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Knowledge, Risk Perception, and Adherence to Preventive Behaviors of an Egyptian Community towards COVID 19 Pandemic

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A B S T R A C T

Background: COVID-19's knowledg**e,** public perceptions of the pandemic, and associated risk are important contributing factors that enhance public participation in disease preventive behaviors as well as lowering deterioration of the case and the need for hospitalization. **Objectives:** To assess knowledge about COVID-19, risk perceptions, adherence to disease preventive behaviors. **Method:** A cross-sectional study was conducted on a convenience sample of 400 Egyptian citizens, who are ≥18 years old and agreed to participate in the study. The respondents fulfill a questionnaire asking about socio-demographic characteristics, knowledge, risk perception, perceived benefits, perceived barriers, and adherence to preventive behaviors of COVID-19. **Results:** the analysis of data indicated that respondents' mean age was 26.8 ±9 years, none of the respondents know about the asymptomatic manifestation of the disease, 61.8% perceived a high chance of infection and 84.5% perceived that contracting COVID-19 represent a serious event. Female sex, better knowledge, and increased risk perception are more likely to enhance preventive behaviors. Regression analyses revealed that adherence to preventive behaviors differed by sex (β =2.2, P<0.05), perceived benefits (β =1.2, P<0.05), residence (β =.97, P<0.05), knowledge (β =.93, P<0.05) working status (β =.91, P<0.05), risk perception (β =.23, P<0.05), and perceived barriers (β = -.68, P<0.05). **Conclusions**: Studied respondents ignore the asymptomatic manifestation of the disease. Female sex and perceived benefits from preventive behaviors are the main influencing factor for their adherence.

INTRODUCTION

Since December 2019, the world has been dealing with a novel rapidly infectious virus known as Coronavirus disease 2019 (COVID-19) that first appeared in Wuhan, China, and quickly expanded outside the country to become an exceptional, worldwide public health problem.[1] The virus's unknown nature and high transmission capability, combined with significant morbidity and mortality, have sparked global concerns about the virus and declared as a pandemic by the WHO on 11 March 2020.[2] In comparison to previous epidemics, studies revealed that the COVID-19 virus has a much greater dispersal capacity than SARS or MERS.[3]

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The most common clinical manifestations associated with COVID-19 infection were fever, cough, fatigue, malaise, and shortness of breath[4] and in severe cases; it causes fatal pneumonia.[5]

COVID-19 pandemic is a public health emergency that necessitates public health emergency preparedness (PHEP). To recover from such an emergency, a wide range of prevention, mitigation, and recovery activities that necessitate the participation of both the government and the public are required.[6] Thus, public engagement is an essential component of PHEP that achieved by increased risk perceptions[7], increased level of awareness, as a result, they will implement the recommended preventive behaviors.[8]

Several countries have taken various preventive measures to halt virus spread. Wearing masks, frequent hand washing, maintaining at least a 6-

foot distance between individuals, avoiding touching face with hands, coughing and sneezing etiquette, avoidance of handshaking, and close contact with respiratory manifested persons, are among the recommended precautions.[9]

Acceptance of the public to adopt recommended behaviors are critical for crisis management, particularly in case of the absence of definitive treatment and shortage of vaccines, putting primary prevention and strong infection control measures as important available options.[10]

According to Health Belief Model (HBM)[11], perceived susceptibility, and severity of diseases, as well as perceived benefits of preventive behaviors and perceived barriers, are important contributors to people's willingness to adopt behavioral changes.

In the light of the importance of host behavior in reducing disease transmission and the widespread of the pandemic all over the country with the scarcity of studies that address adherence to COVID-19 preventive behaviors at that early stage of the pandemic, the current study was carried out aiming to assess knowledge about COVID-19 pandemic, risk perceptions, adherence to protective behaviors and determine its predictors among an Egyptian community.

METHOD

An analytical cross-sectional study was conducted among a sample recruited from an Egyptian community from May 2020 to May 2021.

