

# Combating COVID-19 Infodemic: A Step Towards Building Public Trust

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## Research Article

**Keywords:** COVID-19, Pandemic, Digital Health, Misinformation, Infodemic, Public Mistrust, Decision-Making, Internet, Standards

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# Combating COVID-19 Infodemic: A Step Towards Building Public Trust

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**Background:** The spread of misinformation about different health issues, has become a growing threat nowadays. The process of identifying credible information became a real problem of high urgency. It took a new dimension with the creation of numerous web platforms and ubiquity of internet coverage.

During the current pandemic of COVID-19, misinformation is not the only challenge, but infodemic is another serious consequence of the growing digitization. Infodemic is defined as an excessive amount of information about a problem that is typically unreliable, false or misleading, spreads rapidly, and makes a solution more difficult to achieve. This causes anxiety and mistrust in health authorities, leading to decrease capacities for decision-making and undermining public responses, especially during disease outbreaks or pandemics.

**Aim:** The current study was designed to evaluate the effect of implementing a digital intervention training module, to educate participants about choosing credible online health information, according to quality standards and protocols.

**Methods:** This is a quasi-experimental study with pre/post-assessment comparisons. It took place between October 2019 and October 2020 with the recruitment of a group of 480 medical students, from 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> academic years, at the Faculty of Medicine. They were assigned to an intervention and a control group. The intervention group attended the digital health module, which was conducted online with both its theoretical and practical components. Participants responded to pre and post online questionnaire through google forms, in addition to a post-intervention assessment.

**Results:** Results showed post-assessment significant improvements in all items related to seeking online health information and the ability to check the credibility of such information, among the intervention group in comparison to the control group with p-value < 0.05.

**Conclusion:** The infodemic caused by COVID- 19 pandemic, with all its associated psychological pressure and panic due to misinformation, made it really crucial to disseminate awareness about credible digital information sources. Targeted digital health interventions about online health information quality and credibility, are highly promising, due to the safe outreach and accessibility without any physical contacting, especially during the pandemic time.

**Keywords:**

COVID-19, Pandemic, Digital Health, Misinformation, Infodemic, Public Mistrust, Decision-Making, Internet, Standards

## **1.INTRODUCTION**

Misinformation and lack of information reliability, carry a great risk to online health information seekers, due to the wide gap and disconnection between health promotion digital platforms and scientific validation and quality checking [1]. Misinformation is a real threat that can destroy public trust in governments and health authorities. It has been aggravated during the COVID-19 pandemic, which occurred in a highly connected world, to reach a broad range of spread in what WHO has called “an infodemic”. Anxiety, confusion, and trust destabilizing, are serious consequences of COVID-19 infodemic. They represent a real public health challenge as regards COVID-19 control and mitigation measures [2]. Mistrust in the health authorities decreases capacities for decision-making and undermine public responses, especially during disease outbreaks or pandemics [3].

The spread of non-credible information about different health issues threatens the health outcomes. It took a new dimension with the creation of numerous web platforms and ubiquity of the Internet coverage, which enabled more individuals to search for online information [4].

With the great digital revolution and enormous number of mobile applications, there is a lack of regulations and quality control measures. This has negatively impacted the users’ ability to make the proper decision for choosing mobile applications [5].

The problem is magnified due to the vulnerability of most Internet users, especially the adolescents information seekers, who lack the needed skills to evaluate and choose online health information [6]. They usually do not depend on quality criteria while choosing online health information sources. The choice of some users can sometimes be based on the design and the quality of pictures [7]. This made testing the accuracy of

information and evaluating the sources by applying objective measures and using preset standards and criteria, highly crucial [8].

Many studies and research explored factors affecting the process of online health information seeking [1,9,4]. Other studies emphasized the fact that focusing on the users would be more effective and less costly [5], and recommended to apply strategy-based judgement techniques in order to reduce the negative effect of cognitive biases, which will enhance users' ability to evaluate and apply the online information [10]. But to the best of our knowledge, there is a lack in studies focusing on providing Internet users with the knowledge and skills they might need to combat the infodemic threats.

### **Aim of the study:**

The current study was designed to cross such gap, through an online learning intervention to educate university students about the criteria and quality standards for choosing the credible source of online health information.

