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ORIGINAL RESEARCH

# Comparison of the Effectiveness of Breast Cancer Education through Two Virtual Methods for Increasing Knowledge in Nurses

Forouzandeh Jannat[1], Sadaf Alipour[2,3], Fariba Noori[1], Somayeh Ansari[1], Tahereh Ashtab[4], Amirhossein Eskandari[5], Sepehr Boroumand Sani[6], Marzieh Orouji[1], Donya Goodarzi[1], Fatemeh Dousti Amshaki[4]

[1]*Department of Nursing, Arash Women's Hospital, Tehran University of medical Sciences, Tehran, Iran*
[2]*Breast Disease Research Center (BDRC), Cancer Institute, Tehran, Iran*
[3]*Department of Surgery, Arash Women's Hospital, Tehran University of medical Sciences, Tehran, Iran*
[4]*Department of Nursing, Razi Hospital, Tehran University of medical Sciences, Tehran, Iran*
[5]*Ministry of health and Medical Education, Tehran, Iran*
[6]*Faculty of Medicine, Tehran University of Medicine, Tehran, Iran*

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Corresponding Author:
Fatemeh Dousti Amshaki
Department of Nursing, Razi Hospital, Tehran University of medical Sciences, Tehran, Iran
Email:
fnda2006@yahoo.com

**Abstract**

**Background**: Virtual education today is about to become one of the most important educational methods in nursing. However, there have been few studies that examine the effectiveness of virtual education to increase knowledge towards breast cancer among nurses in Iran.
**Purpose:** The aim of this study was to compare the knowledge towards breast cancer among nurses who were provided with two different methods of virtual training.
**Methods:** This quasi-experimental study was conducted among 182 nurses in two hospitals in Tehran, Iran, who were randomly selected and divided into two groups of 91 nurses. Participants of the first group got virtual training about breast cancer in two sessions within two weeks by Skyroom. In the second group, the content was sent as educational messages by WhatsApp within two weeks. Participants' knowledge in both groups was measured using valid and reliable questionnaires developed by the researchers as a pretest and three posttests, and the satisfaction of the participants was also measured. To analyze the data, analysis of variance, standard deviation, t-test and Tukey test were performed.
**Results:** According to the average score observed in the post-test period, the score of the WhatsApp group was 7.62, significantly higher than the Skyroom group of 6.25. The scores of the three post-test were higher than the pre-test in the two groups (with no significant difference between the two groups, *p*-value = 0.825 in the first post-test), but the scores declined from the first to third tests, showing a decline in the learning effect with time. However, the slope was gentler in the WhatsApp group, indicating a more persistent learning effect.
**Conclusion:** This study showed that teaching with educational messages through WhatsApp had a greater impact on the sustainability of learning than teaching via lecturing through Skyroom.

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## 1. Introduction

Breast cancer is a common disease, accounting for 10% of all cancers in both men and women, and is the second most common cancer after lung cancer. Breast cancer is the most common cancer among women, as it accounts for 22% of all cancers in women (Atoum & Alzoughool, 2017). In 2018, approximately 330,000 women were diagnosed with breast cancer all over the world (Nastasi et al., 2018). In Iran, breast cancer is the most common among cancers diagnosed in women (Blasiak et al., 2020). This type of cancer with 16% of all cancers in women is the fifth leading cause of cancer death among Iranian women (Faramarzi et al., 2021). With respect to the inclusive nature of modern technologies, researchers endeavor to exploit various technologies, such as smartphone applications and social networks, to enhance the degree of breast cancer awareness among people. At present, social media are among the most favorite technologies used for assisting individuals to pursue a more active and healthier

lifestyle. Hence, social media are considered as tools for raising awareness and more effectively confronting breast cancer (Döbrössy et al., 2020) .