The sample size was calculated using the Open-Epi, software package using a 50% frequency of adherence to preventive behaviors at a 95% confidence level, and absolute precision of 5%. The minimum required sample size was 384, we increased the sample size by 15% to overcome sample error to reach 442, the final sample was 400 individuals. They were recruited by convenience sampling technique. A group of 15 randomly chosen students of 4th grade of the faculty of medicine for Girls, Al-Azhar University helped researchers in data collection where they collect data from their surrounding communities in three months, so different Egyptian governorates were represented.

The chosen students received training to standardize data collection, continuous monitoring and follow-up with students occurred during the whole data collection process for better quality control of data.

According to inclusion and exclusion criteria, a non-probability sample was chosen.

The inclusion criteria were Egyptian individuals being residents in Egypt aged ≥18 years, and willing to participate, while the criteria for exclusion were those who are in health-related fields (medicine, nursing, pharmacology, etc.).

A self-administered questionnaire in the Arabic language that was constructed by researchers after reviewing literature[4-7-10] used for data collection. It is composed of the following sections: Socio-demographic characteristics: age, sex, marital status, residence, level of education, and working status; Knowledge about COVID-19 symptoms and mode of transmission which was composed of 12 questions that were answered by yes, no and I don't know, 1 point given for correct answer and zero for don't know or incorrect one. The total maximum knowledge score was 12 and the minimum was 0, with a higher score indicating a higher knowledge level; Sources of information about COVID-19and level of trust; Risk perception that includes a-Perceived susceptibility to COVID-19 which composed of 2 items, with rated response ranging from 1 for (low), 2 (intermediate) and 3 for (high); b-Perceived severity which was assessed by four items with rated responses ranging from 1 (not serious) to 3 (serious).Risk perception scores include both perceived susceptibility and perceived severity scores with a higher score indicating higher risk perception; Perceived benefits and perceived barriers of preventive behaviors; respondents were asked 2 questions for each item. Response rated on a 3-point Likert scale, 1(disagree) to 3 (agree); Preventive behaviors for COVID-19, composed of ten questions to assess how frequently they engaged in those behaviors using a 3-point Likert-type scale (always, sometimes, and rare). Answers of 10 questions were coded as 2 for yes, 1 for sometimes, and zero for no with a total score =20 a higher score indicating better adherence. The questionnaire took around 10-15 minutes to fulfill with 90.5% response rate.

Before the start of the research, validity and reliability of the questionnaire were assessed. Firstly, we asked two Egyptian experts in the field of public health to assess to which degree the items are relevant and can accurately measure our aims, accordingly we performed some modifications. The next step was a forward-backward translation of the questionnaire to ensure the accuracy of

Table 1: Knowledge and general perception related to COVID-19 pandemic among respondents

Knowledge about the mode of transmission and common symptoms	Yes N (%)	Don't know N (%)	No N (%)
- It is transmitted through respiratory droplets during coughing or sneezing.	388 (97.0)	0(0.0)	12 (3.0)
- It is transmitted through close contact with infected person.	392 (98.0)	2 (0.5)	6 (1.5)
- It is transmitted by touching of infected objects.	382 (95.5)	2 (0.5)	16 (4.0)
- Fever is a common symptom	394 (98.5)	4 (1.0)	2 (0.5)
-Dry cough is a common symptom	396 (99.0)	4 (1.0)	0 (0.0)
-Body aches is a common symptom	389 (97.3)	9 (2.3)	2 (0.5)
-Difficulty in breathing is a common symptom	394 (98.5)	6 (1.5)	0 (0.0)
-Sore throat is a common symptom	390 (97.5)	8 (2.0)	2 (0.5)
-Loss of taste and smell is a common symptom	246 (61.5)	134 (33.5)	20 (5.0)
-Diarrhea is a common symptom	279 (69.8)	119 (29.8)	2 (0.5)
-Fatigue is a common symptom	308 (77.0)	68 (17.0)	24 (6.0)
- COVID-19 infection may be asymptomatic	0 (0.0)	54 (13.5)	346 (86.5)
Risk perception items			
a--Perceived susceptibility	**High**	**Intermediate**	**Low**
-What do you think your chance of contracting the disease?	247 (61.8)	124 (31.0)	29 (7.2)
- How concerned are you about contracting COVID-19?	341 (85.3)	15 (3.7)	44 (11.0)
b-Perceived severity	**Serious**	**Slightly serious**	**Not serious**
How would you feel if you contracted COVID-19 disease	338 (84.5)	14 (3.5)	48 (12)
How would you feel the impact of disease on daily life activities	340 (85.0)	51 (12.7)	9 (2.3)
How seriously do you think COVID-19 in comparison to other entire species	323 (80.8)	65 (16.2)	12 (3.0)
How would you feel the fatality rate of COVID-19?	190 (47.5)	81 (20.3)	129 (32.2)
c-Perceived benefits	**Agree**	**Neutral**	**Disagree**
It is easy to control with adherence to protective behaviors such as hand washing, wearing a mask, social distancing	275 (68.8)	79 (19.8)	46 (11.4)
I can adhere to protective behaviors to protect myself	359 (89.8)	18 (4.4)	23 (5.8)
d-Perceived barriers	**Agree**	**Neutral**	**Disagree**
Feeling of discomfort from wearing a mask and social distancing	376 (94.0)	8 (2.0)	16 (4.0)
Feeling of worry from shortage and cost of mask and disinfectants	319 (79.8)	26 (6.4)	55 (13.8)

