

Mobile phones and early detection of breast cancer: possibility of health education for women

Aparelhos celulares e a detecção precoce do câncer de mama: possibilidade de educação em saúde para mulheres

Los teléfonos móviles y la detección precoz del cáncer de mama: la posibilidad de la educación sanitaria para las mujeres

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This study aims to analyze the possibility of incorporating mobile phones in health education strategies related to breast cancer on women cared by the Family Health Strategy (*Estratégia de Saúde da Família*) teams. This is a descriptive study, carried out with women aged 40 years or more, who lived in the city of Maringá, in the state of Paraná, in 2016. We collected data during home visits through the application of a semi-structured questionnaire, composed of questions related to the outline of their use of mobile phones and internet, as well as their access to information on health. We surveyed a total of 259 women, of whom 95.75% reported using mobile phones; 67.18% have used mobiles for more than three years; 69.11% use mobile to make phone calls and 28.96% use mobiles for internet access. In regards to internet use, 45.17% said they used paid internet services, 33.59% said they used the internet for research purposes, 31.27 use the internet to access social media, and 8.11% used the internet to access governmental websites. In regards to health information, 50.19% prefer to use pamphlets; 40.93% use mobile phones and 25.48 prefer lectures. The incorporation of mobile phones in health education strategies aimed at breast cancer is feasible, however, it is necessary to keep in mind the limitations on usability and access to the internet.

Descriptors: Telemedicine; Women's health; Health promotion; Preventive medicine; Breast neoplasms.

O estudo buscou analisar a possibilidade da incorporação dos aparelhos celulares nas estratégias de educação em saúde relacionada ao câncer de mama de mulheres atendidas pelas equipes da Estratégia de Saúde da Família. Estudo descritivo realizado com mulheres com idade igual ou superior a 40 anos residentes em Maringá, Paraná, em 2016. Os dados foram coletados durante visita domiciliar por meio da aplicação de questionário semiestruturado composto de questões relativas ao perfil de uso de aparelhos celulares e internet, bem como do acesso a informações sobre saúde. Pesquisou-se 259 mulheres, das quais 95,75% declarou utilizar aparelhos celulares; 67,18% utiliza há mais de três anos; 69,11% utiliza para realizar ligações telefônicas e 28,96% utiliza para acessar internet. Quanto ao uso de internet, 45,17% afirmou utilizar internet paga, 33,59% utilizam para pesquisar; 31,27% para acessar redes sociais e 8,11% para acessar portais do governo. Para receber informação sobre saúde, 50,19% prefere panfletos; 40,93% prefere aparelhos celulares e 25,48% prefere palestras. A incorporação dos aparelhos celulares nas estratégias de educação em saúde direcionada ao câncer de mama mostra-se viável, porém, faz-se necessário considerar limitações de usabilidade e acesso à internet.

Descritores: Telemedicina; Saúde da mulher; Promoção da saúde; Medicina preventiva; Neoplasias da mama.

El estudio tuvo como objetivo analizar la posibilidad de incorporar los teléfonos móviles en las estrategias de educación sanitaria relacionadas con el cáncer de mama de las mujeres atendidas por los equipos de Estrategia de Salud Familiar. Se realizó un estudio descriptivo con mujeres de 40 años o más residentes en Maringá, Paraná, en 2016. Los datos se reunieron durante las visitas a domicilio mediante la aplicación de un cuestionario semiestructurado compuesto de preguntas relacionadas con el perfil de uso de los teléfonos móviles y la internet, así como el acceso a la información sobre la salud. Se encuestó a un total de 259 mujeres, de las cuales el 95,75% declaró utilizar teléfonos móviles; el 67,18% los ha utilizado durante más de tres años; el 69,11% los utiliza para hacer llamadas telefónicas y el 28,96% para acceder a internet. En cuanto al uso de internet, el 45,17% afirmó usar internet paga, el 33,59% lo usa para hacer investigaciones; el 31,27% para acceder a redes sociales y el 8,11% para acceder a portales gubernamentales. Para recibir información sobre la salud, el 50,19% prefiere los panfletos; el 40,93% los teléfonos móviles y el 25,48% las conferencias. La incorporación de los teléfonos móviles en las estrategias de educación sanitaria dirigidas al cáncer de mama es factible, pero es necesario considerar las limitaciones de uso y acceso a internet.

Descriptorios: Telemedicina; Salud de la mujer; Promoción de la salud; Medicina preventiva; Neoplasias de la mama.