Liu et al. (2017) have shown that education has a significant effect on early detection and prevention of breast cancer. One of the most important measures at this level is supportive and educational care (Andreoli & Cecil, 2007); unfortunately, not enough attention is paid to this issue. The results of a study in Iran showed that the majority (6.63%) of breast cancer patients received moderate supportive care from nurses (Eghtedar et al., 2012). Moursy and Ead (2014), in their study of self-care in breast cancer patients, concluded that the self-care practices performed by the subjects were inadequate. According to them, nurses have an important and effective role in improving the quality of life of cancer patients due to their longer and more direct contact with the patient (Moursy & Ead, 2014). Since women are the center and guarantee of family health, and considering the wide role of women in the socio-economic cycle of the country, the need for early detection and prevention of breast cancer, as one of the best approaches to control this disease, is important (Tahergorabi et al., 2014)).

The ever-increasing development of the internet and enhancement of its accessibility in Iran are noticeable (Akbari & Gabdulhakov, 2019). Thus, smartphones and the internet are highly available in Iran and provide a platform that enables participants to communicate with people and transfer information. On the other hand, this ever-increasing growth and the effects of these media on different domains, such as knowledge and technology, and the role and status of modern media such as cellphones and internet-based systems, can tremendously impact social health promotion (Seyyedi et al., 2020). The movement to make more use of virtual learning has begun around the world, and it is becoming more and more widespread. E-learning increases the power of information retention in learners, in which different elements such as audio, video, short-term exams, and interaction with the learner and others are used to re-emphasize the purposeful learning. If they do not learn a subject, they can refer to it at the right time and learn it, and learning each section is a license to enter the next section (Kadoić & Redep, 2015). Also, the Internet is one of the challenges and disadvantages of e-learning. Lack of a suitable platform has made it impossible to use many programs or has reduced the quality of their use. Theft of personal information, lack of familiarity with e-learning programs and software, and malware are the disadvantages of virtual education (Shahbeigi & Nazari, 2012). As a very popular communication application, WhatsApp is a free messenger application that is extensively used in various societies to transfer simple text as well as multimedia messages including pictures, audio files, or videos (Mefolere, 2016). Skyroom is an Iranian platform that allows participants to easily host webinars, online tutorials and web conferencing sessions (Khodabandelou et al., 2021; Reimers & Schleicher, 2020). Social media, like Facebook, Twitter, or internet forums, which are designated to health-related topics, have been converted to accessible participatory tools by a set of structured textual documents for the exchange of knowledge, experience, and perspectives. Health-related online meetings are used by patients for exchanging information (Nzali et al., 2017).

Application of learning and instruction tools, such as internet and information technology, is increasing rapidly. Virtual learning is one of the most important learning environments today, so efforts and experiences in this area are considered worldwide. Virtual education today is about to become one of the most important educational method (Fini, 2008). Virtual education is an active and intelligent learning that has revolutionized the process of teaching, learning and knowledge management (Delavar & Ghorbani, 2011). A previous study examined the factors affecting the use of information resources by e-learning students and stated that the use of e-learning was easy and fast information retrieval (Liu et al., 2017). Other previous studies have also highlighted the positive impacts of using new educational technologies in health promotion programs (Papzan & Soleimani, 2010; Wang, 2009). However, there have been few studies that have investigated the community with this diversity in the workplace and the level and field of study to examine the knowledge, attitude and practice of women working in hospitals towards breast cancer, especially using latest educational technologies. Since nurses are the most central member of healthcare team, their performance and responsibility play an important role in implementing patient education and self-care program; this training is related to early detection and screening for breast cancer. Nurses should be equipped with knowledge and work according to applicable standard procedures (Tage et al., 2021). Accordingly, this study was conducted to compare the effect of two virtual education methods, including WhatsApp group and Skyroom

platform, on female nurses' awareness of breast cancer and their learning rate in two specialized hospitals in Tehran.

## 2. Methods

### *2.1 Research design*

This was a quasi-experimental study that recruited 180 nurses in two hospitals in Tehran, Iran as participants. They were randomly selected among all nurses of the two hospitals and were divided into two groups.

