The use of mobile mental health apps among Moroccan medical students and its relation with environmental protection: a descriptive study

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Abstract. Medical students report a growing prevalence of mental health illnesses due to the medical school curriculum being considered challenging, lengthy, and leaving little time for leisure. Currently, several mental health apps are available and hold promise in terms of the diagnosis, monitoring, and management of mental health disorders. This study aimed to investigate medical students' habits, attitudes, and intentions about using mental health applications. A survey questionnaire given to one hundred and thirty-three Moroccan medical students at the Faculty of Medicine and Pharmacy of Casablanca and answered by one hundred and eleven of them was used to collect primary data. Improvements in the management and monitoring of mental health illnesses as well as a reduction in environmental costs as a result of a decrease in patient travel to mental healthcare facilities are the most obvious reasons why medical students perceive mental health applications to be useful. The findings also indicate that medical students are less familiar with mental health apps and use them less frequently than other mobile health apps. Furthermore, downloading a mental health app, being diagnosed with mental health issues, and perceiving mobile mental health apps to be useful don't ensure their active use among medical students. Therefore, more research on the determinants of the use of mobile mental health apps is needed. Those related to environmental protection must also be considered.

keywords— Attitudes, Digital Health, E-mental health, Environmental protection, Intention to use, Medical students, Mental health, Mental health apps, Mental health issues, Perceptions, Use.

1 Introduction

Over a billion individuals experience mental health issues every year, with depression serving as the primary global cause of disability, according to the latest World Health Organization Global Burden of Disease study. The COVID-19 pandemic has made this situation even worse, it is estimated to be responsible for a 25% global increase in the prevalence of depression [1]. Younger people are the most concerned by mental disorders; about 20% of children and adolescents worldwide are estimated to have a mental health issue, which is nearly double the prevalence for the general population [2]. University students typically report poor mental health; the prevalence of anxiety, depression, and other mental illness symptoms has increased significantly among them in the last decade [3]. Medical students, in particular, report increasingly common mental health disorders due to the constraints they are subjected to throughout their long and arduous studies, leaving little time for leisure. In Morocco, burnout is particularly common among undergraduate medical students, and over 50% of medical students experienced minor mental disorders [4].

The proliferation and widespread use of mobile smartphones during the past ten years have significantly impacted people's routines all over the world [5]. The mental healthcare routine was also a concern; several mental health apps are now available and hold promise in terms of the diagnosis, monitoring, and management of mental health disorders like bipolar, schizophrenia, and depression [6–8]. In a broad sense, digital mental health solutions are any type of technology used to prevent, support, assess, and treat mental health disorders [9]. They are software packages that offer information and tools, including tracking, psychoeducation, and exercises, to support people in managing their disorders on their own [10]. Digital health solutions can greatly support the delivery of mental healthcare services, especially when it comes to filling healthcare resource shortfalls [11]. It's becoming more and more obvious that digital health apps can expand access to mental healthcare, especially among college students [12].

In addition to their considerable potential in promoting accessibility to healthcare and quality-of-service delivery, digital mental health apps have the potential to save on environmental costs. International studies have shown how digital health has a positive environmental impact in reducing nitric oxides, carbon dioxides, and carbon monoxide emissions [13]. It states that the use of digital health as an alternative to face-to-face consultations can assist healthcare systems in minimizing their carbon footprint [14]. This prevents net CO2 emissions by lowering patient travel to medical facilities.

Despite the effective role of mental health apps in addressing college students' mental health issues, such as depression and anxiety [15,16], and minimizing environmental impacts, college students are slow users of mental health apps, with notably low persistence rates over time [17]. One survey revealed that more than one-fourth of students were open to using an app, but only a small number of them had used a mental health app. They expressed worries about the apps' efficacy and were mostly confused about whether mental health apps were evidence-based [5]. Other research found that the low rate of use of mental health apps was attributed to the fear of stigma and a possible lack of confidentiality [12]. Data on what college students seek from mental health apps and what attributes can encourage the use of these tools is currently lacking. The use of digital mental apps among university students in general and medical students, in particular, is limited [18] and less understood. This suggests that more research on user perceptions and attitudes is required to encourage further use of these apps.

