



Assessment of Community Health Workers' learning in an online course on oral cancer

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Abstract: The course “Abre a boca, meu povo! O que você precisa saber sobre o câncer de boca” is a self-instructional distance learning course on oral cancer for community health workers. The aim of this study was to assess the participants' learning on the subject and to see if there was an association between the variables of the participants' clinical-demographic profile and their performance in the knowledge assessments. This was a pre-post-test experimental study. The participants took an initial knowledge check and, at the end of all the activities, a final knowledge test. Both tests were similar. The Kolmogorov-Smirnov normality test was applied, as well as the Wilcoxon test to compare the scores on the pre- and post-training tests and the Student's t-test, Mann-Whitney test, ANOVA and Kruskal-Wallis test, with a significance level of 95%. In the sample of 205 participants, the results showed higher scores in the final knowledge test than in the initial check. Only the length of professional experience showed a positive statistical correlation with the scores on the initial knowledge test ($p=0.000$). The self-instructional course was effective in training, suggesting an improvement in the participants' knowledge of the subject.

Keywords: Oral cancer, community health workers, continuing education, distance learning, teleeducation.

Avaliação da aprendizagem de agentes comunitários de saúde em curso online sobre câncer oral

Resumo: O curso "Abre a boca, meu povo! O que você precisa saber sobre o câncer de boca" é um curso de formação auto-instrucional, tipo Educação à Distância sobre o Câncer de Boca, destinado a Agentes Comunitários de Saúde. O objetivo deste estudo foi avaliar a aprendizagem dos participantes relacionada ao tema e verificar se existe

associação entre as variáveis do perfil clínico-demográfico dos participantes e o seu desempenho nas avaliações de conhecimentos. Estudo de delineamento experimental do tipo pré-pós-teste. Os participantes realizaram uma verificação inicial de conhecimentos e, no final de todas as atividades, um teste final de conhecimentos. Ambos os testes são semelhantes. Foi aplicado o teste de normalidade de Kolmogorov-Smirnov, teste de Wilcoxon, para comparar as pontuações nos testes pré e pós-treinamento e, os testes t de Student, Mann-Whitney, ANOVA e Kruskal-Wallis, com nível de significância de 95%. Na amostra de 205 participantes, os resultados mostraram pontuações mais elevadas no teste final de conhecimentos do que na verificação inicial. Apenas o tempo de experiência profissional apresentou uma correlação estatística positiva com as pontuações do teste de conhecimento inicial ($p=0,000$). O curso auto-instrucional foi eficaz na formação, sugerindo uma melhoria dos conhecimentos dos participantes sobre o tema.

Palavras-chave: Câncer oral, agente comunitário de saúde, educação continuada, educação à distância, teleeducação

1. Introduction

Oral Cancer (OC) poses a serious disease and for decades it has shown high rates of incidence, morbidity and mortality, especially in developing countries, such as Brazil (NAGAO *et al.*, 2020; HARON *et al.*, 2020; BIRUR *et al.*, 2015; CAVALCANTI, 2019). In this scenario, Primary Health Care (PHC) providers play a vital role, where Community Health Workers (CHW) act as mediators and facilitators between PHC teams and the community dwellers, centralizing health actions (MOROSINI, 2018; SAMUDIO *et al.*, 2017).

According to the World Health Organization (WHO) (1989), CHW are professionals and residents in the communities in which they work, responsible for health actions (WHO, 1989; PERRY; ZULLIGER, 2012). In Brazil there are more than 200.000 CHW, who represent health professionals and members of the community, being one of the most proactive professionals in carrying out actions aimed at prevention and health promotion, surveillance, early detection, and active search for OC (BRASIL, 2020; SAFFER; BARONE, 2017). Lack of training often limits CHW' actions. Therefore, continuing training becomes an indispensable tool for a successful accomplishment of their tasks (DE ARAÚJO *et al.*, 2021; DE OLIVEIRA, 2018; TORRES-PEREIRA *et al.*, 2012).

