



Egyptian Public's Knowledge, Attitudes, Perceptions, and Practices toward COVID-19 Infection and Their Determinants. A Cross-Sectional Study, 2020

Doaa I. Omar¹, Samar A. Amer^{2*}

¹Department of Community, Environmental and Occupational Medicine, Benha Faculty of Medicine, Benha University, Banha, Egypt; ²Department of Public Health and Community Medicine, Zagazig University, Zagazig, Egypt

Abstract

BACKGROUND: The outbreak of coronavirus pandemic in Wuhan, China, since December 2019 has been the major public health concern. With the absence of an effective vaccine or treatment for the disease, current control measures are directed toward preventive measures to lessen disease burden and to curb the spread of the virus.

AIM: The aim of the study was to assess knowledge, attitudes, perceptions, and practices (KAPP) of adult Egyptians toward COVID-19 and to study their determinants.

METHODS: A community-based cross-sectional survey of a random sample of 999 Egyptian residence aged 16 years and above, it was conducted between April and June 2020 using self-administrated online questionnaire. It consisted of 15, five, and eight questions pertaining to knowledge, attitude, and practices toward COVID-19, respectively, in addition to demographic data. Data were analyzed using SPSS Statistics 23.0 at a level of significant at $p \leq 0.05$.

RESULTS: Out of the 999 participants, 628 (62.8%) were aged (20-<40y), 666 (66.7%) were females 576 (57.6) from urban residence, 665 (66.7%) were married with university educated or higher 605 (60.5%), and only 105 (10.5%) had chronic diseases. The total knowledge score was significantly higher among highly educated, females, in rural areas, married, and governmental workers, while higher educational status, females, married, smokers, and being without chronic diseases and governmental workers were significantly associated with higher practice scores.

CONCLUSIONS: Egyptian participates had good level of knowledge, positive attitude about COVID-19 infection and, poor practice; however, community educational campaigns are necessary to ensure to improve on practice campaigns.

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***Correspondence:** Samar A. Amer, Associate Professor of Public Health and Community Medicine, Zagazig University, Egypt. E-mail: dr_samar11@yahoo.com
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Introduction

COVID-19 is an emerging respiratory infection; it was first discovered in December 2019, in Wuhan city, China [1]. By the end of January 2020, the World Health Organization (WHO) has announced an international public health emergency and called for the organized, collaborative efforts at all levels worldwide, for prevention and control its spread [2] Later on, declared it as a "global pandemic" [3].

COVID-19 belongs to a wide family of single-stranded RNA viruses that cause illnesses ranging from common cold to severe disease [4]. Most common symptoms are: Fever, dry cough, and fatigue. Less prevalent symptoms: Body aches and pains, sore throat, headache, conjunctivitis, diarrhea, loss of taste or smell, skin rash, or discoloration of fingers or toes. Serious symptoms are: Difficult breathing or shortness of breath, chest pain, and loss of speech or movement [5]. Older people, and those with chronic diseases such as cardiovascular disease, diabetes

mellitus, chronic respiratory disease, and cancer are more prone to develop serious illness.

COVID-19, primarily is a droplet infection, so washing hands regularly with soap and water, or hand sanitizer, avoiding touching the face and practicing physical distancing and refrain from smoking or other practices that weaken the respiratory system, are primary preventive measures [6].

No proven effective treatments or vaccines are available to control COVID-19 posing a significant threat to health-care delivery. The best way for prevention and control is raising awareness about the COVID-19 virus and disease [6]. To minimize the spread of the virus and flatten the curves, most nations, including African countries, have applied strict prevention and control measures to curb the disease including regulations such as general lockdown, ban on public gatherings, obligatory home quarantine, international flights restrictions and raising awareness on proper hand wash, hygiene, and sanitation as well as social distancing [7].

Egypt is one of the biggest countries in the Arab region, Africa and the Middle East with more than 100 million citizens [8]. Egypt announced the first COVID-19 cases in February 2020, by the beginning of April of 2020, there were over 800 confirmed cases, with more than 50 fatalities [9]. This followed by increase in the number of cases exceeding 91,000 confirmed cases and over 3200 deaths. Low- and middle-income countries in Africa including Egypt, face difficulties in preventing and controlling the spread of the disease due to their inadequate preparedness accompanied by low allocated resources, which could lead to catastrophic consequences [10].

The Egyptian government explore its efforts facing COVID-19 pandemic and declared that work was carried out on 6 axes, which were the application of preventive measures, the ban on the movement of citizens and the limitation of gatherings, the strengthening of medical infrastructure, the provision of strategic supplies and goods, the reduction of the repercussions of "Corona" on the Egyptian citizen and economy, and the return of Egyptian People stranded abroad and media awareness and confronting rumors [11].

In Egypt, the high number of Egyptian citizens could be associated with a great risk of spread and mortality. To slow the spread, minimize the crowd the government enforced a nighttime curfew for 2 weeks starting from the last week of March 2020 and close all restaurants and cafes for the same period of time [12]. The effectiveness of these efforts depends on the public awareness of the COVID-19 infection.

Thus, this study aims to assess the Egyptian public knowledge, attitudes, perceptions, and practices (KAPP) regarding COVID-19, and obstacles they face during the implementation of practices during the pandemic. KAPP is a corner stone to provide better insights to direct the policy and health decision makers toward the weakness points and gaps in knowledge and practice, and the development of preventive strategies and health promotion programs targeting those points. In addition to provide baseline information about the Egyptian society, to determine the type and level of intervention that may be required to change misconceptions, adapt, and implement behavioral changes health measures.

The Methodology

This cross-sectional study was conducted among the general population of Egypt, from April 15, 2020, to June 15, 2020. The target population were all the residents of Egypt during the study period, and using internet excluding the illiterate, COVID-19 cases, and health-care provider (doctor, nurse, pharmacist, technician, dentist, etc.)

