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Original article

Evaluating the effects of mental health e-learning on the knowledge, attitudes and practices of allied and healthcare professionals in Senegal

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ABSTRACT

Background: Despite the widespread prevalence and substantial burden of mental disorders, they remain significantly underdiagnosed and undertreated. In low- and middle-income countries like Senegal, integrating mental health services into primary care represents the most feasible strategy to bridge the treatment gap. This study aimed to assess the effects of a mental health e-learning program on the knowledge, attitudes, and practices of allied and healthcare professionals in Senegal.

Methods: An e-learning platform including 12 interactive modules was used to train 322 allied and healthcare professionals. We evaluated changes in knowledge, attitudes, and practices, as well as in satisfaction with knowledge and in self-assessed ability to diagnose and manage patients, by comparing data collected before and after the e-learning modules. Qualitative feedback on the satisfaction with the various components of the program was also collected via a post-training survey.

Outcomes: Knowledge, attitudes and practices scores increased significantly for all modules. Additionally, scores related to satisfaction with knowledge and ability to diagnose and manage patients showed significant improvements (+77.0 % and +75.0 %, respectively), surpassing the gains observed in knowledge, attitudes, and practices scores (+19.2 %, +11.1 % and +15.0 %, respectively). Mean scores regarding participants' satisfaction with the various elements of the program ranged from 8.1 to 9.1, out of a maximum of 10.

Conclusion: Although only a limited number of participants completed all 12 modules, the mental health e-learning program showed positive results on the knowledge, attitudes, and practices of participants. It also increased their confidence and was perceived as a very positive experience by learners.

1. Introduction

Mental disorders are very common in all countries of the world. In the World Mental Health Report[1] recently published by the World Health Organization (WHO), data suggest that in 2019, an estimated 970 million people across the world (or 13 % of the global population) were living with a mental disorder, 82 % of whom were in Low- and Middle-Income Countries (LMICs). Among the most common mental disorders highlighted in this report were anxiety disorders (301 million people, 4.0 % prevalence), and depressive disorders (280 million people, 3.8 % prevalence).[1]

Burden of disease studies have also shown the significant impact of mental disorders which account for 5.1 % of the global burden of diseases with 129 million disability-adjusted life years (DALYs). Mental disorders are the leading cause of years lived with disability (YLDs), accounting for 15.6 % of YLDs globally, depressive disorders and anxiety disorders being among the top ten leading causes of global YLDs in 2019, representing 5.6 % and 3.4 % of global YLDs respectively.[1]

Despite the high prevalence and significant burden of mental disorders, they remain under-diagnosed and under-treated, especially in

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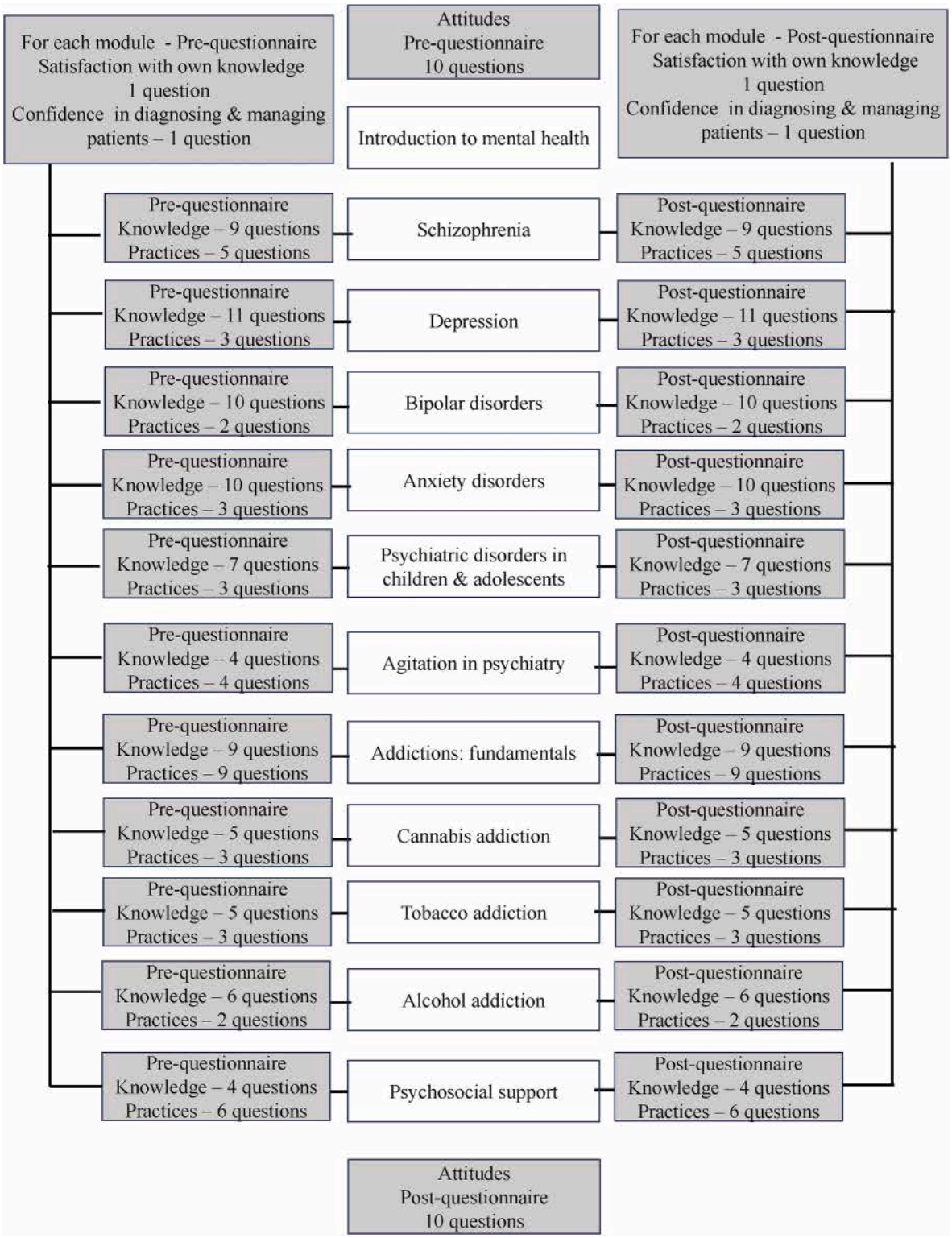

