

Implementation of a population-based breast cancer prevention program in Poland before, during and after the COVID-19 pandemic. Poland in comparison with other countries

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Introduction. Breast cancer is the most common malignant tumor in women in Poland and in the world. It accounts for about 24% of all cancer cases in Polish women. The aim of this study was to analyze the coverage of the population eligible for a population-based breast cancer prevention program in Poland before, during and after the COVID-19 pandemic, and to compare the Polish data with data from other countries around the world.

Material and methods. The study was based on epidemiological data related to the performance of mammography examinations among Polish women under the breast cancer prevention program. The results were compared with data from other countries around the world.

Results. In the years 2014–2022, a significant decrease was observed in the number of mammography examinations among Polish women under the population-based breast cancer prevention program.

Conclusions. A continuous decrease in the number of preventive examinations in Poland is related not only to the COVID-19 pandemic, but also to the discontinuation of sending paper invitations for mammography under the breast cancer prevention program.

Key words: breast cancer, prevention, cancer

Introduction

Breast cancer is the most common malignant tumor in women in Poland and in the world [1, 2]. It accounts for about 24% of all cancer cases in Polish women [1]. It is more common after menopause than before. The risk of developing the disease increases after the age of 50. An analysis of incidence rates in individual age groups showed a significant increase in the group of patients aged 50–69 years [3]. Risk factors for breast cancer include:

- age 50–69,
- breast cancer in the family (the degree of risk depends on the number of cases in the family and the degree of relatedness with the ill person),
- mutations found in the *BRCA1* and/or *BRCA2* genes,
- early menarche – before the age of 12,
- late menopause – after the age of 55,
- having a child after the age of 35,
- childlessness,

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- alcohol consumption,
- obesity among postmenopausal [2, 4, 5].

The etiology of breast cancer is still not sufficiently clear. The same cancer can be induced by several or even a dozen or so carcinogenic factors. More and more frequently, genetic determinants are indicated as risk factors for developing breast cancer: about 10% of breast cancer cases in Poland occur in women with mutations in genes, most often in *BRCA1* [6–8]. It is of key importance to detect cancer at the earliest stage of its development. Mammography is a medical examination that allows the diagnosis of pathological changes in the breast tissue. Its sensitivity is the highest of all tests, and it is estimated at 90–95% in postmenopausal women. In the group of women aged 50–69 who had mammography examinations every year or every 2 years, there was a 25–30% reduction in mortality. It is recommended to perform a mammography in 2 projections: every 2 years in women from the low-risk group who are aged 50–69, and every year in women from the high-risk group I.

In populations where preventive examinations are not performed, there is a high mortality rate due to advanced invasive breast cancer. Invasive breast cancer requires costly treatment. Depending on the clinical stage of advancement, surgical treatment (breast amputation), radiotherapy or systemic treatment (chemotherapy, hormone therapy) is applied. All these treatment methods are very expensive [9].

In the USA and in the countries of the European Union, it was recognized that the most effective method to reduce breast cancer incidence and to improve the results of malignant tumor treatment are national cancer control programs. These programs are financed from the state budget, and apart from population screening, they involve the purchase of modern diagnostic and therapeutic equipment and educational activities among the general population and medical staff [10–12].

According to data from the World Health Organization, the incidence of cancer is mainly influenced by three factors: lifestyle, genes and the environment. The World Health Organization's estimates on the possibility of cancer prevention suggest that even 30% to 50% of cancer cases can be prevented by avoiding risk factors. These factors include:

- smoking,
- excessive body weight (obesity),
- improper diet,
- alcohol,
- low physical activity,
- lack of vaccinations [2, 5].

According to the latest report published in November 2022 by the Sarcoma Association for Sarcomas and Melanomas, as many as 39% of Polish women and men do not know that free of charge, National Health Fund-financed, preventive examinations detecting cancer at an early stage are available in Poland. Almost half of Polish men and women cannot name any preventive examination for cancer. As many as 2 out

of 3 people do not perform regular preventive examinations for cancer. Unfortunately, the report also shows that every fifth Pole believes that prophylaxis will not save their life [13].

