

An Awareness Program for Preparatory School Students Regarding COVID-19 and Its Variants Based on Health Belief Model

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Abstract: Background: The COVID-19 and its variants outbreak proved to be one of the most transformative events in the modern period and had a significant global impact, especially on educational sector.

Aim: To evaluate the effect of an awareness program for preparatory school students regarding COVID-19 and its variants based on health belief model.

Design: A quasi- experimental design (pre and post-test). **Setting:** This study was conducted at three preparatory schools were selected randomly in El-Masara, Helwan, Egypt. **Sample:** A multistage random sample of 210 students from 1st and 2nd preparatory grade.

Tool: One tool was used a self-administered questionnaire sheet consists of six parts; students' demographic data, medical health history and COVID-19 related experiences, knowledge, attitudes, reported practices, and health belief model scale regarding COVID-19 and its variants.

Results: 60.5% of the studied students had poor knowledge pre-program, which improved to 90.5% of them had good knowledge post-program, 61.4% of them had negative attitudes pre- awareness program, which improved to 100% of them had positive attitudes post-awareness program and 72.4% of them had unsatisfactory reported practices pre-awareness program, which improved to 98.1% of them had satisfactory practices post- awareness program. Also, the studied students' total mean score of health belief model increased significantly from (65.42 ± 5.79) pre-awareness program to (106.35± 5.58) post-awareness program (P≤0.001).

Conclusion: The awareness program based on health belief model had a positive effect on the preparatory school students' knowledge, attitudes, reported practices, and health beliefs regarding COVID-19 and its variants so hypothesis was accepted.

Recommendations: Continues awareness programs for all preparatory school students to raise their awareness about COVID-19 & its variants and dissemination of awareness booklet about COVID-19 and its variants among school students.

Keywords: An awareness program, COVID-19 and its variants, Health belief model, Preparatory school students.

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I. INTRODUCTION

In December 2019, an outbreak of novel coronavirus disease occurred in Wuhan, China. The causative agent of the disease is the severe acute respiratory syndrome coronavirus 2. The World Health Organization (WHO) named it Coronavirus Disease 2019 (COVID-19), and declared it a public health pandemic, on March, 2020. Since that time, it had affected the entire world in a very short time. ^[1]

COVID-19 may lead to serious feeling of stress especially after developing new variants from it, as infection of COVID-19 variants became more serious due to rapid spread of these mutated variants, which are more likely to cause break down through or re-infections in those who are vaccinated or previously infected. These variants are more likely to cause severe disease which lead to very serious effect on different sectors including education. ^[2]

Preparatory school students are at risk of COVID-19 and its variants infection due to various factors. Students can contract and transmit the virus through the close proximity in classrooms, shared spaces, and social interactions. It is important for schools and communities to implement preventive measures to reduce the risk of COVID-19 and its variants transmission among the students. Students' awareness plays a pivotal role in preventing and controlling infection, and the behavior of students influences the spread of infectious agents. ^[3]

The health belief model (HBM) suggests that the threat of an illness combined with a belief in the effectiveness of the recommended behavior. The likelihood of adopting a certain behavior is based on an individual assessment of threat, which involves evaluating the likelihood of getting the disease and its severity. ^[4] In addition, individual factors (e.g., age, gender, socioeconomic status, knowledge, and awareness), cues of action, and the benefits and feasibility of adopting a behavior help to predict whether preventive measures will be adopted. Knowledge and awareness related to all constructs in HBM help individuals carry out an assessment, which results in either adopting a new behavior or not. ^[5]

An awareness program based on health belief model aims to increase the perception of students about a health threat and direct their behaviors towards health. Likewise, the model focuses on a student's health related behavior and belief in predicting future actions. The perceived risk of students developing COVID 19 or its variants is considered to be the primary motive to change within the health belief model, which assumes that the higher the perceived threat, the more likely an individual will modify his or her behavior to avoid that threat. ^[6]

A school health nurse has a vital role in helping preparatory school students improve their knowledge about COVID-19 and its variants. It is believed that the more health knowledge a person possesses, the better healthy behaviors they will adopt. ^[7] Nurses can educate students about protective behaviors of COVID-19 and its variants, such as wearing a mask while outside the home or dealing with infected individuals, keeping 1 meter at least apart from others, washing hands frequently for at least 20 seconds, avoiding overcrowded places, and avoiding sharing personal items. ^[8]

1.1 Significance of the Study

The virus that causes COVID-19 is continually evolving and producing new types of variants that spread quickly across the world because of its high transmission rate. This pandemic has resulted in more than 750 million reported cases and more than 6.5 million deaths worldwide. In Egypt, from January 2020 to January 2024 there have been 516,023 confirmed cases of COVID-19 with 24,613 deaths reported to the World Health Organization. ^[9] Education has been severely disrupted by this current global pandemic; 94% of students worldwide were affected, representing 1.58 billion students, from pre-primary to higher education, in 200 countries. ^[10]

The gap in knowledge, poor attitudes, negative health beliefs, and bad practices among students in relation to COVID-19 and its variants prevention and control have a contributing role in spreading the infection. Positive attitude and behavioral changes are driven by the level of knowledge and health beliefs towards preventive practices. Thus, awareness program carried out at schools would have a positive effect on health as well as health behaviors of school students, their families, and community. ^[11] So, the current study aimed to evaluate the effect of an awareness program for preparatory school students regarding COVID -19 and its variants based on health belief model.

1.2 Aim of the study

The aim of this study is to evaluate the effect of an awareness program for preparatory school students regarding COVID-19 and its variants based on health belief model through:

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- 1) Assess preparatory school students' awareness about COVID-19 and its variants.
- 2) Plan and implement an awareness program for preparatory school students regarding COVID-19 and its variants based on health belief model.
- 3) Evaluate the effect of an awareness program on knowledge, attitudes, reported practices and health beliefs of preparatory school students regarding COVID-19 and its variants.

1.3 Research Hypothesis:

After implementation of an awareness program based on health belief model, the preparatory school students will have improvements in their knowledge, attitudes, reported practices and health beliefs regarding COVID-19 and its variants.

II. SUBJECTS AND METHODS

2.1 Research design:

A quasi-experimental design was utilized in this study.

□ Research setting:

The study was conducted at preparatory schools in El-Masara district in Helwan, Cairo Governorate, Egypt. El-Masara district contains 17 preparatory schools, selected randomly (El-Shaheed Ahmed Marzok preparatory school for girls, Khadija Bent Khowayled preparatory school, and 25 January preparatory school). Each school has six classes for the 1st and 2nd preparatory grades, and the total number of students in each class recruited through the academic year 2021-2022 was 32–35.