This study aims to investigate Moroccan medical students' views, perceptions, and attitudes toward mental health applications to better understand user preferences and acceptance in the Moroccan context. These research inquiries formed the basis of the principal objective: How many mental health apps do Moroccan medical students know of? How many have they attempted, and how have they found them? What makes mental health apps popular or unpopular, and why? How probable is it that these apps will be used? How can these apps contribute to environmental protection? To achieve the purpose of this study, primary data was garnered through a questionnaire delivered to Moroccan medical students from the Faculty of Medicine and Pharmacy of Casablanca.

The fact that Morocco is considered vulnerable to climate change, which presents a serious threat to the country's economic growth and human development, the alarming finding of the Economic, Social, and Environmental Moroccan Council (CESE) in October 2022, which revealed that 48.9% of the population aged 15 years and over present or have presented symptoms of mental disorders, the low use of mental health apps among medical university students, and the effective role of these tools in addressing mental health issues and minimizing environmental costs, motivated our research. This study will offer potential solutions to make mental health apps more appealing and useful in order to manage mental issues and contribute to environmental protection.

2 Article maps

In this descriptive study, we will describe the use habits of health apps in general and mental health apps in particular among Moroccan medical students. Then, we will highlight attitudes towards using mental health apps as well as the reasons for perceiving them to be useful or not and the circumstances under which using these tools is probable.

3 Methods

A survey questionnaire with 20 questions was used to collect the data. The questions were related to age, gender, and year of study; smartphone and tablet ownership; previous mental health conditions; general use and experience with mental health apps; and willingness to use them in the future. The survey was carried out between February and April 2022. The questionnaire was designed in French and distributed in a paper version.

The sample population in this study included students from the Faculty of Medicine and Pharmacy of Casablanca; they were randomly chosen from among the 3rd to the 6th years of their medical studies. Pharmacy students were excluded from the study. We delivered a questionnaire to (n=133) students of medicine, and it was completed by (n=111). A descriptive analysis was conducted, and the data were presented as means, percentages, and 95% confidence intervals (CI). Data analysis was conducted using JAMOVI 2.2.5 due to the data analysis process' simplicity and speed.

3.1 Data analysis

One hundred and eleven Moroccan medical students from the Faculty of Medicine and Pharmacy of Casablanca completed the questionnaire; 61% were female, and 30.6% reported having previous mental health illnesses. The sample characteristics are presented in Table 1.

Table 1. Characteristics of the sample (n=111).

Variables	N (%)	95% CI
Age (years), mean (SD)	21.9 (1,73)	
Gender		
Female	61 (55)	
Male	50 (45)	
Year of study		
3	24 (21.6)	
4	24 (21.6)	
5	62 (55.9)	
6	1 (0.9)	
Previous mental health conditions	34 (30.6)	0.22-0.39
Type of previous mental health conditions (n=34)		
Anxiety	19 (55.9)	
Depression	10 (29.4)	
Attention Deficit Hyperactivity Disorder	2 (5.9)	
Bipolar disorder	1 (2.9)	
Addiction	1 (2.9)	

Obsessive-compulsive disorder	1 (2.9)	
Age of diagnosis of previous mental health conditions		
Under 13 years old	2 (4.2)	
Between 13 and 17 years old	9 (33.3)	
Between 18 and 22 years old	23 (62.5)	

Mobile ownership was revealed by all participants (n=111), and 68.2% reported using the Internet for longer than three hours daily. Regarding uses for mental health, the majority of medical students stated that they are unfamiliar with mental health apps (n=92, 82.9%) and have never used them (n=99, 92.5%). Of the eight students who confirmed using mobile mental health apps, over 50% did so just in the last six months, and 62.5 spent less than 1 hour using this app, as mentioned in Table 2.

Table 2. Use habits of mobile mental health applications.

