Original Article

Health-related Factors Associated with Adherence to Breast Cancer Screening

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ABSTRACT

Introduction: In Belgium, an effective preventive program for breast cancer exists but as in many countries to few women participates in the screening. This study aims to describe the factors that affect the participation in the national breast cancer screening program. **Methods:** The participants were aged between 50 and 69 years and were recruited during an exhibition at the Brussels Exhibition Centre. Medical history and health-related parameters of the participants were recorded. **Results:** In total, 350 women aged between 50 and 69 years participated. After adjustment for age and region, 81.5% of the participants had a mammography during the past 2 years. The multivariate analysis confirms the association between not having had a mammography and (a) having an older age (odds ratio [OR]: 0.25–0.87), (b) having diabetes (OR: 0.08–0.80), (c) having a family history of coronary heart disease (OR: 0.16–0.80), (d) not following a cholesterol diet or treatment (OR: 0.10–0.91) and (e) having a higher body mass index (OR: 0.39–0.97). Having had a mammogram was associated with adherence to cervical smear screening (OR: 2.74–11.21). **Conclusions:** Most of these associations are most likely related to socioeconomic status. However, the relationship with diabetes offers opportunities to increase the participation in breast cancer screening programs because these patients have regular contacts with their family physicians.

Keywords: *Breast cancer screening, prevention, primary care, risk factors*

Introduction

Epidemiology

Breast cancer is one of the leading causes of illness and is associated with a significant personal and socioeconomic burden.[1]

Breast cancer in women counts for more than one-third of all malignant tumors, with an age-standardized rate of 170/100,000 women-year in the 35–49 years age group, 369/100,000 in women aged 50–69 years, and 350/100,000 in the elderly group.[1] It is within the entire female population, the most frequent malignant disease and the leading cause of death from cancer, accounting for one in five female deaths. The mean age at diagnosis is 62 years.

Screening for breast cancer

An effective preventive approach for breast cancer is invaluable. In the eighties, the emphasis of screening for breast cancer was mainly on self-examination and clinical examination. Nowadays, these methods are not longer recommended for the early detection of breast cancer.[2]

The effectiveness of early detection of breast cancer by mammography has been suggested by several studies. These studies reported a reduced mortality rate in women between 50 and 69 years.[2] To have a population-based decrease of the mortality, a large proportion of the population needs to be screened. To obtain a 30% decrease in the mortality rate, at least 70% of the target population needs to be screened every 2 years.[3]

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Overall, the early detection and adjuvant therapy resulted in a reduced mortality for breast cancer of 25%–38%.[4] However, population-based breast cancer screening remains controversial and might not be worthwhile because recent studies report only a little effect on mortality.[5-7] For women between 40 and 49 years of age, the effectiveness of early detection with conventional mammography is also controversial.[2,8]

The decrease of mortality in recent decades in many Western countries is not due to mammographic screening. The better diagnostic and therapeutic options and the increased "breast awareness" among women may probably play also an important role.

Since 2000, there is in Belgium a national program for the early detection of breast cancer. The program was established under the impulse of Europe against cancer and is in line with the criteria established by the European Commission. The activities of the Belgian national program were launched in June 2001 in the Flemish Region and 1 year later in the French Community, the Brussels Region and the German-speaking Community. Women between 50 and 69 are invited by the local authorities and their family physician for a mammography, free of charge, in accredited mammography units in their neighborhood.

Despite the national prevention program, it appears that a significant portion of the female target population is not screened for breast cancer.

The Belgian Health Interview Survey (HIS), conducted in 2008 by the Institute of Public Health, reported a coverage of 73% for breast cancer screening in the target population.[9]

The coverage of the target population is higher than 70% coverage needed to obtain a 30% decrease in the mortality rate. However, this is not optimal because some hard to reach populations do not participate in the screening. There is some evidence that the coverage is the lowest among women from the lowest socioeconomic classes.[10,11] This population is very hard to reach and to convince. We were interested to evaluate the opportunity to motivate women attending a food exhibition to participate in a screening.

Aim of the study

This research aims to describe the coverage for breast cancer screening among the visitors of a food exhibition in Brussels and to describe the nonsocioeconomic factors that affect the participation in the national screening program such as measurements of blood pressure, blood sugar, and cholesterol.

