Adherence to COVID-19 Related Public Health Measures among Minia University Students Based on Health Belief Model

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Abstract

Background: Everyone has been affected by the coronavirus disease (COVID-19) epidemic, including students. Understanding public knowledge and adherence level to preventive measures is vital for prevention of COVID-19 pandemic. **Aim**: to assess adherence to COVID-19 related public health measures among Minia university students based on health belief model. **Research design:** a descriptive cross-sectional design was used. **Setting:** Minia University, which comprises (20) faculties. **Sample:** A systematic random sample consisted of 460 students **Data collection Tools:** 1st tool: Structured interview questionnaire: included questions related to socio-demographic characteristics, medical data and life style data. 2nd tool: COVID-19 Knowledge Assessment Questionnaire. 3rd tool: COVID-19 Health Belief Scale. 4th tool: Covid-19 Self-Efficacy Scale and the 5th tool: Adherence to COVID-19 related Public Health Measures Scale. **Results**: less than half of participants their age ranged from 21 – 23yrs. with mean age (21 ± 2.05 yrs.). More than two-thirds of them were knowledgeable about COVID-19 related public health preventive measures with mean score (21.45 ± 3.55). 60.6% of participants students were adherent to these measures. 70.2% of participants have high perceived susceptibility to get COVID-19 while 68.4% of them have high perceived severity. 70.7% of them have high self-efficacy to comply with those preventive measures. **Conclusion:** There was highly statistically significant relation between participants level of adherence and their perceived susceptibility, perceived severity, perceived barriers, their cues to adhere with those measures and their self-efficacy. **Recommendations:** Additional research studies in Egypt should be conducted with a broader geographic scope to assess over all community-level of adherence to preventive measures and to identify barriers of noncompliance with these measures.

Keywords: COVID -19, Public Health Measures, Health Belief Model, Self-Efficacy.

Introduction:

Coronavirus disease -2019 (COVID-19) is a new respiratory infection that has been linked to everything from the common cold to severe acute respiratory syndrome **(Yehualashet et al., 2021).** It is considered as a public health emergency by the World Health Organization's Emergency Committee (WHO EC) on January 2020, due to its significant rapid spread and declared it as a pandemic in March 2020 **(Sohrabi et al., 2020)**.

COVID-19 is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) which is a single-strand,

positive-sense ribonucleic acid (RNA) virus, **(Oliveria et al., 2020)** that infects persons of all ages **(Chudasama et al., 2020)**, with a mean incubation period of 5 days and a median of 3 days and 0–24 days of average **(Li et al., 2020)**.

Fever, cough, fatigue, sputum production, dyspnea, sore throat, headache, and myalgia or arthralgia were the most frequently reported clinical symptoms of COVID-19 **(Wang et al., 2020)**. Less common symptoms were diarrhea and vomiting **(Peyronnet et al., 2020).** Persistent chest pain or pressure, difficulty breathing, confusion, and bluish face or lips are all emergency signs **(Rothan and Byrareddy, 2020).**

In February 2021, the World Health Organization (WHO) registered more than 111 million confirmed cases across 223 countries and territories, with more than two million and 475.020 confirmed deaths **(WHO, 2020). Moreover, the Ministry of Health and Population Egypt (MOHP)**, on February 23, 2021, Egypt had 179,407 confirmed COVID-19 cases and 10,443 deaths **(MOHP, 2020).**

The COVID-19 outbreak has had a significant effect on public well-being and worldwide economy. In response to the escalating pandemic, most nations implemented preventive measures to limit COVID-19 population transmission and thereby limit the spread of cases. Preventive measures included isolation of diseased and suspected patients, the use of personal protective equipment (face masks, gloves, etc.), personal hygiene, restrictions on gathering and travelling, social distancing, and obligatory quarantine and lockdown **(Pradhan et al., 2020)**.

The most critical intervention for controlling COVID-19 infection is adherence to preventive measures. Controlling the pandemic and saving millions of lives, multi-pronged measures are required including national lockdown, contact tracing, maintaining a safe distance, and improving quarantine arrangements for people at risk of infection **(Hendy et al., 2020).**

One of the theoretical models that has been utilized to better explain healthy behavior is the Health Belief Model (HBM) **(Lovell, 2016).** It was developed in the 1950s by psychologists; Hochbaum, Rosenstock, and Kegels who employed for US Public Health Service **(Glanz, Rimer, & Lewis, 2002; Janz & Becker, 1984**), to justify why public health preventive programms were not effective **(Mohammed et al., 2018 ; Alsulaiman and Rentner, 2018).**

