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Effects of Educating Healthy Women About Breast Cancer on Their Breast Cancer Fear and Worry

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ABSTRACT

Background: Breast cancer (BC) is the most common cancer among women worldwide and prognosis depends on early diagnosis; however, women seldom seek medical attention on time. Two of the important reasons for this delay are BC worry (BCW) and fear (BCF). This study tested the hypothesis that educating healthy women about BC would reduce their BCF and BCW.

Methods: Participants were women above 18 years who visited the Breast Clinic, had a normal or benign breast assessment and were not suffering from any psychological disorders. They filled a survey including items of the Hospital Anxiety and Depression Scale (HADS), Lerman BCW scale and Champion BCF scale before and after the intervention. In the course of the study, 20 short educational videos about BC were sent to them on WhatsApp. Changes in scores were analyzed using the Wilcoxon signed-rank test.

Results: The mean age of the 104 participants was 38.37 years. The mean BCW score decreased from 7.95 ± 1.67 to 4.02 ± 1.44 ($P < 0.001$), and the mean BCF score decreased from 22.29 ± 4.09 to 21.43 ± 4.99 ($P = 0.046$). HADS scores showed no significant change.

Conclusion: Our study showed that educating healthy women about BC reduces BCF and BCW. We suggest that similar studies follow the participants in order to assess the effect of such education on their health-seeking behavior about BC in the long-term.

INTRODUCTION

Breast cancer (BC) is the most common cancer among females worldwide, with an estimated 2.30 million new cases in 2022, and constitutes the leading cause of cancer death in women globally.[1] Types and amounts of treatment, tumor response, and survival and quality of life of the patients depend on the inherent characteristics of the disease like tumor grade and the stage at diagnosis.[2,3] Therefore, early

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diagnosis and management of BC play a key role in its overall prognosis and deeply affect the forthcoming years of life of the patient. Also, detection of precancerous breast lesions[4,5], or recognition of BC risk factors including genetic predisposition in women can ease prevention or timely diagnosis of the cancer.[6] However, all these can only be achieved in a setting where the patient is seen before any symptom (i.e., opportunistic or organized BC screening) or at the first presentation. This is more practical in health care systems that carry out BC population screening programs. However, even in these circumstances, many women do not adhere to the programs, and Decision Aids have been developed to assist women in their path toward and through BC screening according to the guidelines. These aids present relevant education to women, and help them decide properly based on the instructions.[7,8] However, much of this evidence comes from countries with established screening programs. In settings without such programs, the applicability of these findings may be limited. Other factors that affect the probability of following BC screening guidelines have been investigated, and age, personal history of cancer, body mass index, race, health insurance status, and the relationship between the patient and the healthcare provider have been detected as effective factors.[9,10] Also, among healthy women, those with higher risks regarding their family history undergo screening more regularly.[11]

On the other hand, in areas with no national BC screening program, women frequently seek medical attention with a significant delay, which affects the clinical picture negatively.[12,13] Two large systematic reviews that assessed the effect of educational interventions on encouraging women for BC screening showed a rise in women's knowledge and increase in adherence to the BC screening guidelines following relevant education.[14,15]

Understanding the reasons for this delay is crucial. Among the various barriers identified, psychological factors play a prominent role. Two of the main obstacles in refusing to seek medical attention for breast conditions are the concerns women have about the possible examination results, and a sense of fear of cancer.[16-19] In other words, BC worry (BCW) and BC fear (BCF) interfere with appropriate care demand.

Educational interventions have been shown to reduce fear and worry in various medical contexts. For example, it has been reported that patient education could decrease pain-related fear after BC treatment.[20] In addition, fear of cancer progression was found to be indirectly related to health literacy levels during BC treatment in elderly women.[21]

Thus, this study was motivated by the question of whether a greater knowledge of BC would decrease BCW and BCF in women attending a breast clinic. We hypothesized that providing accurate, accessible information about BC would reduce BCF and BCW in healthy women attending the clinic. Therefore, the present study was an attempt to investigate this hypothesis.

METHODS

Study design and participants

This pre-post study was carried out in the Breast Clinic of Arash Women's Hospital, affiliated with Tehran University of Medical Sciences (TUMS), from October 1, 2020, to April 1, 2021.