The calculated sample size was 385, at a 95% confidence level, and 80% power of the study, with a hypothesis that 50% of the respondents would have a satisfactory knowledge level of COVID-19. Considering the low response rate of online surveys, the sample size tripled to be 999 participants.

The data collection tool; well-structured, pretested, online self-administered, Arabic questionnaire, prepared based on the WHO course materials emerging respiratory viruses, including COVID-19: Methods for detection, prevention, response [13]. The questionnaire was validated by two experts and pilot study was done on 15 participants to ensure comprehension and clarity and its results were not included in the study (Appendix).

The questionnaire composed of five main sections as follows in order;

1. Socio-demographic and medical history; age, sex, residence, education, occupation, marital status, smoking history, and presence of chronic disease
2. Knowledge section: Composed of 32 questions (Q) (symptoms; 8 Q, mode of transmission: 8 Q, risky groups: 7 Q, and knowledge about preventive measures: 9 Q) and the source of information about COVID-19 infection
3. Attitudes Section: Composed of 4 Q to evaluate attitude. The attitude toward the disease represented by 1 questions, while the attitude toward the available intervention measures was represented by 3 Q [14]
4. Perceptions Section: Composed 7 Q to evaluate perceptions, one Q for perceived severity, 2 Q for perceived susceptibility, 2 Q for perceived benefits from intervention, and 1Q for perceived barriers
5. The practice section was represented by 16 Q to assess the practice during the previous 2 weeks.

N.B; The scoring system; as regard

- Knowledge score; the correct answer was assigned 1 and the incorrect or do not know answer was assigned zero, a higher score indicating better results
- Practice; through a Likert scale, no and rare were assigned as zero. Often and sometimes were assigned as one. Always was assigned as two.

The percentage of the total score of the knowledge, and practice scores were categorized according to bloom's cutoff point, as good if the score was between 80% and 100%, moderate if the score was between 60% and 79%, and poor if the score was <60% [15]. Using a convenient sampling method, the data were collected through an online self-administered survey portal, Google form was created, and participants were invited to complete and submit the questionnaire, after a written informed consent. The questionnaire was distributed through private Facebook and What's

App accounts the most famous platforms in Egypt and to increase the response rate, continuous reminder messages were sent.

Statistical analysis

The data were analyzed using SPSS version 23, and a level of significance ($p < 0.05$). Qualitative data were presented as frequency and percent, while quantitative data were presented as mean \pm standard deviation (SD). Student's t-test was used to compare the mean between two groups while ANOVA (f test) was used to compare the mean between more than two groups. Pearson's correlation coefficient (r) was used to test the association between two continuous variables.

Results

A total of 999 participants were enrolled in the study. 628 (62.8%) were among the age group (20 -< 40 y), majority of them 666 (66.7%) were females 576 (57.6) from urban residence, 665 (66.7%) were married, with 605 (60.5%) university educated or higher, and only 105 (10.5%) had chronic diseases.

Out of the 999 participants about 97.5% of participant clearly stated that the symptoms of COVID-19 were fever and difficulty of breath, 98% reported that the virus is typically spread through contact with

airborne droplets. As regard the high risk groups, 985 (98.5%) reported older population, and around 96.6% reported that chronic diseases and HCWs. A majority of participants about (99.0%) knew coronavirus can be prevented by implementing measures such as regular handwashing, social distancing, and disinfecting contaminated surfaces (Tables 1 and 2).

The most popular sources of information about COVID-19 infection were social media (64.5%), followed international and governmental official websites (12.8%), family members (12.4%), and (TV and radio) (6%) (Figure 1).

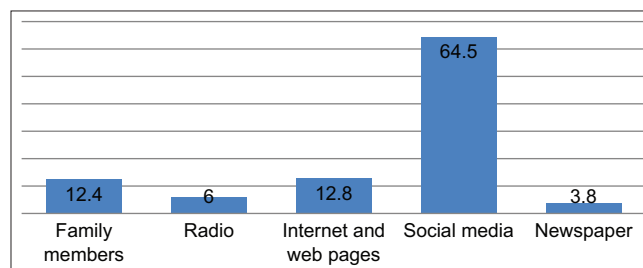


Figure 1: The sources of information about COVID-19 infection among Studied Egyptians

Regarding knowledge of COVID-19 infection; 528 (52.8%) of participants showed good level of knowledge, the average percentage of the overall knowledge score was $80.9\% \pm 7.1$. The average percentage of knowledge in descending order was knowledge about preventive measures (99.2 ± 2.3), symptoms (88.4 ± 17.3), risky groups (76.1 ± 15.2), and the lowest was as the percentage of knowledge about the mode of transmission (54.3 ± 14.5).

