COVID-19: Distance learning to empower educators and health assistants in rural areas

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Abstract:
BACKGROUND: Educators and health assistants can act as key players in controlling the pandemic. In general, they are respected by the community, especially in rural areas, and can help guide and raise the population’s awareness of preventive measures. The objective of this paper is to evaluate the results in knowledge progress of an e-learning course offered to educators and health assistants by a public university and to analyze the profile and satisfaction of the participants.

MATERIALS AND METHODS: A single group pre- and post-test design based on a questionnaire, interventional, study was conducted in the period from April 20th to June 20th. All participants of the course answered sociodemographic and satisfaction questionnaire and a pre- and post-test. Data were descriptively arranged and regarding the distribution and comparison of means and frequency, paired t-test for group comparisons. P < 0.05 was statistically significant. Data were collected from the Moodle® teaching platform, without identifying the participants.

RESULTS: A total of 674 participants were enrolled in the five groups, and 583 concluded the course (86.5%). The reasons for those who did not access the entire course (n = 47) were: Lack of time, difficulty in accessing the internet, and lack of experience with distance learning courses. On the evaluation of the course platform, from the tutors in general and the degree of satisfaction in several questions, participants marked maximum grades. The comparison between pre- and post-proficiency scores showed increased proficiency of the enrolled groups (P < 0.0001).

CONCLUSIONS: The course contributed to the training of health assistants and educators, preparing them to act in a participatory way in the prevention and control of the pandemic. The course was well evaluated and there was a progression of knowledge by the participants.

Keywords:
Coronavirus, COVID-19, e-learning, pandemics, public health

Introduction

The emergence of COVID-19 has created a global public health problem that requires social engagement to be contained. Understanding the disease and preventive measures are crucial to reduce transmission.[1] The education of the community in general and of the educators, for better knowledge and adoption of preventive measures is essential in this context of pandemic. Behavioral changes may have a profound impact on the spread of diseases in epidemics, and an early educational approach can interfere with obtained results and better control.[2]

The period of confinement due to the measures adopted to control the spread of COVID-19 had negative effects on the psychological state of the world’s population. According to WHO, one in three people had mental health issues and mental health problems among young people doubled.[3] Mental health care is essential and can be offered through telehealth centers.

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population. Many teachers feel harassed by the accumulation of demands and by a drought of resources to cope.\textsuperscript{[3]} Chen et al. analyzed the knowledge, attitudes, and practice on COVID-19’s pandemic in residents in Anhui Province (China) by a network sampling survey. They concluded that it would be necessary to strengthen the community publicity, the mental health maintenance of residents and students’ health education.\textsuperscript{[4]}

The World Health Organization’s (WHO) health emergencies platform OpenWHO.org hosts online learning resources for outbreaks and epidemics in various language.\textsuperscript{[5]} In Brazil, many courses addressing COVID-19 have been offered, but most of them are aimed at training health professionals.\textsuperscript{[6]} To the best of our knowledge, in the literature there were no studies with e-courses about COVID-19 aimed to educators and health assistants.\textsuperscript{[7]}

Our institution developed many outreaches, research, and teaching activities in relation to the pandemic, some of them involving small districts and community associations of rural areas. It is important to train the professionals involved with local communities, promoting knowledge, self-care, and empowerment, to provide good interaction with students and the population. The objective of this study is to analyze the e-learning course’ adherence and satisfaction, the pre- and post-course grades. The course is innovative for these professionals of rural areas and can improve their participation in this fight against Covid-19 with more efficiency and confidence.

### Materials and Methods

#### Study design and setting

It was a single group pre- and post-test design based on a questionnaire [Figure 1]. A complete e-learning course with video classes, articles, technical notes, and official documents from Brazilian institutions and from other countries were made available to the enrolled students. Courses were made available for free through the Moodle\textregistered platform of the Health Informatics Center Centro de Informática em Saúde (CINS) of the School of Medicine.

#### Study participants and sampling

The participants were invited by community associations, municipal health, and education secretariats, especially those that were part of university extension projects. Most participants come from rural and underprivileged regions of the Minas Gerais State, Brazil. In this study, we presented the analysis of data from five initial classes distance course, carried out from April 20\textsuperscript{th} to June 20\textsuperscript{th}, 2020. It was a convenience sample.

#### Data collection tool and technique

The course also was disclosed in various media with registration made available through Google forms. A previous project created by the same research team during the pandemic is the “Adopt your neighborhood in times of coronavirus” in which university students, upon returning to their hometowns found leaders who placed and publicize the course. This project was the trigger for the current study.