Variables	**N (%)**	**95% CI**
Mobile phone ownership	111 (100)	
Number of hours spent on the internet		
Less than 3 hours	4 (3.6)	
Between 3 and 7 hours	75 (68.2)	
Between 8 and 12 hours	29 (26.4)	
More than12 hours	2 (1.8)	
Use of mobile health apps	80 (76.9)	0.69-0.85
Type of Mobile health apps used (n=111)		
Activity tracking apps	45 (53.6)	
Calorie counter apps	27 (32.1)	
Coaching apps	6 (7.1)	
Fitness and exercise apps	37 (44)	
Health information	42 (50)	
Screening apps	2 (2.4)	
Wellness apps	22 (26.2)	
Other Type	8 (9.5)	
Previous knowledge about mobile mental health apps	19 (17.1)	
Use of mobile mental health apps	8 (7.5)	0.02-0.12
Period of using mobile mental health apps		
Less than 6 months	4 (50)	
Between 6 months and 1 year	2 (25)	
More than 1 year	2 (25)	
Time spent per week using mobile mental health apps		
Less than 1 hour	5 (62.5)	
Between 1 and 2 hours	3 (37.5)	
Recommending the use of mobile mental health apps	77 (76.2)	

As observed in Table 3, most of the students (n=94, 92.1%) considered as future practitioners perceived mental health apps as useful tools. Improvements in the management and monitoring of mental health illnesses as well as a reduction in environmental costs as a result of a decrease in patient travel to mental healthcare facilities are the most obvious reasons why medical students perceive mental health applications to be useful. When asked why mental health apps are not perceived to be useful, 25% of the students mentioned that close medical supervision is crucial during the treatment of mental health issues and that

mental health apps cannot take the place of a psychiatrist as well as that they lack effectiveness. About the main conditions where mobile mental health apps can be useful, students indicated anxiety (n=76, 73.6%), eating disorders (n=66, 64.1%), addiction (n=63, 61.2%), and depression (n=62, 60.2%).

Table 3. Perceived usefulness of mobile mental health applications.

Variables	**n (%)**
Perceived usefulness	
Useful	24 (23.5)
Somewhat useful	70 (68.6)
Not useful	8 (7.8)
Reasons why mobile mental health apps are useful	
Assist in reducing environmental costs	15 (16.3)
Reduce patient travel costs to medical facilities	13 (14.1)
Overcome mental health stigma or discomfort	8 (8.6)
Allow greater access	7 (7.6)
Promote preventive treatment	3 (3.2)
Enable Immediate and timely support	6 (6.5)
Can be deployed anonymously	7 (7.6)
Allow better management and monitoring of mental health conditions	21 (22.8)
Open up new lines of information and communication	12 (13.04)
Reasons why mobile mental health apps are not useful	
Lack of effectiveness	15 (19.1)
Close medical supervision is necessary for the treatment of mental health conditions	17 (21.8)
Specific features of mental disorders	16 (20.4)
Distinguishing good mental health apps from bad ones might be hard	14 (17.7)
The role of a psychiatrist cannot be substituted by mobile mental health applications	20 (25.5)
Conditions where mobile mental health apps can be useful	
Depression	62 (60.2)
Anxiety	76 (73.8)
Schizophrenia	8 (7.8)
Personality disorders	26 (25.2)
Thoughts of suicide	42 (40.8)
Eating disorder	66 (64.1)
Obsessive-compulsive disorder	33 (32)
Addiction	63 (61.2)
Others	6 (5.8)

As outlined in Table 4, checking health and lifestyle, addressing attention issues, and managing stress were the three primary conditions where using mobile mental health apps is probable, according to 60% of students. Depression and fatigue or loss of energy were the situations where using mental health apps is less probable.

Table 4. Conditions where using mobile mental health apps is probable.

	Improbable	**Less probable**	**Probable**	**Very Probable**
	n (%)	n (%)	n (%)	n (%)
Checking health and lifestyle	11 (10.2)	22 (20.4)	38 (35.2)	37 (34.3)

Attention issues	21 (19.3)	21 (19.3)	46 (42.2)	21 (19.3)
Depression or despair	32 (29.1)	26 (23.6)	37 (33.6)	15 (13.6)
Fatigue and loss of energy	33 (30.6)	32 (29.6)	28 (25.9)	15 (13.9)
Overeating or lack of appetite	26 (23.9)	28 (25.7)	37 (33.9)	18 (16.5)
Psychological problems	36 (33.6)	36 (33.6)	20 (18.7)	15 (14)
Stress or nervousness	14 (12.7)	24 (21.8)	45 (40.9)	27 (24.5)
Trouble sleeping	22 (20)	28 (25.25)	38 (34.5)	22 (20)

