledge about COVID-19				
No	228 (56.3)	450 (40.8)	678 (45)	28.6
Yes	177 (43.7)	652 (59.2)	829 (55)	<0.001
Awareness of seriousness of COVID-19				
No				
Yes	2 (0.5)	23 (2.1)	25 (1.7)	4.6
	403 (99.5)	1079 (97.9)	1482 (98.3)	0.03
Fear of the COVID-19 pandemic				
No	107 (26.4)	401 (36.4)	508 (33.7)	13.2
Yes	298 (73.6)	701(63.6)	999 (66.3)	<0.001
Potential exposure to COVID-19				
No	165 (40.7)	616 (55.9)	781 (51.8)	27.3
Yes	240 (59.3)	486 (44.1)	726 (48.2)	<0.001
Enough measures by the government				
No	277 (68.4)	705 (64)	982 (65.2)	
Yes	81 (20)	210 (19.1)	291 (19.3)	6.5
Don't Know	47 (11.6)	187 (17)	234 (15.5)	0.04

Table 6: Logistic regression analysis of factors independently associated with the protective behavior of the Egyptian participants against COVID-19

Independent variables	OR (95% CI)	P-value
Residence of the participant	1 (reference)	
Rural	2.05 (1.52-2.77)	<0.001

Urban		
Governorate where the participant lives		
South Egypt	1 (reference)	<0.001
Central Egypt	1.98 (1.38-2.86)	
North Egypt	1.46 (1.11-1.92)	
Had enough knowledge about the COVID-19 pandemic		
No	1 (reference)	0.001
Yes	1.57 (1.21-2.02)	
worries about the COVID-19 pandemic		
No	1 (reference)	<0.001
Yes	2.28 (1.71-3.03)	
Potential exposure to COVID-19 infection		
No	1 (reference)	0.001
Yes	1.52 (1.18-1.95)	
Age of the participant		
Less than 30 years	1 (reference)	0.4
30 years or more	0.86 (0.62-1.19)	
Fear of the COVID-19 pandemic		
No	1 (reference)	0.08
Yes	1.28 (0.97-1.69)	
Socioeconomic status of the participant		
Low or average	1 (reference)	0.2
High	1.19 (0.91-1.58)	
The participant is responsible for looking after his family		
No	1 (reference)	0.7
Yes	1.08 (0.79-1.47)	

NB Dependent variable is good protective behaviors OR odds ratio CI confidence interval. ^a Statistically significant

adopted precautionary measures such as hand washing and respiratory hygiene during the pandemic of COVID-19.²⁰ Yildirim *et al.* (2020) reported that Turkish population were highly engaged in preventive behaviors, particularly frequent hand washing and avoidance of public transportation.²¹ Moreover, a survey from Malaysia reported that a high proportion of respondents were already adopting precautions such as avoiding crowds (83.4%) and practicing proper hand hygiene (87.8%) at the time of their study in late March, 2020, however, wearing of face masks was less common (51.2%).²²

Notably, low proportion of the Egyptian participants (12.7%) increased the number of groceries purchased. This is much lower than what was reported by Balkhi *et al.* (2020) who found that more than half of Pakistani stocked up on food.²³ Such behavior can be explained by the fact that about three quarters of the studied Egyptians had average to low income and may not have the resources to face the crisis, and a large proportion of the participants were not the main individuals taking the responsibility for feeding and looking after their families.

Study of the associations between the demographic characteristics of the respondents and the reported behaviors during COVID-19 pandemic revealed that females were more likely to apply physical distancing and to avoid crowded public places ($p < 0.001$), more anxious to cough or sneeze into elbow ($p < 0.001$), and more likely to avoid the use of public transport ($p < 0.001$). Females were also, more likely to report uptake of both preventive and avoidance behaviors, consistent with studies during SARS and H1N1 pandemic influenza.²⁴⁻²⁷ Earlier studies have indicated that women are more likely to perceive themselves to be susceptible and hence adopt the behaviors.^{28,29} Contrary, a study conducted by Balkhi *et al.* (2020) found that Pakistani males washed their hands more frequently than females and they were more likely to fear leaving their homes after the COVID-19 pandemic was declared.²³ Furthermore, our results showed that people aging 30 years and above were more likely to adopt protective behaviors by (82.4%) compared to younger age groups (62.1%). This finding is similar to that of a study conducted in Australia and found that older age was associated with the adoption of precautionary behaviors.¹⁹ This may be attributed to the feeling of the elder people that they are more susceptible to the complications of the COVID-19 infection since they may have more chronic diseases and pre-existing conditions than the younger ones. There was a higher tendency of urban residents to apply physical distancing, use face mask, wash their hands frequently, use hand sanitizers, cough or sneeze into elbow and cleaned surfaces more frequently. These results were in coherence with Mya *et al.* (2020) who observed that urban population have better access to internet and other information sources, which provide health education with possible explanation for practicing

protective behaviors compared to the rural population.³⁰

Studies during previous pandemics clarified that trust in health institutions and governmental initiatives to implement public health interventions play an important role to spur behavioral change, and it can indirectly affect the adoption of the recommended measures. The way the Singaporean government dealt with the SARS outbreak in 2003 is an important example exploring the importance of trust in dealing with crisis.^{31, 32} Those with greater trust in authorities to contain the spread of SARS and swine flu were more likely to adopt precautionary³³ and avoidant behaviors.²⁴

The current COVID-19 pandemic has caused an unprecedented healthcare crisis and a major disruption that triggered stronger governmental actions across the world. A large-scale survey covering 58 countries, 42% of respondents believe that their government's actions are not sufficient. In addition, a substantial proportion of respondents 36% indicated that they do not trust their government's handling of COVID-19, and 34% even stated that they believe their government has not been truthful about COVID-19.³⁴ In accordance with previous findings, our study found that nearly, two-thirds of Egyptians (65%) claimed that the measures taken by the Egyptian government to combat COVID-19 were not sufficient and 49.8% of them distrusted the Egyptian health authorities.