Table 1: The Public's knowledge toward COVID-19 infection

Knowledge variables	No	Don't know	Yes	Total	Total knowledge	
Knowledge about the symptoms						
Fever	16 (1.6)	8 (0.8)	975 (97.5)	Score=7.1 \pm 1.3 0-8	Total knowledge score=25.9 \pm 2.3 15-32	
Cough	36 (3.6)	40 (4.0)	923 (92.3)			
Difficulty of breath	16 (1.6)	14 (1.4)	969 (97.0)	Score percentage=88.4 \pm 17.3		
Fatigue	64 (6.4)	116 (11.6)	819 (82.0)			
Sore throat	54 (5.4)	40 (4.0)	905 (90.6)			
GI/T upset (vomiting and diarrhea)	116 (11.6)	130 (13.0)	753 (75.3)			
Loss of smell and taste	84 (8.4)	96 (9.6)	819 (82.0)			
Asymptomatic	26 (2.6)	36 (3.6)	937 (93.8)			
Knowledge about the mode of transmission						
Drople	12 (1.2)	8 (0.8)	979 (98.0)	Score=4.3 \pm 1.2 0-8		
Contact	16 (1.6)	4 (0.4)	979 (98.0)			
Blood born	163 (16.3)	296 (29.6)	540 (54.1)	Score % = 54.3 \pm 14.5		
Zoonotic	232 (23.2)	305 (30.5)	462 (46.2)			
Food	197 (19.7)	144 (14.4)	658 (65.9)			
Drink	253 (25.2)	185 (18.5)	562 (56.3)			
Airborne	221 (22.1)	191 (19.1)	587 (58.8)			
Indirect contact	10 (1.0)	8 (0.8)	981 (89.2)			
Knowledge about the high risk groups						
All community members	430 (43.0)	42 (4.2)	527 (52.8)	Score 5.3 \pm 1.1 1-7	Total knowledge % = 80.9 \pm 7.1 (46.8-100.0)	
Patients with chronic diseases	10 (1.0)	26 (2.6)	963 (96.4)			
Pregnant females	44 (4.4)	118 (11.8)	837 (83.8)			
Children	381 (38.1)	126 (12.6)	492 (49.2)			
Older people	8 (0.8)	6 (0.6)	985 (98.5)	Score % = 76.1 \pm 15.2		
Healthcare workers (HCWs)	12 (1.2)	20 (2.0)	967 (96.8)			
Smokers	65 (6.5)	188 (18.8)	746 (74.7)			
Knowledge about the preventive measures						
Hand washing with soap and water	4 (0.4)	0 (0.0)	995 (99.6)	Score=8.9 \pm 0.2 7-9		
Using tissue during coughing or sneezing	4 (0.4)	4 (0.4)	991 (99.2)			
Cough etiquette	16 (1.6)	26 (2.6)	957 (95.8)	Score % = 99.2 \pm 2.3		
Avoid touching eyes, nose and mouth with hands	--	4 (0.4)	995 (99.6)			
Avoid direct contact with cases	--	6 (0.6)	993 (99.4)			
Wearing masks in crowded places	--	0 (0.0)	999 (100.0)			
Keep personal hygiene	12 (1.2)	6 (0.6)	981 (98.2)			
Social distancing (2 m)	8 (0.8)	0 (0.0)	991 (99.2)			
Cleaning and disinfection of groceries	8 (0.8)	0 (0.0)	991 (99.2)			

* $p < 0.05$ There were statistical significant difference.

Assessment of attitude toward COVID-19 infection; (Table 3); generally, the majority of the participants had a positive attitude toward the inquired preventive measures items with a mean 14.5 ± 3.2 . 943 (94.4%) agreed that COVID-19 is curable, 989 (99.0%) believed that Lockdown measures designed by the Egyptian government to reduce transmission of infection are essential, and 954 (95.5%) agreed that the isolation of COVID-19 cases at specialized hospitals is essential, but only 329 (32.9%) believed that Egyptian's health awareness level is satisfactory.

Table 2: The level of knowledge among studied participants

The levels of knowledge	F (%)
Low level of knowledge < 60%	123 (12.3)
Moderate level of knowledge 60 < 80	348 (34.8)
High level of knowledge 80–100%	528 (52.8)

Assessment of perceptions toward COVID-19 infection; (Table 4); 990 (99.0%) perceived themselves as susceptible, and 925 (92.6%) perceived severity of the disease. On the other hand, as a perceived benefit

Table 3: The attitude of among the participants toward COVID-19 infection

Participants attitudes	Disagree	Borderline	Agree
Attitude towards the infection			
COVID-19 infection is a curable	28 (2.8)	48 (4.8)	923 (92.3)
Attitude toward prevention and control of spread of infection			
Lockdown measures by the authorities are essential to prevent spread of the infection	8 (0.8)	18 (1.8)	973 (97.3)
Isolation of COVID 19 cases at specialized hospitals is essential	37 (3.7)	8 (0.8)	954 (95.5)
Egyptian's health awareness about the COVID-19 is satisfactory	616 (61.7)	54 (5.4)	329 (32.9)

from preventive interventions; 973 (97.4%) believed that early detection and management will improve the outcome, and 989 (99.0%) stated that following the preventive measures, decrease the risk of infection.

Table 4: The Health Belief Model among the studied participants

Participants perceptions (health belief model)	Disagree	Borderline	Agree
Perceived susceptibility			
Perceived susceptibility of infection	2 (0.2)	8 (0.8)	990 (99.0)
Why you perceive yourself as susceptible person F (%)	84 (8.4)	304 (30.4)	611 (61.2)
Everyone is susceptible as going outdoors=760 (76.1)			
Coming from abroad=32 (3.2)			
Contact with COVID-19 positive case=20 (0.2)			
Contact with travelers from abroad=42 (4.2)			
Had chronic diseases=44 (4.4)			
Smoker=40 (4.4)			
Perceived severity			
COVID-19 infection is a serious disease.	60 (6.0)	14 (1.4)	925 (92.6)
COVID-19 Perceived benefits.			
Early detection of COVID-19 can improve the outcome	24 (2.4)	32 (3.2)	943 (94.4)
Follow preventive measures decrease the risk of exposure to infection	2 (0.2)	8 (0.8)	989 (99.0)
Perceived barriers			
Economic burden	357 (35.7)		
Lack of commitment of other community members	467 (46.7)		
Dislike using face masks	139 (13.9)		
Going to work is necessary	297 (29.7)		
Expensive masks	266 (26.6)		
Expensive disinfectant	438 (43.8)		
Unavailable disinfectant	156 (15.6)		
Unavailable soap	16 (0.16)		
Embarrassing on wearing masks in public	51 (5.1)		
Cannot tolerate mask in hot weather	405 (40.5)		

Practices of preventive measures toward COVID 19; 785 (78.5%) of participants were classified

as poor practice. The mean total practice score 52.7% and 9.6% SD (Table 6).