Study outcomes

Our primary outcome was the change in BCF and BCW median scores from baseline to post-intervention, as measured by the Champion Breast Cancer Fear Scale and the adapted Lerman Breast Cancer Worry Scale, respectively. The secondary outcome was the association between the breast-related medical history of the patients and their baseline and post-intervention BCF and BCW scores.

Inclusion and exclusion criteria, sample size calculation

As per the initial design of the research, participants were planned to be selected from among the women attending the Breast Clinic of the hospital for screening or benign breast complaints. However, due to the restrictions created by the COVID-19 pandemic and the conversion of patients' physical presence to virtual modes of visits[22], the plans and the inclusion criteria changed relevantly. Therefore, participants were chosen from among women who had attended the Breast Clinic between March 1, 2020 and March 1, 2022, whose phone numbers recorded in their files. This modification to the recruitment protocol, necessitated by the COVID-19 pandemic, was reviewed and approved by the Ethics Committee of TUMS. Inclusion criteria consisted of age above 18 years, willingness to participate, a normal breast history and exam, and a normal or benign last breast imaging. Exclusion criteria comprised history of breast or any other cancer, new breast complaints, first-degree family history of BC, history of psychological disease, illiteracy, and inability to use virtual platforms.

We calculated the sample size based on the primary outcome of BCF score. Assuming a minimal clinically important difference of 3% (based on expert clinical consensus) in the BCF score after the intervention, and considering a power of 80% and a confidence interval of 95%, a sample size of 102 women was estimated to be appropriate. BCF was

chosen for sample size calculation as it was our primary outcome of interest. The Champion BCF scale was used as it has well-established psychometric properties allowing for effect size estimation.

Interventions, measurements, and tests

Records of eligible women were picked out from the clinic files and initially reviewed by the surgeon of the Breast Clinic to assess inclusion and exclusion criteria that could be verified from file data, including age, breast history, and the last breast imaging results. A trained staff member called these women, explained the purpose of the study, assessed their willingness to participate, and inquired about any new breast complaints, first-degree family history of BC, self-reported history of a diagnosed psychological disorder (e.g., major depression, anxiety disorder, bipolar disorder, or psychosis) requiring treatment, literacy level, and the ability to use virtual platforms. Then, cases qualified for the study were enrolled after giving their virtual consent to participate by selecting an "I agree" button on the first page of the online survey.

First, all of the participants filled out an online survey which consisted of 34 items. The first 11 items considered general characteristics and medical histories through self-reports and included age, level of education, history of benign breast disease, history of breast surgery for benign lesions, oral contraceptive pill (OCP) use, hormone replacement therapy (HRT) use, and previous breast imaging results. The next 23 items investigated the general psychological health, BCW and BCF. Among these 23 questions, the first 2 consisted of 2 of the 3 questions of the Lerman BC Worry Scale.[23] This scale[23] consists of 3 questions, inquiring about the rate of worry, effects on the patients' functioning, and effects on their mood. We followed the approach used by Lee *et al*.[24], who adapted the first 2 items in order to assess BCW in their study. Each item was scored on a 4-point Likert scale, with total BCW scores ranging from 2 to 8. Higher scores indicate greater worry. Although this represents a modified version of the original scale, and no separate validation of the 2-item Persian version was conducted in this study, it had been previously used in published research.[24]

The next 7 questions comprised the Farsi version of the Champion Breast Cancer Fear Scale (BCFS-Farsi). The original Champion scale consists of 8 questions.[25] However, in the Farsi translation validated by Moshki *et al.*[26], the last 2 questions were merged, resulting in a 7-item scale. The BCFS-Farsi has been validated in healthy individuals, showing appropriate content validity, internal consistency, and temporal stability.[26] Items are scored on a 5-point Likert scale, with total BCF scores ranging from 7 to 35. Higher scores indicate greater fear. The last 14 questions consisted of the Hospital Anxiety and Depression Scale (HADS).[27] The Farsi version of HADS has previously been validated by Montazeri *et al.*[28] The first 7 questions investigate anxiety, and the next 7 the patient's depression. Each item is scored from 0 to 3, with subscale scores ranging from 0 to 21 for anxiety and depression separately, and a total score ranging from 0 to 42. Higher scores indicate greater distress. The HADS measures general symptoms of anxiety and depression, while the Lerman BC Worry Scale and Champion BC Fear Scale assess cancer-specific worry and fear, respectively.