Fig. 1. Description of e-Learning platform (modules and questionnaires).

LMICs: between 76 and 85 % of people with severe mental disorders living in LMICs receive no treatment.[2]

Published data[3] for Senegal suggest a 3.9 % prevalence rate for anxiety disorders and 2.7 % for depressive disorders (crude prevalence rates, not age-standardized), indicating a prevalence just as high as in other countries. Similarly, published disease burden estimates for mental disorders in Senegal[3] seem aligned with worldwide figures: 8.1 % of total YLDs for depressive disorders and 2.9 % for anxiety disorders.

In Senegal, as in most LMICs, mental health is under-resourced. Among the 14 regions of the country, only 8 have psychiatry departments in the hospitals, and 46 % of these psychiatry departments are concentrated in Dakar, the capital.[4] Specialized mental health workforce is low: for instance, there are only 0.22 psychiatrists per 100,000 population in Senegal[5] compared to 10.54 in the US[6] or 23.63 in France.[7]

To help bridge the treatment gap, the WHO has recommended for mental health services to be integrated into primary care,[8] however

mental health literacy of first line health workers is low, especially in LMICs, and negative attitudes towards people with mental disorders are not uncommon.[9–11] These remain very significant obstacles to providing the care and support that people with mental disorders need.

For mental health care to be effectively integrated into primary care, first line health workers and allied professions, need to acquire the relevant knowledge, attitudes, and skills to be able, in their own communities and practices, to identify, diagnose, manage and support people with mental disorders. Our study aimed to evaluate in Senegal the effects of a brief mental health e-learning intervention on the knowledge attitudes and practices (KAP) of allied and healthcare professionals. The e-learning platform and program implemented in Senegal under the auspices of the Ministry of Health was previously piloted in Mali in a small group of general practitioners (GPs) and showed promising results (*Mroueh* L et al*., 2023; submitted for publication*).

2. Methods

2.1. Type and period of study

This study had a quasi-experimental "before/after" design: it compared data about learners' mental health KAP collected through online questionnaires, which were completed before and after each of the e-learning modules. The e-learning program was rolled-out between September 2021 and December 2022.

3. Ethics approval and consent

Ethics approval was obtained from the Comité National d'Ethique pour la Recherche en Santé under n° 0000125/MSAS/CNERS/SP. Informed consent was provided by all individual participants included in the study via an on-line form, which was completed at the time of registering for the e-learning program.

3.1. Study population

All learners registering for the mental health e-learning program were invited to take part in the study, and only those who started the e-learning program were included in the study. Although 499 allied or healthcare professionals registered after being encouraged to do so by the Ministry of Health, only 322 actually started the e-learning program by accessing at least one online module.

3.2. E-learning program

The e-learning platform, which was piloted in Mali prior to its roll-out in Senegal, included 12 modules (an introduction, 10 modules focusing on various mental disorders and one on psychosocial support) which learners could access at any time, and complete at their own pace (Fig. 1). Modules included animated text and graphics with a voice-over recording, to solicit both visual and auditory memories. The modules also included several quizzes each, to make learners' experience more interactive and engaging. It has been estimated that the total curriculum would take a maximum of 15 h to complete. As connectivity can be an issue in LMICs, modules could be accessed online, or downloaded and completed off-line. However, registration and questionnaires had to be completed online.

In addition to the content of the e-learning platform, the program was complemented by interactive webinars organized at set times by local psychiatrists. In order to attend a webinar, learners had to have validated the corresponding online modules. The webinars provided learners with an opportunity to clarify questions they might have had while doing the online modules, to explore some topics more in depth and to discuss clinical cases with a psychiatrist (Supplementary Data-1).

3.3. Evaluation criteria

The primary endpoint was a change in the Knowledge and Practices score for each of the mental disorders (each module), and in the Attitudes score for all mental disorders.

Secondary endpoints were the changes in the level of participant's satisfaction with their knowledge, and in the self-assessment of their ability to diagnose and manage patients.

3.4. Data collection

At the beginning and at the end of each e-learning module, a pre- and post-online questionnaire had to be completed to evaluate knowledge and practices related to each module. There were 11 questionnaires with single or multiple-choice questions, directly related to knowledge and practices elements dealt with in each module (Fig. 1). Scores were expressed as a percentage of correct answers.

