Impact of Teaching Program Regarding COVID-19 on Knowledge, Attitudes, Practices among Student

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Abstract

Corona-virus pandemic disease 2019 which called “COVID-19” considered an emerging respiratory disease and highly infectious that is caused by corona-virus and was detected in December 2019 in Wuhan, China. Corona-virus has affected educational systems worldwide and leading to the total closures of schools, universities, and colleges, in the middle of March 2020. The study aimed to evaluate the impact of a structured teaching program regarding COVID -19 on knowledge, attitudes, and practices among secondary school students. A pre/post quasi-experimental design was adopted. 260 students were selected from two secondary schools at Sohag City using a multi-stage sample. A self-administered questionnaire and health education Arabic handout was prepared by the researches. There was a statistically significant difference between secondary student’s knowledge attitudes, and practices pre and post- structured teaching program implementation. A structured teaching program is effective in improving knowledge, attitudes, and practices among secondary school students regarding COVID -19.

Introduction

By the end of January 2020, the World Health Organization (WHO) declared a public health emergency of international concern and called for the collaborative efforts of all countries to prevent the rapid spread of COVID-19 (1, 2). The WHO declared COVID-19 as a global pandemic on 12 March, which has spread widely and rapidly, from Wuhan city to other parts of the world, and threatens the lives of many people (3).

Extraordinary efforts have been implemented to control the rapid spread of COVID-19 in Egypt. Its clinical presentation ranges from being an asymptomatic infection and developing into severe disease and is associated with a high mortality rate (4). At the time of writing (May 16, 2020), over 4,425,485 COVID-19 cases and 302,059 deaths have been registered worldwide (5). In Egypt, there are 11,228 positive individuals and 592 deaths (6).

COVID-19 is characterized by rapid transmission that occurs through close contact with an infected person and is not the only method of transmission (7). Some of the signs and symptoms of coronavirus include fever, dry cough, fatigue, myalgia, dyspnea, sore throat, runny nose, and sneezing. Images that illustrate the Morphology of Coronaviruses; the club-shaped viral spike polymers, colored red, create the look of a corona surrounding the vision when observed with an electron (8). The mortality rate soared and the ease of spread was upsetting. Research shows that older people and those with underlying medical problems such as cardiovascular diseases, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illnesses from coronavirus (3).

All aspects of human activities globally affected by the outbreak of COVID-19 ranged from education, research, sports, entertainment, transportation, worship, social gathering/interactions, economy, businesses, and politics. Indeed, the entire world was in distress as a result of COVID-19 threats (9).
There was closure in most parts of the world, and persons were asked to work from home. Some countries even deployed their military to enforce coronavirus restrictions, and to reduce the number of covidiots. There was an increased need for health equipment including, protective gowns, sanitizers, face masks, and hand gloves (10).

Substantial efforts to control the disease have been made by health authorities through various measures. Public education is considered one of the most important measures that can help control diseases. Efforts to control the spread of COVID-19 including non-pharmaceutical interventions and preventive measures such as social-distancing and self-isolation have prompted widespread efforts (11).

There were no reliable treatments for Coronavirus, as at the time of this study, but a series of studies were in the pipeline across the world towards discovering a clinical vaccine for the contagion. However, recent events show that behavioral change can help contain the spread of coronavirus (12). Some of the suggested measures to halt the coronavirus pandemic include improved individual habits such as personal hygiene, including constant washing of hands with alcohol-based sanitizers, good respiratory attitude (close coughing and sneezing), and other personal protection practices such as wearing of face mask, avoiding touching of the face, social distancing, and reducing contacts with people by self-isolation at home or avoiding nonessential travels or gatherings. Coronavirus considered a global problem that requires more action coordination and global cooperation to successfully contain the outbreak and to deal with its aftermath effects. The consequences of COVID-19 could be more severe; if people do not comply or adhere strictly to public health regulations and advice (1).

With the absence of any definite therapy against COVID-19, it becomes imperative that people must stringently abide by advisories of social distancing and hand washing (13, 14, and 15).

Knowledge, attitude, and practices towards COVID-19 are affected by people's adherence to these control measures, following the "KAP theory". The "KAP theory" is a health behavior change theory wherein the change in human behavior includes three successive items, namely, gaining the right knowledge, generating of attitudes and adopting of practice (16). Many studies have illustrated that the KAP level in individuals is associated with effective prevention and management of illness and promotion of one's health (16, 17, 18, 19) because deficiencies in KAP are associated with poor health and maladaptive disease preventive behavior, (17, 20).

The nurse plays an important role in preventing the spread of the disease by encouraging students with adherence which is influenced by the student's knowledge, attitudes, and practice toward COVID-19 and providing health education about COVID-19 prevention and control. Evidence shows that student knowledge is important in managing pandemics (21, 22). Many facts about students' perceptions and practices can be gained by assessing students' knowledge about coronavirus which helps to identify attributes that affect the students' adoption of healthy practices and responsive behavior (23). There was a need to understand the student's knowledge, attitudes, and practice toward COVID-19 at this critical moment.
As members of the health care team, nurses play an essential role in patient care, which includes contributing to the decision-making process within the multidisciplinary health care team, taking responsibility for nursing care, prevention, health educator, and assessment of patient care (24). Here, we present the results of this study to evaluate the impact of a structured teaching program regarding COVID-19 on knowledge, attitudes, and practices among secondary school students.

