

Developing a core risk factors set for assessment of breast cancer risk in Iranian females: A qualitative Delphi consensus.

Elham Manouchehri

Mashhad Medical sciences, Islamic Azad University, Mashhad, Iran.

Robab Latifnejad Roudsari

Mashhad University of Medical Sciences

Tahereh Fathi Najafi

Mashhad Medical sciences, Islamic Azad University, Mashhad, Iran.

Abbas Ebadi

Baqiyatallah University of Medical Sciences

Fatemeh Homaei Shandiz

Mashhad University of Medical Sciences

Ali Taghipour (✉ a.taghipour41@gmail.com)

Mashhad University of Medical Sciences

Research Article

Keywords: Qualitative Delphi, risk assessment, Expert consensus, Breast cancer, Iranian women

Posted Date: February 4th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1214719/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: There have been several methods designed to assess the risk of breast cancer. But according to studies conducted in Iran, the risk to Iranian women could not be accurately calculated with current tools. The aim of this study was to obtain consensus regarding potential breast cancer risk factors in Iran.

Methods: A long list of risk factors identified from an integrative review of literature and specialist interviews (round 1) were used to design a questionnaire survey. In round 2 specialists were asked to rate the importance of each risk factor. Items considered very important after round 2 were carried out to the primary draft of core risk factors set and less important items were excluded. In round 3, respondents were asked to reprioritize moderate important risk factors. The items considered very important in round 3 must be included in core risk factors set.

Results: In first round 11 specialists were interviewed and a total of 119 items were obtained of the first round and results of integrative review of literature. 30 specialists (response rate 50%) prioritized risk factors of BC in round 2. 51 were carried forward to the round 3 for consensus. No consensus was reached on any of the risk factors that went into Round 3 (response rate 86.7%). Therefore, a list of risk factors containing 25 important risk factors for breast cancer were obtained.

Conclusion: This study highlights the items experts feel would be most important to include in the clinical assessment of breast cancer risk in Iran. With the results of this study, it is possible to provide appropriate and usable tool for screening high risk women in primary health care in Iran.

Introduction

Breast cancer is the most common invasive cancer among women that occurs in different parts of the world in different age groups (1). Iranian women's age of onset of breast cancer is 10 years lower than that of western countries (2). Attempts to detect breast cancer early have led to screening programs and early detection of the disease (3).

Risk assessment means the use of a proven systematic method to identify individuals who are more likely to be at potential risk. The use of risk assessment tools is for the proper allocation of resources in preventive measures (4). Today, there are different models for identifying the risk of breast cancer in women, of which the Gail model is the best known (5). The well-known model of Gail in white American women who have access to mammography is considered as an effective tool to identify the risk of breast cancer, but the use of this model in Iranian women is not very effective because, this model, overestimates the risk of BC in Iranian women (5–9). There are variations in the relative identified risk of individual breast cancer, and these variations may arise from differences in race, taking into account epidemiological diversity and risk factors for breast cancer in populations such as Iranian women (10, 11).

There is a lack of adequate performance of the Gail model in Asian countries for the model to be applicable across cultures or even outside the health care setting in which such instruments were developed (8). Therefore, tools based on the lifestyle, environmental and cultural situation of Iranian women should be designed to assess the risk of breast cancer so that patients can be diagnosed at earlier stages of cancer (8). It is now agreed upon by all instrument development specialists that the contents of a health tool should be determined directly by the people who reference the tool (12).

There is not any consensus on risk factors of breast cancer in Iran and we need the opinion of different expertise from a vast geographical area, Delphi method is useful for this objective (13). So this study used the qualitative Delphi technique to reach consensus for a list of risk factors suitable for inclusion in a breast cancer risk assessment tool for Iranian women.

Material And Method

This qualitative Delphi study is part of a sequential exploratory mixed method study. The Delphi process was anonymized, with panel members unaware of the identity of other members, and responses kept anonymous(13).

In this qualitative Delphi survey, three rounds of surveys will be conducted. Development of the questionnaire involved three phases: phase 1, development of a questionnaire with a list of potential risk factors; phase 2, sequential surveys with key informants using Delphi methods to prioritize the risk factors; and phase 3, consensus round with experts to agree the risk factors set. Full ethical approval was obtained for the study (IR.MUMS.NURSEREC.1397.034). Delphi survey methods, with anonymized feedback of results, involving key informants were used to develop the core outcome set (14, 15).

Summary of methods used to develop a core risk factor set for assessment of breast cancer risk in Iranian females.

