

Effect of Interactive Digital-based Psychoeducational Intervention about COVID-19 on Knowledge, Fear, and Anxiety among Secondary School Students

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Abstract

Aim: Investigate the Effect of Interactive Digital-based Psychoeducational Intervention about COVID-19 on Knowledge, Fear, and Anxiety among Secondary School Students..

Background: The novel COVID-19 pandemic creates a horrible state of social restriction that can foster fear, anxiety, and misinformation.

Material and methods: A Quasi-experimental study was used to collect data among secondary schools at Damanhour city/Egypt. A convenient sample of 200 secondary school students was enrolled. An online self-administered questionnaire sheet composed of sociodemographic data, COVID-19 Knowledge Scale, COVID-19 Fear Scale and COVID-19 Anxiety Scale.

Results: The mean of the total knowledge score significantly increased to 10.35 ± 1.60 after the intervention ($F=1481.40$, $p<0.001$). However, the mean of both the total COVID-19 fear and anxiety scores significantly decreased after intervention ($16.81+5.34$, $4.45+4.43$) respectively. ANCOVA results showed a significant improvement as the effect size showed that 93.7%. 90.9% and 50.5% of the difference between pre-post test score are due to intervention, respectively.

Conclusion: The interactive digital-based Psychoeducational intervention was effective in improving knowledge and decreasing fear and anxiety regarding COVID-19 among secondary school students.

Recommendations: Expanding the psychoeducational intervention application to the whole community via multimedia.

Keywords: COVID-19 • Psychoeducational • Digital intervention • Students • Knowledge • Fear • Anxiety

Introduction

Coronavirus disease 2019 (COVID-19) is a novel communicable disease caused by the recent strain of coronaviruses known as Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2)[1]. Its initial outbreak was discovered in December 2019, in Wuhan/China as pneumonia of unidentified etiology that was linked to a seafood market exposure [2]. The World Health Organization (WHO) categorized it as a pandemic in March 2020. This initiates the daily monitoring of the incidence of COVID-19 cases by all countries. Simultaneously, this public health crisis has triggered a variety of psychological troubles as anxiety, panic disorder, and depression [3]. The current COVID-2019 pandemic is provoking fear of falling sick, dying, helplessness, and stigma, urgent and well-timed understanding of mental health status is necessary to help the community mitigate the negative influences of COVID-19[4]. The National Health Commission has issued guiding principles for emergency psychological crisis intervention for societies affected by COVID-19 [5].

Fear is a natural human feeling with an adaptive function. It helps coping with certain threats however, it can become dysfunctional relying on the case, intensity, and frequency. When an individual experiences the fear of unknown there is a rising sense that his perceived information is not sufficient for coping with the situation, at any point of processing or level of attentiveness [6]. COVID-19 pandemic and the resulting quarantine have

compacted mental health and the academic environment. Numerous studies reported that the pandemic has initiated an increase in fears of COVID-19 that contribute to growing levels of stress, anxiety, and depression and post-traumatic stress [7]. recently identified five factors to the coronavirus related stress and anxiety symptoms namely, danger and contamination, fear about economic costs, coronavirus-related xenophobia, compulsive and reassurance-seeking, and traumatic stress symptoms [8].

The COVID-19 pandemic could have numerous life consequences especially among students such as chronic and acute stress, fear and worry, unexpected bereavements, sudden school shutdown, and home confinement, increased access time to the internet and social media, worry for the economic future of their family and the whole country [9]. In addition to home quarantine, it is associated with insecurity and anxiety due to disruption in students' education, physical activities, and opportunities for socialization. Lack of structured school setting for an extended time leads to disruption in routine, boredom, and lack of innovative ideas for participating in varied educational and extracurricular activities. A recent study noticed that older students and youth are more anxious about the postponement of examinations, exchange programs, and academic events [10].