2.3 Sampling technique:

A multi-stage random sampling technique was used for the selection of preparatory school students according to the following stages:

First stage: the total number of governmental preparatory schools at El-Masara is 17; three schools were chosen randomly to conduct this study by using numbers that were written on closed paper and assigned to each school. The researcher then closed his eyes and randomly picked up a subset of three numbers that represent three schools from the 17 schools in El-Masara district.

Second stage: two classes from first and second preparatory grades were selected randomly from each school. The total number of classes included in the study was six.

Third stage: all school students in selected classrooms were included in the study (210).

2.4 Subjects:

A multistage random sample of 210 students from the first and second preparatory grades was included in this study from the selected preparatory schools in El-Masara district.

2.5 Tools of data collection:

The data were collected through using the following tool:

A Self - Administrated Questionnaire: This tool was developed by the researcher after a comprehensive literature search and based on the most recent available information from the World Health Organization, the Center for Disease Control and Prevention and the Egypt Ministry of Health. It composed of six parts:

Part I: Concerned with demographic characteristics of the students related to age, sex, place of residence, preparatory school grade, father's education, mother's education, family members whose work in the health sector, family income, number of family members, and number of household rooms. It consists of 10 items (Q1 - Q10).

Part II: Concerned with the students' medical history and COVID-19 related experience, which included: Do you have an existing chronic disease, how do you rate your overall health, how worried do you about coronavirus, previous infection with COVID-19 or its variants, know someone who had been infected with COVID-19 or its variants, know someone who died from COVID-19 or its variants and primary sources of COVID-19 pandemic. It consists of 7 items (Q11-Q17).

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Part III: Concerned with students' knowledge about COVID-19 & its variants which included: knowledge regarding meaning, causes, routes of transmission, incubation period, common symptoms, vulnerable groups, diagnosis, and available treatment of the disease, complications, prognosis, general preventive measures and knowledge regarding variants of COVID-19. This part was used before and after the awareness program to evaluate the effect of the program. It consists of 60 items (Q18- Q77).

Scoring system for students' knowledge items:

This part contained 60 closed ended questions; they were answered on "yes," "no," and "I don't know" options. A correct answer was assigned a score of 1 and zero for an incorrect answer, or I don't know. The total knowledge score ranged from zero to 60; scores were converted into percentages, with high scores indicating good knowledge about COVID-19 and its variants. Items were evaluated for internal reliability using Cronbach's alpha coefficient of 0.82, indicating internal reliability.

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

- Good knowledge ($\geq 75\%$ -100%) (≥ 45 -60 scores).
- Average knowledge ($50\% < 75\%$) (30- <45 scores).
- Poor knowledge ($< 50\%$) (0<30 scores).

Part IV: Concerned with students' attitudes toward COVID-19 and its variants, for example: feel anxious when you think of COVID-19 and its variants, think that you are a potential source of infection for your family, and think that keeping a safe physical distance is the duty of all people. This part was used before and after the awareness program to evaluate the effect of the program. It consists of 20 items (Q78- Q97).

Scoring system for students' attitudes items:

This part contained 20 questions; in this section, scores were calculated based on the students' answers to each attitudinal statement using three-point Likert scale, which was rated from 1-3: 1 = disagree, 2 = neutral, and 3 = agree. Total scores ranged from 20 to 60; scores were converted into percentages, with high scores indicating positive attitudes. The Likert scale was assessed for internal reliability using Cronbach's alpha. Cronbach's α coefficient was 0.84, indicating internal reliability.

The total scores of students' attitudes were divided into two levels:

- Positive attitude $\geq 60\%$ (≥ 36 - 60 scores).
- Negative attitude $< 60\%$ (20 - < 36 scores).

Part V: Concerned with reported practices about COVID-19 and its variants to assess the adherence to preventive measures like: covering mouth and nose with a tissue or elbow when sneezing & coughing, disposing of used tissues in the bin & washing hands in regular manner with soap and water or with disinfectants, and sanitize the surfaces which are suspected of infection exposure. This part was used before and after the awareness program to evaluate the effect of the program. It consists of 20 items (Q98-Q117).

Scoring system for students' reported practices items:

This part contained 20 questions; in this section, scores were calculated based on the students' answers to each statement using three-point Likert scale, which was rated from 0-2, zero = never, 1 = sometimes, and 2 = always. Total scores ranged from 0 to 40; scores were converted into percentages, with high scores indicating satisfactory reported practices. The Likert scale was assessed for internal reliability using Cronbach's alpha. Cronbach's α coefficient was 0.87, indicating internal reliability.

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The total scores of students' reported practices were divided into two levels:

- Satisfactory reported practice $\geq 60\%$ (≥ 24 - 40 scores).
- Unsatisfactory reported practice $<60\%$ (0-< 24 scores).

Part VI: Health Belief model (HBM) scale that was adapted from (Champion et al., 2002) [12] to assess students' health beliefs regarding COVID-19 and its variants. It included questions about perceived susceptibility to COVID-19 and its variants (8 items), perceived severity of COVID-19 and its variants (6 items), perceived barriers to COVID-19 and its variants' preventive measures (5 items), perceived benefits of preventive safety measures of COVID-19 and its variants (4 items), perceived Self-efficacy (8 items), cues to action (8 items). This part was used before and after the awareness program to evaluate the effect of the program. It consists of 39 items (Q118- Q156)

Scoring system for HBM:

All the items of subscales have three-point Likert scale, which was rated from 1-3: 1 = disagree, 2 = neutral and 3 = agree. Unless perceived barriers 3= disagree, 2 = neutral and 1 = agree. The total score ranged from 39 to 117; which were scoring as following: 24 for perceived susceptibility, 18 for perceived severity, 15 for perceived barriers, and 12 for perceived benefits, 24 for self-efficacy and 24 for cues to action. The Likert scale was assessed for internal reliability using Cronbach's alpha. Cronbach's α coefficient was 0.89, indicating internal reliability.

2.6 Validity

The tools validity was done by five of Faculty's staff nursing experts in the field of experts in medical surgical and community health nursing, Faculty of Nursing, Helwan University, specialties reviewed the tools for clarity, relevance, comprehensiveness, applicability, and reliability.