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INTRODUCTION

Breast cancer is the most common form of cancer among women in the world and represents one of the main causes of death among the female population^{1,2}. In Brazil, 59,700 new cases of this type of cancer are expected in 2019, with an estimated risk of 56.33 per 100,000 women³. Nowadays, in many regions of the country, diagnosis occurs at very advanced stages of the disease, increasing treatment-related morbidity and reducing patient survival rates⁴. Limited access to screening and early diagnosis are barriers we need to overcome in order to reduce breast cancer morbidity and mortality in the country⁵.

As the mortality of this type of cancer is associated with late diagnosis⁶, several countries have adopted resources to control this malignancy based on investments in early diagnosis⁷. Considering the progressive incorporation of public policies in Brazil aimed at controlling chronic non-communicable diseases since the late 1980s, it was possible to achieve some advances in reducing breast cancer mortality⁸.

However, mortality still remains high, especially in women in lower economical-social classes⁹. In addition to this, there is a need for strategies to improve the quality of primary care, reduce income inequality and improve basic education, which must be taken into account in the development of public policies to reduce breast cancer mortality in Brazilian municipalities⁹.

Recently, there have been discussions about the implementation of new recommendations for early detection of breast cancer in the country, with a special focus on the need for changes related to regulation of care, financing and implementation of shared decision process in primary care¹⁰. It is also likely that the success of this implementation depends on the training of both professionals and users of the health system.

Access to information is important for the development of self-care skills and competences, such as the search for health services to perform early detection tests¹¹. Thus, female empowerment on the topic increases women's self-responsibility in the decision-making process, reduces feelings of uncertainty about risk factors and strengthens access to protective factors¹².

Information and communication technologies (ICT) can facilitate the transmission of information about breast cancer in order to promote improved adherence to programs to control the illness^{13,14}. In this context, mobile devices with internet access, so-called smartphones, with varied functionality, such as audio, video and applications (apps), especially online social networking apps, stand out as an omnipresent technology with great potential to be incorporated into health education strategies¹⁵. Studies on the use of mobile phones to strengthen self-care practices aimed at controlling breast cancer have been carried out in several countries¹⁶⁻¹⁸. However, they are still scarce in Brazil.

With the relevance of using mobile phones in coping with health problems^{19,20} due to the scenario in breast cancer control actions in mind, this study aims to characterize the profile of mobile phone and internet usage by women cared by Family Health Strategy - FHS (*Estratégia de Saúde da Família - ESF*) teams of the Unified Health System (*Sistema Único de Saúde - SUS*) and its relationship with access to information on early detection of breast cancer.

METHOD

This is a descriptive quantitative cross-sectional study, and it was carried out between March of 2015 and November of 2016. The population sampled was composed by women over the age of 40 (N = 59,845) cared by the FHS teams of SUS and registered in the 32 Basic Health Units - BHU (*Unidades Básicas de Saúde - UBS*) of the city of Maringá, located in the North-Central meso-region of the state of Paraná, Brazil.

We used a random sampling stratified by the BHU. The sample calculation with a significance level of $\alpha = 5\%$ and a maximum permissible error between the estimate and the

real value of the parameter of $e = 0.05$. After the calculation, we applied the correction factor for finite populations.

This study includes women aged over 40 years registered in the BHU of the city and excludes those unable to answer the questionnaire, especially those with a diagnosis of neurodegenerative disease. The interviewers held meetings with the community health agents (CHA) of each BHU and agreed that the questionnaires would be applied during home visits (HV) carried out by the health agent.

The HVs were scheduled according to the schedule defined by the BHU. There was no refusal by the users selected by the CHA to answer the questionnaire. As some women selected to participate in the study lived in areas that were not covered by health services due to removal or dismissal of the health agent responsible for monitoring the homes, it was not possible for researchers to collect this data without monitoring.

Collection of data happened through the application of a semi-structured questionnaire during the home visit of the health agent, after signing the Free and Clarified Consent Form. The testing of said questionnaire happened during a pilot study. We organized the following in dimensions: 1) sociodemographic characterization; 2) mobile phone usage; 3) internet usage; 4) knowledge about early detection of breast cancer; and 5) means of transmitting information about breast cancer.

We put the collected data on an Excel spreadsheet and analyzed the results through descriptive analysis, with the aid of R-Development Core Team to obtain frequency table. We calculated the percentage by dividing the absolute frequency by the number of respondents to the questionnaire.

The experimental protocol was approved by the Human Research Ethics Committee of the Centro Universitário de Maringá, CEP/CESUMAR under No. 1,401,268.

RESULTS

Sociodemographic characterization

For this study, 259 women participated, as the study could not get hold of 15 other women, all distributed through 32 UBS. The data regarding the participants' sociodemographic characterization are shown in Table 1.

