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Research paper

Inequalities in breast-conserving surgery for female breast cancer in Świętokrzyskie Province, Poland

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ABSTRACT

Introduction: Breast cancer is the most common cancer among women in the world. Differences in the treatment of breast cancer may be observed by age, disease stage, place of residence and comorbid conditions.

Aim: The aim of the study was to analyse the differences in the use of breast-conserving surgery among women in the Świętokrzyskie Province.

Material and methods: The study included 483 female residents of Świętokrzyskie Province who were diagnosed with invasive breast cancer in 2013. Following indicators, recommended to evaluate the compliance with the best oncology practice, were calculated: a proportion of patients receiving post-operative breast radiotherapy after the breast-conserving surgery and a proportion of the breast-conservation surgery in pT1 cases.

Results and discussion: The difference in the distribution of surgical procedures by age group (breast-conserving surgery vs. mastectomy) in pT1 cases was statistically significant ($P = 0.006$). The highest values of both indicators were observed in the age group recommended for breast cancer screening in Poland, while the lowest in women 70 years of age and older. Our study revealed a non-significantly higher proportion of patients receiving post-operative breast radiotherapy after breast conserving-surgery in urban than in rural women, amounting to 36.5% and 29.4%, respectively.

Conclusions: Existing inequalities in the use of breast-conserving surgery indicate the need to consider the recommended breast cancer treatment to the highest possible proportion of patients residing in rural areas.

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1. INTRODUCTION

Breast cancer is the most common cancer among women in the world. In 2018, 2 088 849 breast cancer cases in women were reported, the age-standardized rate (ASR) was 46.3 per 100 000 people. The age-standardized incidence rate of breast cancer ranges from 96.3 per 100 000 people in South-Central Asia to 463.1 per 100 000 people in Australia and New Zealand.[1] Breast cancer incidence rates in developed countries are higher, while relative mortality is greatest in developing countries. One of the potential barriers in achieving equitable access to appropriate cancer therapy is the geographic area of the patient's residence, especially for patients living in rural communities.[2,3]

Breast cancer treatment depends on the stage of disease. Breast-conserving surgery (BCS) with radiation therapy is preferred therapeutic procedure for low stage breast cancer. Several prospective studies and randomized controlled trials revealed that BCS with radiation was at least equivalent to mastectomy with respect to survival rates of patients.[4]

The aim of the European Cancer Health Indicator Project, 2001–2003 (EUROCHIP Project), carried out under the auspices of the International Agency for Research on Cancer was to develop a comprehensive list of cancer health indicators (CHI) and to design a European system for collecting and analysing cancer data. The list of these indicators recommended for cancer control contains variables referring to aspects including: the prevalence of cancer, the presence of risk factors, recurrences of the disease, cancer patients' survival, diagnostic and therapeutic procedures, and oncological care standards.[5] During the implementation of the EUROCHIP Project indicators used to monitor the compliance with the best oncology practice were defined. CHI indicators can be the starting point for initiating, implementing, monitoring and comparing activities carried out for cancer control.

2. AIM

The aim of the study was to examine the disparities in BCS among women diagnosed with breast cancer in the Świętokrzyskie Province. The results of the study will serve as the evaluation of compliance with the best oncology practice in the field of breast cancer treatment in the Świętokrzyskie Province.

3. MATERIAL AND METHODS

The study material included information from the Cancer Registry Card MZ/N.1a The study embraced 483 women, who in 2013 were diagnosed with invasive breast cancer and reported to the Świętokrzyskie Office for Cancer Registration. The year 2013 was the year of collecting data, including the type of surgery, based on a Protocol of EUROCARE (European Cancer Registry Based Study On Survival and Care of Cancer Patients) High Resolution Study. The cancer diagnosis was microscopically affirmed in 100.0% of cases. There were no cases for whom the death certificate is a sole provenance of notification. Breast cancer cases were coded in accordance with the International Classification of Diseases for Oncology (ICD-O-3). Patient's address was obtained from the National Official Register of Territorial Division of the Country Place for the purpose of determining the residence (urban/rural).

The Chi-square tests were used to study differences in surgical procedures distribution by age group and place of residence. The *P* value of more than or equal to 0.05 was considered statistically significant.

Based on the information on the frequency of the use of treatment procedures, following indicators recommended for cancer control were calculated: A proportion of patients receiving post-operative breast radiotherapy after the breast-conserving surgery and a proportion of the breast-conservation surgery in pT1 cases. Both indicators were defined and suggested by treatment group for breast cancer in the EUROCHIP Project to evaluate the compliance with the best oncology practice.[5] The indicator demon-

Table 1. Distribution of surgical procedures in women with breast cancer by age group in Świętokrzyskie Province, 2013.