Questionnaires were made available to the patients via an online survey platform which enabled them to answer the tests anonymously. All data, including demographic information and baseline questionnaire responses, were collected through this online platform, not via telephone interviewing. Patients were only recognized by a number which was assigned by the link.

Then, a series of messages consisting of 20 short videos, including animated texts and images about BC definition, clinical presentation, diagnosis, treatment, impact of early diagnosis on disease management, and follow-up were sent to all of the participants. The content and format of the messages had been prepared earlier for another study[29] by a multidisciplinary team consisting of surgeons, nurses, students, educators, and laypersons. The process consisted of drafting the topics using questions asked by the people gathered through a preliminary study[29], drawing cartoon pictures and finalizing. The resulting package included 20 videos, each lasting around 60 to 90 seconds. A summary of the topics is presented in Table 1.

Then, the content was converted to short, interesting videos. Some of the simple images used in the videos are demonstrated in Figure 1. The content of the program included answers to patients' questions about BC definition, stages, risk factors, and screening; breast self-awareness, clinical breast exam, techniques of breast imaging, their definition and benefits, types of biopsies and their very low risk profile, and methods of BC treatment. In a previous study, the messages had been sent to a group of healthy women, and the rate of learning as well as the satisfaction of the participants had been assessed[29], which were found to be high in the analysis.

In the present study, the messages were sent one by one on a daily basis on the WhatsApp mobile application privately to each participant, in order to make sure they received and opened every message. Around 1 month after sending the last film, another

survey was filled by the participants via the same method, containing only the 23 questions of HADS, Lerman BCW scale and Champion BCF scale. The 1-month interval was chosen to allow the participants sufficient time to view all the 20 videos at their own pace while minimizing loss to follow-up.

Table 1. Summary of the Topics Covered in the 20 Breast Cancer Educational Videos

1. What is BC? What are BC stages?
2. What are the risk factors of BC?
3. What are the signs and symptoms of BC?
4. Diagnosis methods. Why is early diagnosis important? What to do for an early diagnosis?
5. What is the meaning of breast self-awareness?
6. How to perform breast self-exam? What signs to look for during BSE?
7. Breast imaging regarding age
8. What is mammography and how is it done? What are the advantages? Is it dangerous?
9. MRI
10. What is breast biopsy? How is it done? Is the needle dangerous for the mass?
11. Breast mass size detected with and without screening
12. Methods of BC treatment
13. Is surgery always needed in BC treatment? What types of surgery are done, and how?
14. Do all BCs need chemotherapy? When and how is it done? What is fearful in chemotherapy?
15. Do all BCs need radiotherapy? When and how is it done?
16. Do all BCs need endocrine therapy? When and how is it done?
17. What is immunotherapy? When and how is it done?
18. Follow-up after BC treatment
19. Is BC preventable? How to prevent advanced BC?
20. How does early diagnosis affect BC treatment?

BC, breast cancer; BSE, breast self-examination; MRI, magnetic resonance imaging.