A viable alternative for continuing education for health professionals is the Distance Education (DE) format – an education model that uses Information Communication Technologies as tools to create a new pedagogical approach (BRITES; ROCHA, 2017; PERES; SILVA; BARBA, 2016; COELHO; VASCONCELOS; DIAS, 2018; ZOGAS *et al.*, 2018). The course “Abre a boca, meu povo!” – O que você precisa saber sobre o câncer de boca.”, in English, “Open your mouth, folks! – What you need to know about oral cancer.” is a DE-type, self-instructional training course on OC targeted at CHW. It is free available on a Telehealth teaching platform from Secretary of Health of the State of Pernambuco (NET-SES/PE) in the state of Pernambuco, Brazil, created from September 2020 to August 2021, by a technical-scientific team of content experts, made up of professors and Masters and PhD students in Dental Clinics, with an emphasis on Stomatology and Oral and Maxillofacial Pathology, linked to a Post Graduate Program (SANTOS, 2021).

The methodological path for the elaboration and evaluation of the course was based on ADDIE, a generic Instructional Design method used as a framework for the



development of educational projects where Analysis is the identification of the problems and definition of the target audience; Design is the determination of the scientific content to be worked on; Development is the preparation of the teaching materials; Implementation is the insertion of the course into the virtual learning environment and Evaluation is the assessment of the target audience's level of learning and whether the project's objectives have been achieved (RODRIGUES *et al.*, 2019; BARREIRO, 2016; ROSA; BARBOSA, 2017).

The practical working routine of CHW was used to contextualize the scope of the content. In addition, simplicity, clarity and objectivity were prioritized in the transmission of knowledge, both in spoken, written and visual language. The course is available to all health professionals and students who register on the platform www.telessaude.pe.gov.br. However, the target audience is CHW.

The course has a workload of 40 hours and is permanently available to the participants on the platform. It comprises a Student Guide; Initial Survey (IS) - a clinical-demographic profile questionnaire; Initial Knowledge Check (IKC) to analyzing prior knowledge; Eight Learning Units, which were distributed in four sequential modules with handouts available in PDF format, interactive gamification activities, formative assessments (FA) per module; Final Knowledge Test (FKT); Learner Satisfaction Survey (LSS). After completing the satisfaction assessment (SANTOS *et al.*, 2023), participants were directed to the link that gave access to course certification.

The IKC is the same as the FKT. The objective of which is to compare the results and analyze whether learners gained new knowledge after the training. In the literature, there are no reports of a training course on oral cancer, aimed at CHW, configuring an unpublished work, and the data of this study, results of its 1st edition.

Therefore, this study aimed to assess CHW' learning related to the identification of Oral Lesions (OL), prevention, screening and training on OC, evaluate and compare the level of correctness in the identification of OL, type of lesion and anatomical location, in the initial knowledge check (IKC) and final knowledge test (FKT) and to verify whether there is an association between the clinical-demographic profile variables of the CHW participating in the course with the performance in the IKC and FKT in the “Abre a boca, meu povo!” – O que você precisa saber sobre o câncer de boca” course.

As expected results, we hypothesized that the self-instructional course helps to improve the knowledge of CHW about oral cancer and there is an association between the variables of the clinical-demographic profile of CHW and their performance on the pre- and post-training knowledge tests.

2. Method

Described as a pre-post test experimental design study, was submitted to the Research Ethics Committee and approved under protocol number 4.958.203. The convenience sample consisted of CHW working together with PHC providers from all parts of the country, who enrolled in the “Abre a boca, meu povo! – O que você precisa saber sobre o câncer de boca.” and followed the methodological path of the course from August 14 to October 28, 2021. All participants signed the Free and Informed Consent Term, by an electronic questionnaire.