## **2.METHODS**

### **Study Setting and Design**

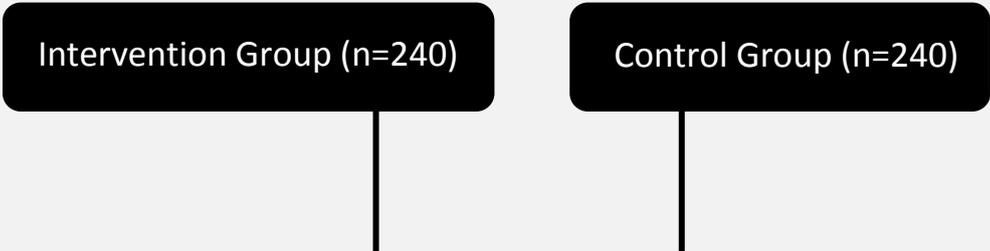
A quasi-experimental study, with pre/post-assessment comparisons. Medical students from 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> academic years, at the Faculty of Medicine, Helwan University were recruited and assigned to the intervention or the control groups. The study took place over the period between October 2019 and October 2020.

## **Sample Size**

According to similar previous studies, a sample size of 250 participants in each group (intervention and control) was calculated , after considering an effect size of 0.295 [5], an estimated standard deviation of change in outcome of 1.55 and an attrition rate 10 to 15%, with confidence level of 95%.

