RESEARCH ARTICLE

Knowledge, Practice, Preferences and Willingness-to-Pay for Mammographic Screening Tests among Iranian Women: A Contingent Valuation Method

Akram Karimabadi[1], Elahe Pourahmadi[2], Sadegh Bafandeh Imandoust[1], Afsane Nikoukar[3], Mehdi Aryafar[2]*

Abstract

Objective: This study sought to investigate Iranian women's preferences and willingness-to-pay (WTP) based on the level of breast self-examination and mammography screening practice and knowledge, including risk factors, signs and symptoms, and early detection methods via mammography screening. **Methods:** This is a descriptive, cross-sectional, population-based study conducted from October to March 2020 on over 35-year-old women living in Mashhad, selected through the convenient sampling method applied in health centers of Mashhad city. To measure the willingness to pay, the study participants were asked for their preferred choices concerning out-of-pocket payment for screening. **Results:** More than one-half (58.6%) of the study's sample size had an intermediate level of knowledge regarding breast cancer's risk factors, and only 12.7% of them had an unsatisfactory level of knowledge. However, most of the participants had a poor level of practice towards breast self-examination and mammography screening. The results of measuring the willingness to pay (WTP) indicated that 11.5% of the participants were not willing to pay at all for mammography breast cancer screening, while 53.3% of the participants were willing to pay 2.27 to 3.41 \$U.S, and 35.2% of the participants were willing to pay more than 3.41 \$U.S for mammography breast cancer screening. **Conclusion:** Any attempt to promote breast cancer screening among Iranian women should primarily focus on increasing such indices as awareness, education, health status, and household income. It should be noted that the majority of the participants possessed an average level of knowledge. Moreover, women lack appropriate information about breast cancer and its' early detection measures. However, it was found that self-employed women were more likely to practice breast self-examination than the women employed in governmental organizations, which could be attributed to the fact that self-employed women could dedicate more time to checking their breasts and practicing breast self-examination.

Keywords: Breast cancer screening- willingness-to-pay- knowledge- mammography

Introduction

Breast cancer is the most common cancer in women, imposing substantial social, economic, and health burdens on individuals and society annually (Daroudi et al., 2015; Sechopoulos and Mann, 2020). Considering the demographic changes in the populations, it is predicted that the global burden of cancers will increase from 13.3 million cases in 2010 to 21.4 million cases in 2030 (Heer et al., 2020; Dsouza et al., 2021). Breast cancer in women is a significant health problem worldwide. It is the most commonly diagnosed cancer among women in developed and developing countries and the leading cause of death among women globally (Ferlay et al., 2010). Moreover, breast cancer was identified as the leading cause of global inflection with cancer in 2020, with an estimated 2.3 million newly diagnosed cases, representing 11.7% of all cancer cases worldwide (Sung et al., 2021). It is the fifth cause of cancer mortality worldwide, with 685,000 deaths each year (Zeng et al., 2021). In fact, breast cancer accounts for 1 in 4 cancer cases and 1 in 6 cancer-induced deaths among women, ranking first in the cases diagnosed with cancer (Sung et al., 2021).

Early diagnosis of cancer significantly increases the chances of successful treatment. There are two primary components of early diagnosis of cancer: health promotion, including education and screening. Increasing the social awareness regarding the cancer and performing screening for common cancers provide for the most cost-effective approach to prevent and control different types of cancer, bearing high public health potential(Abu, 2020; Mulmi et al., 2021).

*[1]Department of Economics, Payame Noor University (PNU), Tehran, Iran. [2]Social Determinants of Health Research Center, Department of Health and Management, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran. [3]Department of Agricultural Economics, Payame Noor University (PNU), Tehran, Iran. *For Correspondence: ar7315834@gmail.com*

Physicians' beliefs influence their breast cancer screening recommendations and practices. Adopting more effective strategies in empowering physicians and preparing them to prescribe appropriate screening tests are key factors that ultimately contribute to early diagnosis and optimal breast cancer prognosis (Wu et al., 2020).