Phase 1	<p>Identification of all potential risk factors for breast cancer (qualitative phase)</p> <p>Systematic literature searches to identify the risk factors of breast cancer</p> <p>Qualitative interviews with healthcare professionals regarding the risk factors of breast cancer.</p> <p>This produces a list of all potential risk factors (119 item).</p> <p>The list is grouped into 10 risk factor domains to avoid repetition</p>
Phase 2	<p>Prioritization of risk factors by key stakeholders</p> <p>Stakeholders from all referral centers of Iran are surveyed and asked to prioritize each risk factor base on their experience.</p> <p>The items are presented to health care professionals and items were rated in a liker type questionnaire</p> <p>Data are analyzed by the research group using predefined criteria to reduce the list of risk factors.</p> <p>This produces a list of 51 risk factors (with intermediate importance) ready for phase 3</p>
Phase 3	<p>Consensus round is held separately with key stakeholder groups</p> <p>Results of the survey are fed back to stakeholders and they are asked to reprioritize each risk factor.</p> <p>Items rated as 'unsure' are discussed and more voting is undertaken</p>

Phase 1: questionnaire development

A long list of risk factors was generated from an integrative review of the all studies about breast cancer risk factors that were published from 2005 to 2018 .

Semi-structured interviews with specialists were undertaken, which aimed to determine the potential risk factors for BC in Iran. The results of the integrative review of literature in the first phase of the study were used to design the questions for the first round. Examples of questions for experts include: "Based on your experience: What are the risk factors for breast cancer / What is the factor that increases the prevalence of breast cancer in Iranian women?". In order to analyze the Delphi results in the first round, the conventional content analysis method was used (figure 1) (16).

First, the interviews were transcribed verbatim and they were read several times for general and correct understanding. Then the text was considered as units of analysis. The units of analysis used for breast cancer risk factors included words, phrases, sentences and paragraphs. The risk factors categorized into domains by two independent researchers and dual extraction and categorization of outcomes with senior discussion if discrepancies occurred (17).

Phase 2: Delphi consensus methods

Then the specialists from all over the Iran were asked to score the importance of each risk factor for BC in Iran, according their experience of the patients in different convince of Iran on a 9-point Likert scale from 1 (not important) to 9 (extremely important) (figure 1). The scoring system was selected after discussion with the study team and experts in medical instrument development (AE and AT) to facilitate maximum discrimination between questionnaire items based on previous experience in this area, and has been used widely in this field (18–20). The questionnaire was piloted with professionals to check face validity, understanding and acceptability.

Identification of Delphi panel members

Key informants were defined as specialists who are involved in management of BC and would have an in-depth understanding of which risk factors should be measured in research. They were identified from breast and general surgeons, oncologists, nutritionist and palliative care specialists. There were no definitive rules for selecting and recruiting experts for the team, but the expertise of them was given more priority than the number of participants recruited (21).

Specialists were recruited purposively across the Iran. Maximum variation sampling was used to ensure adequate inclusion of all identified expertise with regard to the workplace (different referral cities from different convinces of Iran) and duration of practice to ensure a comprehensive representation of views (22).

Delphi surveys

Potential specialists at breast cancer management all over Iran were identified from previous research participation and recent publications and the members of the national medical boards. A summary of the purpose of the study and an invitation letter and questionnaire were sent to each professional by post. To ensure freedom of expression, anonymous participation was granted. Each participant provided data about his or her specific expertise and current affiliation before beginning to complete the questionnaire. The questionnaire asked participants if they have a specific opinion about any of the mentioned risk factors or risk factors that are not on the list. Non-responders were sent a reminder 2 weeks later. Batches of invitations were sent until the desired sample size was achieved.

The second-round questionnaires were analyzed by calculating the proportions of participants rating each item as very important (score 7, 8 or 9), moderate importance (score 4,5 or 6) and low important (score 1,2 and 3). After receiving the responses, we calculated the median of the attributed weights and the corresponding interquartile ranges (IQR) for each of the risk factors. The "very important" risk factors (median scored 7–9) included in the primary draft of the instrument, and the "low importance" risk factors (median score 1–3) were excluded. Moderate risk factors entered the third round of Delphi to reach a consensus.

Phase 3: consensus phase

All the "moderate importance" risk factors (median score 4-7) were retained for round 3 (figure 1). In round 3, participants received group feedback from round 2 in the form of the percentage of respondents rating each item as very, moderate or low important, in addition to their own score for that item from round 2. Specialists were asked to reprioritize the risk factors with moderate importance using 9-point Likert scale. Round 3 responses were analyzed with more stringent criteria. Items rated as very important (median score 7–9) by at least 70 percent of the professional group, were carried to the primary draft of the instrument. These cut-offs were selected for pragmatic reasons as there is currently no consensus regarding cut-off selection in Delphi studies (19, 23). Before the Delphi rounds, criteria for consensus regarding item inclusion and exclusion were agreed. The consensus round (round 3) concluded with the ratification of round 2 by all participants plus 4 other specialists (1 surgeon and 3 oncologists). Each participant obtained the Delphi results, including the median and IQR of all items, at the end of the Delphi study. The data analysis was conducted using SPSS 25 software in rounds 2 and 3 of Delphi.