### *2.2 Setting and samples*

This research was conducted in the first six months of 2021. The population of this study consisted of nurses working in two small specialized hospitals in Tehran, Iran (n=344). Among this population, a sample of 182 people was selected using the Cochran's formula (Kotrlik & Higgins, 2001). The inclusion criteria included all nurses of the hospitals who were willing to participate in the study. Meanwhile, the exclusion criteria were all nurses who did not have the opportunity or desire to use social networks, nurses who have completed breast care education, nurses working in the hospital breast clinic, and nurses who themselves or their first-degree relatives have had breast cancer. The reason for excluding these nurses was that they had already been trained in breast cancer, and they would thus answer the pre-test and post-test questions correctly. Therefore, they could not be evaluated regarding the effect of the education. Two of the researchers were education supervisors of the nursing staff in the two hospitals, and the nurses were approached according to the defined regulations of the hospitals.

### *2.3 Intervention*

For the first group, breast cancer education was delivered in the form of a lecture; which was held in two sessions in Skyroom throughout two weeks. As to the second group, educational messages containing practical information about breast cancer with the same outline as the former group were sent in a dedicated WhatsApp group within two weeks. Prior to the start of classes, in addition to informed consent to participate in the training, all nurses declared their devotion to be committed to the research design process and not to use another source. This process is shown in Figure 1.

### *2.4 Measurement and data collection*

First, a pre-test was taken from all participants. The pre-test consisted of 20 items, the first 10 of which included scientific topics related to the subject of education. These items had been prepared in advance through three steps. In the first step, 50 questions were written by a breast surgeon, and ranked by experts. Then, the first higher-ranked 20 questions were presented to 20 women whose education and profession were not related to medical sciences and who had never suffered from breast cancer. The first 10 questions that had been answered by less than 40% of the examinees correctly were selected as pre-test and post-test awareness questions. To estimate the participants' level of knowledge, we gave a positive score to each correct answer, and zero score to incorrect answers. Therefore, individuals' knowledge scores ranged from 0 to 10 in both the pre-test and post-test. Moreover, the learning effect in each group was roughly calculated by the formula: "post-test score minus pre-test score divided by the pre-test score. To measure the participants' satisfaction, a 9-item questionnaire was given simultaneously with the third post-test. All the questionnaire items were based on a 5-point Likert scale. The satisfaction score of each participant was in the range of 9-45 in that the values ranged from 9 to 27 (low satisfaction), 27 to 36 (medium satisfaction) and 36 to 45 (high satisfaction), respectively, to ensure sufficient variation among the item scores.

In order to determine the validity of the questionnaire, after preparing the initial version, the questionnaire was distributed among ten university professors who practice and teach breast diseases; they reviewed and rated the questions. Then, the questionnaire was modified based on the received comments. To calculate the Cronbach's alpha coefficient of the questionnaire, the validated version of the questionnaire was distributed among 20 participants; and the Cronbach's alpha coefficient was calculated. The coefficient was higher than 0.9 in all dimensions of the questionnaire, and the alpha coefficient of the whole questionnaire was equal to 0.93, which indicated the high reliability of this tool.

In this study, as soon as the teaching process ended, the first post-test was given (post-test 1). After one month, both groups were retested (post-test 2). In the last step, after three months, the post-test was taken again by both groups (post-test 3), and the results of the four experiments were compared. To measure the participants' satisfaction, the 9-item questionnaire was given simultaneously with the third post-test.