SIGNIFICANCE OF THE STUDY:

In Egypt, changes every day of life have been rapid, with virus outbreaks, and an increasing death rate. Coronavirus is considered pandemic in Egypt as part of an ongoing worldwide coronavirus pandemic. The Ministry of Health and Population Egypt confirmed that the first case of COVID-19 in Egypt was on February 14, 2020 (25). As the coronavirus pandemic rapidly spread across the world, there is a need to improve students' knowledge, attitude, and practice to help prevent and control disease among them. The emerging pandemic coronavirus (COVID-19) is considered a specific and unusual phenomenon. There are, however, no academic studies about the impact of a structured teaching program regarding COVID-19 on knowledge, attitudes, and practices among secondary school students in Egypt.

Therefore, the current study represents the first impact of a structured teaching program regarding COVID-19 conducted in secondary school students in a city in Egypt within the first month of the COVID-19 outbreak. This study aims to evaluate the impact of structured teaching program regarding COVID-19 on knowledge, attitudes, and practices among secondary school students in Egypt in the initial stage of the coronavirus pandemic (COVID-19) outbreak. Additionally, Assessing students' knowledge is important in clarifying gaps and strengthening ongoing prevention efforts facilitating outbreak management of COVID-19 in Egypt and controlling the disease spread among students.

AIM OF THE STUDY:

The study aimed to evaluate the impact of a structured teaching program regarding COVID-19 on knowledge, attitudes, and practices among secondary school students.

RESEARCH HYPOTHESIS:

1. Secondary school students who will be exposed to a structured teaching program regarding COVID-19 will have improved in their knowledge and the total knowledge score will be higher post-intervention than pre-intervention.
2. Secondary school students' who will be exposed to a structured teaching program regarding COVID-19 will have improved in their attitude and the total attitude score will be higher post-intervention than pre-intervention.
3. Secondary school students' who will be exposed to a structured teaching program regarding COVID-19 will have improved in their practice and the total practice score will be higher post-intervention than pre-intervention.
Subjects And Methods

RESEARCH DESIGN:

A pre/post-quasi-experimental research design was adopted in the current study.

SETTINGS:

The present study was conducted at Al-Shimaa and Sohag Secondary School in Sohag city in Egypt.

SUBJECTS:

In this study, multistage sample of 260 secondary school students who were selected randomly was included in this study from two different secondary schools in Sohag city. Sohag City contains 10 secondary schools. Researchers selected 20% of the total number of schools by stratified random sample which was approximately two schools. The total number of students in secondary schools was approximately 650 students; and we have taken 10% of students from the two selected secondary schools (260 students). The students were from grades one, two, and three. The inclusion criteria were as follow: secondary school students, aged 15 to 18 years, from both sexes (male and female) and willing to interact in the study.

TOOL AND TECHNIQUES OF DATA COLLECTION:

It was developed by the researcher after reviewing related literature. Data pertinent to the study were collected using the following tools:

1-A self-administered questionnaire: - It was composed of four parts.

Part (1):- Sociodemographic data was including age, sex, school level, and residence.

Part (2): consisted of (30) items about knowledge regarding COVID -19, (definition of COVID -19, risk factors of COVID -19, sign & symptoms of COVID -19, treatment, methods of transmission, 19, and preventive measures of COVID - 19.

Part (3): consisted of (6) items about the attitude toward COVID -19.

Part (4): consisted of (14) items about practice regarding COVID -19.

Tool (2):- A health education Arabic handout was prepared by the researchers including a structured teaching program regarding COVID -19.

Scoring system:

• (A) The scoring system for the present study was designed as follows:
Knowledge about COVID-19. It contains 30 questions; these questions were answered on a YES/NO basis option. A correct answer was assigned 1 point and an incorrect answer was assigned 0 points. The total knowledge score ranged from 0 to 30.

The total scores of students' knowledge were divided into three levels:-

- Score above (≥ 65%) considered good
- The Score between (50% – < 65%) were considered fair
- A score of less than 50% was considered poor.

Attitude toward COVID-19. It contains 6 questions; these questions were answered on a YES/NO basis option. A correct answer was assigned 1 point and an incorrect answer was assigned 0 points. The total knowledge score ranged from 0 to 6.

The total scores of student attitude were divided into three levels:-

- A score above (≥ 65%) considered good
- The Scores between (50% – < 65%) were considered fair.
- A score of less than 50% was considered poor.

The scoring system for student's practice was classified as a student's practice about COVID-19 with 14 items. These questions were answered on a YES/NO basis option. A correct answer was assigned 1 point and an incorrect answer was assigned 0 points. The total knowledge score ranged from 0 to 14.

The total scores of adolescent student practice were divided into three levels:-

- A score above (≥ 65%) considered good
- The scores between (50% – < 65%) between considered fair
- A score of less than 50% was considered poor.

TOOL VALIDITY:

The content validity of the tools was determined through an extensive review of the literature about the effect of educational programs for adolescent students regarding BSE. The content of the data collection tools was submitted to a panel of five experts in the community health nursing, and pediatric nursing fields with more than ten years of experience in the field. Modifications of the tools were performed according to the panel judgment on the clarity of sentences, appropriateness of the content, sequence of items, and accuracy of scoring and recording of the items.

TOOL RELIABILITY:

The tools' reliability was estimated by using the Pearson correlation coefficient test to compare variables. The Pearson correlation coefficient for the variables ranged between (P < 0.5) and (P < 0.001), which
indicated a highly significant positive correlation between variables of the subjects. The findings from the validity and reliability suggested that the tools of the study could be used as valid and reliable data collection tools for the current study. The Cronbach's alpha coefficients of the knowledge, attitude, and practice questionnaires were 0.79, 0.85, and 0.87 respectively in our sample, indicating acceptable internal consistency.