Three common approaches to breast cancer screening include breast self-examination, physical examination by a physician, and mammography (Miller and Baines, 2011; Shieh et al., 2017). Monthly breast self-examination is currently under discussion as a screening method (Bokaie and Lotfi, 2013). However, the American Cancer Society (ACS) does not recommend a monthly breast self-examination, emphasizing that the detection of symptoms often occurs unorganized while women are taking a shower or getting dressed (Rahman et al., 2019). According to the ACS, self-awareness is more effective than structured self-examination. Accordingly, over-20 women should be aware of breast self-examination's possible benefits and limitations (Elasbali et al., 2019).

Early diagnosis of breast cancer increases the chances of successful treatment and survival and reduces mortality and disease incidence trends (Francies et al., 2020). Diagnostic strategies include breast self-examination, clinical examination by a physician, and mammography (Al-Mousa et al., 2020), among which the latter is considered as an effective screening method for diagnosing breast cancer at early stages (Grady et al., 2017). In fact, breast cancer could be diagnosed through mammography 1-3 years before its symptoms appear in the patient (Venkataramanan et al., 2020). Therefore, timely mammography screening in 40- year-old or older women could help prevent breast cancer mortality by 15- 30% (Irani et al., 2021).

The World Health Organization (WHO) has also attracted global attention to the significant increase in breast cancer cases in recent years and warned of the growing trend of the cancer in the coming years, suggesting early diagnosis as an essential strategy in controlling breast cancer (Akinyemiju, 2012). In fact, this strategy which could increase the chances of breast cancer diagnosis in the early stages of the disease tends to be more curative (Phi et al., 2018).

The breast cancer screening program seeks to diagnose the breast masses early when they are small, and the patient still displays no specific clinical symptom. Therefore, early diagnosis of benign and malignant masses may alleviate the concerns of the patient's family. People who get screened are those with no signs and symptoms of breast cancer (Gardezi et al., 2019; Ginsburg et al., 2020).

According to the studies conducted from 2004 to 2015, the most common types of cancer in Iran include gastrointestinal cancer in males and breast cancer in females, and the age of women diagnosed with the cancer are approximately 41-45 years old, being ten years younger than that of the development countries (Askarzade et al., 2019).

Willingness to pay-contingent valuation method (WTP-CVM) has emerged as one of the most reliable tools for pricing the early diagnosis of breast cancer. In fact, the contingent valuation method (CVM) is used to estimate the willingness to pay (WTP), which itself is measured in cost-benefit analysis in economics (Ghaderi et al., 2012).

As few studies have so far been conducted to examine the level of knowledge, attitude, practice towards breast self-examination and mammography screening, and willingness to pay for early diagnosis of breast cancer in over 35-year Iranian women, this study sought to investigate women's preferences and willingness-to-pay (WTP) in terms of the level of practice towards breast self-examination and mammography screening, and breast cancer knowledge, including risk factors, signs and symptoms, and early detection methods, performing mammography screening on over 35-year-old women living in Mashhad, the largest city in eastern Iran.

Materials and Methods

Study design, sampling, and population of the study

This study is a descriptive, cross-sectional, population-based research conducted from October to March 2020 among over 35-year-old women living in Mashhad. To this end, the study's participants were selected from among those who visited Mashhad's health centers using convenient sampling.

The study's target population comprised of Iranian females who were 35 years old or over living in Mashhad (Northeast of Iran). Data were collected from five culturally and economically different regions of Mashhad, which were selected based on expert opinions and represented all parts of the city. The samples were randomly collected in proportionate to the population of each region.

Data Collection

As Mashhad has 13 urban areas, the largest health center was selected from each municipal district. From each center, 30 female clients who were over 35 years old were selected. Totally, 384 people were selected as the sample size of the study, using the Cochran formula.

In similar studies, 50% of the participants had performed regular mammogram. Based on this proportion, the sample size was calculated using the following equation: Sample size (n) = $(Z_{1-\alpha/2})^2 \times pq/d^2$, where, Z =1.96 for 95% confidence interval (Prevalence (p) = 0.5; Compliment of P (q) =1-0.5= 0.5, d=0.05).