Using digital devices has become a vital part of every daily life. The use of technology continues to rise rapidly since 2011 from 52% to 77.5% whereas those who are categorized as modern users have become more than double [11]. This generates a pervasive accessibility of "digital technology"

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such as computers, internet, smartphones, and software applications. Electronic health (eHealth) and multimedia have been recognized as key areas of forthcoming clinical practice and research in psychological issues especially among high-risk individuals as school students[12]. The current evidence proves a beneficial effect of the cognitive behavioral therapies and web-based programs for management of many adolescents' psychological problems [13]. The Internet has many beneficial effects through its accessibility, availability, and anonymity that help in overcoming the spatial, temporal, and psychological barriers. The online atmosphere can permit anonymous access to data and support, at anytime, anyplace, and in a format easily tailored [14]. Thus, the use of the web has facilitated various new ways to deliver Psychoeducational interventions which are outlined as data provided regarding health-related conditions and management [15,16] Psychoeducational interventions integrate the education of patients with many other activities, such as well-designed and time-limited interventions for stress management, psychological support, and health education [17,18]. There is a mounting interest in the psychoeducational interventions which gives precise information to both individuals and families, and cares for mental health through precise diagnosis, management, prognosis, and prevention strategies.

Significance of the study

In Egypt, by the start of April 2020, there were more than 800 affirmed cases, with in excess of 50 fatalities, and a quick propensity towards increment [19]. Over around one month, the quantity of affirmed cases expanded hugely to arrive at 6465 cases on the third of May 2020, with around 430 casualty cases; a leap that can make uneasiness and dread everyone [20]. According to WHO, until September 2021, the COVID-19 cases continuing to rise in Egypt to reach 298,608 confirmed cases with 16.099 deaths [21].

This unprecedented COVID-19 epidemic is initiating fear, and a well-timed understanding of mental health status is earnestly required for society [22]. Knowledge, attitudes, and practices (KAP) towards COVID-19 assume significant parts in surveying the ability of a local area particularly students to take on social change drives during the pandemic [23]. Empirical studies for knowledge and practices help in uncovering the basic data to employ effective types of intervention for curbing an infectious disease. Accordingly, knowledge enhancement is a possible appreciated strategy to gain better insight for tackling misconceptions [24]. Furthermore, decent levels of knowledge were found to be positively linked with positive attitudes and proper practices [25]. In the meantime, illustrations learned from the 2003 SARS outbreak exhibited that knowledge and practice towards infectious diseases were significantly associated to a low level of anxiety and fear [26]. As well, relaxation along with cognitive-behavioral techniques are among the most widely deployed procedures to diminish anxiety and fear related symptoms. Therefore, the current study aimed to investigate the effect of interactive digital-based psychoeducational intervention about COVID-19 on knowledge, fear, and anxiety among secondary school students.

Materials and Methods

Research hypotheses

- The total knowledge level will be increased after the psychoeducational intervention implementation compared to before it.
- The total fear level will be lessened after the psychoeducational intervention implementation compared to before it.
- The total level of anxiety will be diminished after the psychoeducational intervention implementation compared to before intervention.

Study design

A quasi-experimental (one group pre/posttest) research design was adopted.

Setting

The study was conducted at four governmental secondary schools at

Damanhour city as it is the capital of El-Beheira governorate/Egypt.

Subjects

Secondary school students in Damanhour city were the subjects of the current study who were selected based on the next inclusion criteria: Both sexes, Possessed a smart mobile phone/computer and internet connection, Willing to participate in the study. Exclusion criteria: The presence of either visual or auditory problems and psychological or mental disorders.

Sampling

A multistage sampling technique was used to select the required sample size as follows:

- Four schools were randomly selected (two males and two female schools) from Damanhour city
- Two random classes were chosen randomly from each school
- A convenient sample of 200 secondary male and female students was included in the study as elaborated in Figure 1.