We can notice that 63.71% of women were between 40 and 60 years old, most of whom were married (62.93%), with children (89.19%) and had educational levels inferior to high school qualifications (57.14%). The majority (71.43%) were the legal owners of their houses, 55.60% lived with their spouse and 49.81% lived with their children. In regards to family income, 59.07% said they had an income of one or two minimum wages, and 52.51% of them did not do any paid activity.

Characterization of mobile device usage

Only 4.25% of the participants declared not to use a mobile phone, while 67.18% had been using it for more than three years. As for the activity with the greatest use of mobile phones, 69.11% stated that they use it to make phone calls, while 28.96% stated that they use it to access the internet (Table 2).

Table 1. Sociodemographic characterization of women surveyed on mobile phone use. Maringá, PR, 2016.

	Frequency	%
Age (years)		
40 to 49	80	30.89
50 to 59	85	32.82
60 to 69	70	27.03
70 and +	24	9.27
Marital status		

Married	163	62.93
Single	34	13.13
Divorced	21	8.11
Widowed	30	11.58
Other	8	3.09
Did not answer	3	1.16
Educational level		
Illiterate	6	2.32
Primary (incomplete)	40	15.44
Primary (complete)	26	10.04
Secondary (incomplete)	31	11.97
Secondary (complete)	27	10.42
High school (incomplete)	18	6.95
High school (complete)	81	31.27
Currently in university	3	1.16
University (complete)	24	9.27
Higher education	2	0.77
Did not answer	1	0.39
Family income		
1 to 2 MW	153	59.07
2.1 to 4 MW	42	16.22
4.1 to 6 MW	8	3.09
6.1 to 8 MW	43	16.60
8.1 to 10 MW	3	1.16
More than 10.1 MW	1	0.39
Did not answer	9	3.47
Children		
No	27	10.42
Yes	231	89.19
Did not answer	1	0.39
Housing		
Own	185	71.43
Rent	51	19.69
Other	22	8.49
Did not answer	1	0.39
Lives with?*		
Spouse	144	55.60
Partner	25	9.65
Children	129	49.81
Siblings	6	2.32
Alone	19	7.34
Relatives	40	15.44
Other	13	5.02
Paid activities		
No	136	52.51
Yes	112	43.24
Did not answer	11	4.25

*Question allows for more than one answer. MW: minimum wage

Table 2. Women according to mobile phone usage. Maringá, PR, 2016.

Aspects	Frequency	%
Time of mobile phone usage		
Do not use	11	4.25
Less than 1 year	11	4.25
Between 1.1 and 3 years	32	12.36
Between 3.1 and 5 years	33	12.74
More than 5 years	141	54.44
Did not answer	31	11.97
Has mobile phone with internet access		
No	96	37.07
Yes	134	51.74
Did not answer	29	11.20

Activities in which uses phone the most*

Making phone calls	179	69.11
Receiving phone calls	166	64.09
Sending messages (SMS)	78	30.12
Access internet	75	28.96
Play games	27	10.42
Other	24	9.27
Did not answer	38	14.67

*Question allows for more than one answer.

Internet usage characterization

The majority of the surveyed women (45.17%) accessed the internet via private wifi network, while only 0.77% accessed it via public wifi. Mobile phones were the most common device used for internet access (34.36%), followed by the personal computer (22.01%) (Table 3).

The amount of time used to access the internet on a daily basis ranged from less than one hour (42.86%) to more than one hour (16.21%), with 34.75% of women declaring they had no set access time. They accessed the internet mainly for research purposes (33.59%) and browsing social networks (31.27%), with 8.11% of women declaring that they use the internet to access government websites. In regards to the use of social networks, 41.31% said they use Facebook and 42.08% used WhatsApp (Table 3).

Characterization of knowledge about early detection of breast cancer

It is possible to notice that 82.24% of women declared that they know what cancer is, and 81.47% say they know what breast cancer is. The majority (81.47%) said they knew about the existence of tests that could detect breast cancer early and that these are offered free of charge by SUS (83.40%) (Table 4).

As for the mammography exam, 74.13% of the women declared that they had already gone through the exam, and 76.06% took the result as soon as it was available. Of the total number of participants, 70.66% stated that, in case of breast pain or discomfort, the right course of action was to go to a health center and make an appointment. The majority of women (74.52%) said they knew what the Pink October Campaign meant (Table 4).

Table 3. Women according to characteristics of internet usage. Maringá/PR. 2016.