Thus, based on a 95% confidence level and 10% p allowable error (d), the sample size included 384 cases.

The study's participants were selected via nonprobability purposive sampling. The data were collected by the corresponding author and the first author via entirely voluntarily face-to-face interviews with women who visited the health centers. Moreover, a researcher-developed questionnaire was administered, comprising five parts, whose items concerning the women's willingness to pay, knowledge of breast cancer, practice towards breast self-examination and mammography screening, and preferences were derived from previous studies (Sabermahani et al., 2017; Mathioudakis et al., 2019; Rahman et al., 2019; Al-Mousa et al., 2020). The first part of the questionnaire was to elicit demographic background regarding the respondents'

age, education, working status, marital status, housing status, domicile, income level, health insurance coverage, voluntary supplementary insurance, family size, health index, knowledge index, practice index, and personal or family history in terms of breast cancer.

The second part examined the participants' knowledge of breast cancer's risk factors (13 items), the third explored the respondents' knowledge concerning breast cancer's signs and symptoms (7 items), and the fourth part investigated the participants' practice of breast cancer's early diagnosis (3 items). Finally, the last part attempted to examine the participants' willingness to pay for performing mammographic breast cancer screening tests using the contingent valuation method. The required time to fill out the questionnaire ranged from 5 to 20 minutes.

As mentioned before, the contingent valuation method (CVM) was used in this study to estimate the willingness to pay (WTP), which is theoretically based on a cost-benefit analysis (CBA) in an economic evaluation. The Contingent Valuation Method (CVM) is usually employed to value goods that are not available in the market (Phelps et al., 2018). To measure the willingness to pay, the participants' preferred choices concerning the out-of-pocket payment for screening were asked. Contingent Valuation estimates the value that a person assigns to a product. Instead of inferring individuals' willingness to pay (WTP) for receiving specified goods or services based on observing their behaviors in regular marketplaces, the approach asks people to report their willingness to pay in that regard directly.

Statistical analysis

This study used the Excel 2013 software to summarize and analyze the data collected by the questionnaire. Moreover, the study used the SPSS software for descriptive analysis of the variables involved and the STATA 14 software for estimating the sequential logistic regression (SLR) to examine the factors associated with willingness to pay for breast cancer screening with mammography.

The score of the knowledge-related items was calculated by adding the correct answers, dividing them by the overall number of the relevant items, and multiplying the number by 100%. The score was used to report the results in terms of poor (>29.99%), intermediate (30%–65%), and good to excellent knowledge (>65%).

Results

Participants' characteristics

Overall, 384 women participated in this study whose average age was 44.5 ± 7.86 years. Sixty-five percent (65%) of the participants were 20-45 years old. The participants' average family size was 4 ± 1, and the average income of most of the participants ranged from 80± 16.75 to 240± 25.75 $ U.S. per month (1 $ U.S. = 250000 Iranian Rials). The highest level of education belonged to the bachelor's degree. However, less than half of the participants held bachelor's degrees (38.5%). Furthermore, more than half of the participants were married (44.9%), most of whom were housewives

Table 1. Frequency Distribution of Respondents' Knowledge Risk Factors

Number	Items	No (%)	Don't Know (%)	Yes (%)
1	Increasing age	13	18	69
2	Early menarche at the age of ≤ 12 years	33	45	22
3	Late menopause at the age of ≥ 55 years	24	48	28
4	Late pregnancy reduces the incidence of breast cancer	28	21	51
5	Bearing the first child at the age of ≥ 30	27	18	55
6	No breast-feeding	12	16	72
7	Recent long-term use of hormonal replacement therapy (estrogen and progestin)	5	72	23
8	Smoking	4	10	86
9	Obesity	17	44	39
10	Exposure to radiation at a young age (adolescence and early adulthood) in females could	6.2	57.5	36.5
11	Current use of oral contraceptive pills	45.6	15.9	38.5
12	Positive family history of breast cancer	3.6	5	91.4
13	Consumption of fatty foods increases the risk of breast cancer	28	14	58.0

YES, Refers to the correct answer; Abbreviation, %, percent

(288 women (75% of the participants)). Also, 87% of the participants were covered by health insurance, and 35% of them had supplementary health insurance. According to the study's results, 30% of the participants had a family history of breast cancer, and only 9.4% of them were previously diagnosed with breast diseases.