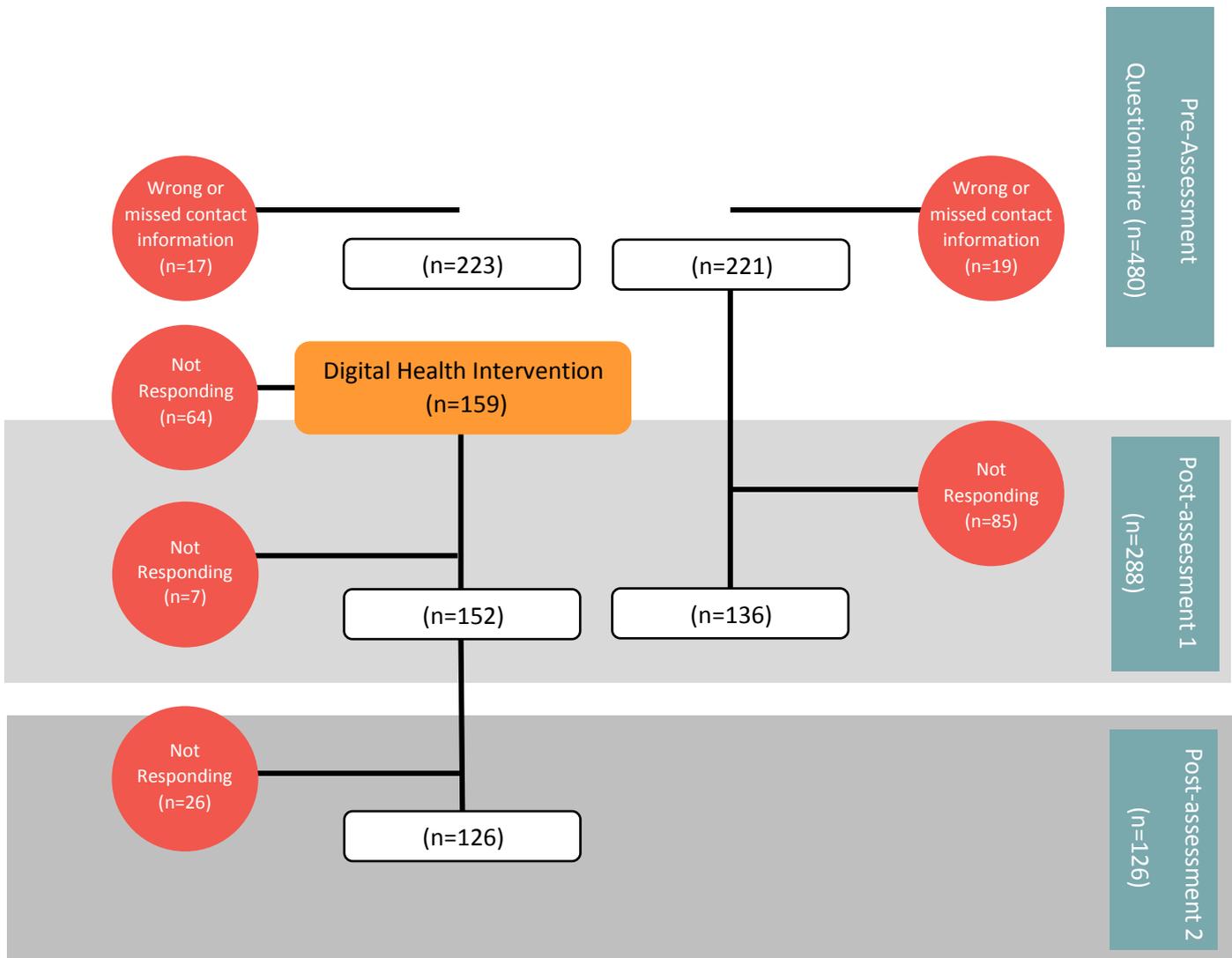
## **Study Population**

Students were enrolled if they were students in the 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> years of Faculty of Medicine, Helwan University, in addition to having a digital device and Internet access.



Intervention Group (n=240)

Control Group (n=240)



**Figure 1: Actual study flow chart showing participant students' distribution on study phases.**

### **Phases and Tools of the study:**

The study was implemented in four phases: preparatory, pre-intervention, digital module intervention and post-intervention phase.

**2.1** During the preparatory phase, a structured questionnaire form was designed to inquire about the participants' sociodemographic, health and digital usage characteristics. The digital intervention module was also prepared during this phase.

2.1.1 Questions about socio-demographic characteristics included three-items: age, gender, and nationality. Participants were asked about suffering from health problems and the type of such health issue if present.

Due to the absence of previous validated tool, questions for digital usage were validated according to expert opinion and reliability was checked by Cronbach's alpha test using SPSS. These questions were about: 1. Usage pattern (type of technology used frequently, preferred type of digital media, using mobile applications as well as the type of the online health information sought by the study participants [11]. 2. Participants' ability to decide which mobile application they can use and which health information they can trust by asking about checking the reliability of digital messages as well as checking the qualification of the provider. 3. Participants' knowledge about advantages and disadvantages of using digital tools [5].

2.1.2 Digital Module Intervention Preparation started by choosing the suitable Learning Management System (LMS): which fulfilled the criteria of being easy to be used, allowing the needed number of participants and allowing follow up as well as audios and videos. The module content was written in accordance with the desired study objectives. Standards were simplified and written in both languages "English" and "Arabic". Audios for all lectures were recorded then edited and saved. A practical example about protective measures against Corona virus was added with illustrative videos to emphasize the importance of referring to credible sources whenever such important information is needed. The module included 18 lectures, 1 practical example illustrated in 2 lectures and a completion assessment. The module was about 1 hour if taken at a time, but the participants were allowed to attend it at their own pace. It was made available for two weeks on the LMS.

**2.2** During the pre-intervention phase, participants were recruited by contacting the students' leaders through administrative authority at Faculty of Medicine, Helwan University. The recruitment started in March 2020 and ended in April 2020. Participants were then allocated into two groups, an intervention, and a control group, each has 240 students.

**2.3** The digital module intervention allowed participants to receive a general introduction about: "Digital Health" definition, impact, advantages and disadvantages. They were trained on how to choose the suitable mobile application by using the evaluation framework of standards, which were driven from the quality principles modeled on ISO/IEC 25010 for health software and compiled by Albrecht et al. in their study [5]. They included: mobile practicality and usability, risk adequacy, legal standards, content validity and technical adequacy. They were also trained on how to evaluate website messages by applying Information Quality Evaluation Guidelines derived from the DISCERN instrument which was used to evaluate text-based information quality. It included a set of items (e.g., content authority, content sources, objectivity and content currency)

**2.4** By the end of the training module participants were eligible to take an immediate post-intervention assessment (Post-intervention1) to evaluate the change in digital aspects that were included in the pre-assessment questionnaire. Another assessment was conducted 3 months later (Post-intervention2).