The HBM is a method for identifying, explaining, and predicting preventive health behaviors. It offers a theoretical framework for researching cognitive factors and focuses on variables that are important for a healthy behavior. Furthermore, it has been used to prevent disease at all levels of the health care system, including primary, secondary, and tertiary prevention (**Orji et al., 2012 and Yazdanpanah et al., 2015).**

The HBM is made up of four dimentions: perceived susceptibility perceived severity, perceived benefits, and perceived risks. In addition to the four perceptions, the HBM suggests that individuals behaviors can be affected by what is known as a cue to action, which are factors that can stimulate individuals to alter their behavior **(Hayden, 2014;**

Janz & Becker, 1984) or to adopt a new behavior **(Janz & Becker, 1984).** Furthermore, in 1988, Bandura added a self-efficacy dimension into the model **(Rosenstock et al., 1988).** This dimension is concerned with a person's desire and ability to change, like as developing new, healthier habits **(Hayden, 2013).**

Community health nurses are on the front lines of the COVID-19 pandemic's public health crisis. They work on mobile strike teams that investigate case-contacts, deliver education on self-isolation and quarantine through hotlines and home visits, and interpret the rapidly shifting guidance from the Centers for Disease Control and Prevention (CDC). They are reliable and proven responders during infectious disease emergencies, providing safe, effective, and nondiscriminatory care to the communities in which they work **(Edmonds et al., 2020).**

Significance of the study:

The majority of researches have focused on adherence to hygiene measures among healthcare personnel solely, therefore little is known about community-level adherence to the various control measures used around the world **(Houghton et al., 2020 and Hillier, 2020 & Saitoh et al., 2020)**. However, detailed documentation of compliance with preventive measures is required to feed into projects attempting to predict outbreaks **(Acuña-Zegarra et al., 2020 & Ngonghala et al., 2020)** and, from the other side, to adjust and tailor health promotion messaging for those sub-populations, including various age groups, who may have difficulty meeting compliance with specific measures **(West et al., 2020).**

it is critical to evaluate the communities' self-efficacy, perceived benefits, perceived hurdles, and perceived vulnerability to COVID-19 in order to improve community compliance towards the suggested protective actions of COVID-19 **(Yehualashet et al., 2021)**.

Egypt is an African Arab country, with more than 100 million inhabitants, as reported in 2020. The primary case of COVID-19 in Egypt was affirmed on 14 February 2020 **(MOHP, 2020)**. In the first coronavirus wave, Egypt was among the five countries reporting the highest number of cases in Africa with a total of 17, 265 cases **(Salyer et al., 2021).**

University students are a distinct subsection of the student population, with greater independence and independent living but with little prior life experience. In addition, university students are among the most active users of the social networks. Their attitudes and actions could have a huge effect on how a pandemic expansion (**Peng et al., 2020)**. **In Egypt** assessment of knowledge concerning COVID-19 was done, but very limited studies have assessed public practice of COVID-19 preventive measures. Therefore, the current study aims to assess adherence to COVID-19 related public health measures among Minia University students based on Health Belief Model.

Aim of the study:

This study aims to assess adherence to COVID-19 related public health measures among Minia University students based on health belief model.

Research questions:

- What are the levels of knowledge toward COVID-19 preventive measures among University Students?
- Are university students adhering COVID-19 preventive measures?
- Is there a correlation between Adherence level to COVID-19 preventive measures and sociodemographic data and medical data among University Students?
- Is there a correlation between Adherence level to COVID-19 preventive measures and health belief model and self-efficacy among University students?

Subjects and methods

Research design:

A descriptive cross-sectional research design was adopted in this study.

Setting:

This research was carried out at Mania University, which comprises (20) faculties. These faculties were divided into two groups. Group 1 consisted of five medical faculties and group 2 consisted of the remaining (15) non-medical faculties. Two faculties from the medical and six faculties from non-medical faculties were randomly chosen with a ratio 1:3. The selected medical faculties included (Nursing and Dental medicine) and the selected six non-medical faculties included (Fine arts, Tourism, Linguistics, Dar El-Olom, Rights , and Agriculture).

Sampling:

A total of 460 students were selected by systematic random sampling from the mentioned faculties.

Sampling technique:

The required sample size was calculated using the statistical software EPI-INFO V5.4.6. Since there are limited local data about the compliance of the population to the announced measures against COVID-19 we considered that the prevalence of adherence of the university students to public health measures to control COVID-19 pandemic as 50%. Then we used the expected frequency in the equation for calculating the sample size with a maximum acceptable error of 5% and a confidence interval of 95%. We obtained a sample size of 384 students. Then we added 20% to guard against the non-response. The number of participants that was successfully recruited was 460 with a response rate of 97.83%. Numbers of university students have been gathered from Minia University Information Systems Management.