ETHICAL CONSIDERATION:

Each secondary student was informed about the aim and benefits of the study in the first part before starting the questionnaire where every student could not be starting the questionnaire without consent to participate in data collection in the current study. Each student informed them that participation in the study was voluntary and that they had the right to withdraw from the study at any time before completing the questionnaire with no consequences, without giving any reason and that their responses would be held confidentially.

DATA COLLECTION:

The researchers used the online Google form spreadsheet to create the research. The researchers shared a link to the students to collect data that included an online questionnaire. The link was presented in WhatsApp groups. On the first page of the online questionnaire, students were informed about the background and objectives and expected outcomes of the KAP of the study. All the students' responses were gathered in an online spreadsheet to evaluate the impact of a structured teaching program regarding COVID-19 on knowledge, attitudes, and practices among secondary school students. The online questionnaire was used three times. For the first time, it was used as a preprogram application for the assessment of secondary school students' knowledge, attitude, and practices regarding COVID-19. Then it was used another time as immediate postprogram application and repeated follow up after one month to evaluate the effect of a structured teaching program.

The average time spent for secondary school students completing the online questionnaire was approximately 6-8 minutes from the first week of March to the end of April 2020. The online questionnaire was designed in English and translated into Arabic. The questionnaire was designed as a multiple-choice question (quiz). We provided the correct answers to all questions wrongly answered by the respondents as feedback. All questions and responses were based on the latest recommendations by the WHO. The content of the structured teaching program included simple and clear information about COVID-19. It also included the preparation of teaching materials i.e., photos, videos about ideal hand washing and PowerPoint presentation about COVID-19 and its preventive measures for protection and health education. The Arabic handout was prepared by the researchers including a structured teaching program regarding COVID-19 that was introduced to secondary school students in WhatsApp groups. The handout was sent to each student. This handout contained all the information needed to know about COVID-19 as well as photos that clarified the information. The evaluation took place one month after the program, to examine the secondary school students' knowledge, attitude, and practice using a pre-posttest online questionnaire.
STATISTICAL ANALYSIS:

The data obtained were reviewed, prepared for computer entry, coded, analyzed, and tabulated. Data entry and analysis were performed using the SPSS 17.0 statistical software package. Data are expressed as the mean, SD, and number, and percentage. The Manhiti test was used to determine significance for numeric variables and the Chi-Square test was used to determine significance for the non-parametric variables. A paired T-test for comparisons between pre, post, and follows up. Using Person's correlation for a numeric variable in the same group, $P > 0.05$ was not significant, $P < 0.05$ was significant, $P < 0.01$ was moderately significant and $P < 0.001$ was highly significant.

Results

Out of 260 students who answered the questionnaires, (57.3%) were female and (42.7%) were male. The age of the participants ranged from 15 to 18 years old. (40%) of them were 16 to 17 of age. Regarding residence, nearly to three quarters (74.00%) of students was from urban areas and (26%) were from rural areas (Table 1).

Figure (1) shows an illustrated educational level among students and that most relevant of them (35.0%) were on the third level.

Regarding students' sources of information about corvid-19, the results indicated that the main source of information about COVID-19 was social media (73%) followed by television (49%), which Facebook is the most frequently cited source of knowledge among social media followed by Whats App (Figure 2).

Table (2) shows the secondary school students' knowledge about COVID-19 pre/post and after one month of program implementation. This table indicates that there was an improvement in secondary school students' knowledge compared to preprogram knowledge. There was a highly statistically significant difference between pre/post and after one month of program implementation to the secondary school student's knowledge regarding COVID-19 ($P$-value <0.000).

Out of all subjects, 260 (100%) had poor pretest knowledge level. In the posttest 234(90.0%) secondary school students had a good knowledge level followed by 182 (70.0%) who improved after program implementation. There was a highly statistically significant difference ($p= <0.000$) in the secondary school students’ total knowledge mean scores as pre/immediate post and after one month of program implementation regarding COVID -19 (Table 3)

There was an improvement in secondary school students' attitudes compared to preprogram knowledge. There was a highly statistically significant difference between pre/post and after one month of program implementation to the secondary school student's attitude regarding COVID-19 ($P$-value <0.000) (Table 4). Secondary school students' attitudes were measured with 6 items. The highest negative result was answered regarding the COVID-19-related attitude item: "feel anxious when you think of coronavirus disease / COVID-19". The highest positive result was answered regarding COVID-19-related attitude items:
'regular hand washing, maintaining social distancing and use of masks can protect'. However, the lowest positive attitude result answered is related to the attitude item: 'Egypt's strict measures can help win the battle against COVID-19 preprogram implementation which improved after program implementation (Table 4).

There was a highly statistically significant difference (p= <0.000) in the secondary school students' attitude mean scores as pre/immediate post and after one month of program implementation regarding COVID-19 (Table 5).

Out of all subjects, 202 (77.7%) had a poor pretest attitude level followed by fair (20.0%) and good 6 (2.3%). In the posttest, all 260 secondary school students had a good attitude level which improved after program implementation (Table 6).

There was improvement among secondary school students' practice regarding COVID-19 pre/immediate post and after one-month program implementation, where there were highly significant differences (P=0.000) with regard to practice of all the preventive measures from COVID-19 (Table 7). In the pretest program many preventive measures not practicing and secondary school students showed a low-performance rate, as out of 260 (8.5%) participants were not practicing social distancing; (8.5%) hand washing; (0.0%) use disinfectants; (22.8%) use of masks; (40.0%) recently go to a crowded place; (7.0%) stay at home and (90.0%) shake hand upon the meeting of friends/family members/other, which improved after program implementation and secondary school students showed a high-performance rate (Table 7). There was a highly statistically significant difference (p= <0.000) in the secondary school students' practice mean scores as pre/immediate post and after one month of program implementation regarding COVID-19 (Table 8).