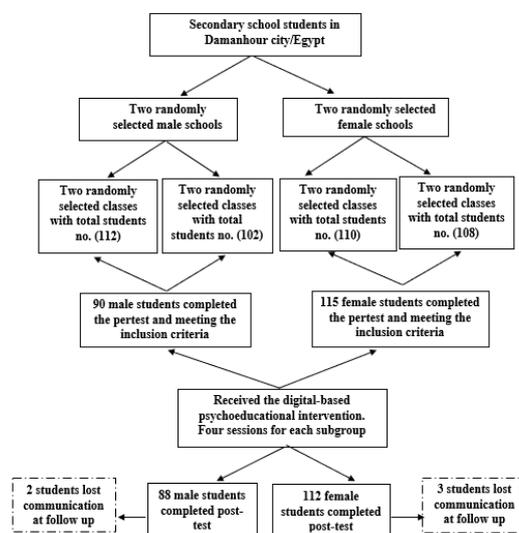


Figure 1. graphic illustration of the studied sample flowchart.

The sample size was calculated for the paired sample (before-after study) using the MedCalc software based on the following parameters: Type I error rate/two-tailed test $\alpha=(0.05)$, Type II error rate/ $\beta=20$, Effect size (E)=0.5, SD=1 with 80% power and 95% confidence limit [27,28]. This resulted in a minimum required sample size of 167. Thus, the final sample size adopted in this study was adjusted to 200 participants to compensate for potential non-response.

Study instrument

An online self-administered questionnaire sheet was used. It composed of four parts:

Part I: Socio-demographic data as age, sex, residence, father's and mother's education and occupation, family size and income, and crowding index.

Part II: Knowledge regarding COVID-19 scale: it was developed by the researchers based on relevant recent literature to assess the students' knowledge regarding COVID-19 signs and symptoms, risk factors, modes of transmission, preventive behaviors, complications, and treatment. It comprised 12 items on a dichotomous scale: yes (1) or no (0) answers. The total correct knowledge score was calculated and ranged from zero to 12 and leveled as poor knowledge (0-6), fair knowledge (7-9), good knowledge (10-12).

Part III: COVID-19 Fear Scale: it was adopted [29]. It consisted of 7 items rated on five-point Likert scale from strongly disagree (1) to strongly

agree (5). The total score was calculated by averaging the respondents' answers to the seven statements. It ranged from 7 to 35 and categorized as accepted fear level (7-17) and high fear level (18-35).

Part IV: COVID-19 anxiety scale: it was adopted [30]. As a self-reported screening tool for dysfunctional anxiety associated with the coronavirus crisis, it contained 5 items on five-point Likert scale: 0=never, 1=rare (less than a day or two), 2=several days, and 3=more than 7 days, and 4=daily over the last two weeks. The overall score varies from 0 to 20 and classified as accepted anxiety level (0-9) and high anxiety level (10-20).

The content validity and reliability

- The content validity of the study instrument was tested by a jury of five experts in fields of Community Health Nursing and Psychiatric Nursing and Pediatric Nursing affiliated to Alexandria and Menoufia universities. The jury assessed the relevance and clearance of each item on 3-point Likert scale. The content validity index per item ranged from 0.8 to 1.0 for both relevance and clarity.

- The Cronbach Alpha Coefficient test was employed to measure the tool's reliability after translated in Arabic Language and revealed an acceptable reliability score ($r=0.82$ /part II, $r=0.79$ /part III and $r=0.80$ /part IV).

Pilot study

It was conducted on 10% of the secondary school students who were selected from another school and omitted from the actual study sample. It assessed the clarity and feasibility of the research instrument. Basically, the needed modifications were done.

Program development

It was conducted according to the following phases:

Needs assessment phase: The study instrument was entered to the Google form spreadsheet. A WhatsApp group was created to share the link with the students for pre-post-test. A pre-test was completed to evaluate the students' knowledge about COVID-19 and the associated level of fear and anxiety to address insufficiencies to be deemed during the construction of the psychoeducational intervention. It also used as baseline data for comparison with the post-test.