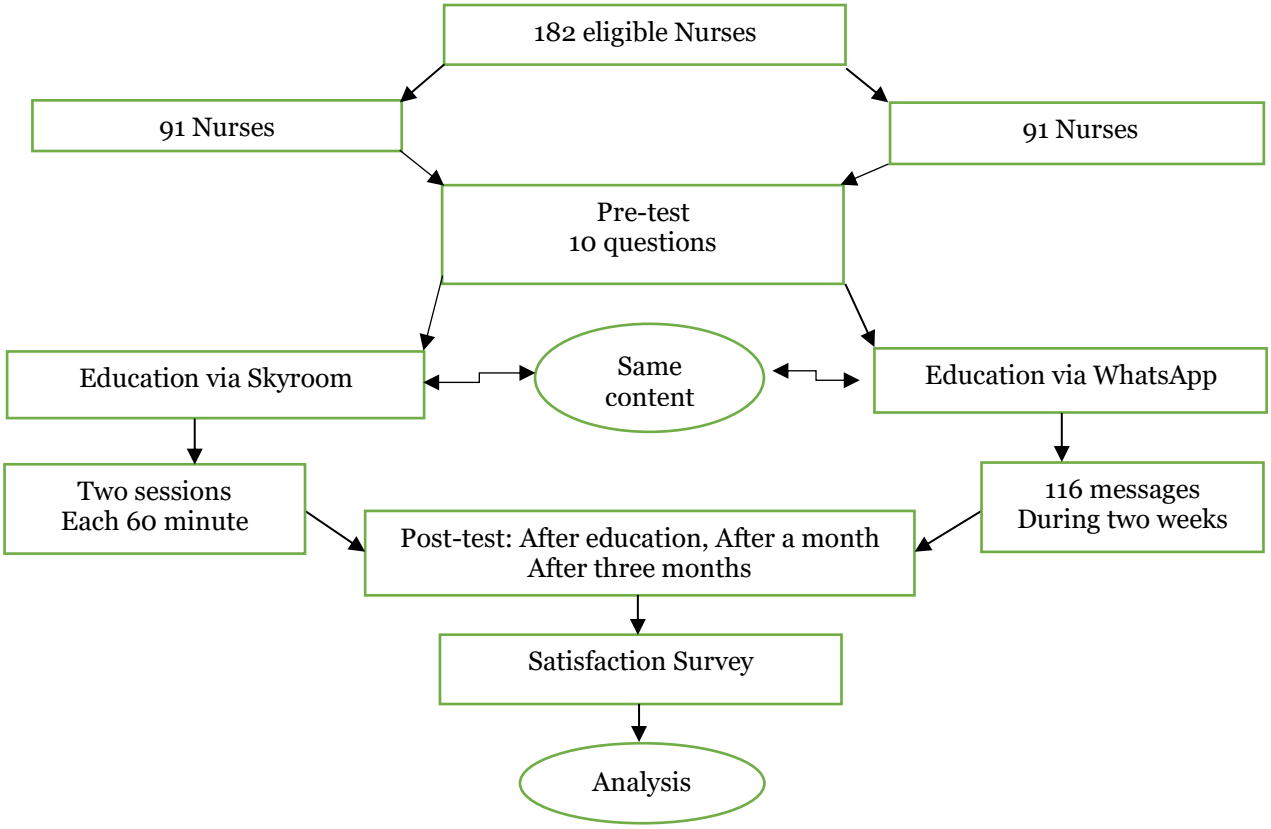


**Figure 1.** Diagram of the research procedure

*2.5 Data analysis*

The obtained data were analyzed using SPSS software and statistical tests. Analysis of variance was used to significantly analyze the differences between the scores obtained in each hospital. Test scores were classified and compared into four categories (pre-test, post-test1, post-test2, post-test3). Therefore, the difference in scores varied in different groups. Post-experimental tests were used to show significant differences between the groups. In this study, the method of true significant difference called Tukey test was used. Independent t-test was used to compare the scores of the Skyroom and WhatsApp groups in the pre-test stage. Moreover, the learning effect in each group was roughly calculated by the formula: "post-test score minus pre-test score divided by the pre-test score".

*2.6 Ethical considerations*

This study was approved by the Research Ethics Committee of Tehran University of Medical Sciences with the ethical code of IR.TUMS.IKHC.REC.1399.317. This study was informed to all participants, and an informed consent was signed by all of them prior to their participation.