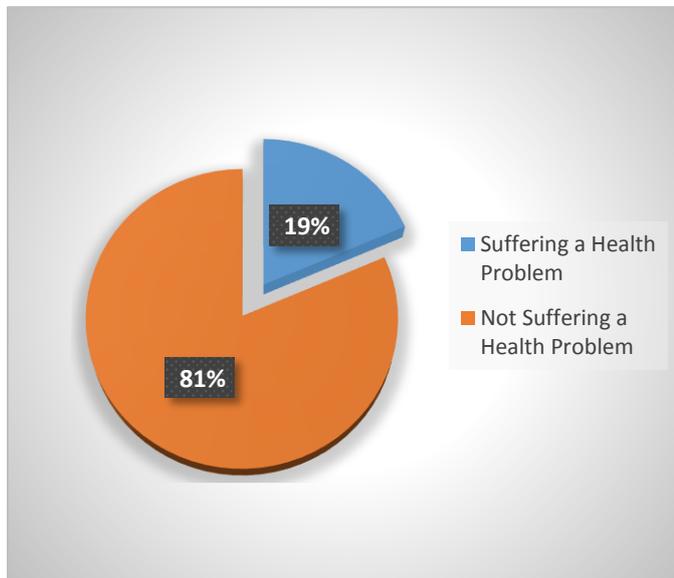
## **Statistical Analysis**

Responses of the self-administered questionnaire were gathered and saved into Excel file, to be prepared for presentation and analysis. Package for Social Sciences (SPSS) version 23 was used for data analysis. Descriptive statistics were performed for all socio-demographic variables. McNemar test was used to detect pre-intervention and post-intervention assessments (1 and 2) significant differences among the study groups with  $p$  value < 0.05.

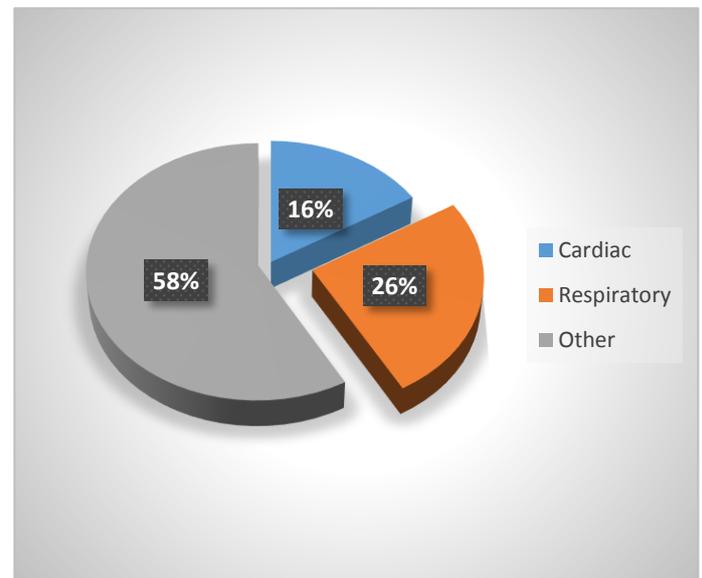
### **3.RESULTS**

A group of 480 medical students was recruited in this study. Their mean age  $\pm$  SD ( $19.7 \pm 1.3$ ), and the females were slightly more than the males (50.8% and 49.2%, respectively). Most of them were Egyptians (88.7%). The majority of the participant students (81%) were not suffering from any health problem, while (19%) were suffering from health problems. By asking about the type of health problems suffered by participant students, 86 responded and it was found that about quarter of the respondents had respiratory diseases (26%), while (16%) had cardiac diseases and more

than half of the participants (58%) had other diseases (including digestive problems, anaemia and diabetes) (Figure 2 & 3).



**Figure 2: Suffering from Health Problems (n=480)**



**Figure 3: Types of the Health Problems (n=86)**

It was found that mobile phones were the most frequently used technological devices by participants (87.9%), as compared to laptops (11.3%) and desktops which were the least frequently used (0.8%). The majority of participants chose social media to be their preferable type of digital media (72.5%) over other types including websites which were preferred by (16.9%) and mobile applications which were preferred by (10.6%) only. Almost one third of participant students use mobile health applications (35.4%). Among those who used mobile health applications (n=170), only (26%) tried to check the quality of the application before using it. Digital information about lifestyle was sought by almost two thirds of the participants (65.4%), information about specific health problems

was sought by more than half of the participants (56.3%), while diet-related digital information was sought by fewer participants (38.1%).