Out of all subjects, 150 (57.7%) had a poor pretest practice levels followed by fair (38.3%) and good 10 (4.0%). In the posttest, all secondary school students had good practice level which improved after program implementation. It illustrated that secondary school students' mean scores for total practice regarding COVID-19 before and after the program implementation was improved, and there was a highly statistically significant difference (p= <0.000) where the mean practice was 10.17 before the program compared to 12.84 after one month from program implementation (Table 9).

There was a highly statistically significant positive correlation between total knowledge scores, attitude, and practice at the post and after one-month program implementation (P=0.004, P=0.005) (Table 10).

**Table (1): Percentage distribution of secondary school students according to their characteristics (N=260)**
| Characteristics of adolescent students | N=260 | % |
|----------------------------------------|-------|---|
| **Sex**                                |       |   |
| - Male                                 |       |   |
| - Female                               | 57.3  |   |
| **2-Age(months)**                      |       |   |
| · 15–16                                | 42.7  |   |
| · 16–17                                | 30.00 |   |
| · 17–18                                | 40.00 |   |
|                                           | 30.00 |   |
| **3-Residence:**                       |       |   |
| · Urban.                                | 74.00 |   |
| · Rural.                                | 26.00 |   |

Table (2): Distribution of secondary school students' knowledge regarding COVID-19 as pre/immediate post and after one-month program implementation (N=260)
| Topics                                                                 | Pre-Program | Immediate-post program | After one month program | P-value |
|-----------------------------------------------------------------------|-------------|------------------------|-------------------------|---------|
| K1. COVID-19 is an infectious disease caused by a novel coronavirus in Wuhan, China |             |                        |                         |         |
| - Yes                                                                 | 167 (64.28%) | 238 (91.4%)           | 260 (100.0%)            | 0.000   |
| - No                                                                  | 93 (35.72%)  | 22 (8.6%)              | 0 (0.0%)                |         |
| K2. The time between catching the novel coronavirus and beginning symptoms is 14 days |             |                        |                         |         |
| - Yes                                                                 | 102 (39.3%)  | 208 (80.0%)           | 260 (100.0%)            | 0.000   |
| - No                                                                  | 158 (60.7%)  | 52 (20.0%)             | 0 (0.0%)                |         |
| K3. Social distance means stay more than 1 m (3 feet) away from a person who is sick |             |                        |                         |         |
| - Yes                                                                 | 18 (7.0%)    | 260 (100.0%)          | 260 (100.0%)            | 0.000   |
| - No                                                                  | 242 (93.0%)  | 0 (0.0%)               | 0 (0.0%)                | ***     |
| K4. Holding breath for more than 10 s is a test for COVID-19          |             |                        |                         |         |
| - Yes                                                                 | 59 (22.8%)   | 208 (80.0%)           | 260 (100.0%)            | 0.000   |
| - No                                                                  | 201 (77.2%)  | 52 (20.0%)             | 0 (0.0%)                |         |
| K5. The virus incubation period is from 1−3 days                       |             |                        |                         | 0.000   |
| - Yes                                                                 | 0 (0.0%)     | 260 (100.0%)          | 260 (100.0%)            |         |
| - No                                                                  | 260 (100.0%) | 0 (0.0%)               | 0 (0.0%)                |         |
| K6. COVID-19 is transmitted from a viral-infected person to a non-infected another person |             |                        |                         |         |
| - Yes                                                                 | 242 (93.0%)  | 0 (100.0%)            | 260 (100.0%)            | 0.001   |
| - No                                                                  | 18 (7.0%)    | 280 (0.0%)             | 0 (0.0%)                |         |
| K7. COVID-19 is transmitted by coughing                               |             |                        |                         | 0.000   |
| - Yes                                                                 | 78 (30.0%)   | 260 (100.0%)          | 260 (100.0%)            |         |
| K8. The disease is transmitted through touching and shaking hands |
|---------------------------------------------------------------|
| - Yes | 156 | 60.0 | 260 | 100 | 260 | 100 | 0.000 |
| - No  | 104 | 40.0 | 0   | 0.0 | 0   | 0.0 |       |

| K9. The disease symptoms are similar to seasonal influenza symptoms |
|-------------------------------------------------------------------|
| - Yes | 234 | 90.0 | 260 | 100 | 260 | 100 | 0.000 |
| - No  | 26  | 10.0 | 0   | 0.0 | 0   | 0.0 |       |

| K10. Infection with the virus cause death always |
|-----------------------------------------------|
| - Yes | 156 | 40.0 | 208 | 80.0 | 260 | 100.0 | 0.000 |
| - No  | 104 | 60.0 | 52  | 20.0  | 0   | 0.0    |       |

| K11. The virus infected a person more than once |
|-----------------------------------------------|
| - Yes | 78  | 30.0 | 260 | 100 | 260 | 100 | 0.000 |
| - No  | 182 | 70.0 | 0   | 0.0 | 0   | 0.0 |       |

Cont.
K12. Coronavirus spreads from person-to-person within close distance of each other.

|   | Yes | No |
|---|-----|----|
| n | 84  | 176|
| % | 32.3| 67.7|
|  | 260 | 0  |
|  | 100 | 0  |
|  | 11  | 249|
|  | 4.3 | 95.7|
| p  | 0.000|