2.1 Eligibility criteria

Included CHW of both genders, from any Brazilian state, who had completed all stages of the course by October 28, 2021 and excluded CHW who did not complete the



clinical-demographic profile questionnaire, called initial survey (IS), CHW who did not take the initial knowledge check (IKC) and/or the final knowledge test (FKT), CHW who failed to complete any of the formative assessments at the end of the modules, CHW who obtained a score lower than 6.0 (cut-off point) in any of the formative assessments at the end of the modules, CHW who scored less than 6.0 (cut-off point) in the FKT.

2.2 Procedures

Healthcare courses demand a lot of responsibility in the application of the knowledge learned; therefore, it was appropriate to require a minimum of 60% of correct answers in all formative and final tests for the participants to obtain a certificate of completion. A minimum score of 6.0 points was not required for the IKC, to ensure participation of all learners in the course.

After answering the first questionnaire, the IS, the participants were asked to complete the IKC, with the aim of analyzing their prior knowledge about identifying the presence of OL, the types of fundamental lesions involved and their anatomical location. This knowledge was compared after the course using the FKT, a questionnaire similar to the IKC, with the aim of comparing the results and analyzing whether there was a gain in knowledge after the training. The questionnaires from IKC and FKT were structured according to Seoane *et al.* (2012).

The learners were asked to analyze OL through three images previously selected by the researchers and randomly identified. No clinical information was provided. They answered three objective questions related to each image: (1) “Do you consider that this person's mouth is normal?”; (2) “If you identified any change, what type is it?”, (3) “Which anatomical location is shown in this image?”, totaling nine questions. In the questions that addressed the type of primary lesion identified in the images, the learners could mark more than one option (Supplementary).

With regard to the marks awarded in the IKC and FKT, for questions with only one correct alternative, the score for a correct answer was 1 point. For questions with two correct alternatives, each scored 0.5 and for questions with three correct alternatives, each scored 0.33.

2.3 Analysis

Software SPSS 13.0 (Statistical Package for the Social Sciences) for Windows and Excel 2010 were used. The results were presented as tables and/or graphs with their respective absolute and relative frequencies. Numerical variables were represented by measures of central tendency and measures of dispersion. The Kolmogorov-Smirnov normality test was applied for quantitative variables.

The Student's *t* test (Normal Distribution) and Mann-Whitney (Non-Normal Distribution) were used to compare two groups; ANOVA (Normal Distribution) and Kruskal-Wallis (Non-Normal Distribution) were used to compare more than two groups; and the Wilcoxon test (Non-Normal Distribution) was applied for paired groups to compare the results obtained in the IKC and in the FKT. A 95% confidence interval and a 5% margin of error were set to all tests.

3. Results

Table 1 - Percentage of correct answers.

Image	eme	Question	Points	% correct answers IKC	% correct answers FKT
1	Presence/absence of lesion	1	1.00	93.7	98.5
	Type of lesion	2	0.50	43.4	59.5
			1.00	11.2	14.6
	Anatomical location	3	1.00	95.1	97.6
2	Presence/absence of lesion	4	1.00	90.2	97.6
	Type of lesion	5	1.00	41.5	74.6
	Anatomical location	6	1.00	62.9	87.8
3	Presence/absence of lesion	7	1.00	93.2	100
	Type of lesion	8	0.33	62.9	52.7
	Presence/absence of lesion		0.67	22.9	31.7
			1.00	6.3	9.8
	Type of lesion	9	2.00	52.2	82.4

Note: IKC= Initial Knowledge Check; FKT= Final Knowledge Test.