The prevention program for early detection of breast cancer in Poland, which is financed by the National Health Fund, has been developed for women aged 50–69 who have not had a mammography examination in the last 24 months and for those who have received a written recommendation to repeat the mammography examination after 12 months. The reason to repeat the mammography may be risk factors: breast cancer in family members (mother, sister or daughter) and mutations in the *BRCA1* and/or *BRCA2* genes. A mammography examination is free of charge and does not require a doctor's referral. The aim of the program is to reduce the mortality rate due to breast cancer to the level achieved in the leading European Union countries, to increase the level of knowledge among women about breast cancer prevention and to introduce rules of diagnostic procedures across the country [14, 15].

The aim of the study was to analyze the coverage of the population eligible for the population-based breast cancer prevention program in Poland before, during and after the COVID-19 pandemic, and to compare Polish data with data from other countries around the world.

Material and methods

The material consists of epidemiological data on the performance of mammography examinations in Polish women under the population breast cancer prevention program in the years 2014–2022. The data are obtained from monthly reports published by the National Health Fund [15]. The prevention program for early breast cancer detection is addressed to women aged 50–69 who have not had a mammography examination in the last 24 months and to those who have received a written recommendation to repeat a mammography examination after 12 months.

The aim of the program is to reduce the mortality rate due to breast cancer to the level achieved in the leading European Union countries. The study is also based on epidemiological data on preventive screenings for early detection of breast cancer in other countries around the world, obtained from the Health at Glance 2021 Organization for Economic Cooperation and Development report (OECD) [2].

Results

Every year, a population of over five million women aged 50–69 is eligible for a preventive mammographic examination under the Population Breast Cancer Prevention Program (tab. I).

The highest percentage of the population was covered by preventive mammography examinations in 2014 (over 44% population coverage). In the following years, a decrease in the percentage of women aged 50–69 was observed with regard to the performance of mammography examinations. The lowest percentage was observed in the years 2020

Table I. Population coverage in women aged 50–69 by prophylactic mammography as part of the Population-based Breast Cancer Prevention Program 2014–2022 in Poland

Year	Females		
	eligible	excluded from the program	who took part in the research
2014	5,337,265	2,389,269	44.77%
2015	5,404,594	2,381,783	44.07%
2016	5,428,839	2,270,033	41.81%
2017	5,425,011	2,141,972	39.27%
2018	5,393,354	2,092,405	38.51%
2019	5,378,866	2,057,447	37.78%
2020	5,352,470	1,848,381	34.89%
2021	5,334,865	1,771,513	33.72%
2022	5,401,858	2,016,543	35.90%

Source: Narodowy Fundusz Zdrowia

and 2021, during the COVID-19 pandemic. Then, in 2022, about 36% of eligible women were examined under the Population Breast Cancer Prevention Program. One of the most probable and impactful factors for the systematic decrease in the percentage of women reporting for mammography examinations under the population breast cancer prevention program is the discontinuation of sending paper invitations to patients, among other reasons. The lowest values were reported during the COVID-19 pandemic due to the limited access to medical facilities, patient isolation and patient fear related not only to the examination itself, but also to the possibility of contracting the SARS-CoV-2 virus during the examination.

Polish women can do mammography examinations not only under the population-based breast cancer prevention program that is addressed to women aged 50–69, but also under outpatient specialist care and under health policy programs implemented by local government units at all levels, which are developed, implemented and financed by provinces, districts and communes. Health policy programs for breast cancer prevention involve not only mammography but also ultrasound examinations for younger women, educational activities addressed to all age groups, and therapeutic programs addressed to women who suffer from cancer and often have already had a mastectomy.

The total percentage of mammography examinations that are performed in Poland and OECD countries is presented in table II, which includes data from the years 2009 and 2019, and in the case of several countries, data from the year 2020, and the average of 61.7% in OECD countries in 2019.

The average performance of preventive mammography among women aged 50–69 in OECD countries was 61.7% in 2019. The highest percentage of mammography examina-

Table II. Mammography screening in women aged 50–69 within the past 2 years, 2009, 2019 (or nearest years) and 2020