Results

Phase 1: questionnaire development

Face-to-face interviews were analyzed qualitatively for 11 interviews with specialists (Table 1). The risk factors categorized into 10 domains (background of disease, drug use, environmental factors, lifestyle factors, nutritional factors, occupational factors, expose to radiation due to medical diagnosis or treatment, reproductive factors, socio-demographic factors and birth characteristics) by two independent researchers using the qualitative technique of content analysis³⁰, and dual extraction and categorization of risk factors with senior discussion if discrepancies occurred³¹. A domain was identified as a wide range of risk factors; for example, the domain hormonal risk factors, included the use of OCPs, HRT, ART, early menarche, late menopause, low parity, and.... After removing duplicate and similar items, a questionnaire containing 202 risk factors for breast cancer was prepared. Due to the time consuming and difficulty of answering a long 202-question questionnaire, some similar risk factors were combined and finally, after several sessions of consultation with the research team, a questionnaire containing 119 risk factors was obtained.

Characteristics of the participants in the first round are presented in the following tables. The first round of Delphi took place from March 2020 to February 2021.

Table 1
 Characteristics of the specialists' participants of the first round of
 qualitative Delphi

Variable	Number (percent)
Specialty	
Oncology	4 (37)
Gynecology (Oncology fellow)	2 (18)
Nutrition	1 (9)
Surgery (general- breast)	3 (27)
Palliative care	1 (9)
Length of Experience	
10-19	3 (27)
20-29	8 (73)
Place of Interview	
Specialized clinics	5 (45)
Private office	2 (18)
Office of specialty group in hospital or faculty	4 (37)

Phase 2: Delphi consensus methods

In the second round of Delphi, draft of questionnaire obtained from a literature review and the first round of Delphi, were sent to specialists via e-mail.

A total of 60 specialists from ten convince of Iran were invited to participate in round 2. Of these, 30 (50 percent) responded; 25 (9.0 percent) declined, 3 (5 percent) experts said they were not active in the breast cancer field and 2 (3.3 percent) postponed the answer to a time beyond the study time. The characteristics of the specialists participating in the second round of Delphi were as follows: three reproductive health specialists, twelve radio-oncologists, eleven general or breast surgeons, four gynecologists-gynecological oncology fellowships. Participants were from Kerman, Shiraz, Mashhad, Rasht, Tehran, Tabriz, Babol-Babolsar, Ahvaz and Isfahan. The average length of participants' experience in BC management was 18.2 years.

In round 2, 43 (36 percent) risk factors were diagnosed as "low important" and met the exclusion criteria (Table 2), 25 (21 percent) risk factors with "very important" label included in primary draft of risk assessment instrument (Table 3) and 51 (43 percent) risk factors were carried forward to round 3. The second round of Delphi lasted six months (February to August 2020) due to the COVID-19 pandemic.

Table 2
The risk factors diagnosed as "low important" in second round of Delphi according to specialists opinion

No	Risk factor	Median	IQR	Mean	SD
1	cholecystitis	1	2	2.13	1.78
2	Allergy (serum IgE)	1	1	1.6	1
3	Multiple sclerosis	2	3	2.6	1.94
4	Rheumatoid Arthritis	2	4	3	2.07
5	Parkinson	1	2	2	1.55
6	Migraine	1	1	1.57	0.97
7	Tonsillectomy	1	0	1.5	1.11
8	Bone high density	2	2	2.6	2.11
9	Hypothyroidism	1	1	1.83	1.21
10	Mononucleosis/ IgG antibody of cytomegalovirus	2	2	2.27	1.41
11	Insulin	2	2	2.4	1.45
12	Antidepressant drugs	2	3	2.5	1.57
13	Multivitamins	1	1	1.57	0.86
14	Antibiotics	1	1	1.37	0.67
15	Lowering cholesterol statins	1	0	1.33	0.71
16	Antihypertensive drugs	1	1	1.4	0.68
17	Diuretics	1	1	1.4	0.72
18	Digoxin	1	1	1/47	0.73
19	Traffic noise	2	2	2.37	1.562
20	Cleaning / Detergent / Air freshener Products	2	2	2.53	1.41
21	Wearing tight bra	2	3	2.83	2.35
22	Egg consumption	2	2	2.17	1.6
23	Calcium deficiency	2	2	2.93	1.91
24	Black tea	1	1	1.47	0/73
25	High Calcium intake	1	1	1.63	1.07

No	Risk factor	Median	IQR	Mean	SD
26	Vegetable oil	1	1	1.67	1.18
27	Olive oil	1	1	1.63	1.25
28	High consumption of milk/ Dairy products	2	2	2.2	1.54
29	Animal oil (Kermanshahi)	2	2	2.4	1.71
30	High Fe diet	1	1	1.4	0.86
31	Vitamin deficiency	2.5	3	2.4	1.85
32	Cabin attendants	2.5	3	2.8	1.79
33	Housewife	1	1	1.7	1.21
34	Teacher	1.5	2	1.87	1.07
35	Farmer	1	1	1.7	1.21
36	Pregnancy	2	6	3.73	3.3
37	Taller height	1	2	2	1.49
38	occupied	2	4	2.87	1.87
39	Higher age of parents at birth	2	2	2.07	1.34
40	High birth weight	1	1	1.87	1.31
41	Mother's overweight at beginning the pregnancy	2	2	2.23	1.63
42	Preterm	1.5	1	1.7	0.79
43	post term	1	1	1.7	0.88