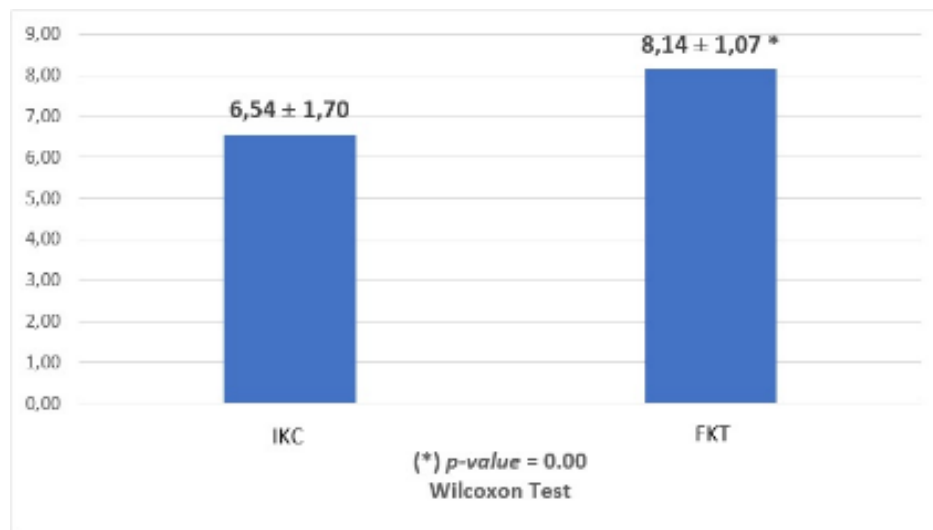
Legend: Percentage of correct answers by points obtained in the IKC and FKT questions.

Source: Santos, 2021.

Data collection took place from August 14 to October 28, 2021. The Moodle (Modular Object-Oriented Dynamic Learning Environment), a Virtual Learning Environment, was configured to allow the trained researchers to access and monitor the students' entire course, as well as their results. So that the virtual environment allowed the downloads of spreadsheets, in Excel format, with the data obtained in the questionnaires and evaluations.

After the eligibility criteria were applied, 36 of the 274 graduates were excluded from the study. Of these, 18 did not answer the demographic clinical profile questionnaire, 5 did not answer the FA III, 2 scored less than 6.0 on the FA IV and 11 did not achieve an average of 6.0 on the FKT. This resulted in 238 participants, 205 of whom were CHW's and 33 professionals from other areas or students. Thus, 205 CHW's made up the sample for this study. The percentage of correct answers for the IKC and FKT detail the points assigned for each correct question as well as the percentage of correct answers by participants in each of the 9 questions are shown in Table 1.

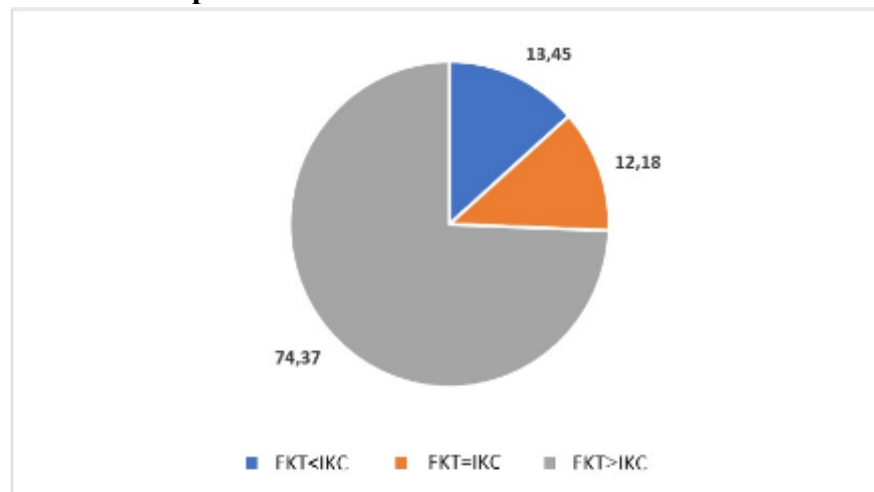
The mean (M) of the scores of the initial knowledge check (IKC) was 6.54, standard deviation (SD) of 1.70, median (Med) of 6.33, minimum score (MiS) of 1.33, and maximum (MaS) of 10.0. In the FKT was observed M=8.14, SD=1.07, Med=8.33, MiS= 6.0 and MaS= 10.0 according to Graph 1.