a translation. Finally, pretesting of the questionnaire on 40 respondents who were asked to fill the questionnaire twice 2 weeks apart to assess reliability, the internal consistency was assessed using Cronbach's alpha. The results showed adequate reliability and internal consistency (0.76, 0.72, 0.65, 0.87,0.85) for knowledge, risk perception, perceived benefits and perceived barriers, preventive behaviors respectively,

Statistical analysis:

Statistical analysis was performed using SPSS 23 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp). Tests of normality were done. Frequencies and percentages were used for qualitative data, mean and standard deviation for quantitative one.

For nonparametric data, Mann Whitney U test used for comparison between two groups and Kruskal Wallis for more than 2 groups.

A multivariate linear regression was performed for significant variables to predict factors that affect knowledge, risk perception and adherence to preventive behavior toward COVID-19. The level of significance was taken at $p < 0.05$.

RESULTS

The respondents' mean age was 26.8 ±9 years, 55.8% aged between 20 to 30 years, 66.5% were females, and 68.8% were single. Moreover, 65.3% were residing in urban areas. Most of the

Table 2: Adherence of studied respondents to preventive behaviors toward COVID-19 pandemic

Adherence to preventive behaviors	Always N (%)	Sometimes N (%)	Rare N (%)
- Wash or disinfect their hands more than usual.	285 (71.3)	38 (9.5)	77 (19.2)
- Covering mouth and nose during coughing or sneezing.	257 (64.3)	29 (7.2)	114 (28.5)
- Disinfect frequently touched surfaces.	249 (62.3)	32 (8.0)	119 (29.7)
- Keeping enough space when dealing with people.	244 (61.0)	83 (20.7)	73 (18.3)
-Wearing face mask when they went outside	173 (43.3)	49 (12.2)	178 (44.5)
- Avoid touching eyes, nose with your hands.	193 (48.3)	63 (15.7)	144 (36.0)
-Avoid close contact with people with flu symptoms.	266 (66.5)	34 (8.5)	100 (25.0)
- Stay at home if you are sick.	264 (66.0)	37 (9.3)	99 (24.7)
- Avoid shaking hands with others.	223 (55.7)	70 (17.5)	107 (26.8)
- Avoid public places, large gatherings, and public transport.	215 (53.8)	52 (13.0)	133 (33.2)

Table 3: knowledge, risk perception, and adherence to preventive behaviors as regards the socio-demographic characteristics of respondents