The participants' knowledge of Breast Cancer's risk factors and signs and symptoms

Table 1 shows the respondents' knowledge concerning each item of breast cancer's risk factors. According to the

Table 2. Frequency Distribution of Respondents' Knowledge Cancer Signs and Symptoms

Number	Items	No (%)	Don't Know (%)	Yes (%)
1	Skin thickening and orange peel texture to the skin	24	43	33
2	Nipple changes (inversion/retraction)	29	30	40
3	Painless breast lump is a warning sign Swollen axillary glands	2	5	93
4	Redness or swelling of the breast	10	39	51
	Breast warmth and itching			
5	Nipple changes Ulceration over breast	35	20	46
6	Asymmetry of breasts	13	32	55
7	Milky discharge from the nipple and bloody discharge from the nipple	2	10	88

%, percent

Table 3. Frequency of Breast Self-Examination, Clinical and Mammography among Respondents

Number	Questions	Never	Once a month	Once a year	Once every 2-3 years	Total
1	Have you ever had a breast self-examination?	178 (46.40)	144 (37.50)	49 (12.70)	13 (3.40)	384 (100)
2	Have you ever had a clinical breast exam (by a doctor / midwife)?	242 (63)	12 (3)	11 (3)	119 (31)	
3	Have you ever had a mammography?	308(80)	1 (0.3)	28 (7.3)	47 (12.2)	

table, participants had limited knowledge regarding the fact that early menarche at the age of ≤ 12 years may cause breast cancer (22%). However, their knowledge about the signs and symptoms of breast cancer, including family history, smoking, aging, and late pregnancy, bearing the first child at the age of ≥ 30, and consuming fatty foods, was generally good (>50%) (See Table 1).

The participants' knowledge concerning breast cancer and its signs and symptoms

Table 2 shows the participants' knowledge about each item of the breast cancer's signs and symptoms. Accordingly, the respondents had good knowledge (>85%) concerning some signs and symptoms of breast cancer such as painless breast lump, swollen axillary glands, milky discharge from the nipple, and bloody discharge from the nipple (see Table 2). Also, more than half (58.6%) of the participants had an intermediate (average) level of knowledge about breast cancer's risk factors, and 12.7% of them had an unsatisfactory level of knowledge in this regard.

Table 3 shows the participants' level of practice towards the breast cancer screening, showing their attempts to perform mammography. Accordingly, it was found that 37.5 % of the participants had practiced breast self-examination once a month, and 46.4 % had never done that (see Table 3), indicating that the majority of the participants had a poor level of practice in this regard. In other words, while the participants had good knowledge regarding breast cancer's risk factors and warning signs,

Table 4. Frequency Distribution of Participant's Willingness to Ppay

Marginal WTP Rials ($US)	Code	Frequency	%
0	1	44	11.5
<500,000 Iranian Rials (<11.9 $US)	2	129	33.5
500,000-750,000 Iranian Rials (11.9-17.86 $US)	3	76	19.8
750,000-1000,000 Iranian Rials (17.86-23.81 $US)	4	36	9.4
1,000,000-1,250,000 Iranian Rials (23.81-29.76 $US)	5	48	12.5
1,250,000-1,500,000 Iranian Rials (29.76-35.71 $US)	6	3	0.8
1,500,000-1,750,000 Iranian Rials (35.71-41.67 $US)	7	48	12.5
Total	-	384	-