## 3. Results

*3.1 Characteristics of the samples and pre-test scores*

A total of 182 nurses (91 in each group) working in two hospitals in Tehran participated in this study. However, two participants were excluded during the study, so the groups consisted of 90 nurses each. This exclusion occurred since the participants were unable to be involved in the measurement over time. In total, the participants ranged in age from 25 to 55. Table 1 shows the demographic characteristics and the rate of studying, use of social networks, and participation

in educational conferences in the two groups. There was a significant difference between the two groups in the pre-test stage. The average pre-test scores were 4.467 and 7.678 in the Skyroom and the WhatsApp group, respectively.

**Table 1.** Demographic characteristics of the samples and pre-test scores

| Demographic characteristics | Categories | Skyroom group | | WhatsApp group | |
|---|---|---|---|---|---|
| | | f | % | f | % |
| Education | **B. S. | 87 | 97 | 77 | 85 |
| | ***M.S. | 3 | 3 | 13 | 15 |
| Using social networks* | Never | 3 | 3 | 2 | 2 |
| | <1 hour | 63 | 70 | 54 | 59 |
| | >1 hour | 24 | 27 | 34 | 38 |
| Watching educational programs* | ≤Once | 27 | 30 | 10 | 11 |
| | Twice to three times | 55 | 61 | 55 | 62 |
| | >Three times | 8 | 9 | 25 | 27 |
| Reading scientific subjects* | ≤1 hour | 19 | 21 | 12 | 13 |
| | 2-10 hours | 65 | 72 | 68 | 75 |
| | >10 hours | 6 | 7 | 10 | 11 |
| Participating in educational conferences* | Never | 34 | 38 | 23 | 26 |
| | 1 to 3 times | 46 | 51 | 50 | 54 |
| | >3 times | 10 | 11 | 17 | 19 |
| Pretest score | | 4.467 | | 7.678 | |

*Notes:* *times in a month, **Bachelor of Science, ***Master of Science

*3.2 Differences in nurses' knowledge between the WhatsApp and Skyroom groups*

The measurement of nurses' knowledge about breast cancer in the two groups (WhatsApp and Skyroom) was carried out several times. These measurements were conducted before the intervention (pretest), two weeks after the intervention (posttest 1), one month after the intervention (posttest 2), and three months after the intervention (posttest 3). The differences in the results of these measurements in the two groups are shown in Table 2.

**Table 2.** Differences in the level of nurses' knowledge about breast cancer between the pretest and serial posttests in the WhatsApp and Skyroom groups

| Group | N | Mean (SD) | Mean (SD) | Std. Error | Std. Error | 95% CI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound WA | Upper Bound WA | *p* | Lower Bound SR | Upper Bound SR | *p* |
| | | WA | SR | WA | SR | | | | | | |
| Pretest | 90 | 6.72 (1.60) | 4.53 (1.52) | 0.16 | 0.16 | 6.38 | 6.38 | 0.182 | 4.21 | 4.85 | 0.049 |
| Postest 1 | 90 | 7.68 (1.44) | 7.67 (1.17) | 0.15 | 0.12 | 7.38 | 7.38 | | 7.43 | 7.92 | |
| Postest 2 | 90 | 7.50 (1.50) | 6.72 (1.70) | 0.15 | 0.18 | 7.18 | 7.18 | | 6.36 | 7.08 | |
| Postest 3 | 90 | 7.62 (1.24) | 6.25 (1.71) | 0.13 | 0.18 | 7.36 | 7.36 | | 5.89 | 6.61 | |

N: number; WA: WhatsApp; SR: Skyroom; CI: Confidence Interval

The results in Table 2 indicate that nurses' knowledge in the Skyroom group increased in the first month; yet was followed by a decline afterward. The results revealed that the scores increased in post-test 1 and declined in post-test 2 and 3. However, all the obtained scores were higher than those of the pre-test. The scores in the WhatsApp group also increased in all the post-tests compared to the pre-test, but there was also a decrease at the end of the third month compared to the first month. Therefore, the scores varied in different groups.