2.7 Reliability

Reliability coefficients were calculated for the questionnaires of preparatory students regarding COVID-19 and its variants, Cronbach's Alpha for their knowledge was 0.82, for their attitudes was 0.84, for their reported practices was 0.87, and for their health belief model was 0.89.

2.8 Pilot study

The simplicity, clarity, and applicability of the tool was evaluated in a pilot study involving 10% of the entire sample (21 students). The time required to collect the questionnaire was determined as well as any problems during data collection were identified. Since no modifications were made, pilot study participants were included within the total sample size.

2.9 Fieldwork

Before conducting the study, permission was obtained from the directors of the schools. The researcher met the students and the aim of the study was explained to them. Their informed verbal consent was secured before collecting data. Data was collected during two semesters of the 2021–2022 academic year, from the beginning of November to the end of May, and the researcher was available two days per week (Tuesday and Wednesday) from 9:00 a.m.–1:00 p.m. in the study setting until the completion of the questionnaire. The study was carried out by interviewing the students in the previously mentioned settings. The time required for each student to fill out the questionnaire was about 15–20 minutes. The researcher re-checked each sheet after the student completed it to make sure no data was missing.

The awareness program phases: This study was conducted by preparatory, assessment, planning, implementation and evaluation phases as following:

(I) Preparatory phase: Tools of data collection development: This phase started a review of current and past national and international related literature, the most recent available information from the World Health Organization, the Center for Disease Control and Prevention, and the Egypt Ministry of Health, and theoretical knowledge of various aspects of the study by using books, articles, internet periodicals, and magazines. This helped the researcher to be acquainted with the problem, and guiding the process of tools' designing.

(II) Assessment phase: By using pre-testing questionnaire to assess preparatory school students' knowledge, attitudes, reported practices and health beliefs regarding COVID-19 and its variants. The researcher introduced herself to the

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students and explained the purpose of the study. The sheets were filled out by students in the presence of the researcher to ensure maximum homogeneity of responses and allow the researcher to read and offer clarification if there were ambiguities or confusing questions.

(III) Planning phase: According to the analysis of pretest findings gained during the assessment phase on detecting the actual needs of students and relevant literature, areas of weakness in students' awareness were identified and implementation program objectives were set. So, the researchers designed an awareness program regarding COVID-19 and its variants based on health belief model to improve awareness. The educational methods and the number of sessions required were determined. Developing an awareness booklet based on students' assessment needs, which had given to students as an educational reference during program implementation. Its aim was providing accurate knowledge, positive attitudes & health beliefs and healthy practices regarding COVID-19 and its variants. The booklet was written in a simple Arabic language with attractive and colorful pictures to be a guide and a reference for the students in the future.

(IV) Implementation phase: In this phase, the researcher implemented the awareness program sessions. The sessions were delivered over 24 weeks, which equals 6 months. Each week involved two sessions for each group lasting 30-45 minutes. The study sample was divided into 8 groups; each group contained 26–27 students, which took 6 sessions; each session took one day. So, 6 sessions took 6 days which means 3 weeks for each group. Contents of booklet including (overview about coronavirus, prevalence and incidence of the disease, common signs and symptoms of the disease, modes of transmission, the incubation period of the disease, evolution of COVID-19 in the body, risk factors and high risk groups, variants of COVID-19, diagnostic methods, treatment, complications, vaccines, hygienic practices and protective preventive measures; the proper method of wearing, removing, and disposing of the mask. Hand washing frequency, and correct technique, as well as coughing and sneezing etiquette. Also, measures related to personal hygiene, physical distancing, and home quarantine).

The awareness program included 6 theoretical and practical sessions (4 for theoretical part and 2 for practical part); each session lasted 30-45 minutes, except for the first session, which was one hour due to conducting the pretest questionnaire, and the sixth session, which was also one hour as the posttest questionnaire was immediately done. The awareness program was designed and developed based on the HBM. The awareness content was about making students sensitive to the problem (perceived susceptibility), then understanding the depth of the risk and the seriousness of its various complications (perceived severity), with positive message that come from their surroundings (cues to action), believing in the usefulness and applicability of preventive behaviors (perceived benefits), not engaging in these behaviors are also less costly than their benefits (perceived barriers) and enabling them to perform preventive actions (self-efficacy) and to ultimately perform preventive measures properly and learning how to protect themselves from COVID-19 and its variants infection. After each session, feedback on the previous session was given, as well as the objectives for the next one. Different teaching methods were used, such as group discussion, brainstorming, and demonstration using data show, PowerPoint presentations, pictures, videos, and a booklet prepared by the researcher.

(V) Evaluation phase: The effect of an awareness program for preparatory school students regarding COVID-19 and its variants based on the health belief model was evaluated by comparing the assessment tools of the students' knowledge, attitudes, reported practices, and health beliefs. They would be filled out twice; pre-program implementation and immediately post-program implementation.

2.10 Ethical considerations:

An official permission to conduct the proposed study obtained from the Scientific Research Ethics Committee Faculty of Nursing, Helwan University. Participation in the study was voluntary and subjects were given complete full information about the study which included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it not be accessed by any other party without taking permission of the participants. Ethics, values, culture and beliefs were respected.

2.11 Statistical analysis:

Data entry and statistical analysis were done using the statistical package for social science (SPSS), version 26. Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation, unpaired student t-test, Pearson's correlation coefficient and chi-square tests. Data were presented using descriptive statistics in the form of

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frequencies and percentages for qualitative variables. Qualitative categorical variables were compared using chi-square test (χ^2) while Pearson's correlation coefficient was used for detection of correlation between two quantitative variables in one group. ANOVA test was used to compare mean in normally distributed quantitative variables in more than two groups. While T test used to compare mean in normally distributed quantitative variables between two groups. In addition, R- tests were used to identify the correlation between the studied variables. Degrees of the significance of results were considered as follows: P-value > 0.05 not significant (NS), p-value \leq 0.05 statistically significant (S) and p.-value \leq 0.001 highly statistically significant (HS).

III. RESULTS

Table 1 shows that 86.5% of the studied students were in the age group 11-13 years old, with mean and standard deviation values of age were 12.18 ± 1.82 years, 65.2% of them were females, 75.2% of them live in urban residence and 60.0% of them were in the 1st preparatory grade. Regarding level of parent's education, 27.6% of their fathers had secondary education, with 21.9% of their mothers were not read and write and had technical diploma equally. Whereas, 51.0% of their parents don't work in the health sector while 49.0% of them work.