Data Collection Tools:

Data was gathered through the use of five different study tools.**1st tool a structured interview questionnaire** was developed by the researcher after analyzing related literature. It was divided into three sections:

Part I: dealt with socio-demographic characteristics included; 8 items (age, sex, residence, faculty, academic grade, current living, type of family and family income).

Part II: Medical data; It asked five questions about the participant's medical history, including**:** presence of chronic disease, previous history of COVID19 infection, personal history, family history and deaths within the family due to COVID-19 infection.

Part III: Lifestyle data; four items pertaining to the participants' lifestyles were included daily hours of sleep, smoking habits, social lifestyle, presence of smokers at home

2nd tool: COVID-19 Knowledge Assessment Questionnaire:

A structured interview questionnaire that was created by the researchers following a study of the pertinent literature, to gather information on participants' knowledge of COVID -19 such as mode of transmission, signs and symptoms, incubation period, preventive public health measures (Q 19-25) and sources of their information about COVID -19 (Q. 26).

The following is the scoring system:

The knowledge scores are based on one point (1 score) for a right answer and zero for an incorrect or unknown response. The total knowledge scores were classified as: **Poor** (if score < 50%), **Fair** (if score 50-70 %) and **Good** (> 70%).

3rd tool: COVID-19 Health Belief Scale:

COVID-19 Health Belief Scale was created by the researchers after analyzing the relevant literature to assess participants health beliefs about adherence to COVID-19 protective measures. The questionnaire has 19 questions that addressed the HBM's variables. There were four questions that were investigated perceived severity, four questions perceived susceptibility, five questions perceived barriers, three questions perceived benefits and three questions cues to action. Scales responses are scored on a five-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

The following is the scoring system:

The total health belief score was ranged from (19-95). Higher ratings on these scales indicate greater perceived severity, susceptibility, barriers, benefits, and action cues, respectively. **High** (if score ≤ 60%) and **Low** (if score ≥ 60%).

4th tool: Covid-19 Self-Efficacy Scale:

The COVID-19 Self-Efficacy Scale was developed as a measure of self-efficacy, or confidence, for behaviors associated with adherence to COVID-19 related public health measures. This scale was created by the researchers after analyzing relevant literatures. It consisted of seven items. Participants were asked to respond on a five-point Likert scale (1= strongly disagree, 2 = disagree, 3= neutral, 4 = agree, and 5 = strongly agree).

The following is the scoring system: -

The COVID-19 Self-Efficacy Scale score was calculated by averaging the responses to each of the seven interrelated items and multiplying by five (range: 7-35) to be categorized into the

following: **low self-efficacy < 60%** (7-21) and **high self-efficacy ≥ 60%% (22-35).**

5th tool: Adherence to COVID-19 related Public Health Measures Scale:

Adherence to COVID-19 related Public Health Measures Scale was developed by the researchers, to assess participants level of adherence to COVID-19 related preventive practices. It consisted of 12 items with two subscales which were, hygiene preventive measures (6 items) and social distancing preventive measures (6 items). A 5-likert scale item (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always) were used.

❖ **Scoring System:**

The score of Adherence to COVID-19 related Public Health Measures Scale was calculated by averaging the response to each 12 related items and multiplying by 5 (total scores: 12-60). **Higher scores (≥ 60%)** indicate greater adherence to preventive measures (25-60), while **lower scores (< 60%)** indicate less adherence to preventive measures (12-24).

Tools Validity:

The content validity of the data collecting tools was tested by a panel of five nursing specialists in the fields of community health, medical-surgical nursing and public health and preventive medicine. Modifications were made based on the panel's judgments on sentence clarity and topic appropriateness.

Tools reliability:

Internal consistency was evaluated using Cronbach's Alpha coefficient test which revealed that tools of the study were reliable as indicated by the value of (0.740 - 0.619 - 0.628 and 0.725) for COVID-19 knowledge assessment questionnaire COVID-19 health belief scale, Covid-19 self-efficacy scale and adherence to COVID-19 related public health measures Scale respectively.

Field work:

Ethical consideration:

Students were informed about the study's goal, right to privacy, and confidentiality in the previously revealed setting. Each student who accepted to participate in the study provided an oral informed consent.

Data collection procedure:

The dean of the Faculty of Nursing gave his formal approval for the study to be conducted, and it was delivered to the deans of the selected faculties. The study started from 17 October 2020 to 30 December 2020.Verbal informed consents were obtained from students. The researchers spent two days a week in the study settings. Data collection tools were distributed to students in small groups ranging from 20-25 students. Each tool took about 15-20 minutes to be completed.