1 $US, 42000 Rials (https://www.cbi.ir/); Abbreviation, WTP, Willingness-to-pay

Table 5. Ordinal Logistic Regression Model

Variable	coefficient	Std. Err.	Z	P-Value
Age in years	-0.044	0.018	-2.44	0.015
Marital status	0.094	0.167	0.56	0.573
Education level	0.195	0.077	2.46	0.014
Educational level of husband	0.191	0.075	2.53	0.011
Job	-0.263	0.133	-1.98	0.048
Housing statuses	0.156	0.239	0.65	0.514
Housing area	0.422	0.16	2.63	0.008
Income	0.703	0.159	4.4	0.001
Health insurance status	0.955	0.308	3.1	0.002
Voluntary supplementary insurance	0.821	0.267	3.07	0.002
Family size	-0.158	0.076	-2.06	0.039
Family history of breast cancer	0.634	0.225	2.82	0.005
previous history of breast cancer	0.549	0.341	1.61	0.108
Health Index	0.735	0.105	7.00	0.001
Knowledge Index	0.104	0.025	4.05	0.001
Practice Index	0.507	0.187	2.71	0.007

Log likelihood, 503/00; N,384; Pseudo R² , 0/72; LR chi 2 (16) , 298/93; probe > χ2 =0/000; Abbreviation, P-Value, significant level / Std. Err, Standard error

most of them never practiced breast self-examination. Only 15% of them had a satisfactory level of such a practice.

The results of examining the willingness to pay (WTP) variable indicated that while 11.5% of the participants were not willing to pay any amount for mammography breast cancer screening, 53.3% of them were willing to pay from 2.27 to 3.41 $U.S, and 35.2% of them were willing to pay more than 3.41 $U.S for that type of screening, suggesting that most of the participants were willing to pay higher prices for mammograms. The mean value of the participants' willingness to pay was 3.5 $ U.S (see Table 4).

Table 5 shows the estimated parameters derived from the ordinal logistic regression model, showing the estimated coefficients of all variables. The positive value of the constant term in the model indicated that the participants preferred screening over no screening.

According to the results of ordinal logistic regression (Table 5), the patient's education, the education status of the patient's husband, domicile, income level, health insurance status, voluntary supplementary insurance, family history of the breast cancer, health index, knowledge index, and practice index had positive effects on the participants WTP for performing mammography screening so that their possible breath cancer is diagnosed at early stages of the disease.

In terms of education, it could be argued that the participants with higher education were more aware of the necessity of performing the screening for their own health.

The significant positive correlation between the family income and the women's WTP for breast cancer screening indicated that women with higher income and more financial strength were more willing to pay for the screening (Coefficient:0.7; The reference group comprised of women with the lowest income level). Moreover, as the supplementary insurance compensates for the costs up to a certain amount, those covered by such insurance were more willing to pay for the mammography screening (Coefficient: 0.82; The women in the reference group lacked supplementary insurance coverage). Women with a history of breast cancer in their families were also more willing to pay for mammography breast cancer screening. In fact, as confirmed by the statistics, worries about being diagnosed with cancer make people pay any amount for the screening (Coefficient: 0.63; The reference group included women with no history of breast cancer).

Furthermore, those who believed in and observed health-related standards were more willing to pay for breast cancer screening (Coefficient: 0.7; The reference group comprised of women who were indifferent to their health), and those with greater knowledge regarding breast cancer and its screening were willing to pay higher prices for mammography screening (Coefficient: 0.1; Reference group comprised of women with lower level of knowledge regarding breast cancer). In addition, women's practice towards breast self-examination and mammography screening had a significant positive effect on the WTP variable, suggesting that women who practiced breast self-examination at regular intervals or had previously practiced mammography were more

willing to pay for such a screening (Coefficient: 0.5; The reference group included women who had not practiced breast self-examination at regular intervals or had not previously practiced mammography). On the other hand, age, occupation, and family size had negative effects on WTP for screening with the aim of early detection of breast cancer.