Table 2 illustrates that 94.8% of the studied subjects had not chronic diseases, 34.8% perceived that their health status was very good and 49.0% were very worried about coronavirus. 75.2% of them hadn't been infected with COVID-19, while 24.8% of them had been infected. 63.5% of the infected subjects reported that the infection was mild and 78.8% of them hadn't been confirmed to have been infected by a test. Moreover, 51.9% of them didn't know people who were or had been infected with COVID- 19 (suspected or confirmed), and 80.0% of them reported that the infected people they knew weren't died from COVID-19.

Figure 1 reveals that 60% of the studied students used social media (e.g., Facebook, Twitter, etc.) as a primary source of information to know about COVID-19 and its variants, followed by 40% of them using television. On the other hand, 12.9% of the studied students' primary sources of information were health care professionals, while 12.4% of them were used radio.

Figure 2 clarifies that there was improvement in the studied preparatory school students' total levels of knowledge regarding COVID-19 and its variants pre and post awareness program ($P \leq 0.001$). As 60.5% of the studied students had poor knowledge regarding COVID-19 and its variants pre-program, which improved to 90.5% of them had good knowledge post-program.

Figure 3 reveals that there was improvement in the studied preparatory school students' total levels of attitudes regarding COVID-19 and its variants pre and post awareness program. As evidenced, 61.4% of studied students had negative attitudes toward COVID-19 and its variants pre- awareness program, which improved to 100% of them had positive attitudes post- awareness program.

Figure 4 represents that, 72.4% of the studied preparatory school students had unsatisfactory practices regarding COVID-19 and its variants pre-awareness program, which improved to 98.1% of them had satisfactory practices post- awareness program.

Table 3 indicates that there was improvement in students' total health belief model and its sub- items related to COVID19 and its variants among the studied preparatory school students pre and post awareness program with a highly statistically significant difference ($P \leq 0.001$) with mean \pm SD 65.42 ± 5.79 for the total health belief model pre awareness program which increased to 106.35 ± 5.58 post awareness program.

Table 4 displays that there was a highly statistically significant positive correlation post-awareness program between the studied students' total level of knowledge, attitudes, reported practices and their health beliefs regarding COVID-19 and its variants ($P \leq 0.001$).

IV. DISCUSSION

The world is now facing a COVID-19 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. ^[13] Improving health awareness is crucial to preventing and controlling the

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disease. Health care teams include school health nurses and are responsible for providing knowledge, delivering good quality management, and protecting students from illness during the epidemic prevalence period. ^[14] Therefore, this study aimed to investigate the effect of an awareness program for preparatory school students regarding COVID-19 and its variants based on health belief model.

Regarding demographic characteristics of the studied students, the current study results revealed that most of the studied students' ages ranged from 11 to 13 years, with a mean \pm SD of 12.18 ± 1.82 years. This result was supported by **Radwan et al.** ^[15] in Palestine, who reported that 55.8% of the studied students aged between 11 and 14 years. Although, this result disagreed with **Subedi et al.** ^[16] in South Asia, who found that the mean age of the studied school students was 14.8 years (range 13–17 years). From the researcher's point of view, this finding might be due to the fact that the age of the students at the 1st and 2nd preparatory grades in Egypt ranged from 11 to 13 years.

Related to sex, the current study represented that about two-thirds of the studied subjects were females. This finding was in line with **Souli and Dilucca** ^[17] in Italy, who revealed that 59.3% were females and 40.7% were males. However, this finding was contradictory to **Waghmare et al.** ^[18] in India, who reported that 57.7% of the studied students were male. From the researcher's point of view, this finding might be due to the number of girls in preparatory schools affiliated with Al-Masara educational administration was higher than that of boys and mixed schools.

Considering the place of residence, the present study showed that slightly more than three-quarters of the studied students lived in an urban area. This result was in agreement with **Wen** ^[19] in China, who found that 64.5% lived in urban areas. From the researcher's point of view, this finding might be due to the selected schools are affiliated to Al-Masara district, which is considered an urban area, and usually parents prefer to live nearby their children's schools.

Concerning preparatory school grade level, the current study clarified that less than two-thirds of the studied students were in 1st grade. This result was in discrepancy with **Dardas** ^[20] in Jordan, who stated that 16.0% of the studied participants were in 1st preparatory grade. From the researcher's point of view, this finding might be due to the high attendance rate of students' enrolled in the 1st grade and their interest in becoming more knowledgeable about COVID-19 and its variants.

Regarding father's and mother's education, the present study results showed that more than one quarter of their fathers had secondary education, while more than one fifth of their mothers read and wrote and had technical diplomas equally. From the researcher's point of view, this finding might be due to living in slum areas and a lack of interest in being highly educated.

With regards to whether any of their family members work in the health sector, the present study illustrated that more than half of their family members didn't work in the health sector. This finding was dissimilar to the result of **Radwan et al.** ^[15] who reported that more than half (52.7%) of students' family members worked in the health sector.

In relation to family income, the present study clarified that more than one-third of the studied students did not have enough income. This result was in disparity with **Radwan et al.** ^[21] in Palestine, who found that about 65.0% confirmed that the economic level of their family is moderate. From the researcher's point of view, this finding might be due to the nature of their parents' occupation, which does not earn enough money based on their educational level.

Concerning to Students' medical history, the finding of the present study explicated that the great majority of the studied students weren't suffering from chronic diseases. This result was similar to **Mudenda et al.** ^[22] in Zambia, who reported that 89.0% of the study participants weren't suffering from chronic diseases. From the researcher's point of view, such a result can be explained by the fact that chronic diseases are not usually common in the youngest age group.

Regarding students' perception of their overall health status, the current study indicated that slightly more than one-third of the studied students perceived that their health status was very good while slightly more than one-fifth perceived it as good. This result was inconsistent with Machado et al. [23] in Portugal, who showed that 59.5% perceived their health as excellent or very good while 31.0% perceived it as good. From the researcher's point of view, this finding might be due to the way people perceive their health is influenced by a complex set of factors such as their view of health, level of education, beliefs, among others environmental, cultural and socioeconomic conditions.

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With respect to worrying about coronavirus, the current study results represented that about half of the studied students were very worried about coronavirus. In the same context, **Xue et al.** [24] in China, who stated that 37.2% of the studied school students were very worried about being infected with COVID-19. From the researcher's point of view, this finding might be due to coronavirus is a highly infectious virus that might infect any age group.