Planning phase: The interactive digital based psychoeducational intervention about COVID-19 was developed by the researchers according to the following steps.

➤ A. Setting objectives

- General objective: Improve the students' knowledge about COVID-19 and alleviate fear and anxiety from COVID-19:

- Specific objectives:

- Identify the COVID-19 pandemic
- List the possible signs and symptoms of COVID-19
- Discuss the preventive measures against Coronavirus infection
- Explain the main complications of COVID-19 and its treatment
- Conceptualize the COVID-19 related fear and anxiety and their causes
- Mention symptoms linked to fear and anxiety and their alleviating measures
- Demonstrate different relaxation techniques
- Apply different ways to reduce fear and anxiety of COVID-19

➤ B. Preparation of the content and presentation methods

- The content was designed by the researchers to cover all the predetermined objectives. It was developed based on review of relevant recent literature about COVID-19. It contains information about the COVID-19 definition, possible signs and symptoms, modes of transmission, preventive behaviors and vaccination, complications, and treatment. In addition to the definition of COVID-19 related fear and anxiety, possible

signs, and symptoms, causes, and different relaxation techniques and alleviating measures.

- Numerous interactive digital-based methods were developed to present the content as WhatsApp group, enlisting the students' Emails, and Zoom meetings. In addition to, PowerPoint presentation, animated graphics, and educational videos

Implementation phase: The field work was spanned for six consecutive months starting from April 2020 to 15 October 2020. The total sample was divided into six subgroups where four sessions on Zoom (about 35-40 minutes) were conducted for every subgroup with a total of 24 sessions for the whole sample [30-35]. The WhatsApp group was employed for fostering the daily communication with the students either in written format or using audio messages. Emails were used for delivering the PowerPoint, educational videos, and graphics. IV-Evaluation Phase. The posttest was conducted after three months from implementing the intervention. It aimed to compare the results with the baseline data from pretest to assure the fulfillment of the study aim.

Ethical considerations

- The study was registered on World Health Organization (WHO) and approved by the Iranian Registry of Clinical Trials with IRCT id (IRCT20210612051555N2).

- The study was approved by the ethical committee by faculty of Nursing, Damanhour University.

- An initial section about the study's instructions was included in the online questionnaire to inform the students about the study objectives. An informed online consent was acquired from each student. They were assured about their voluntary participation and withdrawal at any time and that their data will be solely used for the study aim. Data confidentiality and anonymity was maintained throughout the study.

Statistical analysis

Data were analyzed using SPSS version 23. Categorical variables were presented as frequencies and percentages. Quantitative variables were found to be normally distributed and presented as mean and standard deviation. The paired test and Marginal Homogeneity Test were used to measure the significant change in the studied variables between pre-post interventions. The correlation between the studied variables was tested by the Pearson coefficient (r). ANCOVA Covariance test was used to identify the mean difference and effect size of the Psychoeducational intervention using pre-test as a reference. The cut-off value for statistical significance was $P \leq 0.05$.

Results

Table 1 indicates that 54.0% of the students aged between 17-18 years with a mean of 16.78 ± 1.14 and highest percent of them were females (56.0%) and living in rural areas (75.0%). More than half (52.0%) of the students' fathers had university education and 88% of them were working. However, 32% of their mothers had university education and 69% of them did not work. The largest percentage (47%) of the students stated that their family income is enough and save. The number of family members ranged between 3-9, with a mean of 5.49 ± 1.19 , while the mean score of the crowding index was 2.0 ± 0.60 .

Table 2 reveals that all items of the students' knowledge level about of COVID-19 were increased after the implementation of the psychoeducational intervention with a statistically significant difference between pre and post implementation of the intervention ($p < 0.05$).

Figure 2 portrays that 33.0% of the students had poor knowledge level before implementing the intervention which decreased to only 4% after implementing the intervention. Obviously, good knowledge level was increased after intervention (78.0%) compared to before the intervention (21.0%). A high statistically significant difference was found between students' knowledge level pre and post intervention ($p < 0.001$).