Graph 1 – The means of the scores of the IKC and FKT.

Legend: Comparison of the IKC and FKT results.

Source: Santos, 2021.

Using the Wilcoxon statistical test, a statistically significant difference ($p = 0.000$) between the IKC and FKT scores was observed. Of the 205 CHW, 74.37% ($n = 157$) obtained higher scores in the FKT than in the IKC according to Graph 2.

Graph 2 – Scores in the FKT than in the IKC.

Legend: The FKT scores in relation to IKC.

Source: Santos, 2021.

In the statistical correlations between the age, gender, education, period of work experience, macro-region of the state of Pernambuco and the results obtained in the IKC and FKT, only the period of work experience as CHW revealed a positive statistical correlation with the IKC scores ($p = 0.034$) according to Table 2.

Table 2 - Statistical correlations.

Variables	Scores	
	Pre-training	Post-Training
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	Mean $\pm$ SD	Mean $\pm$ SD
Age		
<30 years	6.10 $\pm$ 1.50	7.95 $\pm$ 1.23
30 to 39 years	6.38 $\pm$ 1.69	8.09 $\pm$ 1.14
40 to 49 years	6.90 $\pm$ 1.70	8.11 $\pm$ 1.07
50 to 59 years	6.36 $\pm$ 1.84	8.30 $\pm$ 0.99
≥ 60 years	6.65 $\pm$ 1.42	8.23 $\pm$ 0.68
<i>p-value</i>	0.234 ^A	0.800 ^B
Gender		
Male	6.94 $\pm$ 1.30	8.11 $\pm$ 1.03
Female	6.50 $\pm$ 1.74	8.14 $\pm$ 1.08
<i>p-value</i>	0.282 ^C	0.839 ^D
Level of Education		
Elementary	6.39 $\pm$ 2.32	8.25 $\pm$ 1.18
Secondary	6.53 $\pm$ 1.79	8.12 $\pm$ 1.02
Higher	6.58 $\pm$ 1.54	8.16 $\pm$ 1.13
<i>p-value</i>	0.955 ^A	0.982 ^B
Period of work experience as CHW		
≤ 10 years	6.25 $\pm$ 1.71	8.15 $\pm$ 1.15
> 10 years	6.76 $\pm$ 1.67	8.13 $\pm$ 1.01
<i>p-value</i>	0.034 ^C	0.828 ^D
Macro-region of PE		
Metropolitan area	6.69 $\pm$ 1.69	8.18 $\pm$ 0.98
Agreste	6.42 $\pm$ 1.67	8.28 $\pm$ 1.04
Sertão	6.33 $\pm$ 1.84	8.00 $\pm$ 1.04
São Francisco Valley	5.93 $\pm$ 1.05	7.97 $\pm$ 1.34
Other states	6.72 $\pm$ 1.77	8.24 $\pm$ 1.35
<i>p-value</i>	0.472 ^A	0.729 ^B

Note: IKC= Initial Knowledge Check; FKT= Final Knowledge Test; SD= Standard Deviation; CHW= Community Health Worker; PE= State of Pernambuco. (A) ANOVA (B) Kruskal-Wallis (C) t Student (D) Mann-Whitney.

Legend: Correlation between profile variables and IKC and FKT means.

Source: Santos, 2021.

4. Discussion

The training course investigated in this study used an image-based test to assess pre-training and post-training knowledge of the participants about the identification of OL, OL type and its anatomical location, according to the study conducted by Seoane *et al.* (2012). This initiative is in line with the WHO strategy against OC, which advocates the training of PHC professionals for the detection of early lesions.

It is necessary to consider the importance of the participants' pre-existing knowledge in the teaching/learning process, as well as in the construction of new knowledge that will be used in their personal and professional life, and applied for the benefit of their community. In this sense, Brassarola (2014) outlines the valorization of prior knowledge and the links that may arise from the associations of already-learned knowledge with the new contents to be built. Freire (2011) emphasizes that every learner has prior knowledge within their life reality, which must be considered in the construction of new knowledge.