K13. All people infected with coronavirus develop symptoms and feel unwell.

|   | Yes | No |
|---|-----|----|
| n | 102 | 158|
| % | 39.3| 60.7|
|  | 208 | 52  |
|  | 80.0| 20.0|
|  | 260 | 0   |
|  | 100.0| 0   |
| p  | 0.000|

K14. Sign and symptoms of COVID-19 have a fever, dry cough, and shortness of breath.

|   | Yes | No |
|---|-----|----|
| n | 156 | 104|
| % | 60.0| 40.0|
|  | 260 | 0   |
|  | 100 | 0   |
|  | 260 | 0   |
|  | 100 | 0   |
| p  | 0.000|

K15. All individuals infected with coronavirus have serious or severe disease.

|   | Yes | No |
|---|-----|----|
| n | 104 | 156|
| % | 40.0| 60.0|
|  | 68  | 192 |
|  | 26.3| 73.7|
|  | 16  | 244 |
|  | 6.0 | 94.0|
| p  | 0.001|

K16. Not all people with COVID-19 have severe cases. Only older adults with chronic illnesses tend to be more severe.

|   | Yes | No |
|---|-----|----|
| n | 102 | 158|
| % | 39.3| 60.7|
|  | 237 | 23  |
|  | 9.0 | 3.8 |
|  | 10  | 0   |
|  | 3.8 | 0   |
| p  | 0.000|

K17. Children do not appear to be at higher risk for COVID-19 than adults.

|   | Yes | No |
|---|-----|----|
| n | 78  | 182|
| % | 30.0| 70.0|
|  | 241 | 19  |
|  | 92.85| 7.15|
|  | 260 | 0   |
|  | 100.0| 0   |
| p  | 0.000|

K18. The coronavirus spreads when you breathe in the respiratory droplets that are coughed out or exhaled by an infected person.

|   | Yes | No |
|---|-----|----|
| n | 182 | 78 |
| % | 70.0| 30.0|
|  | 260 | 0  |
|  | 100 | 0  |
|  | 260 | 0  |
|  | 100 | 0  |
| p  | 0.000|

K19. Coronavirus in respiratory droplets can land on surrounding surfaces and remain alive for a long time.

|   | Yes | No |
|---|-----|----|
| n | 78  | 78 |
| % | 93.0| 0  |
|  | 260 | 0  |
|  | 100 | 0  |
|  | 260 | 0  |
|  | 100 | 0  |
| p  | 0.000|

***
|   | Yes | No |
|---|-----|----|
| K20. Catch the coronavirus if you touch your face, eyes, nose, and mouth after touching objects and surfaces where coronavirus is present. | 146 | 114 |
|   | 56.0 | 44 | 17.0 | 21 | 8.0 | 0.001 |
| K21. People should avoid touching their eyes, nose, and mouth with unwashed hands. | 234 | 26 |
|   | 90.0 | 260 | 100 | 260 | 100 | 0.000 |
| K22. People should only wear a mask if they are infected with the virus, or if they are caring for someone with suspected COVID-19 infection | 167 | 93 |
|   | 64.28 | 238 | 91.4 | 260 | 100.0 | 0.000 |
| Cont. |
**K23.** People infected with coronavirus cannot spread the disease when they have no fever.

|   | Yes | No |
|---|-----|----|
|   | 42  | 218|
|   | 16.0| 84.0|
|   | 241 | 19 |
|   | 92.85 | 7.15|
|   | 260 | 0 |
|   | 100.0 | 0.0 |
|   | 0.000 |   |

**K24.** Young has good immunity and does not need to take precautions to protect against coronavirus.

|   | Yes | No |
|---|-----|----|
|   | 42  | 218|
|   | 16.0| 84.0|
|   | 237 | 23 |
|   | 91.0 | 9.0|
|   | 250 | 10 |
|   | 96.2 | 3.8 |
|   | 237 | 23 |
|   | 91.0 | 9.0|
|   | 250 | 10 |
|   | 96.2 | 3.8 |
|   | 100.0 |   |
|   | 0.000 |   |

**K25.** After being in a public place, after nose-blowing, coughing or sneezing, people must wash their hands with soap and water, or use a hand sanitizer containing at least 60% alcohol, for at least 20 seconds.

|   | Yes | No |
|---|-----|----|
|   | 132 | 128|
|   | 50.9| 49.1|
|   | 241 | 19 |
|   | 92.85 | 7.15|
|   | 260 | 0 |
|   | 100.0 | 0.0 |
|   | 0.000 |   |

**K26.** At present, there is no vaccine or effective treatment for coronavirus disease / COVID-19.

|   | Yes | No |
|---|-----|----|
|   | 104 | 156|
|   | 40.0| 60.0|
|   | 260 | 0 |
|   | 100 | 0 |
|   | 260 | 0 |
|   | 100 | 0 |
|   | 0.000 |   |

**K27.** Antibiotics are an effective treatment for COVID-19

|   | Yes | No |
|---|-----|----|
|   | 52  | 208|
|   | 20.0| 80.0|
|   | 186 | 74 |
|   | 71.4 | 28.6|
|   | 260 | 0 |
|   | 100.0 | 0.0 |
|   | 0.000 |   |

**K28.** Healthy food and drinking water increase the body's immunity and resistance to COVID-19.

|   | Yes | No |
|---|-----|----|
|   | 182 | 78 |
|   | 70.0| 30.0|
|   | 260 | 0 |
|   | 100 | 0 |
|   | 260 | 0 |
|   | 100 | 0 |
|   | 0.000 |   |