In terms of occupation, housewives and women with an occupation that required higher education were more willing to pay for the screening (Coefficient: 0.26; The reference group comprised of self-employed). In addition, age and family size had significant negative effects on the participants' willingness to pay, with the older women and those with larger families being less willing to pay for mammography screening. In other words, younger women paid more attention to their health and were more willing to pay for the screening than the older ones (Coefficient: -0.04; The Reference groups comprised of smaller families and younger women).

Discussion

This study sought to investigate preferences and willingness to pay for mammographic breast cancer screening tests in 2020 among Iranian women living in Mashhad (northeast of Iran), measuring health, knowledge, and practice indices. The majority of the participants possessed an average level of knowledge regarding breast cancer. Self-employed women were more likely to practice breast self-examination than the women working in governmental organizations, which could be attributed to the fact that self-employed women had more free time to check their breasts and practice breast self-examination. Previous studies have revealed that most women have an intermediate level of knowledge concerning breast cancer's risk factors and that only a low percentage of people have a good to an excellent level of knowledge in this regard (Al-Mousa et al., 2020; Pal et al., 2021).

The variables of age and occupation had significant negative effects on WTP, with the WTP decreasing as the age increased, indicating that young women had a better understanding of the need for mammography screening. Also, Kristina et al., (2020), Zhao et al., (2018), and Sana et al.,(2020) reported a significant correlation between age and willingness to pay. However, in a study carried out by Wong and Saengow (2018), no significant correlation was found between the two. This difference between the findings of the current study and those of Wong and Saengow (2918) concerning the correlation between age and WTP could be attributed to the difference in the subject of the study. It is clear that younger women are more willing to pay for mammography screening than other health services so that they may prevent breast cancer.

Family size and financial ability were found to have both negative and positive effects on willingness to pay, which are confirmed by the results found in another study (Yang et al., 2018; Reckers-Droog et al., 2021).

While previous studies have reported that the health index was around 75% in those women who had practiced

mammography breast cancer screening, the current study found the index to be 89% among such women, indicating that the WTP increased with an increase in the importance of health index for women.

The majority of the study's participants were highly aware of breast cancer screening, with their reported average score being 14.4. Moreover, according to the study's results, the willingness to pay will significantly increase with the increase in knowledge regarding breast cancer.

A study conducted by Al-Mousa et al., (2020) to investigate the relationship between the level of knowledge on risk factors, signs and symptoms, breast cancer early detection methods, breast cancer curability, and socio-demographic characteristics found that those who live in urban areas have significantly higher knowledge concerning the breast cancer's signs and symptoms compared to those who live in rural areas. These findings are consistent with the ones found by Kotepui et al., (2014), showing that the female medical and health personnel acquired adequate knowledge on breast cancer due to the daily interactions made between academic and non-academic staff. Furthermore, the knowledge of this study's participants regarding the breast cancer's signs and symptoms, including painless breast lump, swollen axillary glands, bloody discharge from the nipple, and nipple change, was generally good (>70.0%) (Al-Mousa et al., 2020). It should be noted that all of the study's participants were living in urban areas.

According to the results obtained from the logistic regression model, there was a significant positive correlation between income and health insurance status and willingness to pay. Also, people with higher financial ability tended to pay higher prices for breast cancer screening, with the demand for the screening increasing with an increase in income level (Wright et al., 2018; Lew et al., 2020). In addition, indices such as health, knowledge, and practice of mammography screening directly affected the willingness to pay, with younger people typically paying much more money for the screening than do the older people.

The mean value of the willingness to pay was 3.5 $U.S. Moreover, there was a significant positive relationship between education and the willingness to pay, with the WTP for mammography breast cancer screening increasing with an increase in education level (Venkataramanan et al., 2020), suggesting that the higher the women's education was, the more likely they would be to practice breast cancer screening test. These results are in agreement with findings of the previous studies that found a significant correlation between the level of knowledge on breast cancer screening level of education, according to which women with higher education had a higher level of knowledge on breast cancer as they tended to engage more in health improvement activities. Similarly, a study conducted on people living in Kerman province (2017) reported that the factors were involved in WTP for breast cancer screening.