Table 1. Distribution of the studied sample according to their socio-demographic data (n=200).

Sociodemographic data	No.			%
Age (years)				
14–16	84			42.0
17–18	108			54.0
18+	8			4.0
Min–Max	14.0–19.0			
Mean ± SD	16.78 ± 1.14			
Gender				
Male	88			44.0
Female	112			56.0
Residence				
Urban	50			25.0
Rural	150			75.0
Fathers' education				
Illiterate or read & write	4			2.0
Basic	12			6.0
Secondary or technical	62			31.0
University	104			52.0
Post graduate studies	18			9.0
Mothers' education				
Illiterate or read & write	18			9.0
Basic	14			7.0
Secondary or technical	82			41.0
University	64			32.0
Post graduate studies	22			11.0
Fathers' occupation				
Working	176			88.0
Not working	24			12.0
Mothers' occupation				
Working	62			31.0
Not working	138			69.0
Family income				
Not enough	28			14.0
Enough	78			39.0
Enough & save	94			47.0
Family members no				
Min–Max	3.0–9.0			26
Mean ± SD	5.49 ± 1.19			26
Crowding index				
<2	98			49.0
2+	102			51.0
Min–Max	1.0–3.50			
Mean ± SD	2.0 ± 0.60			

Table 2. Distribution of the studied sample according to their knowledge about COVID-19 pre and post intervention (n=200).

Q Knowledge items	Post intervention				Post intervention				MCNp
	Correct		Incorrect		Correct		Incorrect		
	No.	%	No.	%	No.	%	No.	%	
1 Fever, fatigue, dry cough, and myalgia are the main presenting symptoms of COVID-19.	148	74	52	26	184	92	16	8	<0.001*
2 Unlike common cold, stuffy nose, runny nose, and sneezing are less common in coronavirus infected persons.	78	39	122	61	146	73	54	27	<0.001*
3 At present, no effective cure is available for COVID-2019, but initial symptomatic and supportive treatment can help in recovery.	144	72	56	28	186	93	14	7	<0.001*
4 Not all those having COVID-2019 will be severe cases. Only those who are elderly, obese, chronically ill are at risk.	104	52	96	48	166	83	34	17	<0.001*
5 Pet animals can transmit corona to humans.	56	28	144	72	132	66	68	34	<0.001*

6	Persons with COVID-2019 cannot transmit the virus to others when a fever is not present	112	56	88	44	164	82	36	18	<0.001*
7	The COVID-19 virus spreads via respiratory droplets of infected individuals.	102	51	98	49	148	74	52	26	<0.001*
8	Wearing medical masks can prevent the infection.	166	83	34	17	180	90	20	10	0.016*
9	Children and young students are unnecessary to take preventive measures against coronavirus.	156	78	44	22	186	93	14	7	<0.001*
10	To prevent the coronavirus infection, individuals should avoid crowded places such as public transportations	148	74	52	26	190	95	10	5	<0.001*
11	Isolation and treatment of infected coronavirus are effective ways to lower the spread of the virus	138	69	62	31	192	96	8	4	<0.001*
12	People get in contact with an infected person with the COVID-19 should be immediately isolated in a proper place for 14 days.	144	72	56	28	196	98	4	2	<0.001*

Note: McN: McNemar test; *: Statistically significant at $p \leq 0.05$

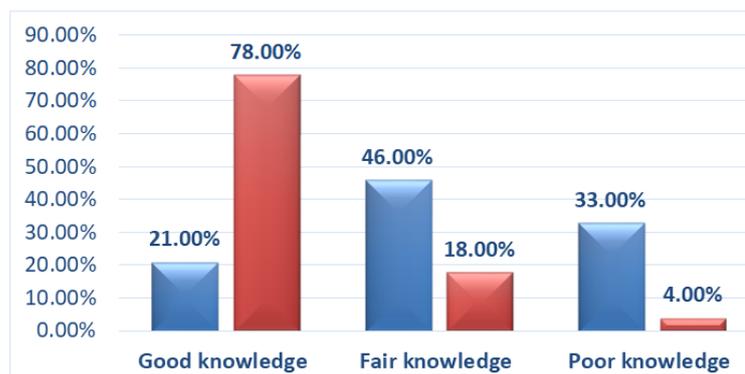


Figure 2. Distribution of the studied sample according to total score level of knowledge related to COVID-19 pre and post intervention (n = 200).