**K29.** Regular hand wash or cleaning them with an alcohol-based hand rub can protect against COVID-19

|   | Yes | No |
|---|-----|----|
|   | 208 | 52 |
|   | 80.0| 20.0|
|   | 260 | 0 |
|   | 100 | 0 |
|   | 260 | 0 |
|   | 100 | 0 |
|   | 0.000 |   |
K30. self-isolate, if you have accidentally come in contact with a person with COVID-19,

- Yes  102  39.3  208  80.0  260  100.0  0.000
- No  158  60.7  52  20.0  0  0.0

8-Knowledge mean scores as pre, immediate and post-program (Mean±SD)

Table (3): Comparison of secondary school students' level of knowledge related to COVID-19 as pre/immediate post and after one-month program implementation (N=260)

| Items         | Pre-program | Immediate-post program | After one month program | P-value |
|---------------|-------------|------------------------|-------------------------|---------|
|               | No. | %    | No. | %    | No. | %    |         |
| Poor > "50 "  | 260 | 100% | 0   | 0.0  | 0   | 0.0  | 0.000    |
| Fair "50-65"  | 0   | 0.0  | 200 | 61.4 | 182 | 70.0 | 0.000    |
| Good"≥ "65"   | 0   | 0.0  | 210 | 80.6 | 234 | 90.0 | 0.000    |
| Total knowledge | 5.68±0.69 | 16.17±3.10 | 24.04±8.04 | 0.000 |

Table (4): Distribution of secondary school students' attitude toward COVID-19 as pre/immediate post and after one-month of program implementation (N=260)
| Attitude topics                                                                 | Pre-Program | Immediate-post program | After one month program | p-value |
|--------------------------------------------------------------------------------|-------------|------------------------|-------------------------|---------|
|                                                                               | No. | %    | No. | %    | No. | %    |         |         |
| A1. feel anxious when you think of coronavirus disease / COVID-19              |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 260 | 100  | 128 | 49.3 | 24  | 9.3  | 0.000   |         |
| - No                                                                          | 0   | 0.0  | 132 | 50.7 | 236 | 90.7 |         |         |
| A2. an unhealthy diet will weaken the immune system and make you prone to get infected with coronavirus |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 102 | 39.3 | 208 | 80.0 | 260 | 100.0| 0.000   |         |
| - No                                                                          | 158 | 60.7 | 52  | 20.0 | 0   | 0.0  |         |         |
| A3. regular hand washing, maintaining social distancing and use of masks can protect |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 167 | 64.28| 238 | 91.4 | 260 | 100.0|         |         |
| - No                                                                          | 93  | 35.72| 22  | 8.6  | 0   | 0.0  | 0.000   |         |
| A4. Lockdown will help control the coronavirus disease / COVID-19 in Egypt.     |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 146 | 56.0 | 201 | 77.14| 260 | 100.0| 0.000   |         |
| - No                                                                          | 114 | 44.0 | 59  | 22.86| 0   | 0.0  |         |         |
| A5. To protect me from COVID-19 exposure, I should stay home if I am sick      |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 132 | 50.9 | 241 | 92.85| 260 | 100.0| 0.000   |         |
| - No                                                                          | 128 | 49.1 | 19  | 7.15 | 0   | 0.0  |         |         |
| A6. Egypt's strict measures can help win the battle against COVID-19.          |     |      |     |      |     |      |         |         |
| - Yes                                                                         | 52  | 20.0 | 186 | 71.4 | 260 | 100.0| 0.000   |         |
| - No                                                                          | 208 | 80.0 | 74  | 28.6 | 0   | 0.0  |         |         |

Table (5): Mean score of the studied secondary school students' attitude regarding COVID-19 during pre/immediate post and after one-month program implementation (N=260)
Table (6): Comparison of secondary school students' level of attitude related to COVID-19 as pre/immediate post and after one month (N=260)

| Levels      | Pre-program | Immediate-post program | After one month program | P-value |
|-------------|-------------|------------------------|-------------------------|---------|
| - Poor > "50" | 202 (77.7%) | 0 (0.0)                | 0 (0.0)                 | 0.000   |
| - Fair "50: 65" | 52 (20.0%) | 0 (0.0)                | 0 (0.0)                 | 0.000   |
| - Good"≥ "65" | 6 (2.3%)    | 260 (100%)             | 260 (100%)              | 0.000   |
| Total attitude | 1.17±1.60  | 4.06±1.73              | 5.84±1.12               | 0.000   |