Before starting the course, all the enrolled participants answered a sociodemographic and pretest questionnaire, and at the end, a satisfaction and posttest questionnaire. The satisfaction questionnaire used simple multiple-choice questions and a Likert scale (five points) to assess the items related to forums they participated in and about the overall course’s objectives. The validity of the questionnaires was established through experts’ opinions in the field of infectious diseases, medicine and nursing. They are 4 professors (1 nurse, 1 infectious disease specialist, and 2 medical doctors) with experience in distance learning courses and Covid-19, following models previously used by the researchers. The material was tested previously, before the final use. The e-learning material was elaborated with the participation of a multidisciplinary team, including physicians, physiotherapists, nurses, mental health professionals, educational therapists, physical educators, among others. The groups were divided and organized with approximately 25 participants, a teaching tutor, and a student tutor. Medical and nursing students were previously trained as a tutor. Tutor students were trained in a project by the Faculty of Medicine of the Federal University of Minas Gerais (UFMG) to answer questions from the population about the Covid-19 disease.\textsuperscript{[6]} Four to five groups were organized for each date of the course, according to the number of participants. The course contained eight modules and each one addressed...
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In each module, participants formulated questions and answers regarding the covered topics. Next, the tutors evaluated the submitted assignments and feedback was provided to the students enrolled in the courses. Forums of each group were used for interaction and to encourage discussions on relevant issues. For pre- and post-tests, multiple choice questions, with five alternatives, were reviewed and validated by the organizing committee and tutors. They were the same in both tests, but the alternatives and the question sequence were randomized. At the end of each class, a virtual meeting was held through an online video platform with a compilation of the latest relevant information about the pandemic and answers to questions sent through chat. The course load was 100 h, as in addition to taking the course, the student still had access to it for updates. All participants were invited to participate in the virtual meeting. The sessions were available for offline access.

Statistical and descriptive analysis
The evaluated parameters were course adherence, participant sociodemographic characteristics, degree of satisfaction of participants, correct answers in pre and posttest, and number of approvals. Data were analyzed in terms of frequency, distribution of means, and paired t-test for group comparison. A $P < 0.05$ was considered as statistically significant.

Ethical considerations
Student data were collected from the institutional Moodle® teaching platform, without identifying the participants and in accordance with “General Data Protection Legislation” (Law 13.709/2018, Brazil) and CONEP (Brazilian Council of Research Ethics, Brazil) Resolution 510 (April/2016), which guarantees data confidentiality.

Results
Each group’s course lasted 10–12 consecutive days. A total of 674 participants were enrolled in the five groups, and 583 concluded the course completely (86.5%). The general data of the participants’ demography are shown in Table 1.

Figure 1 shows the pre- and post-test scores, demonstrating an increase in the knowledge’s proficiency on the course subjects. The average time for the student to answer the questions in the pre- and post-test, respectively, was 25 min, a minimum time of 8 min and a maximum of 40 min in both, with an average grade of $6.45 \pm 1.2$ in the first and $8.77 \pm 0.8$ in the second ($P < 0.0001$). The maximum score was obtained by 13 students in the pretest (1.9%) and by 184 students (31.6%) in the posttest ($P < 0.0001$).

Regarding participation in the course, Table 2 presents data on the percentages of students who completed the course, the reasons for not having accessed all the material available (when applicable) and the evaluation of the interaction by the forums with the tutors.

The evaluation of the tutors’ performance, as support for the participants, is shown in Figure 2.

Figure 3 shows the participants’ assessment of the acquisition of skills and satisfaction with the course.

Discussion
According to the WHO, “health literacy represents the cognitive and social skills that determine the motivation and ability of individuals to gain access to understand and use information in ways which promote and maintain good health.” On the OpenWHO electronic page (https://openwho.org/channels/COVID-19-national-languages) an “Online COVID-19 Course in Multiple Languages” was offered. The focus is on designing knowledge transfer resources for frontline
The source of accurate health information during epidemics has a potential to shape health behavior. The course presented in this paper prioritized contextualization for the reality of small Brazilian districts, recognizing that educators and local assistants of health professionals can be a key to the promotion of health literacy. Meena et al.[8] conducted a cross-sectional, questionnaire-based study with healthcare workers in India to evaluate the knowledge about COVID-19, their experiences while dealing with the disease, and the protective measures taken to prevent the infection. They concluded that more educational training programs for awareness of the professionals are necessary to improve their knowledge and participate in this fight against COVID-19 with more efficiency and confidence. Furthermore, Kumar et al.[9] conducted an online cross-sectional survey study in India to assess knowledge, attitude, and practice towards the COVID-19 disease among health professionals, physicians, nurses, and allied health care staff (dentists, hospital attendants, and nursing students) working in public and private health facilities, in a rapid outbreak in India. They concluded that they have good knowledge, a favorable attitude, and practice. It highlighted the need for focused education and an up-to-date program and training for health professionals across the country.