Surgical procedure by age group	*N*(%) of women
All cases	
BCS	178(36.9)
mastectomy	215(44.5)
other	33(6.8)
unknown	11(2.3)
not done	46(9.5)
total	483(100.0)
Age group of 15–49 years	
BCS	28(29.5)
mastectomy	50(52.6)
other	8(8.4)
unknown	2(2.1)
not done	7(7.4)
total	95(100.0)
Age group of 50–69 years	
BCS	131(45.0)
mastectomy	115(39.5)
other	15(5.2)
unknown	6(2.1)
not done	24(8.2)
total	291(100.0)
Age group of 70 years and more	
BCS	19(19.6)
mastectomy	50(51.5)
other	10(10.3)
unknown	3(3.1)
not done	15(15.5)
total	97(100.0)

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strating the percentage of patients who have undergone the BCS with post-operative radiotherapy was calculated by age group (15–49, 50–69, ≥70), by disease stage and by place of residence (urban/rural). Simplified classification of disease stage recommended by European Network of Cancer Registries (ENCR) for population registries (localised, regional, advanced) was concerned.[6] The recommended indicator assessing the use of BCS in patients with stage pT1 was calculated in total, by age group (15–49, 50–69, ≥70) and by place of residence (urban/rural).

Table 2. Distribution of surgical procedures in women with breast cancer by place of residence in Świętokrzyskie Province, 2013.

Surgical procedure by place of residence	*N*(%) of women
Urban	
BCS	116(39.2)
mastectomy	128(43.2)
other	19(6.4)
unknown	5(1.7)
not done	28(9.5)
total	296(100.0)
Rural	
BCS	62(33.2)
mastectomy	87(46.5)
other	14(7.5)
unknown	6(3.2)
not done	18(9.6)
total	187(100.0)

Table 3. Distribution of surgical procedures in women with breast cancer by stage of disease in Świętokrzyskie Province, 2013.

Surgical procedure by stage of disease	*N*(%) of women
Localised	
BCS	123(52.8)
mastectomy	86(36.9)
other	13(5.6)
unknown	2(0.9)
not done	9(3.9)
total	233(100.0)
Regional	
BCS	53(28.8)
mastectomy	114(62.0)
other	6(3.3)
unknown	2(1.1)
not done	9(4.9)
total	184(100.0)
Advanced	
BCS	0(0.0)
mastectomy	12(30.8)
other	1(2.6)
unknown	1(2.6)
not done	13(48.1)
total	27(100.0)

4. RESULTS

The most common type of breast cancer surgery in the Świętokrzyskie Province was mastectomy (44.5%). The percentage of women who underwent BCS (quadrantectomy, lumpectomy, resection) was 36.9% (Tables 1–3).

The difference in the distribution of surgical procedures for breast cancer by age group was statistically significant ($P = 0.0002$). The mastectomy was most frequently used in the age group of 15–49 years and the oldest patients, i.e. 70 years of age and older, that is respectively for 52.6% and 51.5%. BCS

Table 4. Distribution of surgical procedures in pT1 cases by age group and place of residence in Świętokrzyskie Province, 2013.

Surgical procedure	*N*(%) of women
All cases	
BCS	111(61.7)
mastectomy	68(37.8)
other	1(0.6)
total	180(100.0)
Age group of 15–49 years	
BCS	12(46.2)
mastectomy	14(53.8)
other	0(0.0)
total	26(100.0)
Age group of 50–69 years	
BCS	92(68.1)
mastectomy	42(31.1)
other	1(0.7)
total	135(100.0)
Age group of 70 years and more	
BCS	7(36.8)
mastectomy	12(63.2)
other	0(0.0)
total	19(100.0)
Urban	
BCS	76(64.4)
mastectomy	42(35.6)
other	0(0.0)
total	118(100.0)
Rural	
BCS	35(56.5)
mastectomy	26(41.9)
other	1(1.6)
total	62(100.0)

CORRECTED PROOF

was most frequently performed in the age group of 50–69 years (45.0%). The percentage of performed BCSs in the youngest and the oldest women was 29.5% and 19.6%, respectively (Table 1). Analysis of urban-rural disparities in the use of surgical procedures revealed a non-significantly higher proportion of performed BCS in women residing in urban than in rural areas, amounting to 39.2% and 33.2%, respectively (Table 2).

The BCS was used for 52.8% of patients with localised stage and 28.8% with regional stage and was not performed in patients with an advanced stage of breast cancer (Table 3).

The BCS surgery with post-operative radiotherapy (RT) was performed on 163 patients', that is, for 33.7% women. This treatment regimen was used in 121 women aged 50–69 years (41.6%), in 27 women aged 15–49 years (28.4%) and in 14 women aged 70 years and older (14.4%). BCS with post-operative RT was performed on 108 of the urban residents (36.5%) and on 55 women residing in rural areas (29.4%).