Note: (■) Pre-Intervention; (■) Post-Intervention

Figure 3 portrays that 57% of the students had a high level of fear pre intervention compared to 38% post intervention. A high statistically significant difference was found between the students' fear of COVID-19 level before and after the implementation of the intervention ($p < 0.001$).

Figure 4 depicts 49% of the students had a high COVID-19 anxiety level pre intervention compared to 29% post intervention. A high statistically significant difference was found between the students' anxiety level before and after the implementation of the intervention ($p < 0.001$).

Table 3 indicates that the mean of the total knowledge score significantly increased from 7.47 ± 1.94 before the intervention to 10.35 ± 1.60 after the intervention ($F = 1481.40, p < 0.001$). The mean of total COVID-19 fear

score decreased from 20.25 ± 6.46 before intervention to 16.81 ± 5.34 after intervention ($F = 983.26, p < 0.001$). The mean total COVID-19 anxiety score decreased from 7.81 ± 4.86 before intervention to 4.45 ± 4.43 after intervention ($F = 100.9, p < 0.001$). ANCOVA results showed a significant improvement by taking the pre-test as a reference ($P < 0.001$). The effect size showed that 93.7%, 90.9%, and 50.5% of the difference between pre-post test score are due to intervention, respectively.

Table 4 presents a statistically significant negative correlation between the total knowledge score and both fear and anxiety post intervention ($p < 0.001$) while fear was positively correlated with anxiety level ($p < 0.001$).

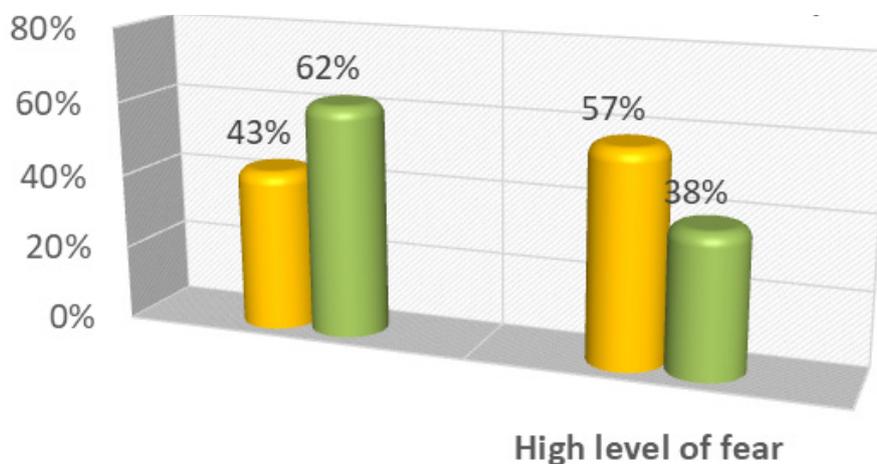


Figure 3. Distribution of the studied sample according to their total score of fear of COVID-19 scale pre and post intervention (n = 200).

Note: (■) Pre-Intervention; (■) Post-Intervention

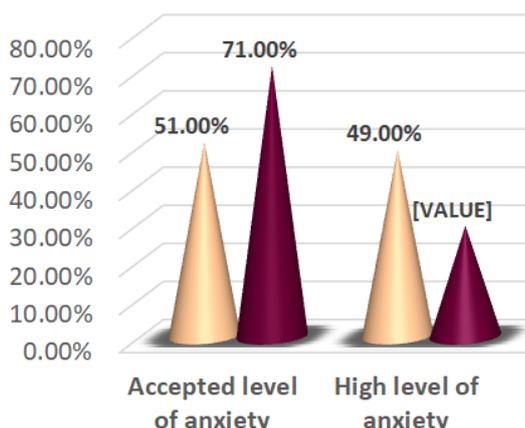


Figure 4. Distribution of the studied sample according to total score COVID-19 anxiety scale pre and post intervention (n = 200).