Items	Knowledge	Significance tests	Risk perception	Significance tests	Preventive behaviors	Significance tests
Age (years)						
<20	9.6±1.6		15.3±1.6		13.2±5.2	
20-30	10.1±1.3	(0.07)	15.5±1.7	(0.002*)	14.5±4.4	(0.002*)
>30	9.8±1.3		16.1±1.5		16.6±3.3	
Sex						
Male	9.5±1.5	Z= -3.6	15.6±1.7	Z= -0.12	12.9±4.3	Z= -6.7
female	10.1±1.2	(0.000*)	15.7±1.7	(0.8)	16±4.1	(0.000*)
Marital status						
Single	9.7±1.2	Z= -2.9	15.6±1.6	Z= -2.1	14.5±4.5	Z= -2.6
married	9.9±1.4	(0.003*)	15.9±1.8	(0.03*)	15.9±1.7	(0.008*)
Residence						
Urban	9.9±1.3	Z= -0.4	15.5±1.7	Z= -1.6	14.4±4.5	Z= -3.4
Rural	9.8±1.4	(0.7)	15.9±1.5	(0.1)	16.1±±3.8	(0.001*)
Education						
Before university	9.4±2.1	Z= -0.5	15.6±1.6	Z= -0.2	13.1±5.6	Z= -1.8
University and higher	9.9±1.2	(0.6)	15.7±1.7	(0.8)	15.1±4.2	(0.06)
Working status						
Working	9.9±1.4	Z= -1.6	15.5±1.7	Z= -2.1	14.6±4.4	Z= -2.5
Not working	9.7±1.3	(0.1)	16.1±1.6	(0.03*)	15.8±4.1	(0.01*)

respondents (92.2%) were highly educated, and 25.7% weren't working.

Most of the respondents were aware of the common modes of transmission and disease symptoms. the lowest level of knowledge appertained to asymptomatic form of the disease (Table1), with significantly higher knowledge score among female and married respondents (p value <0.05) (table 3).

The most commonly stated sources of information related to COVID-19 were social networking sites (68.8%), government official sites (38.5%), health professionals (20.5%), family and friends (16%). However, the most trusted source was health professionals (67.3%) and social networking sites were the least one (14.5%).

Most of respondents (61.8%) perceived a high chance of infection with COVID-19 and (85.3%) were highly concerned about contracting COVID-19. Furthermore, 84.5% perceived that contracting of COVID-19 represent a serious problem with severe impact on daily life activities (85.0%), and (80.8%) perceived that COVID-19 is more severe

in comparison to other entire species (SARS CoV – MERS CoV) and (47.5%) feel it is fetal.

Table 4: Correlation between knowledge, health belief model constructs, and Adherence to preventive behaviors

Items	Adherence to preventive behaviors	
	r	P value
Knowledge	0.5	0.000
Risk perception	0.4	0.000
Perceived benefits	0.4	0.000
Perceived barriers	-0.2	0.000

As regards perceived benefits of preventive behaviors, 68.8% perceived that COVID-19 is easy to control with adherence to preventive behaviors such as hand washing, wearing a mask, social distancing and 89.8% believed that they can adherence to preventive behaviors.

On the other hand, 94.0% feel discomfort from wearing a face mask and social distancing, and 79.8% are worried about shortage and cost of masks and disinfectants (Table 1).

As regards the recommended preventive behaviors, the most frequently practiced behavior was hand washing (71.3%) followed by 66.5% avoiding close contact with people with flu symptoms, 66.0 % staying at home when they are sick and 61.0% keeping enough space when dealing with other people, however, 44.5% not wearing face mask outside, only 48.3% avoiding touching eyes and nose with their hands (Table 2).

Older respondents > 30 years old, married, and not working respondents had higher risk perception than other counterparts (p value <0.05) (table 3). While, age was the only significant predictor for risk perception (β =.02, P<0.05) (Table 5)

There were statistically significant differences in adherence to preventive behaviors among respondents as regards age, sex, marital status, residence, and working status. Older respondents > 30 years old, female, married, rural residence, and not working respondents are more adherent to preventive behaviors (p value <0.05) (table 3).

There was a significant positive correlation between adherence to preventive behaviors with knowledge, risk perception, and perceived benefits (p value <0.05) while a statistically significant negative correlation was found between adherence to preventive behaviors and perceived barriers (p value <0.05) (table 4).