Aspects	Frequency	%
Types of internet access*		
Do not access	99	38.22
Paid Wifi	117	45.17
Dial-up internet	7	2.70
Public network	2	0.77
Public Wifi	9	3.47
Friends' homes	12	4.63
Others	9	3.47
Did not answer	16	6.18
Device used to access internet*		
Do not access	97	37.45
Laptop/PC	57	22.01
Mobile phone	89	34.36
Friends' computers	3	1.16
Work computer	9	3.47
Tablet	9	3.47
Other	4	1.54
Did not answer	18	6.95
Hours of access per day		
None	111	42.86

No set time	90	34.75
Between 1 to 3 hours	31	11.97
Between 4 to 6 hours	7	2.70
Between 7 to 10 hours	2	0.77
More than 10 hours	2	0.77
Did not answer	16	6.18
Use of social networks*		
No	123	47.49
Facebook	107	41.31
WhatsApp	109	42.08
YouTube	36	13.90
Twitter	8	3.09
Google+	43	16.60
Linkedin	5	1.93
My Space	2	0.77
Others	2	0.77
Did not answer	8	3.09
Types of usage*		
Do not use	111	42.86
Play games	26	10.04
Access social networks	81	31.27
Research	87	33.59
Read news	64	24.71
Watch movies	23	8.88
Access government websites	21	8.11
Relax	48	18.53
Study	30	11.58
Shop	17	6.56
Rad e-mails	27	10.42
Others	17	6.56
Did not answer	10	3.86

* Question allows for more than one answer

Table 4. Characteristics of knowledge about early detection of breast cancer. Maringá/PR 2016.

Aspects	Frequency	%
Know what cancer is		
No	4	1.54
Yes	213	82.24
Did not answer	42	16.22
Know what breast cancer is		
No	5	1.93
Yes	211	81.47
Did not answer	43	16.60
Know about early detection of breast cancer tests		
No	2	0.77
Yes	211	81.47
Did not answer	46	17.76
Bi-annual appointment with gynecologist		
No	37	14.29
Yes	180	69.50
Did not answer	42	16.22
Did go through a mammogram		
Yes	192	74.13
No	18	6.95
Did not answer	49	18.92
Right course of action in case of pain or discomfort on breasts*		
Research on the internet about what to do	1	0.39
Ask a female friend/relation about what to do	4	1.54
Go to a health center and make an appointment	183	70.66
Go to emergency services	18	6.95
Go to a pharmacy and ask about which medication to take	2	0.77

Others	14	5.41
Did not answer	46	17.76
Take the results after taking preventive exams		
Always	197	76.06
Often	9	3.47
Sometimes	6	2.32
Hardly ever	1	0.39
Never	3	1.16
Did not answer	43	16.60
Free offer of early detection of breast cancer exams by SUS		
No	1	0.39
Yes	216	83.40
Did not answer	42	16.22
Knowledge about Pink October Campaign		
No	15	5.79
Yes	193	74.52
Did not answer	51	19.69

* Question allowed for more than one answer

Characterization of the means of transmitting information about breast cancer

Of the sampled women, 74.13% said they had already seen posters about breast cancer in the BHU they attended. As for the transmission of information on early detection, 58.69% of women stated that the BHU has already given a lecture on the topic and 76.45% reported having received information on television. As for the transmission of information about risk factors, 37.45% of women answered that they had received this information during public lectures at the BHU, 62.55% received information in private lectures at the BHU and 61.39% through pamphlets (Table 5).

On the other hand, 50.19% of women stated that they prefer pamphlets, 40.93% of women said so due to the functionality of mobile phones (text messages, phone calls, emails, WhatsApp and social networking groups), and 25.48% prefer it through lectures. As for the professional who would have the easiest language to understand for clarifying illnesses, nurses were the professionals of choice for 40.54% of surveyed women, followed by doctors (39.38%) and health workers (38.22%) (Table 5).

Table 5. Women according to the means of transmitting information about breast cancer. Maringá/PR, 2016..

Aspects	Frequency	%
Presence of posters about breast cancer in the neighborhood's BHU		
No	13	5.02
Do not know what it is	4	1.54
Yes	192	74.13
Did not answer	50	19.31
Lectures about early detection of breast cancer in the neighborhood's BHU		
No	21	8.11
Do not know what it is	33	12.74
Yes	152	58.69
Did not answer	53	20.46
Place of participation in lectures about how to detect breast cancer early*		
Never participated	90	34.75
Health center	97	37.45
Community association	9	3.47
Child(ren)'s school	6	2.32
Church/Hall	8	3.09
Comercial association	2	0.77
College/university	10	3.86
Others	15	5.79
Did not answer	53	20.46