Location	2009	2019	2020
Sweden ²	90.4%	95.2%	
Denmark ¹	77.4%	83.2%	
Spain ²	73.3%	81.5%	73.8%
Finland ¹	85.5%	81.3%	
Portugal ²	84.2%	80.2%	
Slovenia ¹	85.1%	76.8%	74.3%
United States ²	80.4%	76.5%	
Netherlands ¹	82.2%	76.1%	
United Kingdom ¹	76.8%	75.1%	
Austria ²	72.7%	74.5%	
Israel ¹	68.6%	72.1%	
Ireland ¹	75.7%	71.6%	
Norway ¹	71.9%	71.6%	
New Zealand ¹	66.9%	71.5%	68.3%
Korea ¹	55.1%	70.2%	
Greece ²	49.6%	65.7%	
Canada ¹	52.8%	62.0%	
OECD36	58.2%	61.7%	
Czech Republic ¹	48.4%	60.9%	
Italy ¹	60.0%	60.7%	
Belgium ¹	62.5%	60.2%	
Iceland ^{1,3}	60.7%	60.0%	62.0%
Estonia ¹	52.0%	55.9%	
Luxembourg ^{1,3}	63.6%	55.1%	
Australia ¹	56.2%	54.5%	
Poland²	57.1%	53.7%	
Lithuania ¹	25.6%	52.9%	45.3%
Germany ¹	54.4%	50.1%	
Switzerland ²	47.4%	49.0%	
France ¹	52.7%	48.8%	
Mexico ¹	17.8%	45.4%	
Japan ²	36.4%	44.6%	
Chile ¹	19.3%	40.1%	36.3%
Latvia ¹	21.1%	39.1%	
Hungary ¹	47.0%	39.1%	
Turkey ¹	30.2%	36.0%	26.9%
Slovakia ¹	34.9%	31.0%	

¹ programme data; ² survey data; ³ 3 year average. Source: OECD Health Statistics 2021

tions was carried out in Sweden (95.2%), Denmark, Spain, Finland and Portugal (values above 80%: 83.2%, 81.5%, 81.3%, 80.2%, respectively). The lowest percentage of mammography examinations was carried out in Latvia, Hungary, Turkey and Slovakia (39.1%, 39.1%, 36.0%, 31.0%, respectively). Data for the year 2020 are incomplete due to the lack of reporting related to the COVID-19 pandemic. Countries that gathered data that were later developed by the OECD were: Spain, Slovenia, New Zealand, Iceland, Lithuania, Chile and Turkey. The highest percentage was reported in Slovenia (74.3%) and Spain (73.8%), and the lowest in Turkey (26.9%). Comparison of the data from 2019 and 2020 showed a decrease in the performance of mammography examinations among women of all countries except Iceland (a different method of reporting). Regarding Poland, the coverage value of 53.7% that was reported by the OECD in 2019 was lower than the OECD average.

The availability of preventive mammography is also related to the number of mammograms available in Poland. Table III presents the number of mammography machines in OECD countries per million inhabitants as of 2021, broken down by outpatient care facilities and hospitals, as well as the summary results.

The biggest number of mammograms in the OECD countries was reported in the United States of America (7,720 per 1,000,000 inhabitants), Greece (68,790 per 1,000,000 inhabitants) and Korea (65,090 per 1,000,000 inhabitants). This is also related to the availability of examinations and the percentage of women who regularly perform preventive mammography examinations. The lowest percentage (in total) was reported in Mexico (9,570 per 1,000,000 inhabitants), Poland (10,260 per 1,000,000 inhabitants) and the Czech Republic (10,560 per 1,000,000 inhabitants).

Discussion

The report *Health at a Glance 2021* shows that the cancer incidence rate in Poland is still relatively low and on average it amounts to 267 persons per 100,000 inhabitants. This rate is lower than in the majority of OECD countries, where the average is 294 persons/100,000. In turn, the cancer mortality rate in Poland is one of the highest in OECD countries and amounts to 228 deaths per 100,000 inhabitants, with an average of 191 deaths per 100,000 population. Poland lags behind other OECD countries with regard to breast cancer diagnosis and treatment [2].

Since breast cancer is the cancer with the highest incidence among women in all OECD countries and the second most common cause of cancer-related deaths among women, a separate section of the *Health at a Glance 2021* report is devoted to this disease. Many OECD countries have implemented breast cancer screening programs, which led to an increase in the proportion of women having mammography examinations from 58.2% in 2009 to 61.7% in 2019. In Poland, an opposite trend can be observed: the share of women aged 50–69

who underwent mammography examinations in the last two years decreased from 57.1% in 2009 to 53.7% in 2019 (survey data).