About half of the participants (45.4%) mentioned that they usually check the reliability of the digital messages they receive. About two thirds of the participants reported that they check the qualifications of the digital message provider (61.3%). Less than quarter of the sample knew about the advantages of digital tools (23.5%), while only one fifth of the participants knew about the disadvantages of digital tools (19.6%) (Table 1).

**Table 1: Digital Usage Characteristics among Participant Students (n=480)**

<b>Digital Usage Items</b>		<b>No.</b>	<b>%</b>
Technological Devices Frequently Used	Mobile Phone	422	<b>87.9</b>
	Laptop	54	<b>11.3</b>
	Desktop	4	<b>0.8</b>
Preferred Digital Media	Applications	51	<b>10.6</b>
	Websites	81	<b>16.9</b>
	Social Media	348	<b>72.5</b>
Using Mobile Health Applications	Yes	170	<b>35.4</b>
	No	310	<b>64.6</b>
Types of Digital Information*	Lifestyle	314	<b>65.4</b>
	Specific Health Problems	270	<b>56.3</b>
	Diet	183	<b>38.1</b>
Checking the Reliability of Received Messages	Yes	218	<b>45.4</b>
	No	262	<b>54.6</b>
Checking the Qualifications of the Provider	Yes	186	<b>38.8</b>
	No	294	<b>61.3</b>
Know the Advantages of Digital Tools	Yes	113	<b>23.5</b>
	No	367	<b>76.5</b>
Know the Disadvantages of Digital Tools	Yes	94	<b>19.6</b>
	No	386	<b>80.4</b>

\* Total may count to more than 100% due to multiple responses given by participant students.

Results of digital usage analysis showed post-intervention significant improvements in the following items: “*checking the reliability of received messages*”, “*checking the qualifications of the provider*”, “*know the advantages of digital tools*” and “*know the disadvantages of digital tools*” among the intervention group in both the immediate and the 3 months interval post-intervention (post-intervention1and2). No significant changes were detected in any of the digital usage knowledge and practices upon analysis of pre and post assessments of control group (Table 2 ).

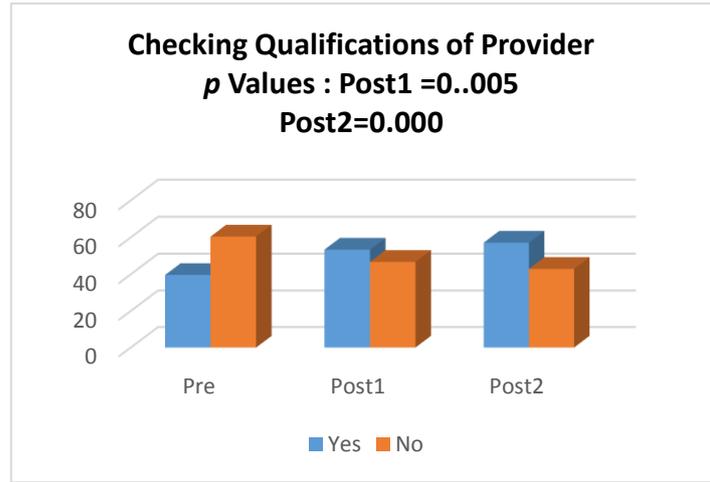
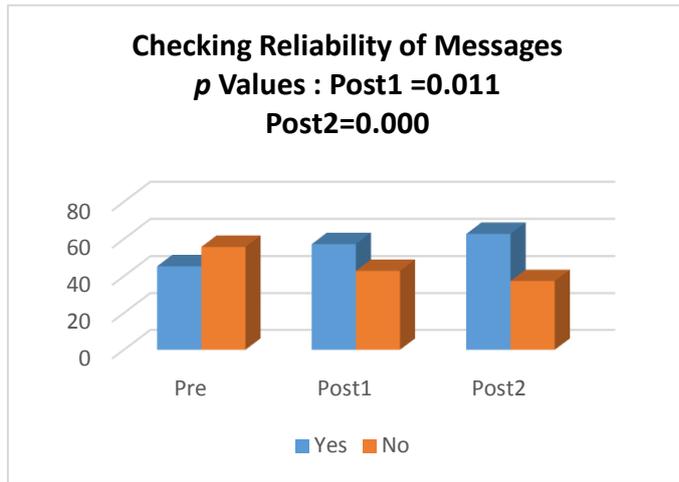
**Table 2: Pre and Post-intervention1 and 2 (immediate and after 3 months, respectively) assessments of digital usage knowledge and practices among the study groups:**