Table 3

The risk factors diagnosed as "very important" in second round of Delphi according to specialists opinion

No	Risk factor	Median	IQR	Mean	SD
1	immunodeficiency	6.5	6	5.4	2.85
2	Dense breast	6	3	5.7	2.47
3	Breast atypical hyperplasia	7	4	6.4	2.3
4	History of breast cancer	9	1	8.33	1.24
5	History of breast biopsy	6	4	5.67	2.72
6	Oral contraceptive pills	6	2	5.93	1.87
7	Androgen therapy	6	3	5.3	2.48
8	Ovary stimulators/IVF drugs	6	2	6.13	1.61
9	Hormone replacement therapy/ Menopausal hormone therapy	7	3	6.47	1
10	Unopposed estrogen	6.5	3	6.43	2.13
11	Environmental ionizing ray	6	4	5.73	2.46
12	Smoking/ passive smoking	6	2	6	1.84
13	Stressful life	7	5	6.3	2.25
14	High BMI/ Obesity/ Overweight	6	3	6.57	1.68
15	High dose chest radiation	7.5	5	6.57	2.69
16	High age at first child birth	6	4	6.4	2.28
17	Early menarche	6	5	5.6	2.59
18	Late menopause	6	6	5.63	2.85
19	Nulliparity	6	6	5.47	2.8
20	Family history of breast cancer	9	1	8.23	1.14
21	Family history of breast cancer under 40 years	9	1	8.5	0.86
22	Family history of ovary cancer	8.5	2	7.8	1.65
23	Family history of sarcoma	6	4	5.43	2.39
24	Female gender	9	1	8.33	1.35
25	Increasing age	7.5	4	6.83	2.23

Phase 3: consensus round

The third round of Delphi took place in September 2020. All round 2 respondents were invited to participate in round 3. Participants were asked (similar to the previous round) to determine the importance of each factor based on the 9-point Likert scale. Of these, 22 (73.3 percent) completed and returned the questionnaire. Also, 4 specialists (different from the second round) who were a surgeon and 3 oncologists were also participating in round 3 (Tumor Board Meeting of Ghaem Hospital – 17/8/2020). So we had a total of 26 responses, and the response rate in round 3 was 86.7%. Demographics of professional participants were similar between rounds 1 and 2. The characteristics of the participants of the third round of Delphi were as follows: 7 surgeons (general-breast), 10 oncologists, 2 reproductive health specialists, 7 gynecological oncology fellowships, from Mashhad, Tehran, Ahvaz, Rasht, Isfahan, Shiraz, Kerman and Tabriz. The average length of work experience of the participants was 19 years.

In the third round, 70% of participants (at least 18 people) did not agree on the importance of any of the risk factors.

So, a questionnaire containing 25 important risk factors for breast cancer, according to Iranian context, remained in the primary draft. Of these 25 items, "female gender" and "personal history of breast cancer" were excluded. Because the tool is designed to assess the risk of breast cancer in Iranian women and to start screening on time based on the personal risk. So naturally it does not include women who have a positive history of breast cancer. Therefore, a questionnaire containing 23 risk factors entered the instrument development process. The final results of the third round of the Delphi are shown in Table 4.

Table 4

Risk factors that were reprioritized in the third round of Delphi according to specialists' opinion

No	Risk factor	Median	IQR	Mean	SD	Consensus (%)
1	Infertility	8	4	7.21	2.02	62.5
2	Metabolic syndrome	5	3	5.29	2.1	45.8
3	Diabetes type 2	6	2	5.42	2.13	54.2
4	Hyperprolactinemia	3	2	3.17	1.66	12.5
5	Systemic lupus erythematosus	2.5	3	2.92	2.13	16.7
6	Endometriosis	3.5	3.75	3.46	2.21	20.8
7	Uterine leiomyoma	2	2.75	2.88	1.92	12.5
8	Ovarian cyst/ Polycystic ovary syndrome	5.5	3	5.33	1.83	50
9	Psychiatric disorders	4	2	4.04	1.85	16.7
10	Breast proliferative benign disease	5	2.75	4.71	1.83	45.8
11	Mastalgia	4	3	4.63	2.02	37.5
12	Progestrons	5	3.75	4.5	2.04	29.2
13	Hormonal intrauterine device	3	3.75	3.8	1.72	20.8
14	Contraceptive implants	3.5	3	3.92	1.93	16.7
15	Residence near a food or beverage factory	3	4	3.92	2.17	33.3
16	Residence near industrial factory (ceramics, detergents)	3	3.75	4.25	2.27	29.2
17	Exposure to light at night	3	2.75	3.46	1.53	8.33
18	Pesticides/ insecticides	4.5	3	4.5	1.98	33.3
19	Air pollution	4.5	3.75	4.83	2.06	37.5
20	Water pollution	5	4	4.79	2.11	41.7
21	Exposure to strong electromagnetic fields	5	3.75	5.08	2.17	37.5
22	Exposure to electromagnetic fields of home appliances	4.5	4.5	4.67	2.18	33.3
23	Living in a low sunny area	5	1	4.38	1.49	16.7
24	Sedentary life	6	2.75	6	1.47	58.33
25	Alcohol consumption	6.5	2.75	6.04	1.97	58.33