The ANOVA test was conducted to examine differences in nurses' knowledge about breast cancer between the WhatsApp and Skyroom groups (Table 3). A further analysis was conducted to see the significance of differences in the level of nurses' knowledge about breast cancer between the WhatsApp and Skyroom groups (Table 4).

**Table 3.** Differences in nurses' knowledge about breast cancer between WhatsApp and Skyroom

| | Training WhatsApp | | | | |
|---|---|---|---|---|---|
| | Sum of Squares | df | Mean Square | F | *p* |
| Between Groups | 54.10 | 3 | 18.03 | 8.52 | 0.000 |
| Within Groups | 753.00 | 356 | 2.11 | | |
| Total | 807.10 | 359 | | | |
| | Training Skyroom | | | | |
| Between Groups | 467.96 | 3 | 155.98 | 65.08 | 0.000 |
| Within Groups | 853.23 | 356 | 2.39 | | |
| Total | 1321.19 | 359 | | | |

**Table 4**: Significance of the differences in scores between in WhatsApp and Skyroom groups

| | Research variables | Average | Mean difference | Equality of variance | T | *p* |
|---|---|---|---|---|---|---|
| Training method (Pre-test) | WhatsApp | 6.72 | 2.25 | 0.000 | 9.61 | 0.000 |
| | Skyroom | 4.53 | | | | |
| Training method (Post-test) | WhatsApp | 7.62 | 0.044 | 0.000 | 0.22 | 0.000 |
| | Skyroom | 6.25 | | | | |

Table 3 and Table 4 show a significant difference ($p$=0.000) in the nurses' knowledge levels before and after the intervention, as well as between WhatsApp and Skyroom groups.

*3.3 Differences in the effect of the intervention on nurses' knowledge about breast cancer between WhatsApp and Skyroom*

The results of the Tukey test showed that the scores in the first post-test had increased significantly, yet decreased significantly in the second and third post-tests. However, the scores increased compared to the pre-test, and there was no significant difference between post-test scores 2 and 3. The independent t-test was used to compare the scores of the Skyroom and WhatsApp groups in the pre-test stage. However, the difference in the mean scores of the first and second groups was not statistically significant immediately after the educational program (i.e., in post-test 1) ($p$=0.825). The results of Tukey's HSD test and Learning effect of teaching breast cancer through Skyroom and WhatsApp are presented in Table 5.

**Table 5.** The differences of learning effect between WhatsApp and Skyroom groups

| Group | N | Subset for alpha = 0.05 SR | | | Learning effect SR | Subset for alpha = 0.05 WA | | | Learning effect WA |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | 1 | 2 | 3 | |
| Pretest | 90 | 4.53 | | | | 6.72 | | | |
| Posttest 1 | 90 | | | 7.67 | 0.729 | | | 7.68 | 0.142 |
| Posttest 2 | 90 | | 6.72 | | 0.510 | | 7.50 | | 0.117 |
| Posttest 3 | 90 | | 6.25 | | 0.398 | | 7.62 | | 0.098 |
| Sig. | | 1.000 | 0.182 | 1.000 | | 1.000 | 0.820 | 1.000 | |

*Notes:* N: Number; SR: Skyroom; WA: WhatsApp.

The results of the Tukey test showed that the scores in the post-test 1 have increased significantly, and in the second and third post-tests, have decreased significantly. However, the scores obtained have increased compared to the pre-test. This shows that the effectiveness of training in the first post-test in the Skyroom group is very high with an increase in the average score (from 4.53 to 6.25), while in the WhatsApp group, it has increased (from 6.72 to 7.62). Moreover, the learning effect in each group was roughly calculated by the formula: "post-test score minus pre-test score divided by the pre-test score".