The distribution of surgical procedures performed on patients with pT1 stage breast cancer by age group and place of residence was presented in Table 4. In the analysed group of patients with breast cancer in the Świętokrzyskie Province in 2013, 37.3% of women were diagnosed with stage pT1. Value of the indicator that demonstrates the proportion of patients with pT1 stage breast cancer, who were treated with breast-conserving surgery was 61.7%. The difference in the distribution of surgical procedures by age group (BCS vs. mastectomy) in pT1 cases was statistically significant ($P = 0.006$). The highest proportion of BCSs in the treatment of pT1 stage breast cancers was observed in the age group recommended for screening (50–69 years old) and equalled 68.1%. Among the youngest patients (15–49 years old) with stage pT1, 46.2% underwent BCS and 38.1% in women 70 years of age and older. Taking into consideration the place of residence, the frequency of the use of the BCS for pT1 stage breast cancer cases was higher in urban women than in rural women. The BCS was performed on 64.4% of urban and on 56.5% of rural women.

5. DISCUSSION

In our study, the frequency of BCS was evaluated, which can be performed on patients with early stages of the disease. Its irreplaceable part is breast irradiation to reduce the risk of local recurrence. Both methods used in the surgical treatment among women with early stage disease: BCS and mastectomy do not differ significantly in terms of the treatment effects.[7] Because the implementation of the BCS requires high qualifications and appropriate infrastructure, the procedure should be carried out in highly specialist oncology centres.

The selection of the Świętokrzyskie Province for research was dictated by the fact that the Świętokrzyskie Office for cancer registration is the leading registry in the country in terms of quality and completeness of the collected data. The registry is characterized by a 100% completeness of the registration, the small number of applications based on the patient's death certificate only (DCO), a high percentage of histopathological data confirmation. High completeness and quality of cancer registration affect the reliable assessment of cancer risk and systematic publication of epidemiological data in Cancer Incidence in Five Continents.[8] The credibility of the data collected in the registry is ensured by the control of the information contained in the MZ/N-1a Cancer Registry Card and conducting the long-term observation of the patient's fate in follow-up studies.

Differences in treatment of breast cancer may be observed by age, disease stage, place of residence and comorbid conditions.[9] In Europe, an upward trend is observed in the use of breast-conserving treatment. A population study conducted in Germany showed that the frequency of the use of BCS increased from 59% in 2000–2001 to 67% in 2008–2009.[10] The study carried out by Habermann et al. from 2000 to 2006 in the United States showed an increase in BCS rates while unilateral mastectomy became less common.[11]

The results of our research showed that the percentage of patients who underwent BCS was 36.9%. In the Świętokrzyskie Province, the dominant surgical procedure was mastectomy performed on 44.5% of women with breast cancer.

Our study showed inequalities in the use of BCS by age. It was expressed by the lowest proportion of BCSs in women aged 70 years and older (19.6%). Giordiano et al. showed that increasing patient age was related to decreased guideline compliance for definitive surgery.[12] The results of a retrospective study conducted in the United Kingdom revealed that older women were less likely to receive standard diagnostic and therapeutic management for breast cancer, compared to younger women. Radiotherapy after BCS was less frequently used among elderly patients (75–79 years of age) compared to women aged 65–69 years.[13] The results of a study conducted in Germany showed that BCS with radiotherapy was performed on 57% of patients with breast cancer diagnosed in the years 2000–2009. Analyses by the age group showed that in patients aged 70 years and older, compared to younger patients (15–49 years old), BCS followed by radiotherapy was less frequently performed (39% vs. 65%, respectively).[12]

Our findings align with other observations showing variation in breast cancer treatment by age. However van Ravesteyn et al. showed that in the oldest women harms outweigh benefits of breast cancer screening.[14]

Possible factors that shift decisions toward mastectomy are a younger population with higher lifetime risk, higher stage disease, more biologically aggressive tumours, patient preference and fear of genetic or recurrence risk.[15]

The results of the presented study noted a low proportion of patients who underwent BCS in the youngest (15–49 years old) age group (29.5%). Results obtained by other researchers confirmed inequalities in the use of BCS among young women. Kheirelseid et al. found that 24.1% of BCSs were performed in women under 40 compared with 38.1% above 40 years.[16] The results of research conducted by Gnerlich et al. showed that in comparison with patients aged 40 and older, women under 40 years of age were more likely to be diagnosed at a later stage of breast cancer and be treated with mastectomy.[17] Research carried out by van Nes et al. showed that after a long follow-up, in young women with breast cancer