No	Risk factor	Median	IQR	Mean	SD	Consensus (%)
26	Insufficient sleep / short sleep	5	3	5.25	1.87	41.7
27	Excessive use of cosmetics	4.5	4	3.96	2.07	29.2
28	Singleness over the age of 30	6	2.75	6.08	1.53	62.5
29	Vitamin D deficiency	5	2	5.08	1.44	29.2
30	Consumption of factory and canned food	5	2	5	1.18	29.2
31	High calorie/ energy intake	6	2	5.96	1.57	58.33
32	Full fat/ fried diet	6	3	5.5	1.79	54.2
33	Meaty diet	5	3	5.46	1.69	45.8
34	Low consumption of fruit and fresh vegetables	5	3	5.25	1.92	37.5
35	Consume food or drink in plastic containers	5	2	4.42	1.56	20.8
36	Irregular meals	3.5	2	4	1.72	20.8
37	Night work/ Shift work	5	3.75	5.17	2.1	37.5
38	Work in garment factories / textile weaving / canning / industries (metal, plastic, dyeing)	3	3	3.5	1.87	20.8
39	Makeup artists/hairdresser	5	3	4.42	1.79	37.5
40	Contact with volatile organic chemicals (laboratory personnel, army personnel)	3	2.75	3.88	1.62	26
41	Diagnostic radiation (mammography)	4	3.75	4.58	2.3	33.3
42	Frequent chest x-ray in tuberculosis	4.5	3	4.67	2.14	37.5
43	Induced abortion	4	3	4.33	1.83	29.2
44	Spontaneous abortion	4	3	3.46	1.56	8.33
45	Low parity	6	2.75	5.88	1.83	62.5
46	Low breastfeeding	5	3.75	5.58	2.10	50
47	High socio-economic status	5	3.75	4.71	1.92	41.7
48	Low socio-economic status	5	3.75	4.75	1.65	33.3
49	Big breast	5	2.75	4.75	1.73	29.2
50	Family history of gastrointestinal cancer	5	2.75	5.46	1.93	45.8
51	Late marriage	6	3	5.83	1.93	58.33

Discussion

The present qualitative Delphi study was conducted in three rounds with the aim of developing a breast cancer risk assessment tool for Iranian women. Breast cancer risk assessment tools (BCRATs) can determine a person's risk of developing breast cancer, thereby making more accurate screening recommendations, changes in high-risk behaviors, and preventative measures (8, 24).

The present study has used rigorous consensus methods to develop a list of important risk factors for breast cancer in Iran. The important risk factors set was developed following detailed scrutiny of the literature and qualitative analysis of the interviews with professionals to identify all potentially relevant risk factors, followed by an iterative consensus process using the views of 30 professionals involved in the provision of specialist care. The results of the study showed that in the third round, 70% of the participants (at least 18 specialists) did not agree on the importance of any of the risk factors with moderate risk and 23 important risk factors for the instrument were agreed.

In the third round, none of the items related to moderate risk factors were agreed upon by the panel members, and this could express a favorable consensus on important risk factors. The high agreement between the second and third rounds was an important factor in stopping the continuation of the rounds. We are unaware of any previous Delphi consensus on most important breast cancer risk factors in Iran.

To succeed in risk assessment of diseases, it is important to carry out systematic risk identification and attention to the country in which the tool will be used. Therefore, important risk factors should be identified and prioritized for a country to improve the quality and efficiency of the risk assessment tool using a convenient method. Therefore, various critical risk factors for breast cancer can be determined and prioritized with Delphi method. Investigating these issues using qualitative methods in multiple global settings has not been conducted to date. Therefore, this research will also contribute to fixing this gap in the literature. In other studies, the Delphi method has been used to prepare a list of effective or risk factors in various medical and non-medical fields using the opinion of experts (18, 25–28). Similar to the present study in the same studies, the modified Delphi method has been used in some Delphi quality studies and in almost all studies the Delphi study has been performed in three rounds.

Given that existing tools for assessing the risk of breast cancer in Iran do not perform appropriately, this study intends to determine the risk factors for breast cancer in Iranian women and design an Iranian risk assessment tool to determine the risk and recommend early screening with more accurate methods in high-risk women.