Methods

Participants

The participants were recruited during an exhibition at the Brussels Exhibition Centre from October 6 to October 21, 2012. All adult visitors were allowed to participate as far that they were not pregnant, did not take Vitamin K antagonists, did not show signs of addiction to alcohol, medication or drugs, nor suffered from a hypersensitivity to blood, and/or fingerpricks. For the present study, only women aged between 50 and 69 years were retained.

Questionnaire

Participants were asked whether they knew their length, weight, abdominal circumference, blood pressure, cholesterol level, and blood sugar level. These parameters were measured if the participants did not know them. Furthermore, participants were asked about their medical history (coronary heart disease, hypercholesterolemia, diabetes, hypertension, and other diseases) and their family history (breast cancer, coronary heart disease, diabetes, and colon cancer). They were also asked about their latest tetanus vaccination, cervix cancer screening, and breast cancer screening.

Participants used a visual analogue scale (VAS) to score their self-reported health (SRH). The scale ranged between 0 and 100 with 0 corresponding to the worst health participants can imagine and 100 meaning the best health participants can imagine. Such a VAS scale is used in the EQ-5D questionnaire.[12] The VAS scale was completed after the participants recorded their age, gender, and zip-code but before other health-related questions were asked.

Measurements

Weight was measured with a digital personal scale Seca Sensa 804. The measurement of the height was done with a Seca 206 wall-mounted measuring tape. The abdominal circumference was measured with a Seca 201 ergonomic circumference measuring tape. Blood pressure was measured with a calibrated DS-54 Welch Allyn sphygmomanometer blood pressure device. Blood sugar was measured with a OneTouch device using capillary blood. Total cholesterol was measured with a Accutrend Plus monitor using capillary blood. Capillary blood was obtained with a fingerprick in the index finger. The food and beverage intake during the 2 h before the measurement were carefully noted.

Approval of the Ethical Committee

The study protocol was approved by the ethical committee of the University Hospital Brussels. Visitors of the exhibition were allowed to participate after they read the patient-information leaflet and signed the informed consent. After the questionnaire was completed, the patients received a health advice and a sample of margarine free of charge.

Statistical processing

The data were introduced through an online custom made user interface based on a PHP and recorded in a MySQL database centrally managed at the Faculty of Medicine and Pharmacy of the Vrije Universiteit Brussel. The data were stored anonymously. It was not possible to identify patients from the recorded personal information (gender, year of birth, and zip code). Body mass index (BMI) was generated by the system. Cardiovascular risk was estimated from the SCORE risk tables.[13] Two groups were created: one with a low SRH and another group with a high SRH. As a cut-off, the median (71.4) for the SRH was used, permitting to compare two groups of a similar size.

Incomplete data sets were eliminated from the database. Analyses were done with SPSS 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp. Released 2011). For the detection of statistically significant differences between discrete variables, the cross-tables and the Chi-square test was used. For continuous variables, the *t*-test was used.

Coverage figures were adjusted for age and region, according to the demographics of the Flemish, Walloon, and Brussels region in 2012.

A logistic regression was done to determine variables linked with high or low SRH. The following variables were entered: gender, age-groups, language, region, hypertension, hypercholesterolemia, diabetes, coronary heart disease, no disease, family history of coronary heart disease, family history of colon cancer, family history of diabetes, family history of breast cancer, no family history, tetanus vaccination up-to-date, weight, length, abdominal circumference, does know blood pressure, does know blood sugar level, does know cholesterol level, no treatment or diet for cholesterol, diet for cholesterol, statin for cholesterol, plant stanol for cholesterol, cervix cancer screening, SRH, smoker, alcohol abuse, physical activity, BMI (four groups), and cardiovascular risk groups (SCORE low, intermediate and high).

Results

Adherence to breast cancer screening

In total, 350 female visitors aged between 50 and 69 years participated [Table 1]. Most of the participants (78%) lived in the Flemish region, 17% in the Brussels Region and 5% in the Walloon Region. After adjustment for age and region, 81.5% of the participants had a mammography done during the past 2 years.