Pilot study:

A pilot investigation was carried out on 10% of the sample (46 students) to test the clarity, reliability, and application of the study tools.

Statistical analysis:

Statistical tests were used to computerize, tabulate, evaluate, and summarize the acquired data as Chi-square for quantitative variables and

percentages for qualitative variables by using SPSS version 26. The level of significance was accepted at P <0.05.

Results:

Table (1): shows that, 43.7% of participants their age ranged from 21 - 23years, 50.7 % of them were males. Regarding to their residence 50.2% of them live in rural area. Their academic grade revealed that 36.1% of them were in the 3rd grade and 17.0% were in the 1st grade. Concerning their current living, 68.7% were live at home with their families while only 14.3% of them were live at external hostel. Regarding their family income, 67.8% of them have adequate income.

Table (2): shows that, 96.1% of participants have no chronic diseases, while 3.9% of them were have chronic diseases (44.5% of them were diabetic). Regarding to their history of COVID-19 infection, 16.7% of them have previous COVID-19, while 22.6% of them have family history of COVID-19 infection and 8.5 % pf them have deaths within the family due to COVID-19. Concerning their lifestyle, 76.5% of participants were socially active, 79.1% of them were non-smokers, while 43.3% of them were have smokers at their homes. As regard to their daily hours of sleep, 66.1% of them have adequate hours of sleep (6-10 hrs.).

Figure (1): illustrates that, 50.4% of participants students obtained their information about COVID-19 from media, followed by 15.2% from doctors and pharmacists**.** while 5.2 % of them obtained that information from their friends.

Table (3): Revealed that 88.3% of participants were knowledgeable about COVID-19 related public health preventive measures. The mean score of participants knowledge was (**21.45 ± 3.55).**

Table (4): Revealed that 70.2% of participants view themselves as more likely and susceptible to be infected with COVID-19 while 68.4% of them have high perceived severity about COVID-19. Consequently, 52.8% of them viewed these measures as so useful. Regarding to barriers of adhering to preventive public health measures of COVID-19, 52.8% of them have barriers to comply with these measures. Also 57.2% of them have cues to adhere to these preventive public health measures. Concerning self-efficacy to comply with these measures, 70.7% of them have high self-efficacy.

Table (5): shows that there was highly statistically significant relation between students' level of adherence to COVID-19 preventive measures and their age, type of faculty, place of living, type of family and their family income where p-value were 0.001, 0.002, 0.001 and 0.001 respectively. Furthermore, the higher level of adherence was among socially active, non-smokers participants, who have family history of COVID-19 and who have adequate daily hours of sleep (6-10 hrs.). Consequently, there was highly statistically significant relation between level of adherence and smoking habits, social lifestyle and daily hours of sleep where p_ value was 0.003, 0.001, 0.002 and 0.001 respectively.

Table (6): shows that the higher level of adherence was among

participants who viewed themselves as more susceptible to COVID-19, have higher perceived severity, have barriers to adhere with preventive measures of COVID-19, have cues to adhere to these measures and have higher self-efficacy. Consequently, there was highly statistically significant relation between participants level of adherence and their perceived susceptibility, perceived severity, perceived barriers, their cues to adhere with those measures and their self-efficacy where p_ value was 0.001, 0.040, 0.000, 0.001 and 0.000 respectively.

Table (1): Distribution of students according to their Socio demographic characteristic n=460.

Socio demographic characteristic	No	%
Age group		
- 18 ≤ 20	136	29.6
- 21 ≤ 23	201	43.7
- 24 ≤ 26	90	19.6
- > 26	33	7.2
Mean ± SD	21 ± 2.05 years	
Sex		
- Male	233	50.7
- Female	227	49.3
Residence		
- Rural	231	50.2
- Urban	229	49.8
Academic year		
- 1st grade	78	17.0
- 2nd grade	67	14.6
- 3rd grade	166	36.1
- 4th grade	149	32.4
Faculty		
- Medical	193	42.0
- Non-medical	267	58.0
Current living		
- Home	316	68.7
- Students hostel	78	17.0
- External hostel	66	14.3
Type of family		
- Nuclear	357	77.6
- Extended	103	22.4
Family income		
- Adequate	312	67.8
- Not adequate	148	32.2

Table (2): Distribution of students according to their medical and lifestyle data (n=460).