Access to pamphlets about risk factors for the development of breast cancer		
No	48	18.53
Yes	159	61.39
Did not answer	52	20.08
Watch television PSA on the importance of doing exams for early detection of breast cancer		
No	11	4.25
Yes	198	76.45
Did not answer	50	19.31
Receive guidance about risk factors for development of breast cancer in the local BHU		
No	31	11.97
Do not go to Basic Health Unit	14	5.41
Yes	162	62.55
Did not answer	52	20.08
Options on receiving information about the ways to prevent cancer?*		
Pamphlet	130	50.19
Text message	16	6.18
Phone call	12	4.63
E-mail	20	7.72
WhatsApp	37	14.29
Social network groups	21	8.11
Through lectures	66	25.48
Others	13	5.02
Did not answer	52	20.08
Professional(s) that have the most simple language on doubts about the illness?*		
Nurse	105	40.54
Doctor	102	39.38
Professor	23	8.88
Health workerd	99	38.22
Healthcare professional in general	70	27.03
Someone who had the illness	39	15.06
Others	6	2.32
Did not answer	51	19.69

* Question allows for more than one answer.

DISCUSSION

The lack of demand and the low adherence of women to early breast cancer detection programs represents issues for the success of control actions in Brazil. Women's health education about the history of the disease and preventive methods can improve engagement with control programs.

Women targeted by breast cancer screening actions cared for at the FHS will be able to use ICT, especially with the use of phones with internet connection to access digital social networks and do online research. However, a large portion of this population does not have free internet access, suggesting, therefore, the need for further discussions about the implementation of these technologies in the context of SUS.

The most used methods in the BHU to transmit information about breast cancer use traditional means of disseminating information such as posters, lectures and pamphlets, as well as guidelines issued during medical consultation, enabling women to be able to say that they know what breast cancer is and what are preventive exams. As the analysis of the effectiveness of these education strategies was not the focus of the study, it is not possible to conclude anything about their meaning, however, in regards to prevention behaviors, the results presented are consistent with the current recommendations.

On the other hand, when thinking about the implementation of the new recommendations, which expands the vision of early detection beyond screening, with strategies for the early diagnosis of cases with suspicious signs and symptoms¹⁰, a greater participation of users of the health system will be charged for shared decision-making, in addition to the need to assimilate new methods and practices for popular education.

In this sense, we reiterate the need to rethink the conduct and methods of education used, aiming to make them relevant for the individual and collective empowerment in the realization of the knowledge to be built by the population. We also question solutions based only on the transmission of information.

The relevance of health education and empowerment for strengthening shared decision-making has been in debate since 1978 by the Alma Ata International Conference, and it was consolidated through the Ottawa Charter for Health Promotion in 1986, in which health education was defined as a process that helps individuals to actively seek to improve their health status, and thus, their quality of life. Since then, health education has stood out as a central element in health promotion actions, supporting activities aimed at informing individuals about the nature and causes of health/disease and that the level of personal risk is associated with behaviors related to style of life (self-responsibility for health education)²¹.

Health literacy is currently seen as a global public health goal, and it is achievable through improved education and communication strategies²². With this in mind, the inclusion of ICT in health education strategies has been suggested for facilitating both access and sharing of health information^{23,24}, as long as usability limitations are respected²⁵. It is in this context that actions that use mobile devices are and may be developed, such as the approach known as mHealth, which can be applied to improve health care, whether through the transmission of information or facilitating communication between users and service providers²⁶.

For the women surveyed, the use of mobile phones for personal use surpasses the use of other ICTs, as 84.56% stated that they prefer to use mobile phones over computers (44.79%) for the development of personal tasks (data not shown). This profile does not seem to differ from that presented by the majority of the Brazilian population, since recent data from IBGE show that the share of people holding mobile phones for personal use increased from 77.1%, in 2016, to 78.2%, in 2017, and it currently exceeds 82% in the Southern and Southeastern regions²⁷, reaffirming that this technology has been progressively incorporated into Brazilian daily life. However, even though access to mobile phones has increased, its use is still mainly directed to communication actions such as making phone calls. This information becomes relevant once we consider using these devices as supporting tools in the health education process.

When considering that not all models of mobile phones available to the Brazilian population have access to the internet, and that about half of the participants said they access the internet through their phones, it is possible to infer that the models of smartphone mobile devices are the most used by them. The number of Brazilians who access the internet via mobile phones has steadily increased; in 2016, 97.2% of accesses were via smartphone and, in 2017, this share increased to 98.7%²⁷, suggesting that these devices represent an important device for information access through internet. As 62% of the women surveyed said they do access the internet, the possibility of incorporating interventions based on the use of the referred mobile ICTs for health education directed at the female population is further strengthened.