Strengths And Limitations

In addition, the dispersion of a group of specialists in the country and do not selection of a panel of experts from one region is another strength of this study because the risk factors of breast cancer in Iran is not the same and due to the geographical spread of Iran, experts' opinion in different regions of Iran contributed to the comprehensiveness of the study results. Also, The avoidance of dominance by

individuals through anonymity was fully observed during the study (29). In addition, all specialists had several years of experience in their profession and it can be concluded that they adequately addressed the theoretical and practical aspects of the management of breast cancer. The high response rate in round 3, resulted partly from our method of reporting indicators, and from the individualized reports, both of which helped to engage participants in the process. The lower response rate in round 2 is discussed in the limitations section. Also, the mixed method design of study in the pre-Delphi stage and integrative review of literature to identify risk factors can be considered as another strength because Delphi was not done only based on the opinion of experts and the findings of the integrated review in addition to the opinion of experts in this study was considered by the authors, which contributed to the comprehensiveness of the results. Finally, the thresholds set for importance and consensus are somewhat arbitrary. We cannot fully rule-out that setting these thresholds differently would affect the overall message of this paper to some extent. By providing the complete list of responses along with the medians and the interquartile ranges we give readers the opportunity to determine the consequences if different thresholds would have been selected.

One of the limitations of the study is that the response rate in round 1 was only 50 percent, indicating that not all specialists had the time or desire or motivation to participate in the study. Data on these individuals were not collected as they did not give consent to participate, so it was not possible to completely investigate differences between respondents and non-responders. However, the use of a rigorous maximum variation sampling strategy ensured that all subgroups of specialists were sufficiently sampled to ensure that the sample was as representative of the professionals involved in the BC care as possible. On the other hand, Delphi rounds were faced with the peak of the corona epidemic in Iran, which led to the cancellation of the National Congress of Breast Cancer in Iran and the possibility of using specialized panels and new results of Iranian studies. Also, due to the corona epidemic in Iran, it was not possible to easily access the panel members because all the medical staff were involved in this disease and this prolonged the rounds. Another limitation of the study relates to the conditions of the Corona epidemic, which made face-to-face interviews difficult.

Conclusion

In this qualitative Delphi survey, a national group of specialists reached a consensus on the most important breast cancer risk factors in Iran that could be used to develop a risk assessment tool for breast cancer in Iranian females for using in primary care consults. Currently, no breast cancer risk assessment tool exists for Iranian women. The most important finding of the present study can be considered to the consensus of over 70% of the experts' group of important risk factors for BC in Iran. An instrument for assessing the risk of breast cancer will be developed as the next part of the mixed method study.

Declarations

Ethics approval and consent to participate:

Ethics approval was granted from the Mashhad university of medical science Mashhad, Iran under code of IR.MUMS.NURSEREC.1397.034 (Grant ID: 970008). Written signed informed consent was obtained from each study participant. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication:

Not Applicable.

Availability of data and materials:

The interviews transcriptions of the first round and the datasets generated and analyzed during the second and third round of Delphi were conducted in Persian, so they are not provided in the supplementary file and will be available upon reasonable request from corresponding author.

Competing interests:

The authors declare that they have no competing interests.

Funding:

This paper has been extracted from the first author's Ph.D. thesis in Reproductive Health and was funded by Mashhad University of Medical Sciences, IRMUMSNURSEREC.1397.034 [grant no. 970008].

Authors' contributions:

EM, AT and RLR were the major contributors to the overall study conception and design. The interviews and data collection were performed by EM. Review of the literature for obtaining a comprehensive list of breast cancer risk factors was done with EM and TFN. Data analysis and initial draft were done by all authors. AT supervised the research process. All authors analyzed and interpreted the data. The manuscript was drafted by EM and TFN and revised critically in consultation with all authors. Also, all authors read and approved the final manuscript.

Acknowledgement:

The authors are grateful to all the experts who took part in the study for sharing their experiences.

Authors' information

1. Department of Midwifery, Faculty of Nursing and Midwifery, Mashhad Medical Sciences, Islamic Azad University, Mashhad, Iran
2. Department of Midwifery, School of Nursing & Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran.

3. Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.
4. Behavioural Sciences Research Center, Life style institute, Baqiyatallah University of Medical Sciences, Tehran, Iran.
5. Nursing Faculty, Baqiyatallah University of Medical Sciences, Tehran, Iran Cancer Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
6. Department of Epidemiology, School of Public Health, Mashhad University of Medical Sciences, Mashhad, Iran.