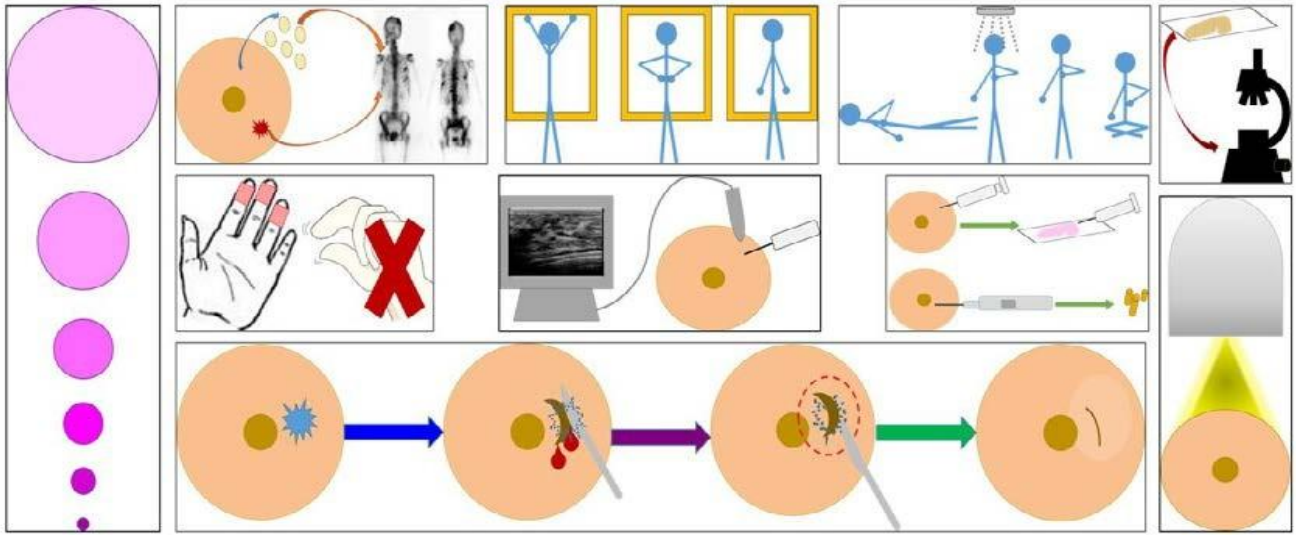

Figure 1. Sample Images from the Educational Video Series. These cartoon-style illustrations were used to explain breast anatomy, self-examination techniques, and breast cancer screening methods in simple, accessible language.

Statistical analysis

The statistical analyses were performed using IBM SPSS version 24. Data are presented as mean ± SD for continuous variables and numbers with percentages for categorical variables. The BCF score was calculated from the 7 questions of the Champion scale and the BCW score from the 2 questions of the Lerman scale. Depression and anxiety were estimated based on the first and second half of HADS, respectively, and the total HADS score was used as the general psychological health score.

For investigating the alterations in general psychological health, BCF and BCW, the Kolmogorov-Smirnov test did not confirm normal distribution. Therefore, analysis of these variables was performed using the Wilcoxon signed-rank test. For descriptive purposes, data are presented as mean ± SD, as this format is commonly used in clinical research to facilitate interpretation and comparison with other studies, while all comparative analyses are based on the non-parametric Wilcoxon signed-rank test. The association of BCF and BCW changes with patient features was analyzed using the Spearman's correlation test for continuous variables, and Mann-

Whitney *U* test or Kruskal-Wallis for the nominal variables. A *P* value of less than 0.05 was considered statistically significant.

RESULTS

One-hundred and four women participated in the study; all except one followed the study to the end. Among the 103 patients, 1 did not fill out the HADS questions, and 2 missed the second half (depression section) of HADS. Given the low rate of missing data (<3% for any single measure) and the absence of a clear pattern in the missing responses, we did not perform imputation or sensitivity analyses. The low attrition rate suggests that bias due to missing data is unlikely to have influenced the findings.

The mean age of the participants was 38.37 (± 9.14) years. Patients' data including level of education, history of benign breast disease or breast surgery for benign lesions, and consumption of OCP or HRT in all participants are presented in Table 2.

Table 2. Level of Education and Medical History of Participants

Variable	No. (%)
Education	
High school	53(60.6)
Academic	41(39.4)
Benign breast disease	42(40.4)
Oral contraceptive consumption	28(26.9)
Hormone replacement therapy	8(7.8)

The anxiety and depression scores according to HADS, and the total score are presented in Table 3. These scores show that the general psychological health of the participants at the point of entry to the study was fairly good, and did not change significantly after the intervention. The mean BCW scores and BCF scores before and after the intervention are also presented in Table 3.

Table 3. HADS-Anxiety, HADS-Depression, HADS Total, BCW, and BCF Scores Before and After the Intervention

	HADS-Anxiety score		HADS-Depression score		HADS total score		BCW score		BCF score	
Before/after the intervention	Before	After	Before	After	Before	After	Before	After	Before	After
No. of participants	104	102	104	101	104	100	104	103	104	103
Mean	9.21	9.01	8.93	9.05	18.14	18.04	7.95	4.02	22.29	21.43
SD	2.41	2.21	2.09	1.97	3.03	2.85	1.67	1.44	4.09	4.99
P value	0.441		0.612		0.637		0.001		0.046	

BCF, Breast Cancer Fear; BCW, Breast Cancer Worry; HADS, Hospital Anxiety and Depression Scale.