In addition, before and after each module, 2 questions were asked to assess learners' level of satisfaction with their knowledge of the topic, as well as their self-assessment of their ability to diagnose and manage people with the disorder which was the topic of the module (Fig. 1). Scores ranged from 1 (extremely dissatisfied/not at all able) to 10 (extremely satisfied/extremely able).

Attitudes were assessed by a general questionnaire completed at the beginning and end of the entire curriculum. This questionnaire included 10 statements (positive and negative) for which learners were asked to indicate their level of agreement by scoring from 1 (strongly disagree) to 10 (strongly agree).

Knowledge questionnaires included questions on the definition of the disease, its etiology, diagnostic criteria, epidemiology, and treatment. Practices questions included mental health-related assessment scales or screening tools, interviewing techniques, procedures, and management. Attitudes towards mental disorders and towards people with mental disorders, dealt with topics including feelings, impressions, stigma and patients' interactions with family, work environment, and community.

In addition to these questionnaires, socio-demographic data regarding the profile of the learners (age, gender, profession, type of institution, etc.) were also collected.

A final post-program survey was conducted in March 2023 to gather more qualitative feedback from the participants: a short online questionnaire asked participants to score their experience overall, as well as with the online modules and the webinars (scores ranging from 1 – extremely dissatisfied to 10 – extremely satisfied) and to select what the key strengths and the key barriers had been among a list of items, with options to list other issues and suggestions.

3.5. Statistical analysis

A statistical analysis was conducted using SPSS 22.0. Quantitative variables were described by the median and interquartile range (IQR) due to the non-normal distribution of the variables. For the post-training survey, quantitative variables were described by using means and standard deviation (SD).

A comparison between sub-scores, and overall scores for knowledge, attitudes, and practices, before and after e-learning, was done using Wilcoxon paired signed-rank test.

Mann-Whitney test was used to compare distributions between two independent groups and Kruskal-Wallis test to compare distributions between more than 2 independent groups.

A p-value <0.05 was considered significant throughout the study.