References

1. Hirsch BR, Lyman GH. Breast cancer screening with mammography. *Current Oncology Reports*. 2011;13(1):63–70.
2. Nafissi N, Khayamzadeh M, Zeinali Z, Pazooki D, Hosseini M, Akbari ME. Epidemiology and histopathology of breast cancer in Iran versus other Middle Eastern countries. *Middle East Journal of Cancer*. 2018;9(3):243–51.
3. Naghibi SA, Shojaizadeh D, YAZDANI CJ, Montazeri A. Breast cancer preventive behaviors among Iranian women: a systematic review. 2015.
4. Tate L, Feeney A. The principles of risk assessment. *Medicine*. 2012;40(11):574–6.
5. Cintolo-Gonzalez JA, Braun D, Blackford AL, Mazzola E, Acar A, Plichta JK, et al. Breast cancer risk models: a comprehensive overview of existing models, validation, and clinical applications. *Breast cancer research and treatment*. 2017;164(2):263–84.
6. Mohammadbeigi A, Mohammadsalehi N, Valizadeh R, Momtaheni Z, Mokhtari M, Ansari H. Lifetime and 5 years risk of breast cancer and attributable risk factor according to Gail model in Iranian women. *Journal of pharmacy & bioallied sciences*. 2015;7(3):207.
7. Panahi G, Shabahang H, Sahebghalam H. Breast cancer risk assessment in Iranian women by Gail model. 2008.
8. Solikhah S, Nurdjannah S. Assessment of the risk of developing breast cancer using the Gail model in Asian females: A systematic review. *Heliyon*. 2020;6(4):e03794.
9. Farahmand L, Shojamoradi MH, Najafi M, Majidzadeh-A K. The Applicability of the Gail Model in Iranian Population. *Multidisciplinary Cancer Investigation*. 2017;1(2):13–9.
10. Khazaee-Pool M, Majlessi F, Nedjat S, Montazeri A, Janani L, Pashaei T. Assessing breast cancer risk among Iranian women using the Gail model. *Asian Pacific Journal of Cancer Prevention*. 2016;17(8):3759–62.
11. Bener A, Çatan F, El Ayoubi HR, Acar A, Ibrahim WH. Assessing breast cancer risk estimates based on the Gail model and its predictors in Qatari women. *Journal of primary care & community health*. 2017;8(3):180–7.

12. Doward LC, Meads DM, Thorsen H. Requirements for quality of life instruments in clinical research. *Value in Health*. 2004;7:S13-S6.
13. Hallowell MR, Gambatese JA. Qualitative research: Application of the Delphi method to CEM research. *Journal of construction engineering and management*. 2010;136(1):99–107.
14. Al-Yateem N, Al-Tamimi M, Brenner M, Al Tawil H, Ahmad A, Brownie S, et al. Nurse-identified patient care and health services research priorities in the United Arab Emirates: a Delphi study. *BMC health services research*. 2019;19(1):1–8.
15. Shi C, Zhang Y, Li C, Li P, Zhu H. Using the Delphi Method to Identify Risk Factors Contributing to Adverse Events in Residential Aged Care Facilities. *Risk Management and Healthcare Policy*. 2020;13:523.
16. Elo S, Kyngäs H. The qualitative content analysis process. *Journal of advanced nursing*. 2008;62(1):107–15.
17. Macefield RC, Jacobs M, Korfage IJ, Nicklin J, Whistance RN, Brookes ST, et al. Developing core outcomes sets: methods for identifying and including patient-reported outcomes (PROs). *Trials*. 2014;15(1):1–12.
18. Potter S, Holcombe C, Ward J, Blazeby J, Brookes S, Cawthorn S, et al. Development of a core outcome set for research and audit studies in reconstructive breast surgery. *The British journal of surgery*. 2015;102(11):1360.
19. Sinha IP, Smyth RL, Williamson PR. Using the Delphi technique to determine which outcomes to measure in clinical trials: recommendations for the future based on a systematic review of existing studies. *PLoS Med*. 2011;8(1):e1000393.
20. Williamson P. Comet Initiative: Core Outcome Measures in Effectiveness Trials. 20 July 2016. 2016.
21. Minghat AD, Yasin RM, Udin A. The application of the Delphi technique in technical and vocational education in Malaysia. *Internafional Proceedings of Economics Development and Research*. 2012;30(1):259-64.
22. Teddlie C, Yu F. Mixed methods sampling: A typology with examples. *Journal of mixed methods research*. 2007;1(1):77–100.
23. Bartlett SJ, Hewlett S, Bingham CO, Woodworth TG, Alten R, Pohl C, et al. Identifying core domains to assess flare in rheumatoid arthritis: an OMERACT international patient and provider combined Delphi consensus. *Annals of the rheumatic diseases*. 2012;71(11):1855–60.
24. Gail MH. Twenty-five years of breast cancer risk models and their applications. *JNCI: Journal of the National Cancer Institute*. 2015;107(5).
25. Bodmer NS, Häuselmann HJ, Frey D, Aeberli D, Bachmann LM. Expert consensus on relevant risk predictors for the occurrence of osteoporotic fractures in specific clinical subgroups–Delphi survey. *BMC rheumatology*. 2019;3(1):1–5.
26. Wahid SS, Pedersen GA, Ottman K, Burgess A, Gautam K, Martini T, et al. Detection of risk for depression among adolescents in diverse global settings: protocol for the IDEA qualitative study in Brazil, Nepal, Nigeria and the UK. *BMJ open*. 2020;10(7):e034335.