Data are presented as mean ± SD for descriptive purposes. Due to the nonnormal distribution and ordinal nature of the data, comparisons between pre- and post-intervention scores were performed using the Wilcoxon signed-rank test. The *P* values reported are derived from this nonparametric test.

Then, we explored the association of the changes in BCW and BCF of patients with patient characteristics and history. There was no significant association between BCW and BCF and age (BCW: $P = 0.981$, BCF: $P = 0.959$); level of education (BCW: $P = 0.771$, BCF: $P = 0.166$); benign breast disorders (BCW: $P = 0.344$, BCF: $P = 0.578$); OCP use (BCW: $P = 0.836$, BCF: $P = 0.258$) and HRT (BCW: $P = 0.12$, BCF: $P = 0.80$). Table 4 shows the correlation coefficient among changes of BCW and BCF scores and the level of education, benign breast disorders and HRT.

Table 4. The Correlation Between Changes of BCW and BCF Scores and Level of Education, Benign Breast Disorders and Hormone Replacement Therapy

Variables	BCF score changes		BCW score changes	
	Correlation coefficient	*P* value	Correlation coefficient	*P* value
Education level	0.051	0.60	0.057	0.56
Benign breast disorder	0.09	0.34	0.004	0.96
Hormone replacement	0.026	0.79	0.15	0.12

BCF, Breast Cancer Fear; BCW, Breast Cancer Worry.

DISCUSSION

In this study, we evaluated the effect of providing healthy women with appropriate educational materials about BC fear and worry and found that this intervention could lessen BCW and BCF. Timely diagnosis of BC is of utmost importance in the prognosis of the disease, but several factors deter this crucial issue. BC population screening programs affect the perception of women and assists in timely diagnosis of BC. However, there is not such a national

screening program in our country and lack of such a program results in late referrals and late BC diagnosis. Some studies have addressed this issue by interviewing healthy women or patients about the reasons for their delays. By using a structured questionnaire to detect the rate of breast self-examination in 261 participants, Parsa and Kandiah[30] found fear from detection of a mass as the reason for avoiding the exam in 17% of the respondents. Similarly, in a large survey recently conducted by Gümüştakim *et al.*[31] on 643 women attending 18 Family Health Centers throughout Turkey, fear from the results was the reason for 15% of evasions from screening. However, Consedine *et al.*[17] explored the emotional factors that affected the rate of undergoing mammography in 1634 African-American women from 6 different ethnicities, and found a significant negative relationship with BCW. Also, Fouladi *et al.*[19] investigated the reasons in 380 women who attended health centers, and detected that around 76% of the participants avoided mammography due to fear of finding a possible malignant tumor. Through in-depth interviews with 22 healthy women based on the Health Belief Model, Noori and Shouten[32] showed that while the participants knew the benefits of mammography, fear was one of the main barriers for performing it; this factor also hindered them from performing breast self-examination. Interestingly, El Asmar *et al.*[18] showed that while fear from hearing bad news about their breasts prevented women from undergoing BC screening, a higher knowledge of the disease reduced this effect. Likewise, while detecting BCF as one of the main reasons that induced delays in diagnosis, Cipora *et al.*[16] emphasized that educating women about the importance of early detection of BC and its impact on successful management of the disease should be carried out in order to improve the situation.

Although BCF and BCW have been recognized as the main reasons for late BC diagnosis in these studies, and while providing knowledge about BC and the importance of early detection through screening programs[14] or Decision Aids[7] has been proposed as a solution, no study has evaluated the effect of these instructions on BCF and BCW together, an issue which has been addressed in our study.

The effect of education on fear has been investigated in other medical conditions. For example, it has been shown that antenatal education of pregnant women could diminish fear of childbirth.[33,34] Also, courses of death education reduced fear of death in students.[35,36] On the other hand, studies have looked at the effect of psycho-education on the fear of BC recurrence and cancer distress in survivors of the disease. Psycho-education generally comprises both educational points about BC and psychological support for the patients and their families. In a study by Stanton *et al.*[37] on around 400 patients, psycho-education neither decreased depressive symptoms nor distress. However, in a multi-center study carried out by Weis *et al.*[38] on 50 patients with BC, psycho-education induced a significant drop in fear of progression and fear of BC recurrence. In a systematic review of psycho-education for BC, Setyowibowo *et al.*[39] showed that this intervention had no effect on the patients' depression or their knowledge, but improved their quality of life, and decreased their anxiety. In a very recent study, Larsen *et al.*[40] investigated the relation between education and fear of recurrence among BC survivors, and showed a reverse association. In our study, the effect of education on BCF and BCW was investigated by a very practical method. The instruction material was prepared by a reliable team and consisted of easy-to-understand and attractive messages that had proved to be effective regarding their scientific content and instructive effect, and satisfactory to most patients in a previous study.[29] BCF and worry were assessed by standard validated tests[23-26], and the general psychological health of all participants was assessed before and after the intervention by a validated test (i.e., HADS).