4. Results

4.1. Description of participants' characteristics

A total of 322 participants started the e-learning with 319 who

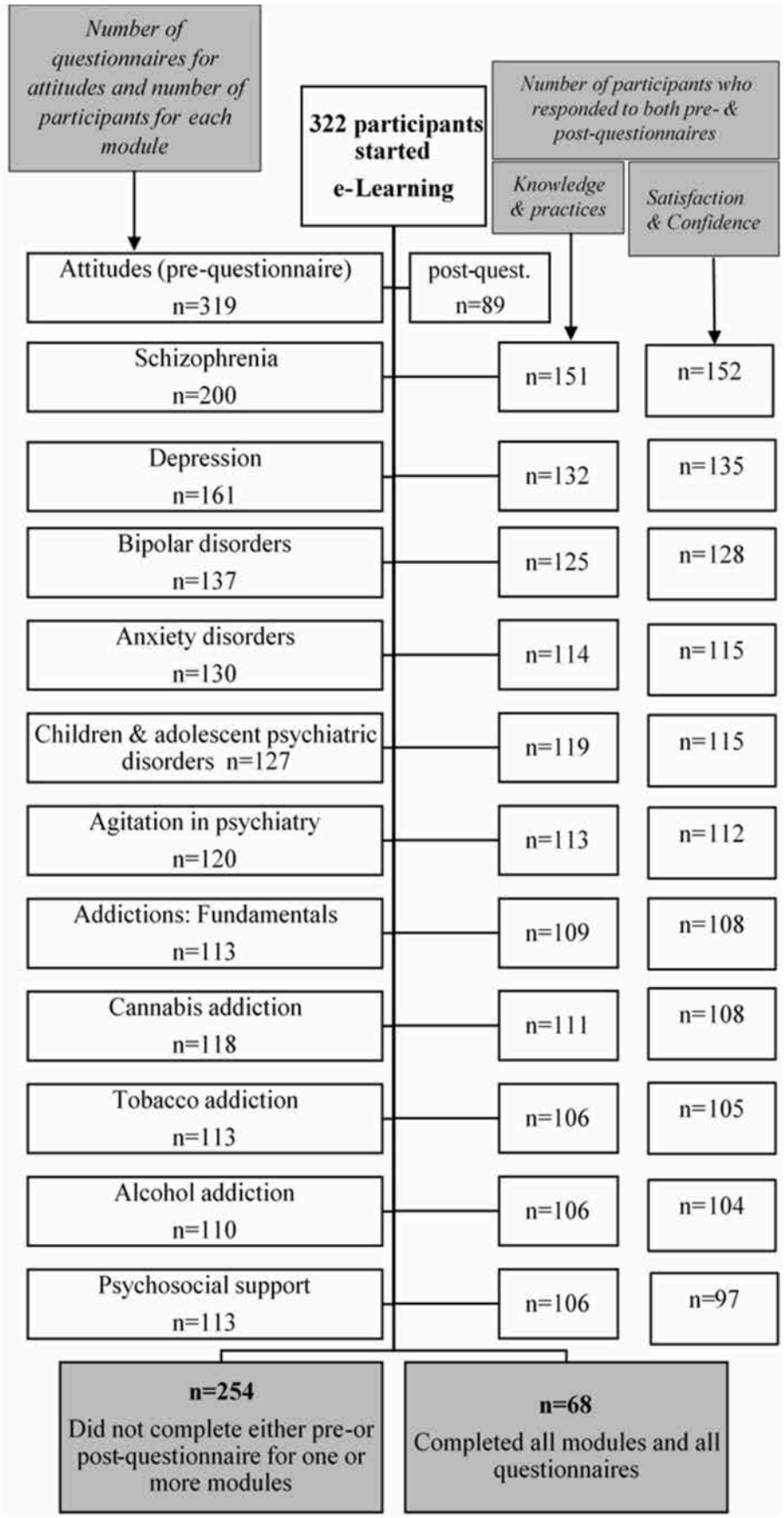

Fig. 2. E-learning participation: number of modules and questionnaires completed.

Table 1
Characteristics of e-learning participants.

Variables (n = 322)		N (%)
Profession	Specialist	62 (19.3)
	General practitioner	31 (9.6)
	Medical/Nurse student	56 (17.4)
	Nurse	59 (18.3)
	Midwife	37 (11.5)
	Social worker	19 (5.9)
	Psychologist/Psychology student	18 (5.6)
	Other	40 (12.4)
Practice type	Public	233 (76.9)
	Private	28 (9.2)
	Both	42 (13.9)
	Missing	19
Work environment	City	210 (68.9)
	Peri-urban	41 (13.4)
	Rural	54 (17.7)
	Missing	17
Type of institution	Community Health Center	27 (22.3)
	National or Regional Hospital	77 (63.6)
	Health post or dispensary	17 (14.1)
	Missing	201
Additional mental health training	Yes	168 (52.2)
	No	154 (47.8)
Gender	Male	153 (47.5)
	Female	169 (52.5)
How did you find about it	Friend/Colleague	139 (44.4)
	Professional Association	23 (7.3)
	Health authorities	63 (20.1)
	University	45 (14.4)
	Ministry	35 (11.2)
	Other	8 (2.6)
	Missing	9
Age (median; IQR)		35.0 (29.0–41.0)
Years of practice (median; IQR)		5.0 (2.0–11.0)

completed the attitudes questionnaire right at the beginning of the curriculum, before the introduction module. There was a continuous drop-out as participants progressed through the curriculum, with 200 accessing the module on schizophrenia and 110 accessing all modules. Numbers of pre- and post-questionnaires both completed for each of the modules, and available for paired analysis, varied from 152 for schizophrenia, down to 97 for psychosocial support.

Overall, 68 participants completed all modules and all questionnaires and 254 did not complete either pre- or post-questionnaire for one or more modules (Fig. 2).

Among the 322 participants, specialists were the most represented group (19.3 %) followed by nurses (18.3 %) and medical and nurse students (17.4 %), with 52.5 % of learners being women. More than three quarters of the participants worked solely in the public sector, and less than 10 % only in the private sector, with 68.9 % practicing in urban areas. More than half of the participants had already completed additional training in mental health (Table 1).

4.2. Comparison of scores for each module and of overall scores before and after e-learning

The overall attitudes score increased significantly after the e-learning. The knowledge, and practices scores increased significantly after the e-learning for all modules. Similarly, scores regarding satisfaction with knowledge, and ability to diagnose and manage diseases, improved significantly for all modules, and in a greater way than the knowledge and practices scores (Table 2).

The overall knowledge, attitudes, practices scores, as well as satisfaction with knowledge and ability to diagnose and manage scores, for the participants who completed all modules and questionnaires (68 and 52 participants respectively) showed significant increases for all scores (Table 3).

Furthermore, relative changes between before and after e-learning were greater in terms of satisfaction and confidence of participants (satisfaction with knowledge: +77.0 %; ability to diagnose and manage: +75.0 %) than their acquired skills scores (knowledge: +19.2 %; attitudes: +11.1 % practices: +15.0 %) (Fig. 3).

4.3. Absolute changes in scores according to characteristics of participants

There were some significant differences in the absolute changes in scores according to participants' characteristics. Indeed, midwifes and nurses had the greatest increases in knowledge: median (IQR) scores of 21.8 (18.2–23.8) and 19.3 (14.7–25.7), respectively (Table 4). The greatest increases in satisfaction with knowledge scores, and with ability to diagnose and manage scores, were seen with nurses, midwives and social workers with median (IQR) scores of 44.1 (39.1–50.9), 47.3 (19.1–70.9), 46.4 (25.5–51.8) and 40.5 (32.7–48.2), 47.3 (18.2–67.3), 49.2 (22.7–51.8), respectively. There were greater increases for participants working in a rural environment vs urban or peri-urban environments in terms of knowledge scores, satisfaction with knowledge scores and ability to diagnose and manage scores. Participants who had not taken any additional training in mental health had a greater increase in their satisfaction with knowledge score. It was also the case for participants who had heard about the program via health authorities or via the ministry (Table 4).

4.4. Post-training survey to gather qualitative feedback from e-learning participants

The online post-e-learning survey was sent to the 163 participants who had completed at least two of the modules (the introduction plus at least one module involving pre- and post-module questionnaires). The response rate was 66.9 %.

Mean (±SD) scores regarding the overall training experience, the online modules, the webinars, the overall benefit and the likeliness to recommend the program to colleagues ranged from 8.1 (±1.7) to 9.2 (±1.6), out of a maximum of 10 (Supplementary Data-2).