Note: (■) Pre-Intervention; (■) Post-Intervention

Table 3. Mean scores of the studied sample knowledge, fear, and anxiety before and after the intervention (n = 200).

	Pre-intervention	Post-intervention	ANCOVA (reference pre-test)			
			F	df	P	Partial Eta square
Knowledge	7.47 ± 1.94	10.35 ± 1.60	1481.40*	1	<0.001*	0.937
Fear	20.25 ± 6.46	16.81 ± 5.34	983.26*	1	<0.001*	-0.909
Anxiety	7.81 ± 4.86	4.45 ± 4.43	100.91*	1	<0.001*	-0.505

Note: *Statistically significant at p ≤ 0.05

Table 4. Correlation between students' knowledge and fear and anxiety post intervention (n=200).

	Post-intervention	
	r	P
Knowledge vs. Fear	-0.582*	<0.001*
Knowledge vs. Anxiety	-0.503*	<0.001*
Fear vs. Anxiety	0.390*	<0.001*

Note: r: Pearson coefficient; * Means Statistically significant at p ≤ 0.05

Discussion

The current study was conducted weeks next the announcement of the pandemic on secondary school students at Damnhour city/Egypt and during the quarantine period. Technology presence in these lock-down months plays an imperative role in providing knowledge and aids students continue their learning [31]. More attention should be given to utilizing technology particularly social media resources, Facebook, or WhatsApp, Zoom and Microsoft teams especially the users of these platforms in Egypt increased from 33 million users in 2016 to more than 40 million in 2019 [32].

The results of the present study highlighted the effectiveness of the current interactive digital-based psychoeducational intervention on enhancing the students' knowledge level about COVID-19 with a significant increase of the mean knowledge score of every item after the intervention. This further validated by ANCOVA test that revealed that 93.7% of this improvement is due to the intervention. Similarly reported increased mean pre-test knowledge scores after application of their educational program. This may reflect the importance of the digital intervention during these lock-down period in increasing students' knowledge from a scientific point of view and not only socially. This further help in counteracting the era of information surrounding the COVID-19, which is one of the main concerns of this study [33,34].

Surprisingly, the present study showed that before the educational intervention about three quarters of the studied students had correct knowledge regarding COVID-19 common signs and symptoms, preventive measures, and treatment. This could a fruitful upshot of the initiative of the

Egyptian Ministry of Health and WHO which delivered reliable information about COVID-19 through their websites to help public to be mindful of updates concerning COVID-19 [35,36]. This observed satisfactory knowledge level in the existing study is congruent with a recent Chinese study done during a very early stage of the epidemic. It observed 90% overall correct knowledge response [23]. Fortunately, our study showed a higher level of knowledge when compared to a study in 2009 to assess the Egyptian university students' knowledge regarding H1N1, where only 39.8% of the participants answered ≥ 4 questions correctly [37].

The COVID-19 pandemic containment activities such as physical distancing, quarantine and social restriction activities can have a negative impact on public mental health [38]. This includes an increase in depression, anxiety, loneliness, perceived stress, and various type of fear (fear to die, to lose the loved ones or to lose income) [39,40]. The native news stated numerous incidents of Egyptian health care workers being rejected by others for the fear of being infected. A female physician who died with COVID-19 was denied burial due to the fear and protesting of her neighbors which result in immense psychological distress for her family [41].