Medical data	No	%
Presence of chronic disease		
- Yes	18	3.9
- No	442	96.1
types of chronic disease (n=18)		
- Diabetes Maleates	8	44.5
- Heart diseases	4	22.2
- Other diseases	6	33.3
Personal history of COVID19 infection		
- Yes	77	16.7
- No	383	83.3
Family history of COVID19 infection		
- Yes	104	22.6
- No	356	77.4
Deaths within the family due to COVID-19		
- Yes	39	8.5
- No	421	91.5
Lifestyle data		
Social lifestyle		
- Socially active	352	76.5
- Not active	108	23.5
Smoking habits		
- Not smoker	364	79.1
- Previous smoker	46	10.0
- Current smoker	50	10.9
Presence of smokers at home		
- Yes	199	43.3
- No	261	56.7
Daily hours of sleep		
- less than 6 hrs.	80	17.4
- 6-10 hrs.	304	66.1
- more than 10 hrs.	76	16.5

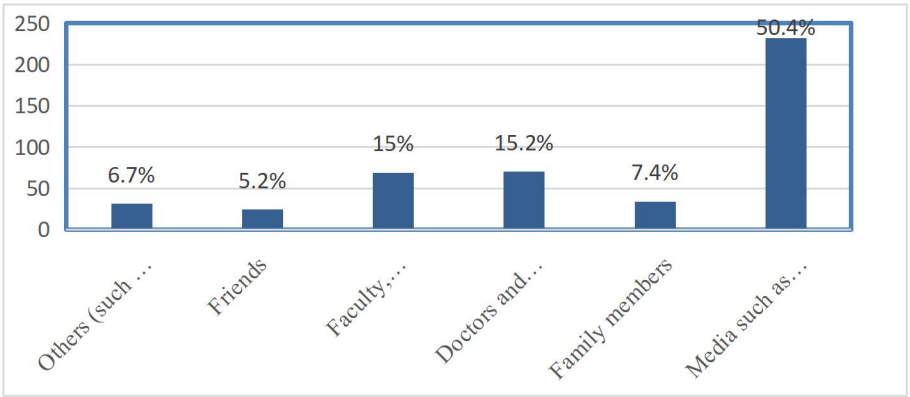


Figure (1): Sources of information about COVID-19 preventive measures.

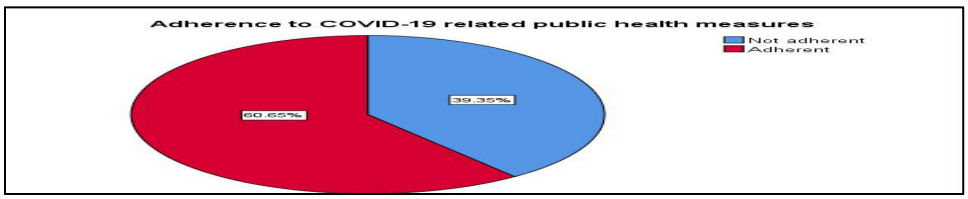
Table (3): Distribution of participants related to their knowledge about COVID19 preventive measures (n=460).

		Yes		No		Don't know	
	Preventive measures of COVID-19:	No	%	No	%	No	%
1.	Wash your hands in a correct way	407	88.5	18	3.9	35	7.6
2.	Use hand sanitizer / alcohol	383	83.3	26	5.7	51	11.1
3.	Use a tissue when coughing or sneezing	404	87.8	0	0.0	56	12.2
4.	Use the upper arm when sneezing in the absence of tissues	107	23.3	276	60.0	77	16.7
5.	Avoid touching the face / nose / mouth	431	93.7	14	3.0	15	3.3
6.	Avoid touching the infected person's tools or contaminated surfaces	401	87.2	46	10.0	13	2.8
7.	Wear masks in crowded places	448	97.4	5	1.1	7	1.5
8.	Commitment to social distancing	413	89.8	39	8.5	8	1.7
9.	Social distancing means keeping a distance of 1.5-2 meters between individuals	415	90.2	13	2.8	32	7.0
10.	Social distancing means avoid crowded groups / places	448	97.4	5	1.1	7	1.5
11.	Social distancing means avoid shaking hands	105	22.8	270	58.6	85	18.6
12.	Social distancing means avoid direct contact with patients	88	19.1	290	63.1	82	17.8
	Mean knowledge score (Mean ± SD)	**Good knowledge**		**Poor knowledge**			
	21.45 ± 3.55	406 (88.3%)		54 (11.7%)			

Table (4): Distribution of participant students according to their total score of the health belief scale and self-efficacy (n=460).