More than half of the women surveyed declared that they use online social networks, so the use of mobile phones is in fact coupled with internet connection. Thus, for this population, it appears that access and sharing of information can be performed with the aid of mobile phones, given that many of these women use the multiple functionalities of these devices, especially online social networks.

Even though WhatsApp placed third in the order of preference as a tool for transmitting information, the possibility of its incorporation into health education strategies as an adjunct to other traditionally recognized forms of popular education advocated by the National Health Promotion Policy (*Política Nacional de Promoção à Saúde - PNPS*) cannot be ruled out. Due to the free and flexible content, such as sending multimedia messages, the interface already recognizable to users and few limitations when compared to text messages, WhatsApp has shown itself both as a means of communication in real time and as a social network for sharing

content²⁸, and actually already incorporated into health interventions for cancer prevention²⁹, reiterating, therefore, the possibility of integration in health education strategies aimed at the prevention of breast cancer.

Likewise, when asked about the preferred way to access information on breast cancer prevention, more than 40% of women mentioned the various functionalities of mobile phones, such as calls, text messages, e-mail and online social networks, which reinforces the feasibility of these technologies in the health education process.

On the other hand, when we think about the use of mobile phones for the population SUS usually cares for, one cannot ignore the expenses for the effectiveness and guarantee of continuity of actions. As 45.17% of women reported accessing internet through paid wifi, there is a need to improve availability of internet access, with a view to ensuring that this type of intervention can actually be carried out for the population that really lacks relevant information about breast cancer.

The fact that high cost is one of the main reasons for not using internet in Brazil²⁷ corroborates the idea that the availability of internet access represents a limiting factor for the effectiveness of actions based on mHealth in the context of SUS. Another important factor to be discussed is the recognition of women about the use of ICT as a strategy for health education.

As previously mentioned, many women still correlate the use of mobile phones to the action of making and receiving phone calls, suggesting the need for previous actions aimed at mobilizing the target population regarding the feasibility of using these devices as a way of transmitting and disseminating educational content. On the other hand, several surveyed women mentioned using the internet to do research and read news, so we can recognize that the implementation of mobile phones in health education strategies is not so far from the reality of the female population cared for by SUS.

In other studies, mobile phones with their multiple functionalities facilitate women's self-empowerment regarding the development of skills and competences aimed at preventing breast cancer^{30,31} and can be used as a tool in health education and in strengthening health control actions breast cancer in Brazil.

Even though it is evident that women cared for by SUS use mobile phones in their daily lives to access information, there are usability restrictions, such as free internet access and the non-recognition that this technology can be used as a carrier of information about cancer, which designates the main barriers to the incorporation of these devices in health promotion strategies.

CONCLUSION

Considering the importance of using ICT in health empowerment, it was possible to show that women cared for by FHS have limited access to information and communication technologies, especially the internet, therefore, they cannot fully benefit from the implementation of health education interventions based in mHealth. In regards to the current context of implementation of new guidelines for early detection of breast cancer and health education for women, further studies will be necessary to determine whether the transmission of this information has enabled the production of knowledge relevant to the control of the disease.

For new studies, we suggest considering that different age groups need to be respected as well as the skills and limitations of digital knowledge, in order to obtain and offer information relevant to the development of the mHealth area. In addition to this, it is necessary to understand the context in which women are immersed in order to develop health education interventions focused on the prevention of breast cancer, so that new strategies linked to individual and collective desires and needs can be applied.

The development of self-care skills and competences, so important for shared decision-making, can be accomplished through interventions based on the use of mobile phones,

especially smartphones. This use may benefit women cared for by FHS through mHealth interventions, as long as the usability characteristics of ICT are respected and that better accessibility to the internet is guaranteed.