As regard daily activities, most of the respondents, 920 (92.1%), always safely dispose tissues, 886 (88.7%) washing their hands with soap and water, 857 (85.8%) Wearing masks in crowded places, and 810 (81.8%) practicing cough etiquette in absence of tissue, while only 639 (64.0%) always used hand sanitizers.

As regard their preventive measures practices during the past 2 weeks, most of people always maintained personal hygiene 947 (94.8%), about 88% avoided travelling to infected areas and eating in restaurants, 862 (86.3%) staying indoor and going outdoor for necessity, while only 333 (33.3%) practicing regular physical activity (Table 5).

The total knowledge score was significantly higher among highly educated, females, in rural areas, married and governmental workers, while higher educational level, married females, smokers, absence of chronic diseases, and governmental workers were significantly associated with higher practice scores ($p < 0.05$) (Table 7).

There was a statistical significant direct correlation between the total practice score and the total knowledge score about COVID-19 symptoms, mode of transmission, preventive measurements, and the total knowledge score (Table 8).

Discussion

The COVID-19 pandemic is a major public health problem in Africa including Egypt [16]. With the absence of an effective vaccine or approved treatment for COVID-19, current control measures are directed toward community education on disease and preventive measures to decrease the disease burden and interrupt the spread of the virus so this study assessed the KAPP toward COVID-19 preventive measures among inhabitants of Egyptians as a key to effective containment.

The findings showed that 80.9% of the respondents have adequate knowledge about COVID-19 infection that corroborates with Ngwewondo *et al.* [17] findings which recorded a knowledge score of 84.2% in Cameroon, and the 83% overall knowledge percentage in India. However, this finding is higher than that the study in Northwest Ethiopia [15] and that conducted in Buea, Cameroon [18] and is the 90% reported % among Chinese [19] and Iran Population. However, most of participants were educated and had an academic degree [14].

Regarding the knowledge about transmission and risky groups (54.3% and 76.1%), these results

Table 5: The practice of preventive measures among studied participants

The practice of preventive measures	No = 0	Sometimes = 1	Always = 2	The total
Daily activity				Mean \pm SD
Washing the hands with soap and water	(0.2)	111 (11.1)	886 (88.7)	Range The total score = 16.8 \pm 3.6 (0–16)
Using hand sanitizers	48 (4.8)	312 (31.2)	639 (64.0)	
Using tissue during coughing or sneezing	23 (2.3)	141 (14.1)	835 (83.6)	
Safe disposal of tissues	16 (1.6)	63 (6.3)	920 (92.1)	
Cough technique in absence of tissue	36 (3.6)	153 (15.3)	810 (81.8)	
Wearing masks in crowded places	50 (5.0)	92 (9.2)	857 (85.8)	
Practices during the previous 2 weeks				The percentage of the total practice = 52.7 \pm 9.6 (0–92.5)
Avoiding travelling to infected areas	28 (2.2)	88 (8.8)	883 (88.4)	
Avoiding eating in restaurants	32 (3.2)	86 (8.6)	881 (88.2)	
Avoiding crowded places	28 (2.8)	180 (18.0)	791 (79.2)	
Staying indoor and going outdoor for necessity	52 (5.2)	85 (8.5)	862 (86.3)	
Avoiding going to school, college or work	120 (12.0)	160 (16.0)	719 (72.0)	
Avoiding shaking hands	53 (5.3)	232 (23.2)	714 (71.5)	
Avoiding public transportation methods	83 (8.3)	181 (18.1)	735 (73.6)	
Proper personal hygiene	8 (0.8)	44 (4.4)	947 (94.8)	
Eating balanced food	45 (4.5)	308 (30.8)	646 (64.6)	
Practicing regular physical activity	216 (21.6)	450 (45.0)	333 (33.3)	

SD: Standard deviation

come in accordance with a study by Ngo Bibaa *et al.* [20] who found that the majority of participants 56.2% had moderate level of knowledge about the modes of transmission of the disease and risky groups which is still a lower than other parts of knowledge about the disease.

Table 6: The level of preventive measurement practice and the changes in the frequency of hand washing during the pandemic

The level of preventive measurement practice	F	%
Poor practice <60	785	78.5
Moderate level practice 60<80	214	21.4
Good practice level 80–100	0	0.0

It was observed that, the total knowledge score was significantly higher among highly educated, females, in rural areas, married, and governmental workers this finding corroborates that of [18]. Female total knowledge score (26.1 \pm 2.3) tended to be more knowledgeable than males'. Similar findings were observed by Akalu *et al.* [15]. Governmental (26.7 \pm 2.1) and private setting workers (25.8 \pm 2.1) demonstrated significantly higher levels of knowledge than students and farmers this explained by that the level of education attained significantly increases the total knowledge scores as they at least had secondary level of education or above whereas most of the students and farmers were less educated. Our findings are in line with similar studies Nigeria [21], and Bangladesh [22]. Lower knowledge scores about the modes of transmission and risk groups (54.3% and 76.1%), respectively, which is similar to the results reported by Erfani *et al.* in Iran [14].

As regard the knowledge gap between different items among Egyptians it was reported to be related to disease transmission which was reported to be 54.3 \pm 14.5%, as some believed that the novel coronavirus can be transmitted to people by many modes of transmission. This observation was, however, higher when compared to Ethiopia [15], [23]. This discrepancy might be due to the differences in the time of data collection and the used assessment tool.

The most popular sources of information about COVID-19 infection among Egyptians were in order social media (Facebook, WhatsApp, and twitter) (64.5%), followed by international and governmental

official websites (12.8%), Family members (12.4%), and (TV and radio) (6%). This comes in agreement with the results by Abdelhafiz *et al.* [9] who reported that social media especially Facebook were the most common source of knowledge among the studied group in Egypt. Furthermore, this study results were lower than that reported by an Ethiopian study (Hager *et al.*) where the internet (social media platforms- 84%) and TV (44%) were the main source of information for the participants. But that inconsistent with the results of a study in in Syria where The most common sources of information were TV (66.4%), followed by government officials (38.7%), Facebook (34.8%), health workers (31.4%), websites (23.8%), and family and friends (43.3%) [23]. Social media platforms had proved to be helpful for population to adapt to the physical social restraints during the COVID-19 compulsory lockdown in and Egypt.