According to data from the report, the COVID-19 pandemic reduced the popularity of breast cancer screening tests, which may have had a negative impact on the results of breast cancer treatment in the OECD countries. This can already be seen in the Netherlands, where screening tests were suspended during the first wave of COVID in 2020 and a higher percentage of patients diagnosed with advanced breast cancer was recorded, as compared to data from the equivalent time period in the previous two years [2]. According to data from OECD countries from the years 2010–2014, 51.5% of women with breast cancer were diagnosed at an early stage of the disease, and 8.6% were diagnosed at an advanced stage. In Poland, the rate of early detection of breast cancer is unfortunately low, and it amounts to 41.3%, which is more than 10 percentage points below the average for the OECD countries [2].

Studies conducted in many countries indicate that the level of health behavior is influenced by various socio-demographic factors, such as age, education, marital status, family situation, social origin and material status [16, 17]. In a study on the socio-demographic profile of women participating in mammography screening tests in Lower Silesia Province, reasons for the low performance of mammography examinations were indicated. They included factors such as place of residence, age, education and professional status. Women aged 55–59, with at least secondary education, mostly pensioners, underwent mammography examinations more frequently than the representatives of other age groups [18]. In 2010, the opinion of women living in villages in the Kuyavian-Pomeranian Province were examined with regards to the importance of breast cancer prevention. More than half of the respondents had never participated in preventive examinations. Most of the respondents admitted that knowledge about the importance of mammography checks, the occurrence of disturbing breast symptoms or medical recommendations did not sufficiently motivate them to participate in screening tests. The only factor that pushed them to do a mammography examination were disturbing changes in the mammary gland [19]. The population-based breast cancer prevention program is a relatively young program. It has been carried out since 2007 with no restrictions on the number of examinations and sending out invitations (paper invitations for examinations stopped being sent out in 2015) [20].

In Sweden, where the population coverage is very high (the highest in the OECD countries), preventive examinations are paid. In another Scandinavian country, if a woman fails to attend the examination after the third invitation, she receives information about an increase in the health insurance premium. Information about the breast cancer prevention program effectively reached the group of women aged 50–69, but did not affect the number of examinations. The reasons behind this

Table III. Mammography machines in ambulatory care providers / total / in hospitals, per 1,000,000 inhabitants, 2021 or latest available

Location	In ambulatory care providers	In hospitals	Total
Australia	data not available	data not available	20,590
Austria	19,290	2,360	21,640
Belgium	16,700	19,590	36,400
Canada	data not available	data not available	17,470
Colombia	data not available	22,310	data not available
Costa Rica	data not available	8,720	8,720
Czechia	4,860	5,700	10,560
Denmark	1,030	14,900	15,920
Estonia	3,010	8,270	11,280
Finland	0.000	30,920	30,920
France	data not available	6,970	data not available
Germany	data not available	4,870	data not available
Greece	54,870	13,930	68,790
Iceland	16,370	0.000	16,370
Ireland	data not available	data not available	16,850
Israel	5,770	5,020	10,780
Italy	16,090	19,190	35,280
Japan	data not available	data not available	33,780
Korea	41,920	23,170	65,090
Latvia	16,310	11,580	27,890
Lithuania	7,510	10,370	17,880
Luxembourg	0.000	11,030	11,030
Mexico	2,100	7,470	9,570
New Zealand	data not available	data not available	20,730
Norway	data not available	data not available	11,870
Poland	4,380	5,880	10,260
Slovak Republic	6,230	9,890	16,120
Slovenia	5,690	9,010	14,700
Spain	2,600	13,980	16,570
Switzerland	data not available	data not available	29,640
Sweden	data not available	19,120	data not available
United Kingdom	data not available	11,220	data not available
United States	data not available	data not available	70,720

Source: <https://data.oecd.org/healtheqt/mammography-machines.htm>

phenomenon should be sought in the attitude of the media to negative statistics and in impersonal messages. A personal invitation or recommendation from a doctor or friend was more encouraging than other forms of communication. It seems advisable to continue sending personal invitations to women,

e.g. *via* the Online Patient Account. Considering that 41% of respondents in the Millward Brown study declared that it was not their own choice to perform the examination, there is a need to educate this particular group on the possibilities of effective treatment of early detected breast cancer. These

women also need information about easy access to medical care if cancer is detected. Women should be convinced that preventive examinations should be performed when a woman is healthy, that is, before the disease manifests itself clinically, and lesions can be detected in advance in a mammography examination [20–24].