Table (7): Secondary school students' practice regarding COVID-19 pre/immediate post and after one-month program implementation (N=260)
| Items                                                                 | Pre-Program | Immediate-post program | After one month program | p-value |
|---------------------------------------------------------------------|-------------|------------------------|-------------------------|---------|
|                                                                    | No. | %       | No. | %     | No. | %    |         |
| P1. stay at home during this COVID-19 pandemic                      | 18   | 7.0     | 260 | 100   | 260 | 100   | 0.000   |
| - Yes                                                               | 242  | 93.0    | 0   | 0.0   | 0   | 0.0   | ***      |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P2. cover mouth and nose with a tissue or elbow when sneezing     | 42   | 16.0    | 237 | 91.0  | 250 | 96.2  | 0.000   |
| - Yes                                                               | 218  | 84.0    | 23  | 9.0   | 10  | 3.8   | ***      |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P3. Follow social distancing when meeting other people              | 22   | 8.5     | 260 | 100   | 260 | 100   | 0.000   |
| - Yes                                                               | 238  | 91.5    | 0   | 0.0   | 0   | 0.0   |          |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P4. perform hand wash in daily routine activities                  | 22   | 8.5     | 260 | 100   | 260 | 100   | 0.000   |
| - Yes                                                               | 238  | 91.5    | 0   | 0.0   | 0   | 0.0   | ***      |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P5. Wear a mask when you visit an infected person                  | 59   | 22.8    | 208 | 80.0  | 260 | 100   | 0.000   |
| - Yes                                                               | 201  | 77.2    | 52  | 20.0  | 0   | 0.0   |          |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P6. Sanitize the surfaces which are suspected of infection exposure.| 0    | 0.0     | 260 | 100   | 260 | 100   | 0.000   |
| - Yes                                                               | 260  | 100     | 0   | 0.0   | 0   | 0.0   |          |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P7. wear a mask when you visit a hospital                          | 0    | 0.0     | 260 | 100   | 260 | 100   | 0.001   |
| - Yes                                                               | 260  | 100     | 0   | 0.0   | 0   | 0.0   |          |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| P8. Traveled to any area affected by COVID-19.                      | 13   | 5.0     | 5   | 2.0   | 3   | 1.0   | 0.000   |
| - Yes                                                               |      |         |      |       |      |       |          |
| - No                                                                |      |         | 260 | 100   | 260 | 100   |          |
| Item | Pre-program | Immediate-post program | After one month program | P-value |
|------|-------------|------------------------|-------------------------|---------|
| P9. shake hand upon the meeting of friends/family | 234 (90.0) | 26 (10.0) | 0 | 0.000 |
| P10 touch routinely your mouth, nose, and eyes. | 234 (90.0) | 26 (10.0) | 0 | 0.000 |
| P11. recently go to a crowded place | 104 (40.0) | 156 (60.0) | 26.3 (10.0) | 0.001 |
| P12. Go out for walking or playing with friends | 146 (56.0) | 114 (44.0) | 17.0 (8.0) | 0.001 |
| P13. Use disinfectants | 0 (0.0) | 260 (100) | 10.1 (13) | 0.001 |
| P14. Avoid eating outside | 13 (5.1) | 247 (94.9) | 10.0 (8) | 0.000 |

Table (8): Mean score of studied secondary school students' practice regarding COVID-19 during pre/immediate post and after one month of program implementation (N=260)

Table (9): Comparison of secondary school students' levels of practice related to COVID-19 as pre/immediate post and after one month (N=260)
| Levels               | Pre-program | Immediate-post program | After one month program | P-value |
|---------------------|-------------|------------------------|-------------------------|---------|
|                     | No %        | No %                   | No %                    |         |
| - Poor > "50 "      | 150 (57.7%) | 0 0.0                  | 0 0.0                   | 0.000   |
| -Fair "50: 65"      | 100 (38.3%) | 0 0.0                  | 0 0.0                   | 0.000   |
| -Good"≥ "65"        | 10 (4.0%)   | 260 (100%)             | 260 (100%)              | 0.000   |
| Total practice      | 10.17±1.60  | 10.06±1.73             | 12.84±2.12              | 0.000   |

Table (10): Correlation coefficient between total secondary school students’ knowledge, attitude and practice scores regarding COVID-19 during pre/immediate post and after one month of program implementation (N=260)

| Items                          | Practice                                      |
|--------------------------------|-----------------------------------------------|
|                                | Pre-program | Immediate-post | After one month |
|                                | R          | P             | R            | P             | R            | P             |
| - Total knowledge post-program| 0.035      | 0.814         | —            | —             | —            | —             |
| - Total attitude post-program  | —          | —             | 0.243        | 0.004***      | 0.412        | 0.005***      |

Discussion

The world is now facing a Coronavirus pandemic which is considered highly infectious. Several preventive measures have been mentioned to prevent its spread among students. However, for these preventive measures to be effective, the students require appropriate and sufficient knowledge. Knowledge, attitude, and practices are crucial to prevent and control the disease. Health care teams include nurses and are responsible for providing knowledge, delivering good quality management, and protecting individuals from an illness during the epidemic prevalence period (26). Here, we present the results of this study to evaluate the impact of structured teaching programs regarding COVID-19 on knowledge, attitudes, and practices among secondary school students.

The present study revealed that more than half of the participants were female and less than half of were male. The age of the participants ranged from 15 to 18 years old. These results were nearly supported by the study conducted by Dafni and Maddalena, 2020 (27) who found in his study in Italy that the age of participants ranged from 14 to 19 years old and that females were more than half of the participants.

The present study indicated that the main source of information about COVID-19 was social media. These results followed the results of Marwa et al., 2020 (28) in her cross-sectional study on awareness and knowledge of COVID-19 among senior pharmacy students.
These results are also strongly supported and similar to findings in which the main source of Middle East respiratory syndrome (MERS) information was reported to be the internet and social media (29). This indicates that secondary school students are conducting on the internet, social media, and online information as is becoming one of the principal and rapid ways to obtain information, compared with other resources. The Egyptian Ministry of Health and Population and the World Health Organization (WHO) have provided information about COVID-19 through their websites and they are recommending people to be aware of updates relating to knowledge about COVID (30, 31). Similarly, previous study mentioned that the internet was the main source of information about COVID-19 (32). This reflects the importance of the Internet in promoting health, especially during infectious diseases and pandemics. Technology presence in these lock-down months plays an important role in providing knowledge and helps students continue their learning. More attention should be given to utilizing technology particularly social media resources, especially Facebook or Whats App, as they help promote public health education among students.