Regarding attitudes of the participants, they showed a positive general attitude toward the preventive measures taken by the government, as 99% of the them agreed that lockdown measures by the Egyptian authorities are essential to prevent spread of the infection, this comes in accordance with an Iranian study where the majority of participants agreed with having quarantine, locking down cities, restricting travel, and closing educational centers and religious cites (96%, 96.8%, 99.3%, and 98.5%, respectively) [14] but slightly higher than reported by an African study (81%) [21].

In this study, 99% of participants perceived themselves at risk to acquire infection; this figure was higher than the percentage among chronic patients in France, which reported to be 63%. This difference may be related to the fact that this study addressed the vulnerability to infection and the French one studied the severity of it [24]. Among those perceived themselves at risk of infection (76.1%) of them, reported the cause that, everyone is susceptible as going outdoors, this result was higher than that observed by Tran and Ravaud in France, who found that (23.7%) reported to be at risk of infection because they worked outside home, had a household member

Table 7: The demographic data and its relationship with the knowledge and practice scores

Socio-demographic Variables	F (%)	Total practice score	Mode of transmission knowledge score	Preventive measurements knowledge score	Risky groups knowledge score	Symptoms knowledge score	Total knowledge score
Age groups							
<20 year	234 (23.4)	17.2 ± 2.4	4.3 ± 1.2	8.9 ± 0.2	5.5 ± 0.9	6.7 ± 1.7	25.6 ± 2.2
20<40 year	628 (62.8)	16.7 ± 3.2	4.4 ± 1.1	8.9 ± 0.2	5.3 ± 1.1	7.2 ± 1.2	26.0 ± 2.2
40 year or more	136 (13.6)	16.6 ± 3.2	4.6 ± 1.2	8.9 ± 0.1	5.2 ± 1.1	6.9 ± 1.7	25.9 ± 2.7
F (p)		1.9 (0.15)	2.8 (0.05)	3.96 (0.02*)	3.92 (0.01*)	16.2 (0.00*)	9.21 (0.06)
Sex							
Female	666 (66.7)	17.1 ± 2.8	4.3 ± 1.3	8.9 ± 0.2	5.4 ± 1.1	7.2 ± 1.3	26.1 ± 2.3
Male	333 (33.3)	16.5 ± 3.5	4.4 ± 1.0	8.9 ± 0.3	5.2 ± 1.0	6.9 ± 1.5	25.9 ± 2.1
t (p)		2.34 (0.02*)	0.33 (0.74)	1.8 (0.07)	2.03 (0.05)	3.8 (0.00*)	2.9 (0.00*)
Residence							
Urban	576 (57.6)	16.7 ± 3.1	4.5 ± 1.2	8.9 ± 0.17	5.3 ± 1.0	7.0 ± 1.5	25.7 ± 2.2
Rural	423 (42.3)	17.0 ± 3.1	4.3 ± 1.1	8.9 ± 0.23	5.4 ± 1.1	7.2 ± 1.2	26.2 ± 2.4
t (p)		1.6 (0.10)	3.34 (0.00*)	1.23 (0.22)	0.97 (0.33)	1.12 (0.26)	2.4 (0.02*)
Marital status							
Single	308 (30.2)	16.8 ± 2.8	4.4 ± 1.1	8.9 ± 0.3	5.4 ± 0.9	6.8 ± 1.6	25.5 ± 2.3
Married	665 (66.5)	17.3 ± 2.9	4.8 ± 0.9	9.0 ± 0.4	5.3 ± 1.1	6.6 ± 1.7	26.1 ± 2.3
Others*	26 (2.6)	16.8 ± 3.1	4.3 ± 1.2	8.9 ± 0.15	5.2 ± 0.9	7.3 ± 1.2	26.0 ± 2.5
F (p)		0.29 (0.74)	1.77 (0.17)	6.55 (0.00*)	1.02 (0.76)	17.4 (0.00*)	14.9 (0.00*)
Level of education							
Read and write/ Primary	52 (5.2)	16.8 ± 1.6	4.4 ± 1.1	8.9 ± 0.2	5.2 ± 1.0	6.8 ± 1.6	24.9 ± 2.3
Secondary/High University/and above	342 (34.2)	16.8 ± 3.2	4.3 ± 1.2	8.9 ± 0.2	5.5 ± 1.03	7.3 ± 1.3	25.9 ± 2.3
	605 (60.5)	17.3 ± 2.9	4.8 ± 0.9	9	5.2 ± 1.1	6.6 ± 1.7	26.1 ± 2.3
F (p)		0.57 (0.64)	0.39 (0.76)	3.42 (0.02*)	1.53 (0.22)	6.61 (0.00*)	5.92 (0.00*)
Occupation							
Don't work/house wife	311 (31.1)	17.2 ± 3.1	4.2 ± 1.1	8.9 ± 0.2	5.1 ± 1.1	7.3 ± 1.2	25.6 ± 2.3
Student	276 (27.6)	16.9 ± 2.6	4.4 ± 1.1	8.9 ± 0.3	5.4 ± 0.9	6.7 ± 1.6	25.5 ± 2.3
Private	198 (19.8)	16.4 ± 3.4	4.5 ± 1.2	8.9 ± 0.14	5.2 ± 1.1	7.0 ± 1.5	25.8 ± 2.1
Governmental	214 (21.4)	16.7 ± 3.0	4.6 ± 1.3	8.9 ± 0.17	5.5 ± 1.0	7.4 ± 1.1	26.7 ± 2.1
F (p)		3.2 (0.02*)	3.9 (0.01*)	0.98 (0.77)	3.7 (0.06)	11.2 (0.00*)	14.6 (0.00*)
Smoking							
Non-smoker	843 (89.4)	17.1 ± 2.8	4.4 ± 1.2	8.9 ± 0.2	5.4 ± 1.1	7.1 ± 1.4	25.9 ± 2.3
Ex-smoker	36 (3.6)	16.1 ± 4.1	4.3 ± 0.8	8.9 ± 0.5	4.7 ± 0.9	6.8 ± 1.5	25.2 ± 1.7
Smoker	120 (12.0)	15.3 ± 4.1	4.5 ± 0.9	8.9 ± 0.18	5.2 ± 1.1	7.1 ± 1.1	25.5 ± 2.0
F (p)		19.4 (0.00*)	0.17 (0.84)	2.86 (0.06)	6.83 (0.02*)	0.26 (0.76)	2.90 (0.06)
Had a chronic disease							
No	894 (89.5)	16.9 ± 2.9	4.4 ± 1.2	8.9 ± 0.2	5.3 ± 1.1	7.1 ± 1.4	25.9 ± 2.3
Yes	105 (10.5)	16.0 ± 3.7	4.3 ± 1.0	8.9 ± 0.1	5.4 ± 1.2	7.1 ± 1.3	25.9 ± 2.3
t (p)		2.99 (0.00*)	1.05 (0.29)	0.05 (0.96)	0.18 (0.86)	0.02 (0.99)	1.02 (0.31)