In conclusion, it could be argued that any promotion of breast cancer screening among Iranian women should primarily focus on increasing such indices as awareness,

education, health status, and household income level. It should be noted that willingness to pay is a hypothetical measure of a person's stated preference. Indeed, some consider it as a less reliable index of people's actual behavior. Therefore, promoting the practice of breast cancer screening tests requires careful planning and more attention to removing the barriers. The majority of the study's participants possessed an average level of knowledge. However, some participants lacked appropriate information concerning breast cancer and its' early detection methods. Self-employed women were more likely to practice breast self-examination compared to those employed by governmental organizations, as they had had more free time to check their breasts and practice breast self-examination.

Abbreviations
WTP: Willingness to pay; CVM: Contingent valuation method; CV: Contingent valuation; P-Value, significant level; Std. Err, Standard error.

Author Contribution Statement

Akram Karimabadi: Data gathering, Analysis and Drafting of manuscript. Elahe Pourahmadi: Analysis and interpretation of data. Sadegh Bafandeh Imandoust, Afsane Nikoukar: Study conception and design, Critical revision. Mehdi Aryafar: Drafting of manuscript, Data gathering, "Corresponding author".

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Conflict of interest Statement
The authors declare that they have no conflicting interests.

References

Abu BM (2020). A successful model of cancer screening in low resource settings: Findings of an Integrated Cancer Screening Camp from a Rural Setting of North India. *Asian Pac J Cancer Care*, **5**, 83-6.

Akinyemiju TF (2012). Socio-economic and health access determinants of breast and cervical cancer screening in low-income countries: analysis of the World Health Survey. *PLoS One*, **7**, e48834.

Al-Mousa DS, Alakhras M, Hossain SZ, et al (2020). Knowledge, attitude and practice around breast cancer and mammography screening among Jordanian women. *Breast Cancer Targets Ther*, **12**, 231.

Askarzade E, Adel A, Ebrahimipour H, et al (2019). Epidemiology and Cost of Patients with Cancer in Iran: 2018. *MEJC*, **10**, 362-71.

Bokaie M, Lotfi MH (2013). Performed a qualitative and

quantitative of breast self-examination: a Checklist Approach. *JCHR*, **2**, 107-16.

Daroudi R, Sari AA, Nahvijou A, et al (2015). The economic burden of breast cancer in Iran. *Iran J Public Health*, **44**, 1225.

Dsouza RJ, Sunny R, Sambhalwar PB, et al (2021). Perception of noncommunicable diseases among the tribals of the Gudalur Valley, Nilgiris, Tamil Nadu. *Curr Med Issues*, **19**, 132.

Elasbali AM, Alonzi Z, Mohammed EME, et al (2019). Breast self-examination's trainees' levels of knowledge about breast cancer's features of early detection in Qurayyat, Northern Saudi Arabia. *Breast J*, **2**, 3.

Ferlay J, Héry C, Autier P, et al (2010). Global burden of breast cancer. In 'Breast cancer epidemiology', Eds Springer, pp 1-19

Francies FZ, Hull R, Khanyile R, et al (2020). Breast cancer in low-middle income countries: Abnormality in splicing and lack of targeted treatment options. *Am J Cancer Res*, **10**, 1568.

Gardezi SJS, Elazab A, Lei B, et al (2019). Breast cancer detection and diagnosis using mammographic data: Systematic review. *J Med Internet Res*, **21**, e14464.

Ghaderi H, Vatankhah S, Khoshkam M, et al (2012). Estimation of willingness to pay for mammographic breast cancer screening tests among women in Tehran, Based On Contingent Valuation Method: 2010. *J Health Hum Serv Adm*, **15**.

Ginsburg O, Yip CH, Brooks A, et al (2020). Breast cancer early detection: A phased approach to implementation. *Cancer*, **126**, 2379-93.

Grady I, Chanisheva N, Vasquez T (2017). The addition of automated breast ultrasound to mammography in breast cancer screening decreases stage at diagnosis. *Acad Radiol*, **24**, 1570-4.