Association with risk factors

In an univariate analysis, we found a significant association between not having had a mammography during the past 2 years and not having had a pap smear during the past 3 years. Not having had a mammography during the past 2 years was also associated with not knowing ones blood sugar level, not having a treatment for hypercholesterolemia and having a high BMI.

Women not having had a mammography during the past 2 years had a higher body weight, a higher systolic blood pressure, a higher blood sugar level, a higher abdominal circumference, a higher BMI and a lower SRH [Table 2].

Logistic regression

All parameters were dichotomized where possible and included in a logistic regression [Table 3]. Age was divided into 10-year age groups, BMI into four groups and cardiovascular risk into three groups. This multivariate analysis confirms the association between not having had a mammography and having a older age, having diabetes, having a family history of coronary heart disease, not having a cervical smear in the past 3 years, not following a cholesterol-lowering diet or treatment, and having a higher BMI.

Discussion

Sample population

In our study, there was an overrepresentation of participants from the Flemish region. As we never aimed to include a representative sample of the Belgian population, this will not hamper the interpretation of our results. We aimed to describe the correlation of objective health-related factors with the breast cancer screening in an arbitrary sample of the Belgian population.

The studied sample was biased by the fact that all participants were visitors of an exhibition and for that reason disabled or seriously ill people were less likely to participate in the study.

Adherence to mammography

Our age and region adjustment coverage for breast cancer was 82%. According to the Belgian HIS, 72% of the women from the target population were screened.[9] Our study as well as the HIS relate to self-reported data. In Spain, the national health survey demonstrated a screening coverage of 84%.[14] The lower figures found in the Belgian HIS must be seen in the perspective that they relate to 2008 and that the coverage is rising systematically in Belgium.[9] According to a European study based on the figures of 2006, the adherence was the lowest in Denmark (<30%) and highest in The Netherlands and France (>80%).[15] This European study mentions for Belgium an adherence of almost 80% in 2006.

Factors associated with breast cancer screening

This multivariate analysis confirms the relationship between not having had a mammography and having an older age. This association was also found in the HIS were

Table 1: Mean adherence rates to breast cancer screening per group

	n	Screening OK (%)	*P*
Brussels region	61	80.3	0.090*
Flemish region	272	87.1	
Walloon region	17	70.6	
Dutch	308	85.1	0.912
French	42	85.7	
No hypertension	245	86.9	0.149
Hypertension	105	81.0	
No hypercholesterolemia	200	82.5	0.108
Hypercholesterolemia	150	88.7	
No diabetes	325	86.7	0.055
Diabetes	25	72.0	
No coronary heart disease	335	84.8	0.362
Coronary heart disease	15	93.3	
No disease	208	87.0	0.232
Some disease	142	82.4	
No family history of coronary heart disease	282	86.5	0.139
Family history of coronary heart disease	68	79.4	
No family history of colon cancer	301	84.1	0.155
Family history of colon cancer	49	91.8	
No family history of diabetes	265	86.7	0.631
Family history of diabetes	85	83.5	
No family history of breast cancer	283	85.2	0.986
Family history of breast cancer	67	85.1	
No Family history of no disease	191	85.9	0.678
Family history of some disease	159	84.3	
Low self-reported health	205	82.4	0.091
High self-reported health	145	89.0	
Tetanus vaccination not up-to-date or unknown	169	84.0	0.569
Tetanus vaccination up-to-date or unknown	181	86.2	
Cervical cancer screening not OK	133	72.2	<0.001
Cervical cancer screening OK	217	93.1	
Does not know weight	5	80.0	0.555**
Does know weight	345	85.2	
Does not know length	30	86.7	1.000**
Does know length	320	85.0	
Does not know abdominal circumference	314	86.7	0.627**
Does know abdominal circumference	36	88.9	
Does not know blood pressure	25	72.0	0.055
Does know blood pressure	325	86.2	
Does not know blood sugar level	88	78.4	0.040
Does know blood sugar level	262	87.4	
Does not know cholesterol level	79	78.5	0.058
Does know cholesterol level	271	87.1	
No diet or treatment for cholesterol	181	80.7	0.015
Diet or treatment for cholesterol	169	89.9	
No diet for cholesterol	295	84.1	0.190
Diet for cholesterol	55	90.9	
No statin treatment for cholesterol	262	82.4	0.014
Statin treatment for cholesterol	88	93.2	
No plant stanol treatment for cholesterol	269	85.1	0.990
Plant stanol treatment for cholesterol	81	85.2	
Nonsmokers	312	85.9	0.255
Smokers	38	78.9	

Contd...