The subjects' scores in the WhatsApp group increased relative to the pre-test one month after the test. This score did not change in the second post-test, but decreased at the end of the third post-test. A relatively similar trend was observed in the Skyroom group; however, the intensity of the decrease in scores was greater at the end of the third post-test. Based on the results, the learning effect in both groups had decreased over time. However, in the WhatsApp

group, it had decreased with a gentler slope; showing that the learning effect was more persistent in teaching via WhatsApp. Independent t-test was used to compare nurses' scores in the pre-test stage. The difference between the average scores of nurses in the two methods of Skyroom and WhatsApp was 2.25. It could be claimed that, with 95% confidence, the scores of nurses with WhatsApp method are significantly higher than nurses with Skyroom method.

*3.4 Differences in nurses' satisfaction between WhatsApp and Skyroom groups*

The independent t-test was used to compare the satisfaction of the Skyroom and WhatsApp training methods. The difference between the average satisfaction of nurses' education with Skyroom and WhatsApp methods was 0.456. The significant value of the observed difference was 0.546, which was greater than the error level of 5%. The t-statistic was 0.606, which was smaller than the critical value of 1.96. Hence, the difference between the observed means was not significant and no difference was observed in satisfaction of the two educational methods.

**Table 6.** Satisfaction rate and significance of satisfaction difference between two training methods in nurses

| Satisfaction Rate | Skyroom group | | WhatsApp group | | T | Equality of variance | Mean difference | *p* |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | | | | |
| Low | 20 | 22 | 15 | 17 | 0.606 | 0.03 | 0.456 | 0.546 |
| Moderate | 32 | 36 | 39 | 43 | | | | |
| High | 38 | 42 | 36 | 40 | | | | |
| Total | 90 | 100 | 90 | 100 | | | | |
| Average | 31.10 | | 30.64 | | | | | |

## 4. Discussion

The aim of this study was to compare the learning effect about breast cancer among nurses who were provided with two different methods of virtual training. There was a significant difference between the two groups in the pre-test stage. The average pre-test scores were 4.53 and 6.25 in the Skyroom and the WhatsApp group, respectively. This difference can be due to the difference in demographic characteristics between the two groups in terms of age and level of education, since the WhatsApp group nurses were younger with a higher level of education. This difference could also be due to the fact that the rate of monthly reading (75%), using social networks (38%) and participation in educational conferences (54%) were also higher among nurses in the WhatsApp group. Previous studies are consistent with the present finding. Kim et al. (2016) examined a sample of Korean women and concluded that greater use of social media increases access to educational content, thus increasing women's awareness of breast cancer. Freedman et al. (2016) pointed out the importance of using social media to increase awareness of breast cancer treatment methods. Nazeri et al. (2017) found that the learners' ability to use technological tools and their level of education were the most important statements from the perspective of all respondent groups. This result is most consistent with the characteristics of computer skills and content interaction that Selim (2007) has listed in his study. The usefulness of virtual modes and apps in educational programs, particularly WhatsApp, has already been illustrated (Cetinkaya, 2017; Gon & Rawekar, 2017; Sayan, 2016; Zulkanain et al., 2020). This role has also been compared with face-to-face classrooms for non-medical science.

In medical education, WhatsApp is gaining substantial interest and approval. Coleman and O'Connor (2019) have reviewed this matter and shown that this app is being used frequently, and is proving useful in this regard. WhatsApp has also been used in instructing health subjects at the community level. Kamel Boulos et al. (2016) reviewed the use of WhatsApp and Instagram in healthcare and quoted that these were useful in that setting, even in low-resource areas. Furthermore, Simons et al. (2018) evaluated the use of WhatsApp as a tool for offering social support in an eHealth program. They found out that groups formed in WhatsApp created a higher rate of participation than most other apps (Simons et al., 2018). Iftikhar and Abaalkhail (2017) also explored the attitude of people in response to medical data received via various media. They detected that WhatsApp was used more frequently than other media and that the information that had been shared on it affected the choices of users regarding the health of their families (Iftikhar & Abaalkhail, 2017). In addition, Maitra (2021) investigated if data shared in