Heer E, Harper A, Escandor N, et al (2020). Global burden and trends in premenopausal and postmenopausal breast cancer: a population-based study. *Lancet Glob Health*, **8**, e1027-e37.

Irani M, Nosrati SF, Ghaffari F, et al (2021). Knowledge, attitude, and practice of women regarding breast cancer screening behaviors in Mashhad, Iran. *JMRH*, **9**, 2715-24.

Lew VH, See AAQ, Goh JJ, et al (2020). Survey on willingness to pay for life-saving treatment, functional recovery, and cosmesis in a neuroscience outpatient clinic setting in Singapore. *Value Health Regional Issues*, **21**, 45-52.

Mathioudakis AG, Salakari M, Pylkkanen L, et al (2019). Systematic review on women's values and preferences concerning breast cancer screening and diagnostic services. *Psychooncology*, **28**, 939-47.

Miller AB, Baines CJ (2011). The role of clinical breast examination and breast self-examination. *Prev Med*, **53**, 118-20.

Mulmi R, Shrestha G, Niraula SR, et al (2021). Screening practices among first degree relatives of breast cancer patients in Nepal: A Cross-sectional Study. *Asian Pac J Cancer Care*, **6**, 297-303.

Pal A, Taneja N, Malhotra N, et al (2021). Knowledge, attitude, and practice towards breast cancer and its screening among women in India: A systematic review. *J Cancer Res Ther*, **17**, 1314-21

Phelps CE, Lakdawalla DN, Basu A, et al (2018). Approaches to aggregation and decision making—a health economics approach: an ISPOR Special Task Force report. *Value Health*, **21**, 146-54.

Phi X-A, Tagliafico A, Houssami N, et al (2018). Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts–a systematic review and meta-analysis. *BMC Cancer*, **18**, 1-9.

Rahman SA, Al–Marzouki A, Otim M, et al (2019). Awareness about breast cancer and breast self-examination among female students at the University of Sharjah: A cross-sectional study. *Asian Pac J Cancer Prev*, **20**, 1901.

Reckers-Droog V, van Exel J, Brouwer W (2021). Willingness to pay for health-related quality of life gains in relation to disease severity and the age of patients. *Value Health*, **2021**.

Sabermahani A, Taghizade SM, Goodarzi R (2017). A comparative study on willingness to pay for breast cancer and osteoporosis screening in Kerman, Southeastern Iran. *Iran J Public Health*, **46**, 693.

Sechopoulos I, Mann RM (2020). Stand-alone artificial intelligence-The future of breast cancer screening?. *Breast J*, **49**, 254-60.

Shieh Y, Eklund M, Madlensky L, et al (2017). Breast cancer screening in the precision medicine era: risk-based screening in a population-based trial. *J Natl Cancer Inst Monogr*, **109**, djw290.

Sung H, Ferlay J, Siegel RL, et al (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*, **71**, 209-49.

Venkataramanan V, Lopez D, McCuskey DJ, et al (2020). Knowledge, attitudes, intentions, and behavior related to green infrastructure for flood management: A systematic literature review. *Sci Total Environ*, **720**, 137606.

Wright CM, Boudarène L, Ha NT, et al (2018). A systematic review of hepatitis B screening economic evaluations in low- and middle-income countries. *BMC Public Health*, **18**, 1-12.

Wu T-Y, Raghunathan V, Shi J, et al (2020). Improving the outcomes of breast cancer in China: Physicians' Beliefs, Recommendations, and Practices for Breast Cancer Screening. *Asian Pac J Cancer Care*, **5**, 251-8.

Yang X, Cheng L, Yin C, et al (2018). Urban residents' willingness to pay for corn straw burning ban in Henan, China: Application of payment card. *J Clean Pro*, **193**, 471-8.

Zeng X, Jiang S, Ruan S, et al (2021). MAPK4 silencing together with a PARP1 inhibitor as a combination therapy in triple-negative breast cancer cells. *Mol Med Rep*, **24**, 1-8.