In relation to previous infection with COVID-19 or its variants, the present study revealed that slightly more than three-quarters of the studied students hadn't been infected with COVID-19, less than two-thirds of the infected students reported that the infection was mild, and more than three-quarters of them hadn't been confirmed to have been infected by a test. Furthermore, more than half of them didn't know people in their immediate social environment who were or had been infected with COVID-19 (suspected or confirmed), and less than one-fifth of them didn't die from COVID-19. Similarly, this result was supported by **Mudenda et al.** [22] who reported that 85.7% of the participants had not suffered from COVID-19, but among these, 46.8% knew a friend or relative who had previously suffered from COVID-19 and 73.5% of them reported not knowing a relative or friend who had died of COVID-19. From the researcher's point of view, this result might be due to COVID-19 and its variants infection has been reported in all age groups, including infants, children and young adults. Even so, studies consistently indicate that children under the age of 18 years old are less frequently infected with SARS-CoV-2. They are mostly asymptomatic or experience much milder symptoms than the adults.

Concerning students' primary source of information, the present study indicated that of less than two-thirds of the studied students used social media as a primary source of information to know about COVID-19 and its variants, followed by two-fifths of them using television. These results go in line with Singh et al. [25] in India, who found that social media (81.4%) and television (75.3%) were the main sources of receiving COVID-19-related information. As well, these results were matched with **Padmanaban et al.** [26] in India, who showed that the majority of students (81.0%) used social media as a vital source of information to know about COVID-19, followed by TV (79.0%).

Contrariwise, these results were incongruent with **Getawa et al.** [27] in Ethiopia, who indicated that 78.7% of the studied student use television and radio as source of information about COVID-19 while 13,2% of them use social media. From the researcher's point of view, this may be due to ease of access to readily updated information to most students via the internet and social media. This indicates the importance of the Internet in health promotion, especially during the occurrence of pandemics; even though it highlights that social media can be a fertile area for the dissemination of misinformation about COVID-19.

In relation to the total level of knowledge regarding COVID-19 and its variants pre- and post-awareness program, the current study clarified that there were highly statistical improvements in the total level of knowledge regarding COVID-19 and its variants pre and post-awareness program among the studied students ($P \leq 0.001$). As less than two-thirds of the studied students had poor knowledge regarding COVID-19 and its variants pre-program, which improved to the majority of them had good knowledge post-program. This result was congruent with **Gazar et al.** [28] in Egypt, who stated that more than half of studied students had poor knowledge at pre guidelines implementation, which improved to more than three quarters had good knowledge after guidelines. Also, this result was agreed with **Ganczak et al.** [29] in Poland, who showed that overall knowledge scores among students improved from (65.2%) to (81.6%) after the intervention ($p < 0.0001$).

Furthermore, this result was in the same line with **Nassar et al.** [30] in Egypt, who found that there was a highly statistically significant difference between pre and post-intervention ($P = .001$). As, 96.0% of the participants had unsatisfactory knowledge regarding COVID-19 in pre-intervention compared to 94.7% of them had satisfactory knowledge at post-intervention. From the researcher's point of view, poor knowledge of the studied students at pre-program might be because students don't follow COVID-19 situations and updates as much as adults, as COVID-19-related knowledge is public knowledge; it is not knowledge in the academic curriculum, and students usually focus more on academic information. This reflected the desire of the students to increase their awareness and know the importance of good practicing during COVID-19 as a method for prevention and protection against infection with coronavirus. However, after program implementation, the improvement in knowledge might be related to the effect of awareness program regarding COVID-19 and its variants on the knowledge of students and the booklet, which covered all identified needs and knowledge gaps about the topic among preparatory school students.

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Concerning total attitudes toward COVID-19 and its variants pre and post awareness program among studied students, the current study revealed that there were highly statistical improvements in the studied preparatory school students' total levels of attitudes regarding COVID-19 and its variants pre and post awareness program ($P \leq 0.001$). As, less than two-thirds of studied students had negative attitudes toward COVID-19 and its variants pre- awareness program, which improved to all of them had positive attitudes post- awareness program. This result was congruent with **Gazar et al.** ^[28] in Egypt, who stated that more than two thirds of studied students had negative attitudes at pre guidelines about prevention of COVID -19, while at post guidelines, the most of them changed to positive attitude. Moreover, this finding goes in line with **Ayed et al.** ^[31] in Egypt, who reported that there were highly significant differences ($p = <0.000$) in the secondary school students' attitude mean scores as pre/immediate post and after three month of intervention implementation regarding COVID -19 as, (77.7%) had a poor pre-test attitude level followed by fair (20.0%) and good (2.3%). In the post-test, 100% of the studied school students had a good attitude level, which improved after intervention implementation. From the researcher's point of view, this is might be due to the correlation between the students' attitudes and knowledge, which indicates that sufficient knowledge reflects their positive attitude among students towards COVID-19 and its variants.

With regards to total reported practices regarding COVID-19 and its variants among the studied students, the current study proved that there was a highly statistically significant difference between pre and post awareness program in students' total reported practices regarding COVID-19 and its variants. As, less than three-quarters of the studied preparatory school students had unsatisfactory practices regarding COVID-19 and its variants pre-awareness program, which improved to the great majority of them had satisfactory practices post- awareness program ($P \leq 0.001$). Similarly, this result was in the same line with **Rezaie et al.** ^[32] in Iran, who showed that the educational intervention was effective in improving students' behaviors to prevent the spread of COVID-19. As after the educational intervention, a significant difference was observed in the intervention group before and after the educational intervention ($P = 0.018$) and between the intervention and the control groups ($P = 0.001$)

In addition, this result was in accordance with the result of the study performed by **Sayed et al.** ^[33] who clarified that less than one fifth of the studied students had total satisfactory practices score pre-program which increased to the most of the studied students had total satisfactory practices score post program, Moreover, **Madian and Sayed** ^[34] in Egypt, who revealed that most of the intervention group initially had a poor level (80.0%) while a good level was reached among most of them after one (82.5%) and three months(82.5%). From the researcher's point of view, unsatisfactory reported practices of the studied students' at pre-program might be due to a variety of reasons including inadequate knowledge, negative beliefs, the high expense of protective equipment such as face masks, and hand sanitizers. On the other hand, after program implementation, the improvement in reported practices might be attributed to that the awareness program helps to improve students' skills including effective hand hygiene, wearing masks, recognizing the importance of self-protection, and recognizing that COVID-19 and its variants may be avoided by following preventive measures as educated during the program. Furthermore, the awareness program based on health belief model might make the studied students perceive and feel more vulnerable, understand the consequences and severity of COVID-19 and its variants infection, as well as have increased motivation and tendency to engage in preventive behaviors, along with reinforced confidence in overcoming barriers. This was reflected in the students' engagement in the recommended preventive practices related COVID-19 and its variants post program.