Nonetheless, the current study showed that about 80% believed that lockdown measures are important and beneficial to limit the spread of the current pandemic of COVID-19. However, perception towards the importance of sharing of the whole community to face COVID-19 was among 38.8%, which is lower than Mya *et al.* (2020) who reported that almost all respondents had positive perception towards community participation in the disease prevention.³⁰

In our results, 405 (26.9%) of the participants were categorized as having good behaviors since they practiced protective behaviors to prevent COVID-19. This figure approximates, which was reported by Mya *et al.* (2020) who found that about 22% of their participants were identified as good-behavioral people.³⁰ Additionally, about 78% and 73.6% of those who were categorized as good-behavioral individuals were anxious and had a feeling of fear, respectively, compared to 22.5% and 26.4% of those

who did not have these feelings. Moreover, almost all of the Egyptian participants with good behavioral change were aware about the seriousness of the COVID-19 disease (99.5%). These results were in line with several previous studies that emphasized that one of the central emotional responses during a pandemic is fear which makes threats more imminent.³⁵⁻³⁷ A meta-analysis conducted by Witte and Allen (2000) found that strong fear appeals produce the greatest behavioral change only when people feel a sense of efficacy.³⁸ However, fear-based behavioral change is usually unsustainable. After the threat has passed, it is predicted that these new habits will scale back considerably.³⁹ Therefore it is believed that emotional response to risky situations often drive risk perceptions and influence thinking.^{14, 40}

Hence the importance of caring about the peoples' emotions. As the negative emotions increase, people may rely on negative information about COVID-19 more than the true information to make decisions.⁸ The present study found that worries about the COVID-19 pandemic was the most important determinant of protective behaviors. Anxious participants were two times more likely to adopt protective behaviors than the non-anxious individuals were. This result was in coherence with Al Najjar *et al.* (2016) who reported a significant association between anxiety and avoidance behaviors including visiting public places and traveling.⁴¹ Increased level of anxiety may lead to mistrust in the measures that are being taken by the government.⁴² On the contrary, inconsistent results were reported by Mya *et al.* (2020) who found that knowledge alone could influence to practice protective behaviors.³⁰

Moreover, emerging sense of shared identity and concern of others, usually arise from the common interests, experiences and common social norms that affect both health behaviors and outcomes during disease outbreaks and foster in-group commitment.⁴³ In order to mitigate the devastating effects of COVID-19, population cooperation is needed which requires people to bear an individual cost to benefit other people because human health is not an isolated issue. So working 'with' rather than 'on' communities is greatly emphasized.^{44, 45} It is believed that health promotion, with all its experiences in community mobilization, empowerment, and health literacy programs, should

be part of disease prevention and control efforts from the very beginning. Health promotion knowledge needs to be fully integrated into infectious disease control, especially in the context of outbreaks.⁴⁶ Moreover, trust in governments and institutions helps individuals to adopt preventive measures and utilize health services, which in turn can increase testing rates, limit disease spread and reduce mortality.^{31, 47, 48}

It is important to pay a special attention to improve the people's emotions during the COVID-19 pandemic to help their compliance with its unprecedented consequences. Additionally, controlling the spread of rumors and misinformation, regarding the COVID-19 pandemic in the official media and the social media, is the responsibility of the government and the health authorities.

Finally, it is not clear, how long it might take for an effective treatment or a specific vaccine against the COVID-19 to be available, therefore, making sure that we adhere to the proper preventive health behaviors is going to be the key in helping to support and protect the Egyptian population.

CONCLUSION

The study concluded that the majority of the study sample participants adopted and complied with certain specific protective measures launched by the government. Residence of the participant, governorate where the participant lives, having enough knowledge about the COVID-19 pandemic, worries about the COVID-19 pandemic and high potential of exposure to COVID-19 infection were correlated significantly with the reported adoption of a spectrum of preventative health behaviors. The government needs to be truthful to the population and share facts regarding COVID-19 as these might help in alleviation of the psychological impacts of COVID-19. Involving local community and including youth in the individualized development and delivery of educational brochures that promote preventive behavioral measures could improve its acceptance and adoption. Further research on wider scale on different populations is warranted.

Ethical Approval

This study was approved by the Ethics Committee of Faculty of Medicine, Minia University. Participants were explained about the purpose of the study. They

have the full will to determine filling out or declining the survey. Choosing to proceed, filling out and submitting the questionnaire was considered as approval and informed consent of participation.

Strengths and limitations

One of the major strengths of this study is that it includes a sample that comprised participants from different Egyptian governorates, and it is the first study that could assess the adoption of the protective behaviors among Egyptians and their perception about the governmental response to the COVID-19 pandemic. However, some limitations existed, which included the following; firstly, the timings of the survey greatly influenced the responses collected which may have varied if the survey was conducted at earlier or later stages of the pandemic. Secondly, because of the online survey, non-response bias could be existing and the distribution of the survey through the internet allowed only those who can read and have internet access to participate. Lastly, evaluating behavior by self-reporting can cause overestimation and misrepresentation.

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