Table 1: Continued

	n	Screening OK (%)	*P*
Nonalcohol abusers	343	84.8	0.600**
Alcohol abusers	7	100	
Low physical activity	241	85.1	0.950
Physical activity	109	85.3	
Underweight (BMI <18.5)	9	88.9	0.009***
Normal weight (18.5< BMI <25)	136	89.0	
Overweight (25< BMI <30)	147	87.1	
Obesity (BMI >30)	58	70.7	
Low cardiovascular risk SCORE	264	87.1	0.188*
Intermediate cardiovascular risk SCORE	44	79.5	
High cardiovascular risk SCORE	42	78.6	

**P* value for the 3×2 table with 2 degrees of freedom, **Fisher's exact test, ****P* value for the 4×2 table with 3 degrees of freedom.
BMI: Body mass index

Table 2: Mean values of parameters according to the adherence to breast cancer screening

	Breast cancer screening	*n*	Mean	SD	*P*
Age	Not ok	52	61.44	6.313	0.357
	Ok	298	60.57	5.870	
Last measured systolic blood pressure	Not ok	37	125.00	15.679	0.679
	Ok	226	126.15	14.930	
Last measured diastolic blood pressure	Not ok	37	77.43	9.547	0.561
	Ok	226	78.41	8.307	
Last measured weight	Not ok	50	74.06	14.057	0.007
	Ok	294	68.16	12.033	
Last measured length	Not ok	48	163.31	5.728	0.249
	Ok	271	162.25	6.270	
Last measured abdominal circumference	Not ok	2	98.00	14.142	0.764
	Ok	19	94.11	10.728	
Last measured blood sugar	Not ok	22	91.09	23.024	0.580
	Ok	182	88.27	14.333	
Last measured cholesterol	Not ok	22	193.00	33.106	0.475
	Ok	194	198.47	37.914	
Self-reported health	Not ok	52	64.92	16.398	0.010
	Ok	298	70.23	13.021	
Mean number of cigarets per day	Not ok	52	2.44	6.166	0.128
	Ok	298	1.30	4.741	
Mean number of alcoholic beverages per day	Not ok	52	2.79	4.184	0.580
	Ok	298	3.14	4.401	
Actual systolic blood pressure	Not ok	52	131.17	20.378	0.005
	Ok	298	124.82	13.841	
Actual diastolic blood pressure	Not ok	52	80.50	10.510	0.085
	Ok	298	77.82	8.140	
Actual blood sugar	Not ok	52	117.37	44.234	0.001
	Ok	298	102.08	26.994	
Actual body weight	Not ok	52	74.10	14.173	0.006
	Ok	298	68.20	12.085	
Actual length	Not ok	52	162.73	5.787	0.433
	Ok	298	162.04	6.262	
Actual total cholesterol	Not ok	52	182.75	36.424	0.202
	Ok	298	189.78	35.642	
Actual abdominal circumference	Not ok	52	93.12	12.319	0.031
	Ok	298	89.08	11.421	

Contd...

Table 2: Continued

	Breast cancer screening	*n*	Mean	SD	*P*
Actual BMI	Not ok	52	27.54	5.207	0.002
	Ok	298	25.49	4.311	

SD: Standard deviation, BMI: Body mass index

Table 3: Logistic regression: Factors related to breast cancer screening

	B	*P*	OR	95% CI for OR	
				Lower	Upper
Age	−0.772	0.016	0.462	0.246	0.867
Diabetes	−1.382	0.019	0.251	0.079	0.797
Family history of coronary heart disease	−1.043	0.012	0.352	0.156	0.795
Cervical smear screening	1.713	<0.001	5.547	2.744	11.210
Follows not a cholesterol diet or treatment (yes/no)	−1.183	0.033	0.306	0.104	0.907
BMI (4 groups underweight > obesity)	−0.493	0.035	0.611	0.386	0.966