By analyzing the predictors for adherence to preventive behaviors, sex, residence, working status, knowledge, and health belief model constructs accounted for approximately 50% of the variance in adherence to preventive behaviors of COVID 19, (adjusted R2 = 0.5, P<0.05). As shown in the table, sex (β =2.2, P<0.05), perceived benefits (β =1.2, P<0.05), residence (β =.97, P<0.05),knowledge (β =.93, P<0.05) working status(β =.91, P<0.05), risk perception (β =.23, P<0.05), were significant positive predictors for behavioral adoption, while perceived barriers was negative significant predictor (β = -.68, P<0.05).

DISCUSSION

The current study respondents were aware about common symptoms and mode of transmission of COVID-19. This was consistent with the findings of Kuang et al, who reported adequate level of awareness about COVID-19 symptoms and mode of transmission.[12]

They were, however, unaware about disease asymptomatic form and the critical role of asymptomatic patients in infection transmission. This finding reflects a gap in emphasizing the important role of transmission of COVID-19 via asymptomatic patients. This was similar to a systematic review that was conducted in China on 6 studies and showed that infection transmission through asymptomatic patients add a challenge to virus control, especially when combined with lack of adherence to preventive behaviors such as wearing a face mask, social distancing, and large people gathering.[13]

In the current study, 61.8% thought that they were susceptible to COVID-19 and 84.5% thought that contacting viruses is a serious problem. Interestingly, Kwok et al. reported that 89% of their respondents thought they were susceptible to COVID-19 and 97% thought the virus cause severe symptoms. [10]

Furthermore, Shahnazet al[14] found that 70.3% of respondents were susceptible to COVID-19 and 72.6% considered disease as dangerous.

This finding was in line with an Iranian study that found a high perceived risk of COVID-19 among investigated respondents, with a positive effect on health behavioral response.[15]

However, in a study conducted in South Korea by Lee and You[7], respondents' perceived low susceptibility, with only 19.6 % believed that they were susceptible to infection; however, their

Table 5: Predictors of adherence to preventive behaviors toward COVID 19 pandemic

Variables	B	p-Value	95% CI	
			Lower	Upper
Predictors of adherence to preventive behaviors				
Sex (ref male)	2.2	.000	1.5	2.8
Residence (ref urban)	.97	.006	.28	1.7
working status (ref working)	.91	.019	.15	1.7
Knowledge	.93	.000	.72	1.1
Risk perception	.23	.000	.1	.35
Perceived benefits	1.2	.000	.87	1.5
Perceived barriers	-.68	.000	-.9	-.46
Predictors of knowledge				
Sex (ref male)	0.5	0.000	0.2	0.8
Marital status (ref single)	0.23	0.11	-0.05	0.5
Predictors of risk perception				
Age	0.02	0.000	14.3	16.1
Marital status (ref single)	0.005	0.98	-0.009	0.04
Working status (ref working)	0.25	0.28	-0.21	0.7

perceived severity was relatively high (68.5%). This difference may be conduction of Korean study in early pandemic stage so the respondents underestimated the rapid spread of the disease, also they denied their susceptibility because adoption of preventive behaviors such as lockdown may affect their economic status.

Güner et al.[16] reported that wearing face masks reduces virus transmission from asymptomatic or pre-manifested patients, so it is necessary for closed spaces, in public transportation, and for crowded places. The current study found that hand hygiene was the most practiced preventive behaviors (71.3%). Research performed in Jeddah, Saudi Arabia by Almutiri et al.[17] supported this finding by observing the adherence to hand washing among 81.7% of their respondents. In addition, Huong et al.[18] found that (79.3%) of their respondents wash their hands frequently.

The adherence to wearing a face mask in public places was 43.3%, which is lower than that reported by Almutiri et al.[17] (88.3%). This observed great disparity between in findings may be due to the high cost and unavailability of masks that reported by 79.8% and 94% of respondents suffered discomfort when wearing masks.

Another major recommended preventive measure is social distancing to prevent droplet transmission.[19] However in Egypt, keeping enough spaces between individuals may be difficult due to overcrowding in workplaces, transportation means, and lack of strict regulations in shopping centers. Additionally, social norms that support individual gathering, that is why only 61% of respondents maintain enough spaces with people despite its importance.