Health belief scale		
Items	N0.	%
1. Perceived susceptibility		
Not susceptible	137	29.8
Susceptible	323	70.2
Mean ± SD		**12.79 ± 3.614**
2. **Perceived severity**		
Low perceived severity	145	31.6
High perceived severity	315	68.4
Mean ± SD		**14.12 ± 3.389**
3. **Perceived benefits**		
Not useful	217	47.2
Useful	243	52.8
Mean ± SD		**11.61 ± 2.020**
4. **Barriers of adhering to public health measures**		
Have no barriers	217	47.2
Have barriers	243	52.8
Mean ± SD		**16.00 ± 3.884**
5. **Cues for adherence to public health measures**		
Have no cues to act	197	42.8
Have cues to act	263	57.2
Mean ± SD		**10.45 ± 2.449**
6. **Self-Efficacy**		
Low self-efficacy	135	29.3
High self-efficacy	325	70.7
Mean ± SD		**25.55 ± 5.312**

Figure (2): illustrates that, 60.6% of participants students were adherent to COVID-19 related preventive



measures while 39.4 % of them were non adherent.

Table (5): Relation between participants level of adherence to COVID-19 preventive measures and their sociodemographic data, medical data and their lifestyle (n=460).

Sociodemographic data	Adherence level to COVID-19 preventive measures			
	Not adherent (n=181)		Adherent (n= 279)	
	N0.	%	N0.	%
Age/year				
- 18 ≤ 20	54	29.8	82	29.4
- 21 ≤ 23	52	28.7	149	53.4
- 24 ≤ 26	62	34.3	28	10.0
- ≥ 26	13	7.2	20	7.2
(*P* – value)			**48.194 (0.000)** **	
Sex				
Male	96	53.0	134	48.0
Female	85	47.0	145	52.0
(*P* – value)			**1.102 (0.290)** NS	
Residence				
Urban	97	53.6	132	47.3
Rural	84	46.4	147	52.7
(P – value)			**1.731 (0.188)** NS	
Faculty				
Non-medical	121	66.9	146	52.3
Medical	60	33.1	133	47.7
(P – value)			**9.505 (0.002)** **	
Place of living				
Home	90	49.7	226	81.0
Students hostel	45	24.9	33	11.8
External hostel	46	25.4	20	7.2
(P – value)			**52.107 (0.001)** **	
Type of family				
Nuclear	118	65.2	239	85.7
Extended	63	34.8	40	14.3
(P – value)			**26.470 (0.001)** **	
Family income				
Adequate	90	49.7	222	79.6
Not adequate	91	50.3	57	20.4
(P – value)			**44.813 (0.001)** **	
Medical data				
Presence of chronic disease				
Yes	3	1.6	15	5.4
No	178	98.4	264	94.6
(P – value)			**1.204 (0.273)** NS	
Personal history of COVID19 infection				
Yes	28	15.5	49	17.6
No	153	84.5	230	82.4
(P – value)			**0.345 (0.557)** NS	
Family history of COVID19 infection				
Yes	54	29.8	50	17.9
No	127	70.2	229	82.1
(P – value)			**8.904 (0.003)** **	
Deaths within the family due to COVID-19				
Yes	18	9.9	21	7.5
No	163	90.1	258	92.5
(P – value)			**0.827 (0.363)** NS	
Lifestyle data				
Social lifestyle				
Socially active	133	73.5	219	78.5
Socially not active	48	26.5	60	21.5
(P – value)			**9.145 (0.002)** **	
Smoking habits				
Not smoker	132	72.9	232	83.2
Previous smoker	17	9.4	29	10.4
Smoker	32	17.7	18	6.5
(P – value)			**14.293 (0.001)** **	
Presence of smokers at home				
Yes	94	51.9	105	37.6
No	87	48.1	174	62.4
(P – value)			**1.536 (0.215)** NS	
Daily hours of sleep				
Less than 6 hrs.	47	26.0	33	11.8
6-10 hrs.	113	62.4	191	68.5
More than 10 hrs.	21	11.6	55	19.7
(P – value)			**17.594 (0.001)** **	

NS= Not statistically significance * Statistically significant at *P* – value ≤ .05 ** Statistically significant at *P* – value ≤ .01

Table (6): Relation between participants level of adherence to COVID-19 preventive measures and Health Belief Scale (n=460).