Of the 205 CHW, 76.6% obtained a higher score in the FKT than in the IKC. These results point to an important improvement in the participants' performance, as they were able to detect the presence of OL, identify the type of primary lesions and their respective anatomical locations. The self-instructional course has proved to be effective in training CHW on OC, improving acquisition of knowledge of these professionals about the topic. Thus, it is clear that this self-instructional course contributes to health professionals' continuing education, enabling CHW to act as knowledge multipliers and to combine efforts with the Brazilian Family Health Strategy Team to reduce OC in the municipalities where they work.

Our results related to the knowledge before and after the course were similar to those found by Brassarola (2014), who reported an average rate of correct answers as much as 7.71 in the pre-training assessment, with a maximum of 10 and minimum of 4 correct answers, and an average rate of 8.19, with a maximum of 10 and a minimum of 5 correct answers in the assessment after the training course on Diabetes Mellitus, using the Moodle as Virtual Learning Environment. It is noted that the CHW' pre-existing knowledge about Diabetes Mellitus was better than the pre-existing knowledge about OC demonstrated in our research.

These findings are consonant with the study carried out by Roxo-Gonçalves *et al.* (2017), who investigated the diagnostic skills of CHW in relation to OC, using the same methodology as in the present study. Seoane *et al.* (2012) assessed an e-learning course with images and concluded that both dentists and other professionals were able to identify the type of OL. For the authors, early detection of OC is very challenging and remains an important issue to be addressed. Furthermore, they emphasize that distance learning courses can improve the knowledge necessary for early detection of OC, bearing in mind that low motivation and adherence are important obstacles that still need to be overcome.

Similar results were found by Takenouchi *et al.* (2020) in a randomized controlled trial, in which the authors developed and evaluated e-learning materials on dental hygiene with 293 students in four schools, using smartphones. Combined results from all schools showed that the changes from pre- to post-examination scores in the test groups were significantly greater than those in the control groups, which did not receive the e-learning materials. Post-examination scores were significantly higher than pre-examination scores in the test groups in all schools. In addition, the post-examination scores of the test groups were significantly higher than those of the control groups.

Given the correlations among the variables age, gender, level of education, period of work experience, macro-region of the state of Pernambuco and the IKC and FKT scores, it was observed that only the period of work experience as CHW showed a statistically association with IKC scores. However, the influence of these variables on the performance of CHW in the FKT was not statistically significant. This fact shows that the content covered in the course was able to meet the learning needs, regardless of age, gender, level of education, period of work experience and region. These findings are consistent with the results of a research carried out by Bragança (2015), which assessed a sample of 220 participants of a distance education course in Pediatric Dentistry during two months, offered at the telehealth platform (TelessaúdeRS) in Rio Grande do Sul. The researchers observed that the comparison between the pre- and post-test mean scores showed a significant improvement in the participants' performance. In addition, it was found that age, time since graduation and period of work experience in PHC had a statistically significant influence on the mean score in the pre-test, but not in the post-test.



Thus, it is believed that the professional experience acquired by CHW over the years of work can influence their previous knowledge about public health problems. However, when they were submitted to the training, the levels of correct answers were more linear, demonstrating a leveling of knowledge between the CHW with less time in the job and those with more experience in the profession. It is noteworthy that the self-instructional methodology of the course did not constitute a barrier for professionals with less time in the profession to reach this leveling.

The limitations of this study are the short time between the availability of the course and the collection of data and preparation of the results. The dissemination of the course led to the participation of a number considered small compared to the number of registered professionals in the country.

5. Conclusions

The self-instructional course was effective in training CHW, suggesting an improvement in the professionals' acquired knowledge about the oral cancer. The period of work experience seems to be related to the CHW' pre-existing knowledge. However, this had no impact on the acquired knowledge after course completion. New editions, made available for longer on the platform, are necessary in this target population.

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