Variable(s) entered on Step 1: Gender, age-groups, language, region, hypertension, hypercholesterolemia, diabetes, coronary heart disease, no disease, family history of coronary heart disease, family history of colon cancer, family history of diabetes, family history of breast cancer, no family history, tetanus vaccination up-to-date, weight, length, abdominal circumference, does know blood pressure, does know blood sugar level, does know cholesterol level, no treatment or diet for cholesterol, diet for cholesterol, statin for cholesterol, plant stanol for cholesterol, breast cancer screening, self-reported health, smoker, alcohol abuse, physical activity, BMI (4 groups), cardiovascular risk groups (SCORE low, intermediate and high). OR: Odds ratio, CI: Confidence interval, BMI: Body mass index

the highest coverage was seen in the age group between 50 and 59 years.[9] Many other studies-related older age with higher coverage.[14,16-18] In a European comparison, the mean age of the screened women in Belgium is among the lowest in Europe (62.6 years) but not suggesting a higher participation in the younger age group.[15]

In our study, there was a strong association between having a cervical smear in the last 3 years and the adherence to breast cancer screening. As well in the United States as in Canada, having had a Pap test within the last 3 years was the strongest and most consistent predictor of compliance with the adherence to breast cancer screening.[19]

This is one of the most important findings of our study. There is a higher chance that patients not attending for a mammography did also not attend for a pap smear and vice versa. Although the age groups and timings for pap smears and mammograms are different, physicians should check the medical records for both screening examinations in the overlapping age group.

We also detected a strong association between not participating in the breast cancer screening and having diagnosed diabetes. This is surprising because these patients should at least every three months attend their family physician for their diabetes. We can hypothesize that this lower participation in diabetics screening is related to the lower social class to which diabetics might belong or to the fact that diabetics are already overburdened with the screening for diabetes complications. A similar association was found among American Indian women with type 2 diabetes. They also participated less in screening programs for breast cancer and cervical cancer.[20]

A study on the adherence to breast and cervical cancer screening in postmenopausal women with coronary heart disease found no relation between low adherence to mammography and having a coronary heart disease.[21] This is in line with our findings. However, the relation between low adherence to mammography and having a family history of coronary heart disease cannot be confirmed by other studies. As for diabetes, we can suggest that the lower participation is related to the lower social class of these patients or to the fact that they are already overburdened with the screening for cardiovascular conditions.

Surprisingly, the adherence to breast cancer screening was not related to a positive family history of breast cancer. In a USA study, this association was found.[22] It is to be expected that women with a family history might pay more attention to breast cancer screening than others. According to their estimated risk, these women should have an adapted and earlier screening program than women without a family history.

An increased BMI was also associated with a low adherence to breast cancer screening. Furthermore, the National Ambulatory Medical Care Survey revealed that in 2005–2007 obese patients were significantly less likely to receive cancer screening such as breast cancer screening and pap smears.[23] Furthermore, in the Spanish study, obesity was associated with a lower coverage.[15]

Similarly, adherence to breast cancer screening was higher among the women following a cholesterol diet or treatment. This suggests that maybe those women following diets are more concerned about their health and are more likely to participate in screening programs.

Weaknesses of the study

In this study, we emphasized on chronic conditions, SRH, and lifestyle of the participants. Initially, we choose not to record sociodemographic parameters because many publications already reported about them.[24] In retrospect, the registration of sociodemographic parameters such as marital status, educational level, monthly income, and nationality might have contributed to a better understanding of our findings.

Conclusions

Our study among women belonging to the target population for breast cancer screening could detect an association between not having had a mammography and older age, diabetes, a family history of coronary heart disease, not having a cervical smear in the past 3 years, not following a cholesterol diet or treatment, and having a higher BMI.

Most of these associations are probably related to socioeconomic status. However, the relationship between no adherence to breast cancer screening and having diabetes is an important finding, because the regular contact between diabetic patients and their family physician offers opportunities to increase the participation in breast cancer screening programs.

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Conflicts of interest

There are no conflicts of interest.

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