In the Millward Brown study from 2015 on the attitudes towards the breast cancer prevention program, attention was drawn to the role of the media and representatives of medical staff in encouraging women to perform preventive mammography examinations. Considering the media, the respondents were of the opinion that instead of providing information on the number of deaths, it is better to talk and write about successfully treated patients who have had a mammography examination [27]. In this study, 83% of respondents were well acquainted with the Population Program for Early Detection of Breast Cancer. According to the respondents, the best source of information about it was the mass media (television, press and radio – 42.5%) [25]. An important role was also played by personal invitations (28.3%), leaflets and posters in health care facilities (23.5%). As many as 41% of women who did not make the decision about the mammography examination on their own knew about free of charge mammography examinations. This attitude resulted from harmful stereotypes about cancer, such as “let sleeping dogs lie” (24% of responses); “it’s better not to know” (24% of responses); “better leave it” (21% of responses) [25]. A different approach to mammography was represented by Polish women who had a mammography performed as part of the breast cancer prevention program in the population. They believed that “examination guarantees access to treatment” (32% of responses), there is a possibility of further diagnosis (28% of responses), and “cancer that is detected early can be cured” (32% of responses) [27]. The study also shows that as many as 72% of Polish women aged 50–69 visit a family doctor at least once a year, and the respondents trust their doctors, which is why they would like primary health care physicians to control the health of their patients on their own initiative and remind them about the schedule of preventive examinations [25].

It is important for women to have a positive attitude towards medical examinations, as British analyzes show that 63% of patients with a positive attitude to mammography examinations participated in the screening tests on time, and 72% of those with a negative attitude did not undergo the examinations on time [26].

In Europe, the best rates of cancer control are achieved in the Nordic countries, where conditions for easier access to medical examinations have been created, and methods of persuading women to systematically participate in screening tests have been developed. This is important because the detection of cancer in the early, preclinical phase is more prognostic than any combination of treatment methods in the later phase of the disease [27–29].

With regards to the modification of the age of women eligible for preventive mammography examinations under a population-based breast cancer prevention program, the latest American College of Physicians (ACP) guidelines on mammography screening, which were published in the *Annals of Internal Medicine*, should be considered. These guidelines were created based on the analysis of the recommendations of 7 English-speaking societies (USPSTF, ACS, ACR, American College of Obstetricians and Gynecologists, Canadian Task Force on Preventive Health Care, National Comprehensive Cancer Network and the World Health Organization). They suggest having a discussion with women aged 40–49 about the potential benefits and disadvantages of an early mammography. In this age group, the risks outweigh the benefits. The recommendations also indicate that women aged 50–74 should undergo preventive mammography examinations every 2 years. Preventive examinations should be stopped when a woman reaches the age of 75 or if life expectancy is less than 10 years. Clinical breast examinations should not be used as a screening test in any age group. These guidelines are dedicated to women with an average risk of breast cancer, without mutations in the *BRCA* genes, or a history of breast cancer in the family [30].

Conclusions

Both the data on the population-based breast cancer prevention program reported by the National Health Fund and the overall data reported by the OECD indicate a low percentage of performance of mammography examinations in Poland. Among other factors, the decrease in the percentage of women reporting for mammography examinations under the population breast cancer prevention program can be related to the discontinuation of sending paper invitations out to patients. It should be considered to reintroduce the sending out of paper invitations. The COVID-19 pandemic had little impact on the decline in women’s performance of mammography examinations under the population-based breast cancer prevention program, which had been observed for several years.

Although the number of breast cancer cases in Poland is relatively low compared to OECD countries, the number of deaths is definitely high. This is related to the detection of cancer at a late stage of the disease. It is worth considering the inclusion of women up to 74 years of age into the screening tests under the population-based breast cancer prevention program. Among the possible solutions which could be taken in order to address the challenge of low participation in breast cancer screenings in Poland, it is worth considering reintroducing sending out paper invitations and introducing invitations by e-mail or telephone.

In addition, breast cancer screening promotion should be used in social media and with the participation of opinion leaders and authorities in the medical community. Reaching out

to young people who are users of social media should create agility and influence of young people on close elderly people, especially grandmothers. Employers should be also involved in creating the optimum conditions for taking care of their employees' health and carrying out preventive measures, as well as encouraging female staff to carry out examinations.

Conflict of interest: none declared

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