Tsao et al.[10] emphasize that social media has great potential to increase community knowledge in the current pandemic condition. The real-time surveillance from social media about COVID-19 may be an important tool in the armamentarium of interventions by public health agencies and organizations. In Brazil, teachers and health assistants of rural areas contribute to disseminate news through social media and to clarify community doubts.

Adherence to the course was high (86.5%) and according

| State of origin                  | n=674, n (%) |
|---------------------------------|-------------|
| Minas Gerais State, Brazil      | 640 (95.0)  |
| Others                          | 34 (5.0)    |
| Age (years)                     |             |
| 18-25                           | 63 (9.4)    |
| 26-35                           | 121 (18.0)  |
| 36-45                           | 255 (37.8)  |
| 46-55                           | 187 (27.7)  |
| >55                             | 48 (7.1)    |
| Gender                          |             |
| Female                          | 610 (90.5)  |
| Male                            | 64 (9.5)    |
| Civil status                    |             |
| Married or stable union         | 207 (30.7)  |
| Not married                     | 396 (58.8)  |
| Others                          | 71 (10.5)   |
| Have children                   |             |
| Yes                             | 440 (65.3)  |
| No                              | 234 (34.0)  |
| Number of children              |             |
| No                              | 237 (35.2)  |
| 1 or more                       | 371 (55.0)  |
| 3 or more                       | 69 (9.8)    |
| Elementary school               |             |
| Studied all or most of it in public school | 577 (85.6) |
| Studied all or most of it in private school | 97 (14.4) |
| High school                     |             |
| Studied all or most of it in public school | 543 (80.6) |
| Studied all or most of it in private school | 131 (19.4) |
| Did technical course            |             |
| Yes                             | 270 (40.0)  |
| No                              | 404 (60.0)  |
| Is public employer              |             |
| Yes                             | 535 (79.4)  |
| No                              | 139 (20.6)  |
| Is health professional from primary care |             |
| Yes                             | 78 (10.6)   |
| No                              | 596 (88.4)  |
| Educator                        |             |
| Yes                             | 520 (77.2)  |
| No                              | 154 (22.8)  |
| If educator (n=520)             |             |
| Child education                 | 226 (43.5)  |
| Elementary school               | 215 (41.3)  |
| High school                     | 37 (7.1)    |
| Others                          | 29 (5.6)    |
| University                      | 13 (2.5)    |
| Had you already studied the topic|             |
| Yes                             | 244 (36.2)  |
| No                              | 430 (63.8)  |
| Motivation for taking the course|             |
| To learn more about the topic   | 258 (38.3)  |
| To contribute to facing the pandemic | 388 (57.6) |
| Boss’ request                   | 10 (1.5)    |
| For other reason                | 18 (2.7)    |
Strong primary care may reduce unnecessary admissions, relieving the hospital system, and expanding the availability of hospital beds for patients with COVID-19. Facing the COVID-19, the Unified Health System (SUS) in Brazil, assumes a fundamental role in the containment of the disease.\cite{15} The Family Health Strategy may help to organize the families to prevent the disease and recognize the severity. For this reason, we also included health assistants as one of the target audiences of this course. The posttest grades demonstrated that there was an improvement in the knowledge of them, so the course fulfilled its objective.

Santos reports that e-learning education is not an easy-to-implement methodology, requiring a prepared team with a well-established organizational infrastructure (technological, pedagogical, and administrative). The development of multiple workspaces, interaction, and socialization is essential for the success of the course.\cite{16} The satisfaction questionnaire carried out in this study showed the good result of the course and the contribution to the involved professionals. Participants believe that after the course they will be safer to provide information to the population to recognize the COVID-19 severity signs and to act professionally and would recommend this training to a colleague. Interaction with tutors through the course forums was well evaluated too.

Using a social network is an important asset for communities and ensures empowerment for better responses, especially in pandemics. Alonzo and Popescu studied the potential of harnessing social media platforms to address the mental health needs of underserved candidates for burnout—a negative psychic experience, linked to chronic emotional stress.\cite{13} Lai et al. (2020)\cite{14} in a cross-sectional study of 1257 health professionals in 34 hospitals and clinics during pandemic, demonstrated a considerable proportion of health professionals with symptoms of depression, anxiety, insomnia, and distress. It seemed to occur especially in women nurses, who worked in Wuhan and the front line. In our study, we had a higher number of women than men ($P < 0.001$). Relaxation practices, guidelines on quality of life and issues related to telework, including ergonomic exercises are important to prevent burnout in these professionals. When a disease starts spreading and causing negative feelings, timely, proper, and effective risk communication is needed to help ease people's anxiety or negative attitudes.\cite{14} One of the objectives of the course we developed was to offer participants ways of relaxation and distraction, to help them overcome the emotional problems related to the pandemic. Moreover, later, they could apply the technique to the population to which they provide assistance or education.