REFERENCES

1. Carioli G, Malvezzi M, Rodriguez T, Bertuccio P, Negri E, La Vecchia C. Trends and predictions to 2020 in breast cancer mortality: Americas and Australasia. *Breast* [Internet]. 2018 [cited 20 Feb 2020]; 37:163-9. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29246526>
2. Sharma R. Breastcancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development, 1990-2016: evidence from Global Burden of Disease Study 2016. *Breast Cancer* [Internet]. 2019 [cited 26 Feb 2020]; 26(4):428-45. DOI: 10.1007/s12282-018-00941-4.
3. Instituto Nacional de Câncer José Gomes de Alencar. Estimativa 2018: Incidência de câncer no Brasil. Rio de Janeiro: INCA; 2017. Available from: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//estimativa-incidencia-de-cancer-no-brasil-2018.pdf>
4. Figueiredo FWS, Adami F. Effects of the high-inequality of income on the breast cancer mortality in Brazil. *Sci Rep.* [Internet]. 2019 [cited 26 Feb 2020]; 9(1):4173. Available from: <https://www.nature.com/articles/s41598-019-41012-8>
5. Lopes TCR, Gravena AAF, Demitto MO, Borghesan DHP, Dell'Agnolo CM, Brischiliari SCR, et al. Delay in diagnosis and treatment of breast cancer among women attending a reference service in Brazil. *Asian Pac J Cancer Prev.* [Internet]. 2017 [cited 26 Feb 2020]; 18(11):3017-23. Available from: http://journal.waocp.org/article_51773_5b645b74784185faa7d8336bd4ae6b5d.pdf
6. Merino Bonilla JA, Torres Tabanera M, Ros Mendoza LH. Breast cancer in the 21st century: from early detection to new therapies. *Radiologia* [Internet]. 2017 [cited 01 Feb 2020]; 59(5):368-79. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/28712528>
7. Coleman C. Early detection and screening for breast cancer. *Semin Oncol Nurs.* [Internet]. 2017 [cited 01 Feb 2020]; 33(2):141-55. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/28365057>
8. Figueiredo FWS, Almeida TCC, Cardial DT, Maciel ES, Fonseca FLA, Adami F. The role of health policy in the burden of breast cancer in Brazil. *BMC Womens Health.* [Internet]. 2017 [cited 26 Feb 2020]; 17(1):121-8. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5704361/>
9. Figueiredo FWS, Almeida TCC, Schoueri JHM, Luisi C, Adami F. Association between primary care coverage and breast cancer mortality in Brazil. *PLoS One* [Internet]. 2018 [cited 01 Apr 2020]; 13(8):e0200125. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30071031>
10. Migowski A, Silva GZ, Dias MBK, Estevez Diz MDP, Sant'Ana DR, Nadanovsky P. Diretrizes para detecção precoce do câncer de mama no Brasil. II – Novas recomendações nacionais, principais evidências e controvérsias. *Cad Saúde Pública* [Internet]. 2018 [cited 01 Apr 2020]; 34:e0074817. Available from: <http://www.scielo.br/pdf/csp/v34n6/1678-4464-csp-34-06-e00074817.pdf>
11. Dianatinasab M, Mohammadianpanah M, Daneshi N, Zare-Bandamiri M, Rezaeianzadeh A, Fararouei M. Socioeconomic factors, health behavior, and late-stage diagnosis of breast cancer: considering the impact of delay in diagnosis. *Clin Breast Cancer* [Internet]. 2018 [cited 01 Apr 2020]; 18(3):239-45. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29033239>
12. Tamimi RM, Spiegelman D, Smith-Warner SA, Wang M, Pazaris M, Willett WC, et al. Population attributable risk of modifiable and nonmodifiable breast cancer risk factors in postmenopausal breast cancer. *Am J Epidemiol.* [Internet]. 2016 [cited 01 Apr 2020]; 184(12):884-93. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/27923781>