Digital Usage Knowledge and Practices		Intervention Group			Intervention Group			Control Group		
		Pre-Intervention No.(%) (n=159)	Post-Intervention1 No. (%) (n=152)	<i>p</i> value*	Pre-Intervention No.(%) (n=159)	Post-Intervention 2 No. (%) (n=126)	<i>p</i> value*	Pre-Intervention No. (%) (n=136)	Post-Intervention No. (%) (n=136)	<i>p</i> value*
Checking the Reliability of Received Messages	Yes	72(45.3)	87(57.2)	<b>0.011</b> ↑**	72(45.3)	79(62.7)	<b>0.000</b> ↑**	63(46.3)	59(43.4)	0.936
	No	87(55.7)	65(42.8)		87(55.7)	47(37.3)		73(53.7)	77(56.6)	
Checking the Qualifications of the Provider	Yes	63(39.6)	81(53.3)	<b>0.005</b> ↑**	63(39.6)	72(57.1)	<b>0.000</b> ↑**	53(39.0)	43(31.6)	0.165
	No	96(60.4)	71(46.7)		96(60.4)	54(42.9)		83(61.0)	93(68.4)	
Know the Advantages of Digital Tools	Yes	39(24.5)	94(61.8)	<b>0.000</b> ↑**	39(24.5)	86(68.3)	<b>0.000</b> ↑**	31(22.8)	48(35.3)	0.060
	No	120(75.5)	58(38.2)		120(75.5)	40(31.7)		105(77.3)	88(64.7)	
Know the Disadvantages of Digital Tools	Yes	33(20.8)	81(53.3)	<b>0.000</b> ↑**	33(20.8)	73(57.9)	<b>0.000</b> ↑**	26(19.1)	34(25.0)	0.522
	No	126(79.3)	111(46.7)		126(79.3)	53(42.1)		110(80.8)	102(75.0)	

\* McNemar Test, *p* Value < 0.05

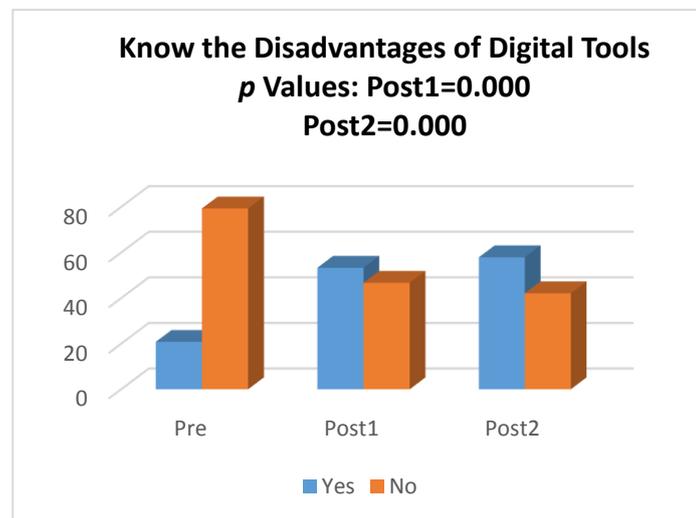
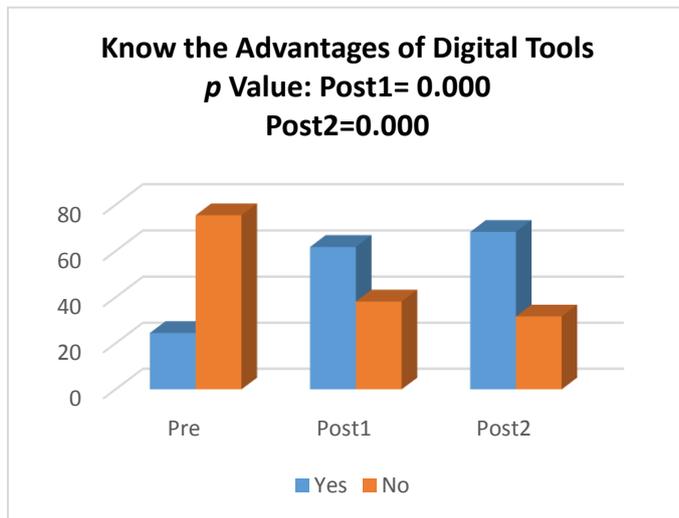
\*\* Direction of change whether improvement or worsening