A nearly similar finding was reported by another Egyptian study conducted by Bakry and Waly[20] where they found that 71% of the respondents keep enough space when dealing with people. Moreover, the current results showed that about 24.7% of the respondents were not committed to staying at home when they are sick; this behavior when combined with inadequate social distancing it could worsen the situation of the pandemic.

Additionally, 29.7% of the respondents rarely disinfect touched surfaces at their homes. This is similar to a study conducted on 1726 respondents in Uganda assessing their risk adherence to preventive behaviors which found that only 20% of the respondents adhere to disinfecting their surroundings.[21]

In the current study, the respondents mentioned some perceived barriers towards adherence to protective behaviors such as discomfort and irritability when wearing a mask, in addition to other environmental barriers such as shortage and cost of masks, alcohol, and disinfectants. This is consistent with the results of a cross-sectional study conducted in Ethiopia on 683 respondents exploring low overall adherence levels to the recommended safety behaviors during the COVID-19 pandemic. This was explained by the different perceived barriers especially discomfort on wearing masks and the economic issues concerning the protective measure.[22]

This also was in line with the study of Ferrer and Klein[23] that found that people were more likely to engage in protective behavior if they perceived its benefits in reduction of disease susceptibility. However, perceived barriers can antagonize their act despite inner desire to engage, thus focusing on these attributes is necessary to adopt protective behaviors and interrupt disease spread.

Based on our data analysis, knowledge, risk perception, and adherence to COVID- 19 preventive behaviors may varied by age, sex, marital status, residence, and working status, perceived benefits from protective behaviors, and perceived barriers.

Respondents older than 30 years old had higher risk perception and adherence to preventive behaviors. This is similar to a cross-sectional study conducted by Saeed et al.[24] in Iraq which showed respondents aged above 30 years had a better practice toward COVID-19 pandemic than the younger group. Older respondents had more experience and responsibilities that oblige them to adhere to preventive behaviors.

Females displayed better knowledge and adherence to preventive behaviors than males. In a study by Shahnazet al[14] on Iranian people, females showed better adherence to preventive behavior than males. In contrast, Abdul-Hafez et al [25] showed that men and women had the same levels of awareness and adherence about the COVID-19 disease. These disparities between males and females could be attributed to personality differences of both sexes. Females are considerably more sensitive and health-conscious than males, especially when the issue affects their families.

In the current study, married respondents displayed better knowledge, higher risk perception, and better adherence to preventive activity than singles. This is consistent with Asnakewet al [26], as being married add more responsibility on individuals, more fear from infection transmission between family members, and serious disease consequences.

Furthermore, those living in rural regions adopted more preventative behavior than city dwellers. This is different from an American online survey [27] conducted on 5000 respondents showed that rural residents were significantly less likely to participate in COVID-19 related preventive behaviors. In Egypt, most awareness campaigns are directed to rural areas. Also, most of those who are in rural areas live with their extended families having elderly people in their household, unlike most urban people who live with their nuclear families. So, rural respondents fear from infection transfer to their elderly parents.

Moreover, not working respondents had higher risk perception and adherence to preventive behaviors. This is in line with the study of Saeed et al.[24] which reported higher knowledge and good practice among the non-employed respondents.

In the current study, there was a significant positive correlation between adherence to preventive behaviors and knowledge, risk perception, and perceived benefits. This was similar to the study of Lu et al.[28] conducted on 4359 American adults which showed higher knowledge and risk perception is associated with a higher frequency of practicing preventive behavior. In consistent with Egyptian a study conducted by Barakat and Kasemy[29] a significant negative correlation was found between adherence to preventive behaviors and perceived barriers.

***Limitation*:** The study had many limitations: the current situation of the pandemic does not permit for random selection of respondents, and generalization of results. The respondents' adherence was based on self-reporting of their behavior that may cause bias, the reluctance of some members to participate due to phobia from just talking about disease and denying of the pandemic was another limitation.

Ethical consideration

All respondents provided informed written consent before participation in the study and were told about the study's purpose, procedure, and confidentiality of their information. The study was approved by the Research Ethics Committee of the Faculty of Medicine for Girls, Al Azhar University.

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