Concerning health belief model constructs regarding COVID-19 and its variants pre and post awareness program, the current study portrayed that there were highly statistical differences in the studied students' total mean scores of health belief model constructs; perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived self-efficacy, as well as cues to action related to COVID-19 and its variants pre and post awareness program ($P \leq 0.001$). These results were in congruity with **EL Sayed and Sarhan** ^[35] in Egypt, who indicated that the health belief model subscales, namely; perceived susceptibility, perceived severity, perceived benefits, perceived self-efficacy, as well as cues to action, were similar before the educational intervention in the study group and the control group, with no statistically significant differences observed. Nonetheless, after one month of the educational intervention, the health belief model subscales were significantly higher in both groups. From the researcher's point of view, this result seems to be logical because if the students' knowledge regarding COVID-19 and its variants increased, the perceived susceptibility, severity, benefits, cues of actions, and self-efficacy to overcome the barriers to prevent diseases would also be increased.

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As regards to the studied students' total health belief model regarding COVID-19 and its variants pre and post awareness program, the current findings showed that the studied students' total mean score of health belief model increased significantly from (65.42 ± 5.79) pre-awareness program to (106.35 ± 5.58) post-awareness program ($P \leq 0.001$). These findings corroborate those of **Elgzar et al.** [36] in Kingdom of Saudi Arabia, who found that there was a statistically significant difference between intervention and control groups in all elements of the health belief model related to COVID-19 and the total HBM mean score ($p < 0.05$) after the intervention. From the researcher's point of view, this is might due to improving students' knowledge regarding COVID-19 and its variants by an effective awareness program which in turn enhanced positive health beliefs regarding COVID-19 and its variants prevention.

As regards correlation between the studied students' total knowledge, attitudes, reported practices and health beliefs regarding COVID-19 and its variants pre and post implementation of an awareness program, the present study represents that there was a highly statistically significant positive correlation pre and post-program between the studied students' total level of knowledge, attitudes, reported practices and health beliefs regarding COVID-19 and its variants. These finding were supported by **Poddar et al.** [37] in India, who showed that there was a positive correlation between knowledge, attitude, and practice. Also, these results were in agreement with **Anaam** [38] in Yemen, who revealed that there was a statistically significant association between practice and knowledge and between practice and attitude. As well, these findings were supported by **Elgzar et al.** [36] who illustrated that there are positive, statistically significant correlations between participants' total HBM score and their total awareness score in both intervention and control groups before and after the intervention,

Furthermore, these results were reinforced by **Kim** [39] in Korea, who indicated that COVID-19 precautionary behaviors were positively correlated with health beliefs (perceived benefits ($r = 0.34$, $p < 0.001$), the perceived severity ($r = 0.24$, $p < 0.001$), and the perceived susceptibility ($r = 0.25$, $p < 0.001$). Likewise, these were in congruence with the study by **Alsulaiman and Rentner** [40] in United States of America, who found that participants with higher scores on the health belief model were more probable than those with lower scores to adhere to COVID-19 preventive measures. From the researcher's point of view, this could be due to students with adequate knowledge had more positive attitudes and health beliefs about the COVID-19 and its variants and practiced more preventive behaviors. Also, this can be explained by the fact that research hypnosis was achieved, highlights the effectiveness of the awareness program and provides the policymaker an effective proof of the importance of conducting health awareness sessions about the disease to help control its spread.

V. CONCLUSION

Based on the study findings and research hypothesis it can be concluded that:

The results of the study supported the research hypothesis which showed that, there was a marked improvement in preparatory school students' knowledge, attitudes, reported practice, and health beliefs regarding COVID-19 and its variants after implementation of an awareness program based on the health belief model. Also, there were highly statistically significant positive correlations between students' total knowledge, attitudes, reported practices and health beliefs model after the awareness program.

VI. RECOMMENDATIONS

On the light of the current study findings the following recommendations are suggested:

Students:

- Continues awareness programs for all preparatory school students to raise their awareness about prevention of COVID-19 & its variants.
- Dissemination of awareness booklet about COVID-19 and its variants among school students.
- Developing appropriate and engaging hygiene and social distancing awareness campaigns targeting school students.

Community:

- Creating social media-based campaigns by concerned public health authorities to lessen the dissemination of falsifying information and misconceptions about COVID- 19 and its variants.

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- Conducting community mobilization campaigns to boost community awareness about COVID-19 and its variants infection, especially in the rural population.

Further research:

- Further researches are needed for school students regarding limitation of COVID 19 & its variants to reduce and prevent this infection and apply it on large sample selected from all schools in Egypt.

Table (1): Frequency Distribution of Demographic Data among Preparatory School Students regarding COVID-19 and Its Variants (n=210).

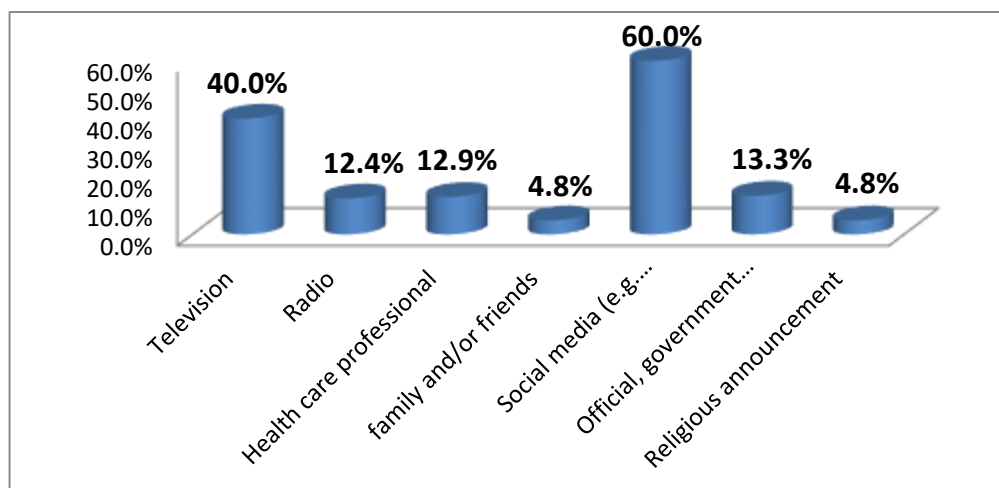
Demographic data	The studied sample (n=210)	
	No.	%
• Age:		
- 11 – 13	189	86.5
- >13 – 15	21	31.5
Mean \pm SD	12.18 \pm 1.82	
Sex		
- Male	73	34.8
- Female	137	65.2
• Place of residence		
- Rural	52	24.8
- Urban	158	75.2
• Preparatory school grade		
- Grade 1 st	126	60.0
- Grade 2 nd	84	40.0
• Father education		
- No read and write	27	12.9
- Read and write	36	17.1
- Basic education	16	7.6
- Secondary	58	27.6
- Technical diploma	37	17.6
- University and above	36	17.1
• Mother education		
- No read and write	26	12.4
- Read and write	46	21.9
- Basic education	36	17.1
- Secondary	23	11.0
- Technical diploma	46	21.9
- University and above	33	15.7
• Any of family members work in the health sector		
- Yes	103	49.5
- No	107	51.0
• Family Income		
- Not enough	86	41.0
- Enough but no saving	63	30.0
- Enough and saving	61	29.0
• Number of family members	4.6857 \pm 0.70966	
• Number of household rooms	3.3048 \pm 0.90320	