	Not adherent		Adherent		P- value
Health belief scale	N0.	%	N0.	%	
Perceived susceptibility					
Not susceptible	38	21.0	99	35.5	
Susceptible	143	79.0	180	64.5	**11.021 (0.001)** **
Perceived severity					
Low perceived severity	63	34.8	73	26.2	**3.937 (0.040)** *
High perceived severity	118	65.2	206	73.8	
Perceived benefits					
Not useful	92	50.8	125	44.8	**1.600 (0.206NS)**
Useful	89	49.2	154	55.2	
Barriers of adhering to public health measures					
Have no barriers	54	29.8	163	58.4	**74.42 (0.001) ** **
Have barriers	127	70.2	116	41.6	
Cues for adherence to public health measures					
Have no cues to act	126	69.6	71	25.4	**13.22 (0.001)** **
Have cues to act	55	30.4	208	74.6	
Self-Efficacy					
Low self-efficacy	86	47.5	49	17.6	**175.159 (0.001)****
High self-efficacy	95	52.5	230	82.4	

NS= Not statistically significance * Means there is statistically significant difference (P – value ≤ .05)
** Means there is highly statistically significant differences (P – value ≤ .01).

Discussion

The World Health Organization (WHO), on December 31, 2019, obtained a report of the existence of unidentified reasons of pneumonia disease in Wuhan, China, this sickness was later classified as a new Coronavirus disease **(WHO, 2020).** Coronavirus disease 2019 (COVID-19) is a new respiratory virus that can cause everything from an ordinary cold to serious acute respiratory syndrome **(Lai et al., 2019)**. College pupils are a distinct subset of the student population, with more autonomy and a strong desire to stay independently but slightly prior life experience (**Peng et al., 2020)**.

The present study revealed that, the mean average age of participant students was 21 ± 2.05 years. It was in the same line with **Angelo et al.,** (2021) In their study in Mizan Tepi University found that, the mean age of the . participants was 23.1 ± 1.7 years

It is worthy of noting that more than half of the studied sample were from non-medical faculties. In contrary to the current study findings **Olaimat et al., (2020)** reported that less than two-thirds of the participants in their Jordanian study . were from theoretical faculties

In terms of COVID-19 information an a halfhsource, it was noted that more t ationmof students obtained their infor ilehabout COVID-19 from the media, w amount of their friends provided the least of this information. Students and people in usingdage group of youth are intereste social media, and the

COVID-19 pandemic has tremendously aided their use of these devices, as well as because of the lockdown and stopping going to the university for periods of time to protect themselves and their families. Additionally, individuals were more interested in everything related to COVID-19 including its origin, symptoms, and prevention strategies, as a result of the fear of the COVID pandemic, and social media is always accessible and in a variety of ways. **Alzoubi et al., (2020)** also supported these results, stating that social media was the most widespread source of knowledge for college students. Similarly, **Abdelhafiz et al., (2020)** discovered that social media and the internet were the most mentioned sources of knowledge, followed by TV/satellite channels and other sources such as friends or family members.

According to the findings of this study, more than three quarters of participants were informed about COVID-19 related public health preventive measures with a mean score of (**21.45 ± 3.55).** This may be due to their high perceived severity of that disease and its complications, as well as the virus spreading to their families, and the availability of information and enhanced government awareness via social media and television, all of which contributed to greater awareness. **Ali et al., (2021)** confirmed up the findings by stating that the participants had a high level of knowledge about the disease and its vital preventive methods. **(17.3±2.9)** was the average knowledge score. In a similar vein, **Ikhlaq et al., (2020) and Banik et al., (2020)**. According to a survey conducted in Pakistan and Bangladesh, 82 percent, and 80 percent of participants, respectively, had appropriate understanding of the coronavirus.

In the current study, more than two thirds of participants were adherent to COVID-19 related preventive measures. This may be justified because university students are sufficiently aware of the seriousness of the Corona virus as a result of their use of various social media platforms, as well as their fear of transmitting the virus to their families, and the university emphasizes the importance of taking all precautionary measures, failing which students will not be permitted to enter. This conclusion contrasts with the findings of **Elnadi et al., (2020),** who found that less than a quarter of the study participants followed the COVID-19 preventive measures, and **Abdelhafiz et al., (2020),** who found that more than a third of the individuals followed all the recommended procedures. Likewise, **Hussein et al., (2021)** found that the majority of Egyptian medical students performed well in terms of preventive measures.

Regarding of perceived susceptibility, more than two-thirds of participants believe they are more probable and sensitive to COVID-19 infection. The researcher's view is that the new Corona virus is not limited to a certain age group, but rather, infections were detected in high numbers in people of all ages, according to daily statistics from every country around the world, making everyone feel exposed to infection. With **Lee & You (2020)**, these conclusions are backed up by evidence **a**ccording to a South Korean study, a large percentage of respondents thought COVID-19 was a dangerous disease. In contrast **Yehualashet et al., (2021)** found that less than half of the respondents believed they were susceptible to COVID-19 infection and **McFadden et al., (2020)** indicated that half of study

participants thought COVID-19 infection was a concern.