The most frequently mentioned strengths of the e-learning program were the ability to do online modules at any time/at own pace, a content adapted to needs and the interactive webinars cited by 80.7 %, 78.0 % and 64.2 % of respondents respectively. The most frequently mentioned barriers were connectivity issues, lack of time to dedicate to the training and difficulty to remain motivated cited by 41.3 %, 37.6 % and 15.6 % of respondents respectively (Supplementary Data-2).

5. Discussion

Our study demonstrated the positive effects of the e-learning program on the knowledge, attitudes, and practices of allied and healthcare professionals. It also increased their confidence as shown by the improvement in their satisfaction with knowledge score, and the self-assessment of their ability to identify and manage people with mental disorders. Interestingly, nurses, midwives and social workers were the groups who had the largest increases in scores, similarly participants from rural environment had greater improvements in scores, suggesting that as opportunities for mental health training might be lacking for these participants, this e-learning could help address an unmet need. Furthermore, the e-learning program was perceived as a very positive experience by learners.

With the scarcity of specialized mental health workforce in LMICs, training of non-specialist workers in mental healthcare can help improve knowledge, attitudes, skills and confidence among health workers, and therefore be a very effective strategy to bridge the treatment gap and improve patient outcome.

Evidence suggests that mental health training provided during the

Table 2
Comparison of scores for the various types of questionnaires before and after each module.

Modules	N	Type of questionnaire	Before	After	p-value
			Median (IQR)		
Overall Attitudes	89	Total	61.0 (50.0–74.0)	82.0 (71.0–90.0)	**0.001**
Schizophrenia	151	Knowledge	74.2 (64.5–83.9)	93.6 (80.7–100.0)	**<0.001**
	151	Practices	94.1 (88.2–100.0)	100.0 (94.1–100.0)	**<0.001**
	152	Satisfaction with knowledge	50.0 (30.0–70.0)	90.0 (80.0–100.0)	**<0.001**
	152	Confidence with diagnosis/management	50.0 (20.0–70.0)	90.0 (80.0–90.0)	**<0.001**
Depression	132	Knowledge	76.9 (69.2–84.6)	96.2 (88.5–100.0)	**<0.001**
	132	Practices	81.8 (72.7–90.9)	100.0 (81.8–100.0)	**<0.001**
	135	Satisfaction with knowledge	50.0 (30.0–70; 0)	90.0 (80.0–100.0)	**<0.001**
	135	Confidence with diagnosis/management	50.0 (30.0–80.0)	90.0 (80.0–90.0)	**<0.001**
Bipolar disorder	125	Knowledge	83.9 (71.0–90.3)	96.8 (85.5–100.0)	**<0.001**
	125	Practices	90.9 (72.7–100.0)	100.0 (86.4–100.0)	**<0.001**
	128	Satisfaction with knowledge	50.0 (20.0–70.0)	90.0 (80.0–100.0)	**<0.001**
	128	Confidence with diagnosis/management	50.0 (20.0–70.0)	90.0 (80.0–90.0)	**<0.001**
Anxiety disorder	114	Knowledge	75.0 (63.6–84.1)	93.2 (84.1–97.7)	**<0.001**
	114	Practices	71.4 (57.1–85.7)	85.7 (71.4–100.0)	**<0.001**
	115	Satisfaction with knowledge	50.0 (30.0–70.0)	90.0 (70.0–90.0)	**<0.001**
	115	Confidence with diagnosis/management	50.0 (30.0–70.0)	90.0 (70.0–90.0)	**<0.001**
Children & adolescent psychiatric	119	Knowledge	79.1 (72.1–88.3)	95.4 (88.4–100.0)	**<0.001**
	119	Practices	87.5 (81.3–93.3)	100.0 (93.8–100.0)	**<0.001**
	115	Satisfaction with knowledge	40.0 (30.0–60.0)	90.0 (80.0–90.0)	**<0.001**
	115	Confidence with diagnosis/management	50.0 (30.0–70.0)	90.0 (80.0–90.0)	**<0.001**
Agitation in psychiatry	113	Knowledge	84.6 (76.9–100.0)	100.0 (92.3–100)	**<0.001**
	113	Practices	86.7 (73.3–93.3)	100.0 (93.3–100.0)	**<0.001**
	112	Satisfaction with knowledge	50.0 (30.0–70.0)	90.0 (80.0–100.0)	**<0.001**
	112	Confidence with diagnosis/management	50.0 (30.0–70.0)	90.0 (80.0–100.0)	**<0.001**
Addictions fundamentals	109	Knowledge	78.6 (67.9–85.7)	96.4 (89.3–100.0)	**<0.001**
	109	Practices	80.77 (73.1–84.6)	96.2 (92.3–100.0)	**<0.001**
	108	Satisfaction with knowledge	50.0 (30.0–70.0)	90.0 (80.0–90.0)	**<0.001**
	108	Confidence with diagnosis/management	50.0 (30.0–70.0)	90.0 (80.0–90.0)	**<0.001**
Cannabis addiction	111	Knowledge	83.3 (75.0–91.7)	100.0 (91.7–100.0)	**<0.001**
	111	Practices	88.9 (66.7–88.9)	100.0 (100.0–100.0)	**<0.001**
	108	Satisfaction with knowledge	50.0 (30.0–60.0)	90.0 (80.0–100.0)	**<0.001**
	108	Confidence with diagnosis/management	50.0 (30.0–70.0)	90.0 (80.0–90.0)	**<0.001**
Tobacco addiction	106	Knowledge	77.8 (66.7–88.9)	100.0 (94.4–100.0)	**<0.001**
	106	Practices	90.0 (70.0–95.0)	100.0 (90.0–100.0)	**<0.001**
	105	Satisfaction with knowledge	60.0 (40.0–80.0)	90.0 (80.0–100.0)	**<0.001**
	105	Confidence with diagnosis/management	50.0 (30.0–72.5)	90.0 (80.0–100.0)	**<0.001**
Alcohol addiction	106	Knowledge	83.3 (72.2–88.9)	100.0 (88.9–100.0)	**<0.001**
	106	Practices	83.3 (66.7–100.0)	100.0 (83.3–100.0)	**<0.001**
	104	Satisfaction with knowledge	50.0 (40.0–75.0)	90.0 (80.0–100.0)	**<0.001**
	104	Confidence with diagnosis/management	50.0 (40.0–80.0)	90.0 (80.0–90.0)	**<0.001**
Psychosocial support	106	Knowledge	86.7 (80.0–93.3)	100.0 (93.3–100.0)	**<0.001**
	106	Practices	85.7 (82.1–92.9)	96.4 (92.9–100.0)	**<0.001**
	97	Satisfaction with knowledge	60.0 (40.0–80.0)	90.0 (80.0–100.0)	**<0.001**
	97	Capacity to develop and motivate	60.0 (40.0–80.0)	90.0 (80.0–100.0)	**<0.001**