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Table (2): Frequency Distribution of the Preparatory School Students regarding Medical Health History and COVID-19 & its Variants Related -Experience (n=210).

Items	No.	%
Having an existing chronic disease		
• Yes	11	5.2
• No	199	94.8
Rate your overall health status		
• Very poor	27	12.9
• Poor	26	12.4
• Fair	38	18.1
• Good	46	21.9
• Very good	73	34.8
Worried are you about coronavirus		
• Very worried	103	49.0
• To some extent	60	28.6
• Not worried at all	47	22.4
Have you been, infected with COVID-19		
• Yes	52	24.8
• No	158	75.2
If “yes”: was the infection:		
• Mild	33	63.5
• Severe	19	36.5
Was the infection:		
• Confirmed by a test	11	21.2
• Not confirmed by a test	41	78.8
Know people who are or have been infected with COVID-19 (suspected or confirmed)		
• Yes	101	48.1
• No	109	51.9
If “yes”: know someone who died from COVID-19		
• Yes	20	19.8
• No	81	80.2



*more than one answer is possible

Figure (1): Percentage Distribution of Primary Sources of Information among preparatory school students (n=210).

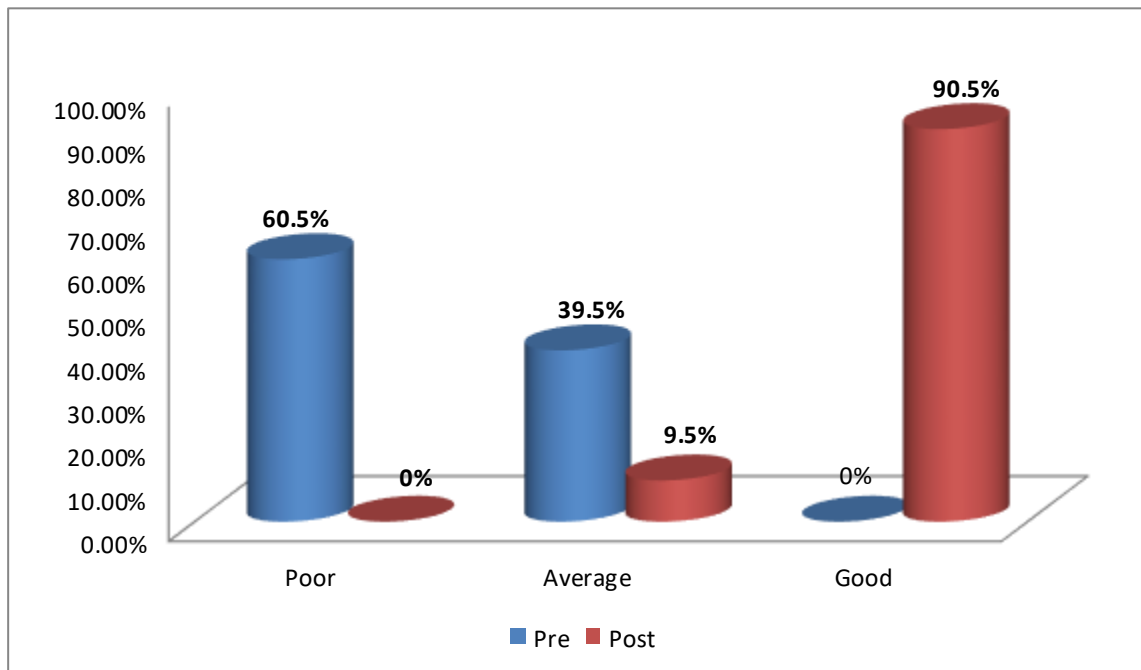


Figure (2): Percentage Distribution of Total Knowledge among Preparatory School Students regarding COVID-19 and Its Variants based on Health Belief Model Pre and Post Awareness Program (n=210).