The current study indicates that there was an improvement in secondary school students' knowledge compared to preprogram knowledge. There was a highly statistically significant difference between pre/post and after one month of program implementation to the secondary school student's knowledge regarding COVID-19 (P-value <0.000). This may be related to the effect of teaching programs regarding COVID-19 on the knowledge, of students and the booklet which covered all identified needs and knowledge gaps about the topic among secondary school students. Students need to have sufficient and correct knowledge about COVID-19 from a biological and scientific point of view and not only socially as correct information during the pandemic is considered the key point on which attention in this research to focus.

The present study revealed that out of all subjects had poor pretest knowledge levels; in the posttest, most of the secondary school students had good knowledge levels, this which indicated the importance of structured teaching programs that were effective in improving the students' knowledge. This reflected the desire of the students to increase and improve their awareness and know the value of health and the importance of good practicing during COVID – 19 as a method for prevention and protection against infection with coronavirus.

The current study indicated that there was an improvement in secondary school students' attitudes compared to preprogram knowledge. There was a highly statistically significant difference between pre/post and after one month of program implementation to the secondary school student's attitude regarding COVID-19 (P-value <0.000). This is related to the correlation between the students' attitude and knowledge which indicates that sufficient knowledge reflects their positive attitude among students towards COVID-19.

The current study revealed that secondary school students' attitudes were measured with 6 items. The highest negative result was answered regarding the COVID-19-related attitude item: "feel anxious when you think of coronavirus disease / COVID-19". This was a country such as Egypt, where stress and
anxiety may occur because basic prevention measures are unavailable (32), and there is insufficient information about the disease. The knowledge that is a prerequisite for achieving positive attitudes and promoting positive behaviors among students are necessary, which helps individuals' cognition to invest a sense towards the infection regarding COVID-19.

The current study revealed that there was improvement among secondary school students' practice regarding COVID-19 pre/immediate post and after one-month program implementation, where there were highly significant differences (P=0.000) with regard to practice of all the preventive measures from COVID-19. This is related to the correlation between the secondary school students' attitude and practice which indicates that their positive attitude is affecting their action towards COVID-19.

The current study revealed that in the pretest program many preventive measures not practicing and secondary school students showed a low-performance rate, as out of 260 (22.8%) of participants were not practicing the use of masks. These results follow the results of (28) who reported in her study that the students showed poor practice when using masks as a protective measure. This was related to the lower level of knowledge about the importance of wearing masks. This is also supported by the findings from a previous study by (33), which mentioned that only approximately one-third of the participants were wearing face masks.

The current study reflected that, out of all subjects, more than half of them had poor pretest practice levels and in the posttest, all secondary school students had good practice levels which improved after program implementation. It illustrated that secondary school students' mean scores total practice regarding COVID-19 before and after the program implementation was improved, and there was a highly statistically significant difference (p= <0.000) where the mean practice was 10.17 before the program compared to 12.84 after one month from program implementation. This finding supported the third stated research hypnosis which stated that secondary school students' who will be exposed to structured teaching programs regarding COVID-19 will have improved in their practice, and the total practice score will be higher post-intervention than pre-intervention.

The present study revealed that there was a highly statistically significant positive correlation between total knowledge scores, attitude and their practice at the post and after one-month program implementation. This can be explained by the fact that research hypnosis was achieved and concluded that the structured teaching program had an impact on secondary school students' knowledge, attitude and practice regarding COVID-19 and values the need for a well-organized teaching program to promote the knowledge, attitude and practice of secondary school students and emphasized the readiness of students to gain more information.

**Conclusion**

In light of the study findings, it was concluded that secondary school students' knowledge, attitude, and practice improved after exposure to the structured teaching program. The provision of a structured teaching program was significantly effective in increasing knowledge level, attitude, and practice among
secondary school students regarding COVID-19. Therefore, the stated research hypothesis was statically supported. Secondary school students have poor knowledge regarding COVID-19. It is reflected in their negative attitude and poor healthy preventive practices towards COVID-19 that have improved after the teaching program. This will help protect them from COVID-19.

RECOMMENDATIONS:

Based on the findings of the current study, the following recommendations are proposed:

1. Secondary school students should receive adequate education, simulation, and counseling regarding COVID-19.
2. Training programs for teachers to be well prepared to provide instructions about prevention and control about COVID-19 for students.
3. Training program for nurses to be well prepared to provide secondary school students with appropriate knowledge and practices about COVID-19 through verbal and written instructions.
4. It is important to encourage cooperation between educational institutions, medical care providers, and health personnel to educate secondary school students about COVID-19 that will help in increasing awareness, decreasing the spread of disease, prevention, and control.

Declarations

COMPLIANCE WITH ETHICAL STANDARDS

ETHICS APPROVAL

Each secondary student was informed about the aim and benefits of the study in the first part before starting the questionnaire where every student could not be starting the questionnaire without consent to participate in data collection in the current study. Each student informed them that participation in the study was voluntary and that they had the right to withdraw from the study at any time before completing the questionnaire with no consequences, without giving any reason and that their responses would be held confidentially.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICTS OF INTEREST

The authors declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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Figures
Figure 1

Percentage distribution of secondary school students according to their educational level (N=260).

Figure 2

Chart Title

| Series1 | Social media | T.V | Family | Friends | Doctors |
|---------|--------------|-----|--------|---------|---------|
|         | 73           | 49  | 48     | 48      | 20      |
Percentage distribution of secondary school students according to their source of information about COVID-19 (N=260).

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- **TOC.png**