*Others (widow -divorced)

working outside home or had regular visits from external contacts [24].

Table 8: Correlation between the total practice score and the following knowledge scores

The total practice score and knowledge scores	r	p
Symptoms	0.23	0.00*
Mode of transmission	0.09	0.01*
Preventive measures	0.08	0.02*
Knowing risky groups	0.37	0.29
Total knowledge score	0.19	0.00*

p<0.05 there was statistical significant difference.

About 46.7% of the studied population complained of lack of commitment of other community members as a barrier toward the preventive measures, this comes in accordance with a study among health-care providers in Ethiopia, that found almost half (51.37%) of participants reported less commitment of the providers as a barrier. Moreover, 70.4% complained of high costs of masks and disinfectants while 15.76% complained of unavailability of masks and disinfectants. Hence, 86.16% reported limited access to infection control materials. This was higher than reported by the Ethiopian study as 52.5% of participants, reported limitation of infection control materials. These differences may be related to the difference in the studied groups, as in the Ethiopian study, the studied group was health-care providers while, in this study, the studied group was the general population [25].

The overall practice of COVID-19 preventive measures was poor among 785 (78.5%) of respondents. This can explain the increase in the number of infected cases in Egypt as, strong preventive measures are

the primary line of intervention to minimize the spread of the virus in both health-care settings and the community [26], and the effective management of the pandemic depends primarily on people's adherence to the recommended preventive measures [14].

Most respondents used face masks when going to public gathering and practicing proper hand hygiene as preventive measures in reducing the chances of being infected. This generally indicates willingness of the Egyptians to relevant practices changes in dealing with COVID-19 pandemic. Similar practice toward most preventive measures were earlier reported in China [19] Egypt [9] and India [27], although there was a reduction in the frequency of using face masks.

Despite a majority of respondents knowing that social distancing is important in COVID-19 prevention, only 32.4% practiced it. This finding is consistent with a study in Nigeria [14], who believed that the virus can only be transmitted through close contact. Considering barriers against implementation of good practices This is because that this study was conducted at beginning of the pandemic so the practices of the population were not yet well developed and also poor practices may be related to positive attitude towards the disease as 92.3% of the participants believed that COVID 19 is a curable disease.

Adequate practice was significantly associated with the age groups and occupation w. The higher adequate practice observed among older respondents

might be to prevent risk of developing severe illnesses. It has generally been observed that older people face significant risk of developing severe illness if they contract the disease due to physiological changes that come with aging and potential underlying health conditions [28].

Although the absence of significant difference between groups in the total knowledge score regarding history of smoking and chronic diseases, there was a significant difference at the total practice score to be significantly higher among participants without chronic diseases and nonsmokers, this finding, may be associated with increased risk of infection, does augur a poor prognosis in patients with COVID-19 [29], [30], [31] so more focus on practices of high risk groups is essential. This can be explained by the fact that people who avoid smoking may have better healthy lifestyle practices than smokers including preventive practices related to COVID 19.

The observed disparity between the level of knowledge, practice, and perceptions in the attached Health Belief Model among the studied participants, might be due to the difference in socio-demographic characteristics, available sources of information, outbreak situation in the studied area, health awareness, routine health practices, and level of participant's worry related to the outbreak, which led to the variation in the application of recommended actions and behaviors to prevent COVID-19. Moreover, the action taken by the government to decrease transmission of COVID-19 might also account for the variation.

There was significant direct association between the total knowledge and the total practice score as the practice and effective adoption of self-protection measures are largely affected by knowledge, attitudes, and practices (KAP) of the public [21] in accordance with the "KAP theory." The "KAP theory" is a health behavior change theory wherein the change in human behavior is divided into three successive processes, namely, acquisition of right knowledge, generation of attitudes, and adoption of behavior (or practice) [26].

Limitations

The majority of the study participants were educated with 73% of the them having a graduate or post-graduate degree. Thus, the study population represented a relatively well-educated and well-to-do section of the community and hence might not be representative of Egyptians. Moreover, the distribution of the survey through the internet allowed only those who can read and have internet access to participate. This represents a major limitation of this study.

Conclusions

Egyptian participates had good level of knowledge, positive attitudes toward COVID-19 infection and its interventions and, unfortunately poor practices, which were related to presence of several barriers and perceptions that should be considered by the government during planning and implementing interventions that enable better practices.