IQR = interquartile range.

Table 3
Comparison of overall scores before and after the e-learning for the 68 participants who completed all modules and questionnaires.

		Knowledge overall score	p[a]	Practices overall score	p[a]	Attitudes overall score	p[a]
Median ± IQR	**Before** *N = 68*	79.6 (72.9–87.1)	**<0.001**	84.2 (78.3–90.0)	**< 0.001**	78.0 (70.0–84.0)	**0.002**
	After *N = 68*	96.1 (91.9–97.8)		95.1 (91.5–97.8)		82.0 (72.0–91.0)	
		Satisfaction with *knowledge* overall score	**p[a]**	Confidence **with *diagnosis/management* overall score**	**p[a]**		
Median ± IQR	**Before** *N = 52*	54.6 (42.7–73.2)	**< 0.001**	55.0 (44.5–72.0)	**< 0.001**		
	After *N = 52*	88.2 (80.5–96.2)		88.7 (78.4–94.5)			

[a] Wilcoxon test - IQR = interquartile range.

formal curriculum of frontline healthcare professionals in LMICs, whether they be nurses, midwifes or general practitioners, is far from ideal. For instance, in Nepal, time allocated to mental health during the entire general medical training ranged only from 25 to 92 h; the clinical rotation on mental health was mostly 2 weeks and the relative weight of summative assessment ranged from 0.21 to 2.5 % total marks of the entire training.[12]

As a result, frontline health workers are ill-equipped to identify, diagnose or manage mental health issues. Studies conducted in LMICs have shown that frontline healthcare workers and allied professionals have insufficient knowledge about mental disorders and often negative attitudes towards people with mental disorders.[13] In Kenya, only 35.6 %

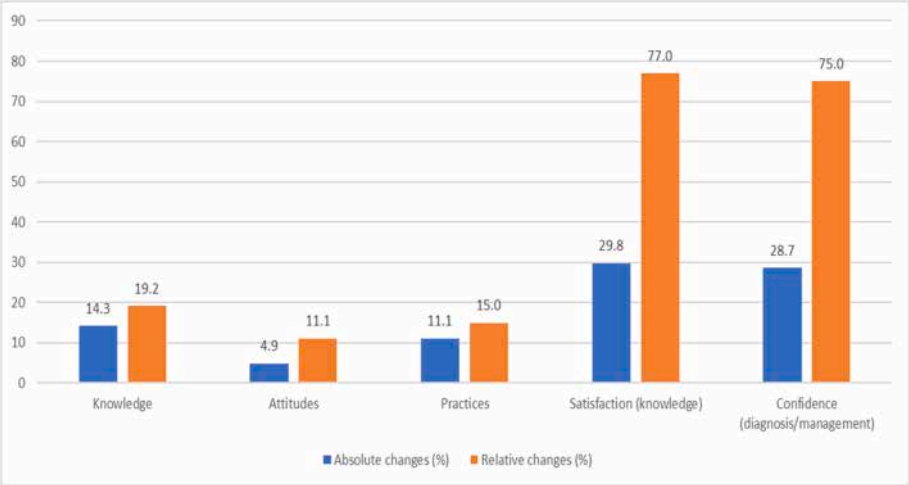

Fig. 3. Absolute and relative changes of overall score.

of primary health care workers could correctly identify depression, and even fewer (15.7 %) could recognize schizophrenia.[14]

Brief mental health training intervention implemented in LMICs have been shown in several reviews and in recent studies to have a positive effect.[15–21]