13. Shneyderman Y, Rutten LJ, Arheart KL, Byrne MM, Kornfeld J, Schwartz SJ. Health information seeking and cancer screening adherence rates. *J Cancer Educ.* [Internet]. 2016 [cited 01 Apr 2020]; 31(1):75-83. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/25619195>
14. Kim H, Filson C, Joski P, von Esenwein S, Lipscomb J. Association between online information-seeking and adherence to guidelines for breast and prostate cancer screening. *Prev Chronic Dis.* [Internet]. 2018 [cited 01 Apr 2020]; 15:E45. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29679480>
15. Bowen DJ, Robbins R, Bush N, Meischke H, Ludwig A, Wooldridge J. Effects of a web-based intervention on women's breast health behaviors. *Transl Behav Med.* [Internet]. 2017 [cited 01 Apr 2020]; 7(2):309-19. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/21643515>
16. Yang Q, Van Stee SK. The comparative effectiveness of mobile phone interventions in improving health outcomes: meta-analytic review. *JMIR MHealth Uhealth* [Internet]. 2019 [cited 01 Apr 2020]; 7(4):e11244. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30942695>
17. Free C, Phillips G, Galli L, Watson L, Felix L, Edwards P, et al. The effectiveness of mobile-health technology-based health behavior change or disease management interventions for health care consumers: a systematic review. *PLoS Med.* [Internet]. 2013 [cited 01 Apr 2020]; 10(1):e1001362. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/23349621>
18. Grekin ER, Beatty JR, Ondersma SJ. Mobile health interventions: exploring the use of common relationship factors. *JMIR MHealth Uhealth* [Internet]. 2019 [cited 01 Apr 2020]; 7(4):e11245. Available from: <https://mhealth.jmir.org/2019/4/e11245/>
19. Collado-Borrell R, Escudero-Vilaplana V, Ribed-Sánchez A, Ibáñez-García S, Herranz-Alonso A, Sanjurjo-Sáez M. Smartphone applications for cancer patients; what we know now about them? *Fam Hosp.* [Internet]. 2016 [cited 01 Apr 2020]; 40(1):25-35. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/26882831>
20. Coughlin SS, Thind H, Liu B, Wilson LC. Towards research-tested smartphone applications for preventing breast cancer. *Mhealth* [Internet]. 2016 [cited 01 Apr 2020]; 2:26. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/27390745>
21. Tengland PA. Behavior change or empowerment: on the ethics of health-promotion goals. *Health Care Anal.* [Internet]. 2016 [cited 01 Apr 2020]; 24(1):24-46. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/24100936>
22. Rowlands G, Dodson S, Leung A, Levin-Zamir D. Global health systems and policy development: implications for health literacy research, theory and practice. *Stud Health Technol Inform.* [Internet]. 2017 [cited 01 Apr 2020]; 240:359-91. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/28972529>
23. Conrad E, Becker M, Powell B, Hall KC. Improving health promotion through the integration of technology, crowdsourcing, and social media. *Health Promot Pract.* [Internet]. 2018 [cited 01 Apr 2020]; 21(2):228-37. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30413129>
24. Melo GRA, Vargas FCS, Chagas CMS, Toral N. Nutritional interventions for adolescents using information and communication technologies (ICTs): a systematic review. *PLoS One* [Internet]. 2017 [cited 01 Apr 2020]; 12(9):e0184509. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/28961248>
25. Mitchell KM, Holtz BE, McCarroll A. Patient-centered methods for designing an developing health information communication technologies: a systematic review. *Telemed J E Health* [Internet]. 2019 [cited 26 Feb 2020]; 25(11):1012-21. DOI: 10.1089/tmj.2018.0236.
26. Changizi M, Kaveh MH. Effectiveness of the mHealth technology in improvement of healthy behaviors in an elderly population: a systematic review. *Mhealth.* [Internet]. 2017 [cited 01 Apr 2020]; 3:51. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5803024/>

27. Instituto Brasileiro de Geografia e Estatística, Diretoria de Pesquisas, Coordenação de Trabalho e Rendimento. Pesquisa Nacional por Amostra de Domicílios Contínua 2016/2017. Acesso à Internet e à televisão e posse de telefone móvel celular para uso pessoal 2017 [Internet]. Rio de Janeiro: IBGE; 2018 [cited 01 Apr 2020]. Available from: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101631_informativo.pdf
28. Montag C, Blaszkiewicz K, Sariyska R, Lachmann B, Andone I, Trendafilov B, et al. Smartphone usage in the 21st century: who is active on WhatsApp? BMC Research Notes [Internet]. 2015 [cited 01 Apr 2020]; 8:331. Available from: <https://bmcresearchnotes.biomedcentral.com/articles/10.1186/s13104-015-1280-z>
29. Ganasegeran K, Renganathan P, Rashid A, Al-Dubai SA. The m-Health revolution: exploring perceived benefits of WhatsApp use in clinical practice. Int J Med Inform. [Internet]; 2017 [cited 26 Feb 2020]; 97:145-51. DOI: 10.1016/j.ijmedinf.2016.10.013
30. Coughlin SS, Besenyi GM, Bowen D, De Leo G, Coughlin SS, Besenyi GM, et al. Development of the Physical activity and Your Nutrition for Cancer (PYNC) smartphone app for preventing breast cancer in woman. Mhealth [Internet]. 2017 [cited 26 Feb 2020]; 3:5. DOI: 10.21037/mhealth.2017.02.02
31. Kim C, Prabhu AV, Hansberry DR, Agarwal N, Heron DE, Beriwal S. Digital era of mobile communications and smartphones: a novel analysis of patient comprehension of cancer-related information available through mobile applications. Cancer Invest. [Internet]. 2019 [cited 01 Apr 2020]; 37(3):127-33. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30821518>

CONTRIBUTIONS

Carolina Correia Bilotti, Maria Gabriela Bernardo Oliveira e Mariane Frez Tavares contributed in the conception, collection and analysis of data and writing. **Marcelo Picinin Bernuci and Regiane da Silva Macuch** participated in the conception, collection and analysis of data, writing and revision.

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