Within the limitations of a pre-post design, our findings strongly suggest that providing accessible information about BC may reduce fear and worry in healthy women. An important finding of this study is that while BC-specific fear and worry decreased significantly, general anxiety and depression scores (HADS) remained unchanged. This distinction is important. Breast cancer fear and worry are disease-specific emotional responses, but HADS measures generalized anxiety and depressive symptoms. Our educational intervention targeted knowledge and perceptions specifically about breast cancer, which may explain why it affected cancer-specific emotions but not general psychological distress. This pattern suggests that the observed changes were specifically related to the intervention content rather than a non-specific improvement in mood.

Beyond statistical significance, the observed reductions in BCF and BCW are likely clinically meaningful. A decrease in the mean BCW score from 8.0 to 4.0 represents a 50% reduction, moving from "frequently worried" toward "rarely worried" on the scale. Similarly, the reduction in BCF scores, though smaller in magnitude, may lower an important psychological barrier to seeking timely breast assessment. Given that fear and worry have been identified as key obstacles to screening[16-19], even modest reductions could translate into improved health-seeking behaviors at the population level.

Our study had some limitations. Firstly, it was conducted in a single center. In addition, baseline HADS scores were relatively low, which may have created a floor effect limiting our ability to detect reductions in general anxiety and depression. Also, the use of a modified 2-item version of the Lerman BC Worry Scale, while previously employed in published research, lacked formal validation in its Persian form. Finally, we could not explore the effect of our intervention on the patients' behavior regarding BC screening, which could be our ultimate goal and that of similar studies. Although previous studies have shown that knowledge, attitude and reaction of women to the possibility of breast cancer depend on their educational level, we did not find such dependence in the current study. This might be due to the distribution of this variable in our sample or lack of enough power of the study to show the differences.

CONCLUSION

The results of our study show that educating healthy women about BC may reduce their fear and worry about the disease. These findings have potential public health implications, particularly in settings without organized screening programs. Simple, low-cost educational interventions delivered via widely accessible platforms (e.g., WhatsApp) could address psychological barriers to early detection. Health policymakers in low-resource settings might consider integrating such educational programs into primary care or community health initiatives. We suggest that studies with controlled designs and longer follow-up periods be performed by following the participants for a reasonable time after the instructions to assess potential effects on their health-seeking behavior about BC.

ETHICAL CONSIDERATIONS

This study was approved by the research Ethics Committee of Tehran University of Medical Sciences, Code: IR.TUMS.IKHC.REC.1399.113. Informed written consent was obtained from all participants before enrollment in accordance with declaration of Helsinki. All participants provided virtual informed consent before entering the study.

DATA AVAILABILITY

The data and material analyzed during the current study are available from the corresponding author on reasonable request.

CONFLICT OF INTERESTS

The authors report there are no competing interests to declare.

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AI DISCLOSURE

No AI tools were used for data generation, data analysis, or interpretation of results. All scientific content, conclusions, and clinical interpretations are the sole responsibility of the authors. The authors have reviewed and verified all outputs generated with AI assistance to ensure accuracy and integrity.

AUTHOR CONTRIBUTION

AN: Methodology, Supervision, Data curation, Reviewing and Editing; YE: Conceptualization, Writing- Reviewing and Editing; LH: Methodology, SBS: Visualization, Investigation; AE: Methodology, Supervision; FJ: Supervision, MO: Visualization, Investigation; RA: Writing- Reviewing and Editing; DG: Visualization, Investigation; SA: Conceptualization, Methodology, Writing- Original draft preparation, Project administration. All authors read and confirmed the final manuscript.

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