Furthermore, as e-learning has become more widespread, its potential benefits have become more obvious and have made it an attractive option, in particular to train health workers: e-learning allows participants to learn at anytime, anywhere and at their own pace; in most cases, it is a much cheaper option than face-to-face training; whether it be webinars, interactive online modules, or e-learning materials on memory stick or disc, it is much easier to organize than face-to-face sessions; often, it allows to easily track each participants learning activities and it is easy to update. In particular, the cost-effectiveness of e-learning[22] makes it a very attractive option to scale-up global health capacity building. Several reviews[23–26] have evaluated the efficacy of e-learning for healthcare professionals or health students in a very broad range of topics. The current evidence base suggests that online eLearning can be equivalent, and in some cases even superior to traditional learning, which presents a potential incentive to encourage its use.[23]

More specifically, for mental health, the benefits of e-learning have been shown in various settings. For instance, in Australia, its effect was evaluated on public servants' knowledge, stigmatizing attitudes, confidence in providing support and intentions to provide support to a person with depression or post-traumatic stress disorder immediately post-training, and at 1-year and 2-year follow-up.[27]

There are nevertheless several limitations to our study. Participants were not randomly chosen but self-selected, introducing a selection bias which would limit the applicability of the results to a broader population. It is worth noting that out of those who were encouraged to take part, 499 registered and only 322 (64.5 %) started the training. It could also be argued that with specialists being the largest group of participants (19.3 %), this program might not have reached the intended target of first-line healthcare workers. It is worth highlighting though that specialists in specialty other than psychiatry, might need to upskill in mental health, as much as primary healthcare providers, in order to deal with patients who might have mental disorders as co-morbidities.

Another limitation is that as participants were not required to complete all modules and all questionnaires, this resulted in a limited number of questionnaires completed for each of the modules and therefore available for paired analysis, thus limiting comparison across modules. This was an assumed decision to let participants choose the modules they wanted to do, and not force them into a compulsory curriculum, since this would be the way this program would be rolled-out on a larger scale. There were still between 106 and 152 paired sets of knowledge and practices questionnaires available for analysis, depending on the module. Another limitation of our work is that it evaluated only the effects of the e-learning modules available on the platform, and not those of the webinars, although the post-survey questionnaire allowed to capture some feedback regarding the webinars. Satisfaction with the webinars got a score of 8.1 (±1.7), and "interesting interactive webinars" was the third most commonly mentioned strengths of the training program, cited by 64.2 % of the respondents. In total, there were six different types of interactive webinars, including three topics complementary to those of the e-learning platform. Each of these webinars was ran nine times for the various groups of learners. This also led to the setting-up of WhatsApp groups, with the specialists who had facilitated the webinars acting as mentors.

Our study only evaluated the first two of the four dimensions of the Kirkpatrick model of training evaluation: (https://www.kirkpatrickpartners.com/the-kirkpatrick-model/). It didn't evaluate Level 3: Behavior ("the degree to which participants apply what they learned during training when they are back on the job") or Level 4: Results ("the degree to which targeted outcomes occur as a result of the training and the support and accountability package"). However, several studies have suggested that for health professionals, learners' self-assessment of their knowledge and skills is a significant predictor of their future performance in clinical activities.[28,29]

Interestingly, the Ministry of Health of Senegal has already planned to integrate mental health in its national e-learning program for the continuing education of health workers. As another consequence of this project, and of the positive feedback from learners regarding mentorship by specialists, mental health supervisors have been appointed, by the Head of the Mental Health Division of the Ministry of Health, in each medical region, to act as mentors for first line health workers willing to upskill in mental health.

6. Conclusion

This study is the first in Senegal to assess the effects of a mental health e-learning platform for allied and healthcare professionals. The positive results seen short term on the knowledge attitudes and practices of the participants are very encouraging and should be the basis for further investigation, in particular regarding whether the effects are sustained longer term and how they translate into positive patient outcomes. The cost-effectiveness of e-learning might allow to train a greater number of healthcare workers, and this e-learning platform, which is now also available in English, might become a very useful tool in LMICs to help address the significant treatment gap for mental disorders.

Table 4
Absolute changes in scores according to the characteristics of participants.