WhatsApp could expand eye health awareness in a deprived area in India. The results showed that not only healthcare workers approved that method for delivering scientific data, but also general people had acquired a higher level of awareness (Maitra, 2021). Likewise, Alanzi et al. (2018) demonstrated that the knowledge of people about diabetes increased more significantly when educational messages were sent to them through WhatsApp. In this study, respondents' scores increased in the WhatsApp group in post-test 1; however, this increase was larger among nurses in the Skyroom group. In the last test, the obtained scores revealed that the learning effect in the WhatsApp group subjects had declined in reference to the first test; however, such decrease was larger in the Skyroom group. These findings depict that education offered through WhatsApp had a higher impact on learning stability. There are few studies comparing the effect of social networks on training. Yaros (2012) found that the training mode in social networks influenced the learning rate and its continuity.

The main findings of this study have demonstrated the positive effect of virtual education on learning about breast cancer and the higher durability of education offered via WhatsApp. Mobile education is a subset of e-learning and virtual education, and due to its special feature, has a significant role in education (Papzan & Soleimani, 2010). Numerous studies in the past have disclosed that training and discussions presented in virtual education effectively contribute to enhancing awareness and preventing breast cancer. For example, Attai et al. (2015) reported that the use of Twitter had a significant effect on increasing women's knowledge and awareness of breast cancer symptoms. Xiaosheng et al. (2018) also showed that virtual education was efficient tools to transfer breast cancer-related information among cancer survivors and healthy individuals. Also, the superiority of virtual education over speech has been shown in results of previous studies (Jabbari Byramy & Bakhshian, 2008; Khakbazan et al., 2008; Khandan, 2008).

This study also measured participants' satisfaction through the questionnaire that was given simultaneously with the third post-test. The results showed that nurses' satisfaction was higher in the WhatsApp group. Previous studies also showed positive attitude of the students towards virtual education (Khandaghi et al., 2009; Mirzaei et al., 2012; Mohammadi et al., 2008). Furthermore, Zolfaghari et al. (2011) also showed that the majority of students and educators had a positive attitude towards new educational technologies, including combined e-learning. The finding from previous studies is consistent with the results of the present study, showing the respondents' satisfaction with the use of virtual education.

## 5. Implications and limitations

With respect to the wideness of virtual method and numerous debates on their merits and drawbacks, the findings of the present study portrait one of the health-related applications of virtual methods. Since breast cancer is a highly prevalent, costly, and, at the same time, fatal disease among females in the country, the findings of this research can be applied to provide educational programs based on virtual method and social networks in order to enhance awareness and prevent the disease. Also, since there is no difference between respondents' satisfaction of the two methods for training nurses, both teaching methods provide can be used.

The statistical population to nurses in two hospitals is one of the most important limitations of the present study. It is suggested that future researchers review other educational programs, make messengers a priority in teaching and learning, and examining this training in other treatment categories. Considering the importance of these programs in higher education, it is recommended that programmers could design and produce a messaging program suitable for educational environments by examining important educational factors.

## 6. Conclusion

This study showed that teaching breast cancer to nurses via virtual modes has a positive learning effect, and that the durability of this effect is higher when the teaching material is delivered via WhatsApp, such as short videos, in comparison with virtual classes held through Skyroom. Primary prevention in the form of lifestyle changes, avoidance of risk factors and extensive education and information, especially through mass media such as radio, television and virtual media in order to raise awareness about breast cancer screening methods, is needed.

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**Author contribution**

The authors confirm contribution to the paper as follows. FJ: Data collection, data analysis, manuscript preparation; SA: study conception and design, data analysis, manuscript preparation; FN: data analysis, manuscript preparation; SA: manuscript revision; TA: manuscript revision; AE: manuscript revision; SBS: data analysis and interpretation, MO: manuscript revision; DG: manuscript revision; FDA: manuscript revision. All authors approved the final version of the manuscript.

**Conflict of interest**

The authors declare that they have no conflict of interest (financial and non-financial).

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