By comparing pre-intervention, post-intervention1 and post-intervention2 results, it was found that more positive changes occurred between pre-intervention and post-intervention2 than that between pre-intervention and post-intervention1 assessments (Figures 4,5,6 & 7).



**Figure 4: Checking the Reliability of the Messages**

**Figure 5: Checking the Qualifications of the Provider**



**Figure 6: Know the Advantages of Digital Tools**

**Figure 7: Know the Disadvantages of Digital Tools**

## **4.DISCUSSION**

In the current study, the effect of implementing a digital intervention training module, to educate participants about choosing credible online health information, according to quality standards and protocols, has been assessed.

The study has investigated some sociodemographic characteristics of medical university students including age, gender and nationality. The participants' mean age  $\pm$  SD was found to be (19.7  $\pm$  1.3). During this stage (18-21 years old), youth are highly vulnerable. They are usually at the risk of higher exposure to more challenges with great impact on their health, than any other age group [12]. Females were slightly more than males (50.8% and 49.2%, respectively). Researchers reported that gender-being female- is one of the highly significant factors affecting online search of health information [9]. In a study done by Jacobs, W. et al, exploring online and alternatives sources for health information according to the consumers' seeking behavior, other factors were found to have an effect on such behavior. Health condition and health status perception were some of these factors. They found that individuals with risks of chronic diseases do not use the web as their primary source of information but they turn first to their healthcare providers. This finding was explained by the researchers as been attributed to the need of patients with chronic diseases to high level of trusted and accurate information, in addition to other important details regarding their disease management which make them rely on their healthcare providers in the first place [13]. In the current study, the majority of the participant students (81%) were not suffering from any health problem, while (19%) were suffering from health problems.

Information about specific health problems was sought by more than half of the participants (56.3%), which matched the findings in Jacobs' et al. study. It was also consistent with findings in a study conducted by Montagni I. et al. who reported that 64.5% of the participants were concerned with online information about illnesses [14], and closer to findings of another study done in Kuwait, where 62.9% of the participants used the internet for the same purpose [9]. Regarding the digital usage characteristics among student participants, it was obvious that mobile phones were the most frequently used technological devices by participants (87.9%) This finding is not surprising due to the increase in the global and local rate of mobile phones ownership and usage. It also agrees with the "ICT Indicators Annual Report 2014–2018", where the reported percentage of individuals using cellphones was 95.7% [15]. This can be explained by the sociodemographic characteristics of the study participants, being a group of high internet users. This high percentage also reflects the great vulnerability of this group to misinformation if left without guidance for improving their digital communication awareness and skills.

The majority of participants chose social media to be their preferable type of digital media (72.5%) over other types including websites and mobile applications. This percentage matches the percentages of individuals using social networks (78.3%) [15].

Different concerns and challenges related to quality of online health information were identified in a study done by Skinner H. et al. Their study aimed at describing adolescents' usage of technology for their health information needs [16]. A series of subsequent studies explored quality of digital health information, among which a study by Albrecht, U., et al., who investigated the perception of medical students to quality principles

of health mobile applications as a step for their usage decisions. Their study showed that students were unable to identify the necessary quality information [5]. The current study findings about the ability of participants to identify digital tools quality principles including checking the reliability of the digital messages and the qualifications of the digital health messages provider, have indicated that although university students are good at using technology, yet they lack the skills which enable them to properly search and evaluate digital information. This is in line with the work of other studies conducted to assess the prevalence of misinformation exposure and beliefs, as stated by Lee et al.. The study was concerned with COVID-19 misinformation exposure and its association with defective knowledge and fewer adoption of preventive practices. They highlighted the potential of COVID-19 misinformation to negatively affect the global actions and steps taken to face COVID-19 pandemic [17].