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after BCS, higher odds of relapses were observed compared to women who underwent a mastectomy. Young women, due to the longer life expectancy, are more at risk of recurrence, and therefore death due to cancer. It is necessary to discuss with each young breast cancer patient the possibility of the breast amputation with possible breast reconstruction.[18,19]

The results of the EUROCARE study, similar to our results, showed differences in the frequency of the use of BCS by disease stage. In each of the countries included in the EUROCARE project, the BCS was used more often in patients with an early stages of the disease.[20] It was noted in the study by White et al. that women with higher disease stage were less likely to have BCS.[9] In our research, the BCS was more often performed on patients with the localised stage of disease than on patients with the regional stage, amounting respectively to 52.8% and 28.8%. The low proportion of BCSs in the age group of 15–49 years observed in the presented study may result from the low, in comparison with the patients in the age group of 50–69 years, the proportion of patients diagnosed at the localised stage of the disease.

Patients who undergo BCS usually require adjuvant radiotherapy.[21] In the presented study, the proportion of patients receiving post-operative breast RT after BCS was 33.7%. Value of this indicator was the highest (41.6%) in the age group recommended for screening (50–69 years old)and the lowest (14.4%) in women aged 70 years and older.

The results of research carried out by Maślach et al. in the Podlaskie Province in the years 2001–2002 among women treated radically revealed much lower (12.6%) than in the presented study value of the index that demonstrates the proportion of patients receiving post-operative breast RT after BCS. The authors of the study showed that the frequency of performed BCSs followed by RT decreased with age. This treatment regimen was used in 21.3% of patients in the age group of 15–44 years, and only in 11.1% women over 75 years of age.[22]

In the examined group of patients, 37.3% of women were diagnosed with pT1 breast cancer. All these patients underwent a surgical procedure. The value of the CHI calculated that demonstrates the proportion of the BCS in pT1 cases in the Świętokrzyskie Province was 61.7%. The most numerous group of breast cancer patients with stage pT1 was the age group recommended for screening, i.e. 50–69 years. In this age group, BCS was performed on 68.1% of women. Among the youngest patients (15–49 years old) with breast cancer in the pT1 stage, BCS was used in the treatment of 46.2% women. This surgical procedure was less frequently (38.9%) used for the oldest patients (aged 70 years and older).

The presented study indicated the highest proportion of patients who underwent BCS treatment in the age group of 50–69 years. The highest values of the CHI, that is: a proportion of patients receiving post-operative breast RT after the BCS and a proportion of the BCS in pT1 cases were also observed in the age group recommended for screening.

BCS treatment depends on the disease stage. In our previous study, it was noted that the proportion of patients diagnosed at a localised stage of disease was the highest in the age group of 50–69 years (48.2%).[23] Better detection of breast cancer at a low stage in the age group recommended for screening and effective screening realisation in Poland may result in the highest proportion of women treated with BCS in this age group.

One of the key objectives for public health policy in Poland is the reduction of health inequalities, including urban and rural disparities. Higher proportion of women diagnosed with early stage of the disease as a consequence of better detection, effectiveness of treatment and better access to health care services have an enormous impact on the results of breast cancer therapy. Our findings confirmed urban and rural inequalities in the use of BCS. Analysis of urban and rural disparities in the use of surgical procedures revealed a non-significantly higher proportion of performed BCS on urban than in rural women. Reports from several authors confirmed that travel distance may represent a barrier in access to RT.[24] Geographic proximity to cancer treatment facilities plays an essential role in the therapy for early-stage breast cancer patients.[25] Forte et al. noticed a significant variation in breast cancer treatment by geographic place of residence. Similar to our results, they found the highest percentage of patients undergoing mastectomy lived in very remote parts of the country (52%) compared with women living in urban and non-remote rural areas (38%).[2] Jacobs et al. showed that the proportion of mastectomy for rural patients with stages I–III breast cancer was higher (59.9%) compared with urban patients (44.9%).[26] Similar data were presented by Markossian et al. Researchers noticed that female rural residents had lowered odds of receiving breast-conserving surgery compared to mastectomy.[27] Disparities in the surgical treatment of breast cancer by patient's residence should be included in strategies for cancer control.

6. CONCLUSIONS

Results of the study showed that the proportion of patients receiving post-operative breast RT after BCS and the proportion of breast conservation surgery in pT1 cases was 33.7% and 61.7%, respectively. The highest values of both indicators were observed in the age group recommended for breast cancer screening in Poland (50–69 years old) and the lowest in women 70 years of age and older.

Existing inequalities in the use of BCS indicate the need to consider the recommended breast cancer treatment to the highest possible proportion of patients residing in rural areas.

Conflict of interest
None declared.

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Ethics

The implementation of the study was approved by the Bioethics Committee of the Medical University of Bialystok – Resolution No. R-I-002/199/2015 of 28 May 2015.

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