4 Results

We delivered a questionnaire to (n=133) students of medicine from the Faculty of Medicine and Pharmacy of Casablanca that was completed by (n=111). The response rate was 83.5%. Findings indicate that 30.6% of respondents reported having previous mental health illnesses, with 62.5% of those diagnoses occurring between the ages of 18 and 22. As can be seen, the majority were diagnosed after their enrollment in medical studies which are known to be challenging, lengthy, and leaving little time for leisure. Thus, the medical training curriculum should be reviewed to lower the prevalence of mental disorders among medical students and public authorities have to be increasingly aware of these mental issues considered as a public health issue. The results suggest that 92.5% do not use mental health apps, even if mobile ownership was revealed by all participants (n=111). As can be observed, mobile phone ownership did not ensure willingness to use mental health apps. Medical students were also unfamiliar with mental health apps, and the period of using these apps among the minority who have confirmed using them was less than 1 hour per week. Hence, downloading these apps did not ensure their active use. Even though 30.6% revealed that they have been diagnosed with a mental illness, only 7.5% use mental health apps. Therefore, being diagnosed with mental health issues doesn't guarantee the use of mobile mental health apps.

Improvements in the management and monitoring of mental health illnesses as well as a reduction in environmental costs as a result of a decrease in patient travel to mental healthcare facilities are the most obvious reasons why medical students perceive mental health applications to be useful; around 60% expressed that these apps can help treat depression and addiction. Even though we observed unwillingness regarding the use of these apps. Medical students' opinions on mental health applications may probably change depending on the specific mental health concerns they deal with. Further investigation into this topic may be beneficial. Among the primary reasons that were expressed by medical students about what makes mobile mental health not useful are the lack of effectiveness, the need for close medical supervision for mental health conditions, and the fact that the role of a psychiatrist cannot be substituted by these apps due to the specific features of mental disorders. To increase the effective use of mental health apps among medical students, it could be relevant to explore more determinants related to mental health app adoption focusing on technology acceptance theories.

5 Discussions and conclusion

This study examined Moroccan medical students' use habits, attitudes, preferences, and intentions about using mental health apps. It contributes to the literature by presenting the perceptions and attitudes of medical students toward using mobile mental health apps. The findings suggest that medical students lack knowledge about mental health apps;

downloading a mental health app, being diagnosed with mental health issues, and perceiving mobile mental health apps to be useful don't ensure their active use, which aligns with other research studies [10, 18]. Hence, further research about other determinants that can enhance the use of mobile mental health apps is required. Those related to environmental protection must also be taken into account. Our study is a descriptive one; it will be interesting to carry out more analytics studies assessing the association between enduring mental conditions, perceived usefulness, and willingness to use mental health apps. Uses and adoption rates of mental health apps can also vary across sexes, examining the relationship between sex and intention to use mental health apps could be interesting.

Furthermore, a positive attitude was shown by students regarding the fact that mobile applications for mental health were effective in reducing environmental costs. Studies indicated that healthcare's carbon footprint could be reduced with the use of health information technologies [14] because they avoid the need to travel to medical facilities for face-to-face appointments. More research about the role of digital health in climate change and environmental protection must be carried out, especially when it comes to mental healthcare settings.

Our findings also indicate that lack of effectiveness was among the main reasons for perceiving mental health apps to be not useful. Studies show that there is no consensus on the effectiveness of mental health apps. Only a tiny minority of applications have undergone an objective evaluation process, which should be compulsory if they claim to be health-related. To support medical students' mental health through apps most effectively, several challenges must be dealt with, such as the reliance on scientific validation and the protection of personal data.

Our study presents some limitations; our inclusion criteria have taken into account Moroccan students of medicine, and the students of pharmacy were excluded, so it will be interesting to conduct future research about attitudes and perceptions toward mental health apps among this category of students. Additionally, to gather and analyze user attitudes and perceptions toward mental health apps, this study only used quantitative methodologies, and data were gathered using a survey questionnaire. Nevertheless, more qualitative data could have been collected using, for example, interviews to further understand attitudes and preferences about mental health apps.

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