Digital public mental health approaches may contribute to lower rates of mental disorders. Indeed, UK surveys proved that the digital interventions for enhancing the public mental health are urgently needed to address the psychosocial consequences of the COVID-19 pandemic [38-43]. This is in harmony with our findings which portrayed that there is a statistically significant decrease of the total COVID-19 fear Scale after the digital psychoeducational intervention. The mean score of the students COVID-19 fear significantly decreased from 20.25 ± 6.46 before intervention to 16.81

± 5.34 after intervention which further confirmed by ANCOVA test that revealed that 90.9% of this change is due to the intervention. These findings are in accordance with other studies of university students Pfefferbaum [44,45].

On elaboration, our study highlighted that 57% of the studied students had a high total COVID-19 fear score before intervention. However, an Indian study stated that 80% of the participants need mental health care for COVID-19 due to the experienced fear, anxiety, and depression [46]. This could be related to the early protective measures that were deployed by the Egyptian government as well as the transparent approach in sharing and reporting the latest details and updates regarding the ongoing pandemic situation that can reassure public. Additionally, the characteristics of the underlying sample of secondary school students who may be more capable to adapt through greater self-responsibility, engage in prosocial behaviors, and have capacities of recovery [47].

Evidence revealed that commanding unfamiliar measures to safeguard public health, inappropriate understanding of modes of transmission, health resource scarcities, and contradictory messages from authorities are among the various factors that leading to public anxiety throughout the COVID-19 pandemic [48]. Numerous researches have presented that substitutes to pharmacotherapy are effective in decreasing anxiety levels [49-51]. In addition, relaxation training and cognitive-behavioral techniques are among the most widely applied procedures to reduce the symptoms of anxiety. The students in the current study had the opportunity of practicing different relaxation techniques to lower their anxiety levels such as time management, cognitive techniques, and relaxation exercises via multimedia (Zoom sessions, PPTs, infographics, videos, WhatsApp). This resulted in a statistically significant decrease of the total COVID-19 anxiety mean score from (7.81 ± 4.86) to (4.45 ± 4.43) after intervention. ANCOVA test also proved that 50.5% of this improvement was due to the psychoeducational intervention. Although anxiety levels had decreased, there were still students in the post-test who were still having high level of anxiety (29%). Thus, it is recommended to develop targeted psychoeducational intervention for this age group to relieve their COVID-19 related fear and anxiety.

The current study proved that the knowledge level was negatively correlated with both fear and anxiety post intervention. Ornell, et al. correspondingly depicted that the participants with higher awareness about epidemics, frequently experience lower levels of anxiety [52]. Consequently, it is crucial to provide health education and create awareness during such COVID-19 epidemic for effective prevention of disease spread and mental health promotion. Furthermore, the study depicted that COVID-19 fear was positively correlated with anxiety level post intervention. This was elucidated by who described that fear is deemed as one of the leading contributors to greater anxiety and depression. It could also predict inadequate overall health status, insomnia, and immunity suppression.

Conclusion

The current study findings supported the alternative hypotheses which reveal the effectiveness of the digital-based psychoeducational intervention on enhancing the secondary school students' knowledge and lessen their fear and anxiety level. The study proved that 93.7% of the improvement on knowledge score, 90.9% of the reduction on fear level and 50.5% of the reduction on anxiety levels among secondary school students were due to the digital-based psychoeducational intervention.

Recommendations

The current study recommends the following:

- Establishing targeted educational and training programs for teachers and school health nurses as a first line of defence to reach students. This helps in keeping them well informed about the evidence based COVID-19 prevention and control measures, and fear and anxiety alleviation techniques.

- Embolden cooperation between educational and health institutions, to raise students' awareness about COVID-19 and alleviate fear and anxiety among students.

- Expand the implementation of digital-based psychoeducational interventions for the community using multimedia to counteract the rising trend of infodemic toward COVID-19.

- Further studies are essential to shed the light on the psychological consequences of infectious disease epidemics.

Conflict of Interest

The author declares that there is no conflict of interest.

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We would like to thank all those who participated in this study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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