Hybrid teaching can be one of the pedagogical proposals that meet the reality of the 21st century. Digital technologies integrated into teaching can help to develop the participant's autonomy as it is a creative, reflective, and critical process.\cite{12} In this way, the course was offered with the support of tutors, students, and teachers, and contributed to digital inclusion, providing knowledge, and consequently empowerment.

Amri et al.\cite{3} evaluated the magnitude of exhaustion and associated factors among elementary school teachers in Kenitra, Morocco, during this period of confinement. They concluded that interventions designed to promote the mental well-being of teachers during and after confinement should be implemented. The teachers may no longer adapt, making themselves potential

### Table 2: Data obtained from the satisfaction questionnaire at the end of the course

| Data | Number of participants, $n$ (%) |
|------|---------------------------------|
| Participants who completed the course | $n=583$ |
| Participants accessed all the course content? | |
| Yes | 417 (71.5) |
| No | 47 (8.0) |
| No answers | 119 (20.4) |
| Reasons for those who did not access the entire course: ($n=47$) | |
| Lack of time | 15 (32.0) |
| Difficulty in accessing the internet | 13 (27.7) |
| Personal reason | 6 (12.8) |
| Lack of practice in using distance learning course | 13 (27.7) |
| Disinterest | 0 |
| Were the group forums well developed? | |
| Yes | 349 (59.9) |
| No | 115 (19.7) |
| No answers | 119 (20.4) |
| Were the general forums well developed? | |
| Yes | 360 (61.8) |
| No | 104 (17.8) |
| No answers | 119 (20.4) |
| Did the tutors provide the necessary assistance? | |
| Yes | 437 (75.0) |
| No | 27 (4.6) |
| No answers | 119 (20.4) |

to the target audience, it is within expectations. It is important to emphasize that several participants live in small towns, with weak internet connections and reporting little experience in distance learning courses. According to Appenzeller et al., the main problems identified in distance education are unstable internet and/or only the possibility of access via mobile networks; great difficulty in following synchronous activities; students who needed to share computers or notebooks with other family members.\cite{13}
The pandemic has highlighted the need for strong partnerships between educators and healthcare professionals to facilitate collaborative efforts and improve knowledge of the community. Educators and health professionals, through their involvement, have an opportunity to showcase their value and position as essential long-term partners on teams committed to the pursuit of students’ health and educational well-being. The public university has the important role to give back the community the knowledge to overcome the difficulties faced by the pandemic.

Bagheri Lankarani et al. studied the Iran people’s expectations of government measures to control and manage the coronavirus disease 2019. Some people underestimated the risk of COVID-19, which would ultimately lead to rapid spread of the disease. It is necessary to provide authentic and practical information to guide the people to protect themselves. They concluded that one of the best ways to respond to these demands is appropriate risk communication.[18]

The e-learning course offered to health assistants and educators aimed to teach: (1) preventive measures toward the virus, (2) guidance on how to recognize the signs and symptoms of COVID-19, and (3) maintenance of a good quality of life during the pandemic. The subjects were addressed in a simple way, in order to facilitate the comprehension and incorporation of good practices. The highly respected educators and health assistants had the power to provide reliable and updated information to their rural communities, avoiding fake news and properly promoting the knowledge and the empowerment of everyone in the fight against the pandemic.

**Limitations and recommendations**

As one of the limitations of this study is the fact that it is a cross-sectional study with a relatively small sample size. Another factor is the generalizability of the findings. However, it is noteworthy that the heritage of the course given was valued for access to information with the support of local leaders. The interaction between a public university such as UFMG and the poor rural community is essential for the dissemination of quality information, especially in times of pandemic. A multicenter study would have been better to assess the knowledge progress and satisfaction about the course. Despite these limitations, this study is innovative in our country as it provided important information that empowered the educators and health assistants of rural area. It happened in an early stage of the pandemic when no information was available for them. These professionals are considered leaders in our country, especially in small communities.

**Conclusions**

The e-learning course contributed to the training of educators and health assistants, preparing them to act as protagonists in the prevention and control of the pandemic. The course was well evaluated and there was a progression of knowledge on the part of the participants. The public university must fulfill its role of supporting communities to improve health. Professors and undergraduates in medicine and nursing courses were able to act effectively after the pandemic was declared.

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**Conflicts of interest**

There are no conflicts of interest.

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