Variables	Absolute change of Knowledge score		Absolute change of Attitudes score		Absolute change of Practice score		Absolute change of Satisfaction (knowledge) score		Absolute change of Confidence (diagnosis/ management) score	
	Median ± IQR	p	Median ± IQR	p	Median ± IQR	p	Median ± IQR	p	Median ± IQR	p
Profession										
Specialist	8.6 (6.4–12.2)	**0.001b**	5.5 (−5.0-15.0)	0.398b	5.8 (4.5–6.9)	0.063b	17.8 (11.4–24.5)	**0.008b**	16.9 (10.5–24.5)	**0.008b**
General practitioner	12.2 (9.9–15.9)		5.0 (4.0–6.0)		9.6 (7.3–10.8)		34.5 (16.4–50.9)		36.4 (10.0–46.4)	
Medical/Nurse student	13.3 (9.2–18.4)		6.0 (−2.0-12.0)		11.3 (5.4–21.7)		20.0 (10.9–32.7)		19.1 (15.5–30.9)	
Nurse	19.3 (14.7–25.7)		−1.0 (−6.0-7.0)		11.8 (10.4–19.0)		44.1 (39.1–50.9)		40.5 (32.7–48.2)	
Midwife	21.8 (18.2–23.8)		2.0 (−3.0-11.0)		9.2 (7.1–19.6)		47.3 (19.1–70.9)		47.3 (18.2–67.3)	
Social worker	13.5 (12.5–18.5)		3.0 (0.5–12.5)		10.3 (1.7–11.5)		46.4 (25.5–51.8)		49.1 (22.7–51.8)	
Psychologist/ Psychology student	3.0 (2.6–13.9)		0.0 (−5.0-6.0)		8.5 (3.8–12.1)		33.2 (20.0–53.7)		35.0 (16.8–59.1)	
Other	11.1 (9.1–14.0)		7.0 (4.0–11.0)		7.5 (4.6–10.4)		16.4 (8.2–40.9)		9.1 (6.4–26.4)	
Practice type										
Public	13.5 (8.7–19.2)	0.481b	4.5 (−2.5-10.5)	0.213b	9.4 (5.7–12.4)	0.916b	34.5 (16.4–46.4)	0.407b	33.6 (16.4–46.4)	0.337b
Private	15.9 (10.7–21.6)		7.5 (4.0–12.0)		7.5 (4.6–16.7)		30.0 (5.9–54.1)		25.9 (5.9–49.1)	
Both	11.5 (8.7–14.8)		0.0 (−12.0-11.0)		8.7 (6.7–9.2)		19.6 (12.7–35.5)		18.7 (10.0–30.0)	
Work environment										
In city	12.2 (8.5–15.9)	**0.004b**	4.0 (−3.0-11.0)	0.275b	8.6 (5.5–12.1)	0.090b	26.0 (13.6–44.6)	**0.046b**	25.5 (11.8–42.7)	0.084b
Suburban	13.9 (10.6–20.2)		6.0 (4.0–15.0)		8.3 (5.8–11.1)		29.1 (19.1–43.6)		26.8 (20.9–39.1)	
Rural	19.1 (18.5–25.7)		2.5 (−4.0-7.0)		11.8 (10.3–19.6)		46.8 (38.7–55.5)		45.0 (34.6–52.3)	
Additional mental health training										
Yes	11.1 (8.4–20.0)	0.253a	4.0 (−1.5-9.5)	0.858a	8.9 (4.3–13.6)	0.729a	20.0 (10.9–41.4)	**0.032a**	18.7 (9.6–44.6)	0.103a
No	14.4 (9.9–18.6)		6.0 (−3.5-11.0)		8.9 (5.8–10.8)		37.3 (19.1–50.9)		33.6 (19.1–43.6)	
How did you find about it										
Friend/ Colleague	11.1 (7.6–16.4)	0.254b	4.0 (−4.0-12.0)	0.784b	8.0 (5.1–10.1)	0.139b	23.2 (16.4–43.6)	**0.042b**	24.5 (15.5–40.0)	0.085b
Professional Association	18.7 (13.5–21.5)		1.0 (−3.0-4.0)		7.2 (4.1–9.4)		18.2 (1.8–34.5)		22.3 (8.2–36.4)	
Health authorities	16.8 (12.5–20.0)		5.5 (−2.0-9.0)		11.0 (7.3–13.6)		43.6 (35.5–50.9)		42.3 (24.5–49.1)	
University	11.6 (8.4–13.9)		6.0 (−2.0-11.0)		12.1 (6.9–16.7)		14.5 (8.2–32.7)		16.4 (8.2–30.9)	
Ministry	14.0 (9.6–20.6)		2.0 (0.0–11.0)		10.8 (4.9–27.0)		38.7 (19.1–53.6)		32.8 (17.7–49.1)	
Other	13.4 (13.4–13.4)		16.0 (16.0–16.0)		2.3 (2.3–2.3)					

a Mann-Whitney test; b Kruskal-Wallis test.

Authors' contribution

All authors contributed significantly to this paper and participated in meetings to discuss design, implementation, analysis and interpretation. All authors were involved in the design of the study. EHMB coordinated field implementation and data acquisition. TG and FB performed data and statistical analyses. All authors were involved in the data interpretation. PEB drafted the first version of the article. All authors reviewed subsequent versions and approved the final manuscript. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Competing interests

PEB and AFN were Sanofi employees at the time of the project and own Sanofi shares. EHMB, JADT, and LK report grants or personal fees received either directly or indirectly from Sanofi Global Health in the context of the submitted work. FB, PMP and LK report grants from Sanofi Global Health outside the submitted work. TG and DM report no competing interests.

Availability of data and material

De-identified data are stored on the secure server of the EpiMaCT team and may be shared on a case-by-case basis upon reasonable requests to the corresponding author.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: El Hadji Makhtar Ba reports financial support was provided by Sanofi Global Health. Jean Augustin Diegane Tine reports financial support was provided by Sanofi Global Health. Line Kleinebreil reports financial support was provided by Sanofi Global Health. Pierre-Emile Bruand reports a relationship with Sanofi Global Health that includes: employment and equity or stocks. Amy Fall Ndao reports a relationship with Sanofi Global Health that includes: employment and equity or stocks. Pierre-Marie Preux reports a relationship with Sanofi Global Health that includes: funding grants. Farid Boumediene reports a relationship with Sanofi Global Health that includes: funding grants. Line Kleinebreil reports a relationship with Sanofi Global Health that includes: funding grants. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix B. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.cegh.2024.101821.

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