The current study's findings revealed that more than two-thirds of participants have a high perception of COVID-19's severity. Because COVID-19 infection does not only cause disease, but also causes a huge number of people to die. Another interpretation, COVID-19 is thought to be a life-threatening virus, thus any family member is at danger of infection. This finding contradicted with **Singh et al., (2020),** who found that the majority of participants perceived COVID-19 as a serious disease, and **Chan et al., (2020)**, who indicated that more than three-quarters of Chinese people thought COVID-19 causes serious health problems. Similarly, **Hussein et al., (2021)** discovered that the majority of participants have a high-risk perception level when it comes to COVID-19.

It is worthy to mention that more than half of the participants have barriers to comply with COVID-19 preventive public health measures. The researcher suggests that university students think that they are less likely to have complications when exposed to infection with COVID-19, unlike the elderly, and in addition to that, their immunity will protect them from infection with the virus even if they do not follow the precautionary measures. On the other hand, the current study's findings were found to conflict with those of **Mirzaei et al., (2021)**, who reported that more than half of participants had no hurdles to implementing COVID-19 prevention strategies with Mean±SD (24.61±4.58).

According to our findings, more over half of the participants have cues to adhere to these preventive public health measures. This is due to their worry of contracting the virus and then spreading it to their family. Another interpretation, this finding revealed that there are still some gaps in the understanding of COVID-19 disease. This is not in line with **Yehualashet et al., (2021)**, who found that most respondents have cues to execute COVID-19 preventive measure actions.

In terms of self-efficacy to comply with COVID-19 preventive public health measures, more than two thirds of them had a high level of self-efficacy. This is explained by university students' understanding of the dangers of the emerging corona virus, not only in terms of health, but also in aspects of the country's economic issues, and the need to take preventive steps to control the outbreak. This conclusion is in line with **Mirzaei et al., (2021) and Shewasinad et al., (2021),** who reported that over sixty percent of participants exhibit self-efficacy to adopt COVID-19 infection prevention strategies.

According to the current research, there was a statistical significance difference between the level of adherence to COVID-19 preventive measures and their faculty (non-medical and medical). This may be referred to the theoretical faculties account for two-thirds of the university's faculties. Unlike the current study, **Olaimat et al. (2020)** indicated that the college of study had a significant impact on student knowledge of COVID-19.

Concerning Family income, the current study found that a statistically significant relation between adherence to COVID- 19 preventive measures and income as the students with adequate

income following the COVID-19 preventive measures. This is explained by the fact that students with a sufficient income had more money to spend on masks, gloves, and other protective equipment than their peers. Such results are consistent with that of **Azlan et al., (2020)** who reported that higher knowledge scores were obtained among participants in the higher income category as subjects with a high income. Additionally, **Ibrahim et al., (2020)** discovered that there was a statistically significant relation between preventive practices and enough income.

Our findings reveal a statistically significant relation between adherence to COVID-19 preventive measures and residence, with students living at home following COVID-19 preventive measures. According to the researcher, students who live with their families are more concerned about their family's health, and the family's duty is to emphasize adherence to preventive measures. It is agreed with **Ditekemena et al., (2021)** who reported that Living in a single room or a small studio/apartment was associated with a low adherence to COVID-19 preventive measures.

Outcomes of the present study indicated that a highly statistically significant relation between adherence to COVID-19 preventive measures and students age, although students aged 21 to 23 are more committed to preventive measures. Because the elder student is more mature and concerned about health prevention. Another interpretation is that the older student had scientific information about the dangers of the Corona virus and the importance of following the virus's preventive procedures.

Conclusion:

The current study's findings led to the conclusion that the most popular source of information regarding COVID-19 was media. The participants have good knowledge about COVID-19 preventive measures. However, only roughly two-thirds of participants adhere to these measures. There was a highly statistically significant relation between students' level of adherence to COVID-19 preventive measures and their age, type of faculty, place of living, type of family and their family income. There was highly statistically significant relation between participants level of adherence and their perceived susceptibility, perceived severity, perceived barriers, their cues to adhere with those measures and their self-efficacy.

Recommendations:

The researchers recommended that, based on the findings of this study:

1. Health education programs to teach students about the necessity of following .COVID-19 preventive measures
2. A scientific subject is introduced to the literary faculties, and it is taught by medical personnel to improve student awareness regarding pandemic disease.
3. Additional research studies in Egypt should be conducted with a broader geographic scope to assess over all community-level of adherence to preventive measures and to identify barriers of noncompliance with these measures.

Limitations of the study:

Students were reluctant to fill out the questionnaire.

Conflicts of interest disclosure

No conflicts of interest were declared by the authors.

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