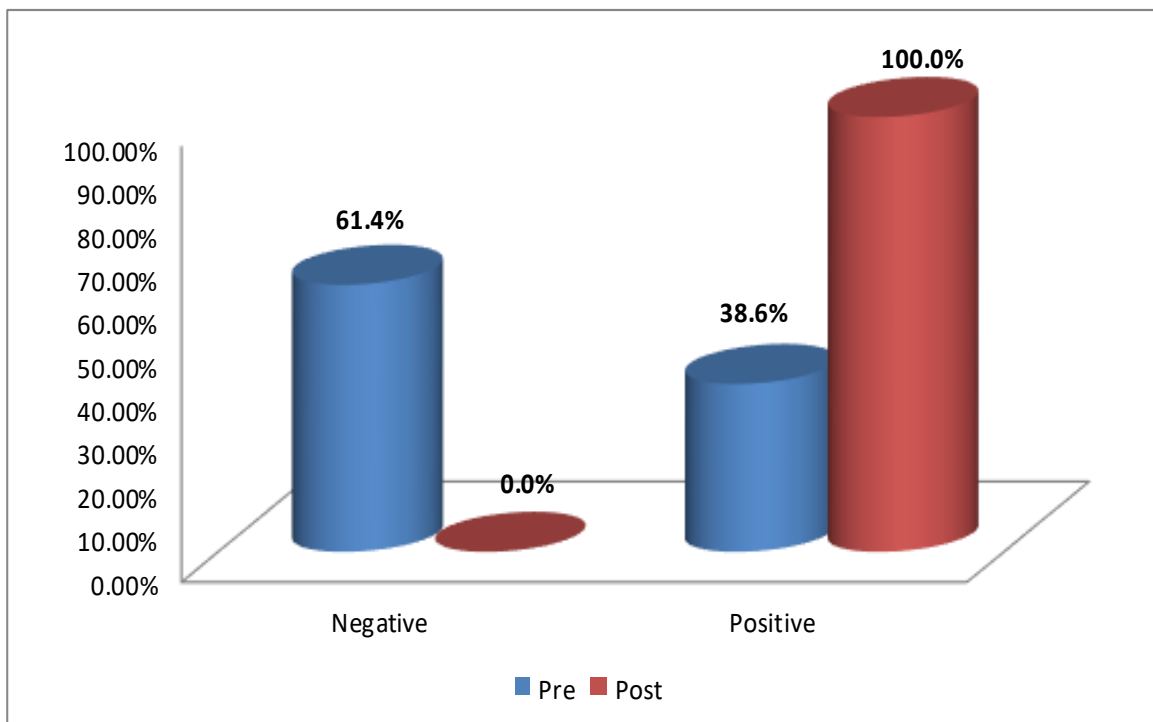


Figure (3): Percentage Distribution of Total Attitudes among Preparatory School Students regarding COVID-19 and Its Variants based on Health Belief Model Pre and Post Awareness Program (n=210).

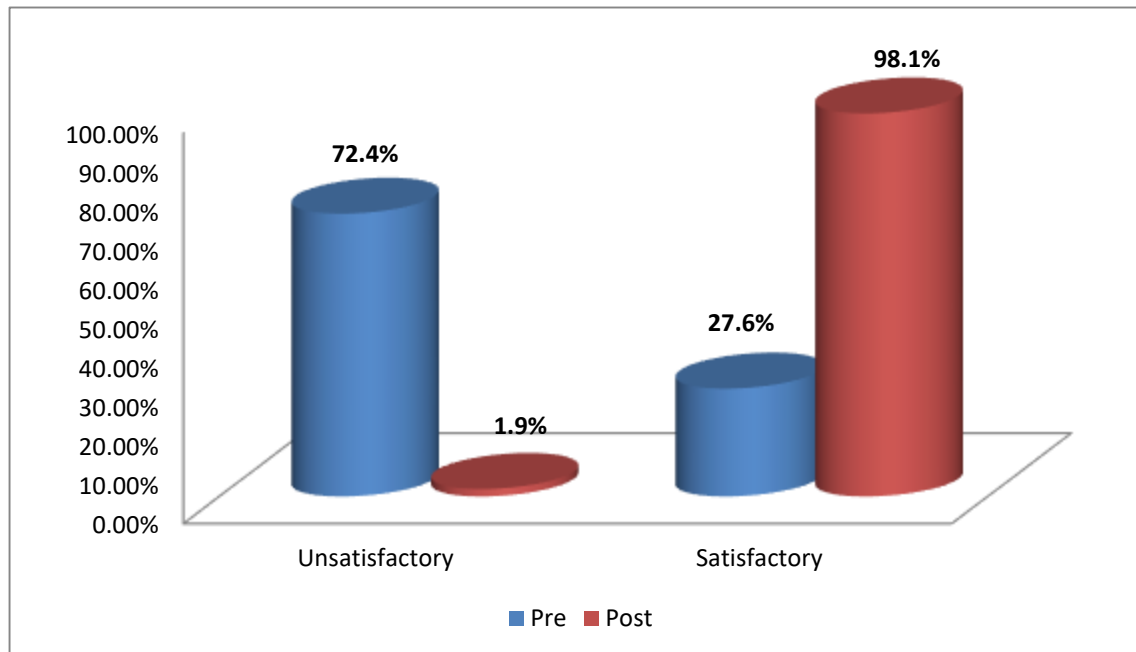


Figure (4): Percentage Distribution of Total Reported Practices among Preparatory School Students regarding COVID-19 and Its Variants based on Health Belief Model Pre and Post Awareness Program (n=210).

Table (3): Mean and Standard Deviation Statistical Difference between the Studied Preparatory School Students' Total Health Belief model Constructs regarding COVID-19 and Its Variants based on Health Belief Model Pre and Post Awareness Program (n=210).

Total Health Belief Model constructs	The studied sample (n=210)		Paired t test	P value
	Pre	Post		
	Mean ± SD	Mean ± SD		
- Perceived Susceptibility	14.68 ± 2.54	22.17 ± 1.75	31.249909	0.000*
- Perceived Severity	10.21 ± 1.61	16.44 ± 1.15	45.800232	0.000*
- Perceived Barriers	8.81 ± 1.39	13.60 ± 1.20	35.554290	0.000*
- Perceived benefits	6.63 ± 1.15	10.52 ± 1.51	32.933604	0.000*
- Self-efficacy	12.85 ± 1.85	22.29 ± 1.6003	46.272203	0.000*
- 'External' cues to action	5.70 ± 1.53	10.67 ± 1.54	32.599463	0.000*
- 'Internal' cues to action	6.53 ± 1.04	10.67 ± 1.55	30.686966	0.000*
Total health belief model	65.42 ± 5.79	106.35 ± 5.58	64.455530	0.000*

*Significant at $p \leq 0.05$ **Highly significant at $p \leq 0.001$ Not significant at $p > 0.05$

Table (4): Correlation between the Studied Preparatory School Students' Total Knowledge, Attitudes, Reported Practices and Health beliefs regarding COVID-19 and Its Variants Post-Awareness Program (n=210).

Items		Total knowledge	Total attitudes	Total reported practice	Total Health beliefs
Total knowledge	R	---	0.366	0.704	0.557
	p-value	---	0.000**	0.000**	0.000**
Total attitudes	R	0.366	---	0.475	0.480
	p-value	0.000**	---	0.000**	0.000**

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Total reported practices	R	0.704	0.475	---	0.418
	p-value	0.000**	0.000**	---	0.000**
Total Health beliefs	R	0.557	0.480	0.418	---
	p-value	0.000**	0.000**	0.000**	---

*Significant at $p \leq 0.05$ **Highly significant at $p \leq 0.001$ Not significant at $p > 0.05$

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