Recommendations

(1) Redistribute the results to the policy makers as an up-to-date national study. (2) Community education on preventive measures remains the best control measure to reduce the disease burden and spread. (3) Measures to enhance good preventive practices and reducing barriers should be considered by the government. (4) The demographic characters associated with KAP could be the cornerstone in directing policy-makers to target the health education campaigns to the suitable target groups. (5) Furthermore, comprehensive studies.

Authors' Contribution

DIO conceived the study, designed the data collection tool, data acquisition, and wrote the proposal. Statistical analysis, data interpretation, manuscript preparation, and drafting by SAA. The manuscript was written, reviewed, and edited by DIO and SAA.

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Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethical considerations

The objectives of the study, voluntary involvement or withdrawal, and confidentiality of the data were clarified to the participants before taking agreement on involvement. All these data were appended with the electronic form of the questionnaire.

References

1. Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG. A new coronavirus associated with human respiratory disease in China. *Nature*. 2020;579(7798):265-9. PMID:32015508
2. Tang D, Tou J, Wang J, Chen Q, Wang W, Huang J. Prevention and control strategies for emergency, limited-term, and elective operations in pediatric surgery during the epidemic period of COVID-19. *World J Pediatr Surg*. 2020;3(1):e000122. <https://doi.org/10.1136/wjps-2020-000122>
3. World Health Organization. Coronavirus Disease (COVID-19) Situation Report-126. Geneva: World Health Organization; 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situationreports/20200525-covid-19-sitrep-126.pdf?sfvrsn=887dbd66_2. [Last accessed on 2020 May 25].
4. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, Evaluation, and Treatment of Coronavirus (COVID-19). Treasure Island, FL: StatPearls Publishing LLC; 2020.
5. World Health Organization, Health Topics, Coronavirus, Symptomes. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_3. [Last accessed on 2021 Jan 12].
6. World Health Organization. Considerations for Implementing and Adjusting Public Health and SOCIAL MEASURES in the Context of COVID-19: Interim Guidance, 4 November 2020. Geneva: World Health Organization; 2020. Available from: <https://www.apps.who.int/iris/handle/10665/336374>.
7. Bruinen de Bruin Y, Lequarre AS, McCourt J, Clevestig P, Pigazzani F, Zare Jeddi M. Initial impacts of global risk mitigation measures taken during the combatting of the COVID-19 pandemic. *Saf Sci*. 2020;128:104773. <https://doi.org/10.1016/j.ssci.2020.104773> PMID:32296266
8. The Central Agency for Public Mobilization and Statistics Website; 2020. Available from: <https://www.capmas.gov.eg/Pages/populationClock.aspx#>. [Last accessed on 2020 Apr 04].
9. Abdelhafiz AS, Mohammed Z, Ibrahim ME, Ziady HH, Alorabi M, Ayyad M, *et al*. Knowledge, perceptions, and attitude of Egyptians towards the novel coronavirus disease (COVID-19). *J Community Health*. 2020;45(5):881-90. <https://doi.org/10.1007/s10900-020-00827-7> PMID:32318986
10. Hager E, Odetokun IA, Bolarinwa O, Zainab A, Okechukwu O, Al-Mustapha AI. Knowledge, attitude, and perceptions towards the 2019 coronavirus pandemic: A bi-national survey in Africa. *PLoS One*. 2020;15(7):e0236918. <https://doi.org/10.1371/journal.pone.0236918> PMID:32726340
11. Presidency of the Council of Ministers, Report of the Egyptian Government Efforts Facing Novel Corona Virus Pandemic. Available from: <https://www.cutt.us/hCgLd>. [Last accessed on 2021 Jan 13].
12. Egyptian Government's Anti-virus Plan Met with Mixed Reactions; 2020. Available from: <https://www.almonitor.com/pulse/originals/2020/03/egypt-coronavirus-curfew-sisi-measures-protests.html>. [Last accessed on 2020 Apr 04].
13. WHO Courses. Emerging Respiratory Viruses, including COVID-19: Methods for Detection, Prevention, Response, and Control. Available from: <https://www.openwho.org/courses/introductionto-ncov>. [Last accessed on 2020 Feb 10].
14. Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M. Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: A population-based survey in Iran. *Bull World Health Organ*. 2020. <http://dx.doi.org/10.2471/BLT.20.256651>
15. Akalu Y, Ayelign B, Molla MD. Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen hospital, Northwest Ethiopia. *Infect Drug Resist*. 2020;13:1949-60. <https://doi.org/10.2147/idr.s258736> PMID:32612371
16. World Health Organization. Time-line COVID-2019. Available: <https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19> [Last accessed on 2020 Jun 25].
17. Ngwewondo A, Nkengazong L, Ambe LA, Ebogo JT, Mba FM, Goni HO, *et al*. Knowledge, attitudes, practices of/towards COVID 19 preventive measures and symptoms: A cross-sectional study during the exponential rise of the outbreak in Cameroon. *PLoS Negl Trop Dis*. 2020;14(9):e0008700. <https://doi.org/10.1371/journal.pntd.0008700> PMID:32886678
18. Tendongfor N, Forlemu VM, Seraphine NE, Amana BT, Kouam TD, Lambou FV, *et al*. COVID-19 knowledge, attitudes and practices in a conflict affected area of the South West Region of Cameroon. *Pan Africa Med J*. 2020;35(2):34. PMID:33623559
19. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, *et al*. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *Int J Biol Sci*. 2020;16(10):1745-52. <https://doi.org/10.7150/ijbs.45221> PMID:32226294
20. Reuben RC, Danladi MMA, Saleh DA, Ejembi PE. Knowledge, attitudes and practices towards COVID-19: An epidemiological survey in North-Central Nigeria. *J Community Health*. 2020;2020:1-14. <http://dx.doi.org/10.1007/s10900-020-00881-1> PMID:32638198.
21. Singh AK, Gupta R, Ghosh A, Misra A. Diabetes in COVID-19: Prevalence, pathophysiology, prognosis and practical considerations. *Diabetes Metab Syndr*. 2020;14(4):303-10. <https://doi.org/10.1016/j.dsx.2020.04.004> PMID:32298981
22. Ferdous MZ, Islam MS, Sikder MT, Mosaddek AS, Zegarrah-Valdivia JA, Gozal D. Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online-based cross-sectional study. *PLoS One*. 2020;15(10):e0239254. <https://doi.org/10.1371/journal.pone.0239254> PMID:33035219
23. International Federation of Red Cross and Red Crescent Societies. Knowledge, Attitudes and Practices (KAP) Assessment on COVID-19 - Community Based Migration Programme. Geneva: International Federation of Red Cross and Red Crescent Societies; 2020. https://doi.org/10.1163/2210-7975_hrd-9813-2015012
24. Tran VT, Ravaud P. COVID-19-related perceptions, context and attitudes of adults with chronic conditions: Results from a cross-sectional survey nested in the ComPaRe e-cohort. *PLoS One*. 2020;15(8):e0237296. <https://doi.org/10.1371/journal.pone.0237296> PMID:32760127