Another important finding about students' awareness of advantages and disadvantages of using digital tools, which showed a low level of knowledge. This gives insights about the students' need for guidance and support to be more competent at using digital tools in a way that ensures their getting the most benefit and in the same time being protected from any harm they may be subjected to.

Adolescents lack digital health literacy and depend mainly on their personal perception for choosing online health information [6], and other studies recommended exerting effort to improve digital literacy skills among adolescents [18]. In the current study digital health module intervention revealed significant improvements among the intervention group as compared to the control group upon analysis of pre and post-intervention (immediate and after 3 months) assessments of digital usage including the ability to choose credible online information by checking the

provider qualifications as well as the reliability of information. More over knowledge about advantages and disadvantages of digital technology has been significantly improved. This positive effect supports the need for applying more interventions to improve digital health literacy among youth. This matched the findings of Albrecht, U., et al., whose study showed that informing participants' about digital information quality principles, caused a significant change in their perception towards such principles and in turn higher ability for usage decisions [5].

Results of comparing pre-intervention, post-intervention<sup>1</sup> and post-intervention<sup>2</sup>, showed that long-term follow-up among participants led to better outcome. Such results highlighted the importance of designing future interventions across longer time period with close follow-up and feedback.

## **5.CONCLUSIONS**

In the light of the present study, it can be concluded that university medical students are high internet users, who prefer using mobile phones and social media. They are more likely to seek online health information, yet they lack digital health skills which makes them vulnerable to the risks of misinformation.

Digital health interventions targeted to enhance students' awareness about online health information quality and credibility, are highly fundamental. They are a vital solution to COVID-19 infodemic, aiming at improving public trust in health authorities, to guarantee better responses and more compliance to the decisions which are concerned with overcoming COVID-19.

## **6. RECOMMENDATIONS**

Youth represent a growing segment of digital health communication users, they are exposed to poor quality information and incredible sources of data. It became a real priority to apply more interventions and provide tools to enhance their ability to choose credible sources of information and improve digital health literacy among such vulnerable group.

The intervention can be replicated and tailored to target different groups to guarantee better outcome as regards combating the COVID-19 infodemic and raising public trust.

### **Strengths and Limitations**

Choosing medical university students as the study population, is a point of strength, because they are future healthcare providers who can communicate what they have learnt to their peers and patients.

The decision of using an LMS as a digital platform to implement the training intervention, was a real practical step, which highly matched the study objectives to improve the participants digital communication skills. Another great advantage, was related to the outreach and accessibility without physical contacting, specially in the Covid 19 pandemic.

Regarding the current study limitations, the difficult terms and scientific standards, which were hard to be simplified and introduced to the students, were a big challenge. The high rate of drop out was considered another limitation, which could be explained by the COVID-19 consequences of lock down and changing the location to areas without Internet coverage.

## **Declarations**

### **Ethical Approval and Consent to participate**

Approval of the institutional review board at Kasralainy Faculty of Medicine, Cairo University was a prior step before starting the study (MD-58-2019). Participants indicated consent to participate through a statement of agreement, at the beginning of the questionnaire after reading a full description about the study. Participation in the study was voluntary and students had the full freedom whether to join or to withdraw from the study at any time. Students were assured that the collected data was of high confidentiality and anonymity. As an incentive, a certificate of appreciation was sent to every participant, by the end of the study.

### **Consent for publication**

Not applicable.

### **Availability of data and materials**

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

### **Competing interest**

No potential conflict of interest was reported by the author(s).

### **Funding**

No specific funding was received to conduct this research

## **Authors' contributions**

HS and RH made substantial contributions to conception and design, analysis and interpretation of data, and writing the manuscript. OK, SB and MF were involved in revising carefully for important content, analysis and final conclusion and recommendations. The authors read and approved the final manuscript.

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