27. Khoshfetrat R, Sarvari H, Chan DW, Rakhshanifar M. Critical risk factors for implementing building information modelling (BIM): a Delphi-based survey. *International Journal of Construction Management*. 2020:1–10.
28. Murphy M, Hollinghurst S, Salisbury C. Agreeing the content of a patient-reported outcome measure for primary care: a Delphi consensus study. *Health Expectations*. 2017;20(2):335–48.
29. Humphrey-Murto S, Varpio L, Wood TJ, Gonsalves C, Ufholz L-A, Mascioli K, et al. The use of the Delphi and other consensus group methods in medical education research: a review. *Academic Medicine*. 2017;92(10):1491–8.

Figures

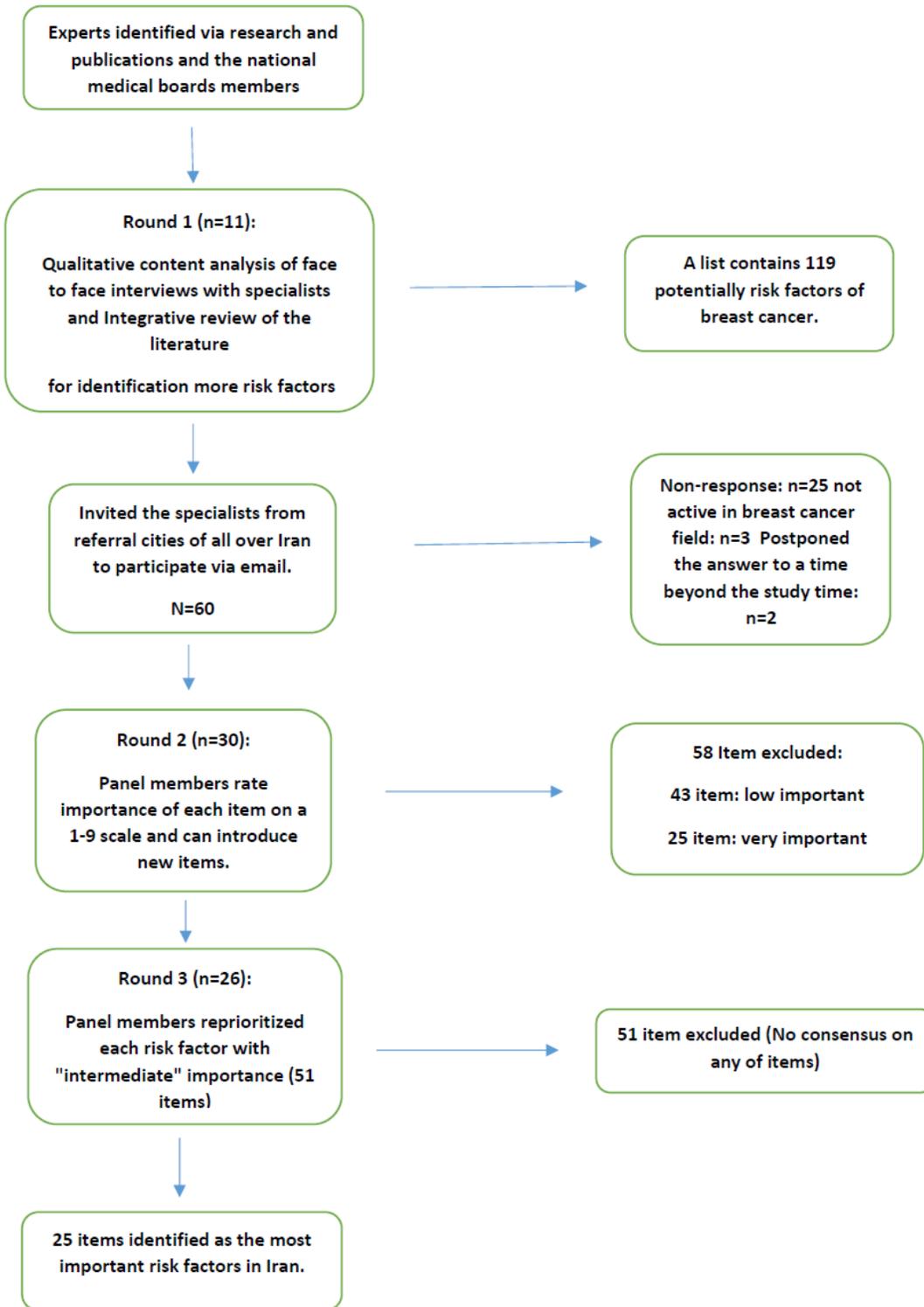


Figure 1

Flowchart of how information was collected over the three Delphi rounds.