25. Biriha BM, Bayih WA, Alemu AY, Belay DM. Perceived barriers and preventive measures of COVID-19 among healthcare providers in Debretabor, North Central Ethiopia, 2020. *Risk Manag Healthc Policy*. 2020;13:2699-706. <https://doi.org/10.2147/rmhps.s287772>
PMid:33244283
26. Pal R, Bhansali A. COVID-19, diabetes mellitus and ACE2: The conundrum. *Diabetes Res Clin Pract*. 2020;162:108132. <https://doi.org/10.1016/j.diabres.2020.108132>
PMid:32234504
27. Agarwal P, Imtiyaz B, Raunaq MS, Jamwal C. Knowledge, Attitudes, and Practices (KAP) about COVID-19 among Indian Population: A Cross-sectional Study (July 22, 2020); 2020. Available from: <https://www.ssrn.com/abstract=3658195> or <http://dx.doi.org/10.2139/ssrn.3658195>.
28. World Health Organization. WHO Delivers Advice and Support for Older People during COVID-19. <https://doi.org/10.7748/nop.32.5.5.s1>
29. Li JY, You Z, Wang Q, Zhou ZJ, Qiu Y, Luo R, *et al*. The epidemic of 2019-novel-coronavirus (2019-nCoV) pneumonia and insights for emerging infectious diseases in the future. *Microbes Infect*. 2020;22(2):80-5. <https://doi.org/10.1016/j.micinf.2020.02.002>
PMid:32087334
30. Ngo Bibaa LO. Primary health care beyond COVID-19: Dealing with the pandemic in Cameroon. *BJGP Open*. 2020;4:bjgpopen20X101113. <http://doi.org/10.3399/bjgpopen20X101113>
PMid:32900705
31. Fadini GP, Morieri ML, Longato E, Avogaro A. Prevalence and impact of diabetes among people infected with SARS-CoV-2. *J Endocrinol Invest*. 2020;43(6):867-9. <https://doi.org/10.1007/s40618-020-01236-2>
PMid:32222956

Appendix

The questionnaire of KPAP study: (Knowledge, perceptions, attitude, and practices)

Age – sex – residence – marital status- education- occupation- smoking history- presence of chronic disease

I.P

Symptoms of novel coronavirus infection

- Fever
- Dry cough
- Difficulty of breathing (dyspnea)
- Fatigue and muscle pain
- Sore throat
- Gastrointestinal disturbances (vomiting or diarrhea)
- Absence of apparent symptoms.

Modes of transmission

- Droplet infection (during coughing or sneezing)
- Contact with contaminated surfaces
- Blood transfusion
- Dealing with or eating wild animals
- Eating contaminated food
- Drinking contaminated water
- Airborne infection
- Direct contact with cases.

High risk groups

- All community members
- Patients with chronic disease
- Pregnant females
- Older persons
- Children
- Health care providers
- Smokers.

Preventive measures for novel corona virus infection

- Frequent washing the hands with soap and water
- Using tissue during coughing or sneezing
- Using upper hand during coughing or sneezing in absence of tissue
- Avoid touching eyes, nose and mouth with hands
- Avoid direct contact with cases
- Wearing masks in crowded places
- Keep personal hygiene
- Social distancing (2 m)
- Cleaning and disinfection of groceries.

Attitudes and perceptions

Novel corona virus infection is severing (perceived severity).

Early detection and management will improve the chances of cure (attitude towards intervention).

Novel corona virus infection can be treated at home (attitude towards the disease).

Novel corona virus infection is curable (attitude towards the disease).

Health awareness about the disease in Egypt is satisfactory (attitude towards intervention).

Lockdown measures in infected areas are essential for prevention and control of spread of infection (Attitude towards intervention).

Isolation of cases at specialized hospitals is essential (attitude towards intervention)

Are you at risk of infection?? (perceived susceptibility)

Why you perceive yourself as susceptible person?

The practice

Routine practices (daily life practices)

- Frequent washing the hands with soap and water
- Disinfection of hands.
- Using tissue during coughing or sneezing.
- Safe disposal of tissues.
- Using upper hand during coughing or sneezing in absence of tissue.
- Wearing masks in crowded places.

Other preventive practices during the last 2 weeks.

Avoiding travelling to infected areas.

Avoiding eating in restaurants.

Avoiding crowded places.

Staying indoor and going outdoor for necessity.

Avoiding going to school, college or work.

Avoiding shaking hands.

Avoiding public transportation methods.

Personal cleanliness.

Eating balanced food.

Practicing regular physical activity.

To what extent novel corona virus pandemic has affected your hand washing habits?

Obstacles during following the preventive measures (perceived barriers).

Basic sources of knowledge about the disease.