BREAST CANCER SURVIVAL GAP BETWEEN URBAN AND RURAL FEMALE POPULATION IN PODLASKIE VOIVODSHIP, POLAND, IN 2001–2002. POPULATION STUDY

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Abstract: The aim of the study was to evaluate differences in breast cancer 5-year relative survival rates between the urban and rural female population in Podlaskie Voivodship in 2001–2002, before the introduction of the Population Screening Programme in 2006. The analysis was based on 659 breast cancer cases diagnosed in 2001–2002 and registered in CR in Białystok (Voivodship Cancer Registry). Relative survival and relative excess of risk of death after 5 years of diagnosis as function of age and stage among urban and rural women population were calculated. The results showed that survival rates in Podlaskie Voivodship were low (69.4%) in comparison to the European average (79.4%), and they differed between urban and rural areas. Patients living in rural areas had a much lower survival rate than those living in urban areas at local and regional stage of disease, whereas survivals were higher at the metastatic stage. In all age groups considered in the study, the survivals in rural areas were lower than in urban areas. The multivariate analysis confirmed that both the cancer stage and place of residence are independent prognostic factors. Relationship with age was not confirmed. The research results indicate low curability of breast cancer in Podlaskie Voivodship, and significant differences between urban and rural areas. These results need to be considered in the planning and monitoring of further intervention in order to increase the effectiveness of prevention and treatment standards for more disadvantaged rural areas. It is particularly significant when implementing the National Cancer Control Programme.

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INTRODUCTION

Urban–rural inequalities in survival have been observed among patients with certain types of cancer [16]. Female breast cancer survival rates have been reported to be higher in urban compared with rural areas [5]. The relative 5-year survival rates describe the actual curability of cancers in the population. They depend mainly on better detection and, consequently, a higher proportion of women with early stage of the disease, and also a better access to effective

oncological treatment [2]. Access to early detection and health care facilities differ between urban and rural communities. People living in rural areas in Poland usually have less access to health care services [18, 32]. In 2001–2002, there were approximately 1,208,600 inhabitants in Podlaskie Voivodship, including 617,399 women, which amounts to about 51%. More women lived in urban – 371,270 (60.1%) than in rural areas – 246,128 (39.9%) [25].

Before 2006, no population screening programmes had been carried out in Podlaskie Voivodship, prevention activities included mainly the urban women population, and in the rural areas were conducted by mobile mammography units.

In 2002, access to mammography in Podlaskie Voivodship was the lowest in Poland (36,600 women per one device) [1] and differed between urban and rural areas. There were 10 devices in Podlaskie Voivodship, including 5 in Białystok, which is the largest town in the region. Unequal access to early detection for rural women is also a consequence of their distant location and concentration in urban areas.

The research was undertaken into consideration the unequal access to early detection, as well as the health care system in urban and rural areas, and the implementation of the Population Screening Programme in Podlaskie Voivodship in 2006 within the frame of the National Cancer Control Programme. Its aim was to evaluate the 5-year relative survival, as well as the influence of selected prognostic factors on breast cancer outcome in urban and rural areas in Podlaskie Voivodship in 2001–2002.

MATERIALS AND METHODS

In 2001–2002, 696 cancer patients were registered in the CR in Białystok. Cases were coded according to the International Classification of Disease (ICD-10) [12]. Histologically verified and non-verified cases were all considered for analysis. Cases registered from a death certificate only (DCO cases) and those discovered at autopsy were excluded.

Analysis was performed based on 659 cases for whom the month of diagnosis and the day of last observation or date of death if patient died within 5 years since the diagnosis were known. A total of 456 cases in urban and 203 in rural areas were considered in the analysis.

Age of patients was taken on the basis of CR's data. Incomplete data on the stage and breast cancer diagnosis were provided or verified on the basis of patients' medical records from the hospitals where they were treated.

Residence (urban – rural) was determined on the basis of the address of patients according to the National Official Register of Territorial Division of the Country – TERYT. Urban population was defined if urban official municipal rights were granted. In Podlaskie Voivodship there are 39 towns [33].

Table l. Patients characteristics.

Place of residence	Included in analyses		Morphologically verified	Autopsy or DCO [a] cases
	No. of women	%	%	%
Urban	456	69.2	97.6	3.6
Rural	203	30.8	94.6	9.0
All cases	659	100.0	96.7	5.3

[a] Death Certificate Only

Patients were observed in the period of 5 years or through to the date of death. Missing data concerning the patient being alive or dead were updated and verified by the Office of the Citizen's Affairs and Migration in Białystok, with the use of the National Identification Number (PESEL), which guaranteed the right quality of the observation.

As Table 1 shows, nearly 70% of the patients were from urban areas. 96.7% of breast cancer included in the analysis were histologically verified, the proportion was 97.6% in urban and 94.6% in rural areas. The overall percentage of DCO and autopsy cases was 5.3%, with the higher value in the rural areas (9.0%). There were no cases lost to follow-up.

In order to evaluate the stage of disease, a simplified classification recommended by ENCR (European Network of Cancer Registries) for population registries (localised, regional, metastatic) was applied [8, 31].

5-year relative survival rates were calculated for the Voivodship, and separately for urban and rural women population. The calculations were performed according to the stage at diagnosis in compliance with ENCR criteria, and in the following age groups: 15–44, 45–54, 55–64, 75 and above. Standardisation of the indicators was carried out with the use of ICSS (International Cancer Survival Standards) [6] population, which enabled the comparison of European results.

Multivariate analysis including the following variables: age group, stage of diseases and place of residence was performed to examine if the other causes related to residence, mainly access to early diagnosis and standard of treatment, can explain differences in survival.

R software (package relsurv) was used to prepare data and perform statistical analysis [23, 24].

The 5-year relative survival rates were calculated with the application of the Hakulinen life-table method [10]. This method is recommended by WHO for survival analyses based on CR cohorts, which usually consist of the date of cancer diagnosis and its complete observation, but do not include information concerning the cause of death. Life-table specific for Podlaskie Voivodship was provided by Central Statistical Office in Warsaw. Calculations of the 5-year survival were carried out if there were at least 20 patients in a group.

Analysis of prognostic factors evaluated the influence of age, stage at diagnosis, and place of residence for relative

excess mortality risk (RER). For analysis of the prognostic factors, the Hakulinen-Tenkanen multivariate regression analysis approach recommended for population registries data evaluation was used [24]. This method allows evaluation of differences in the risk of death between the risk in the study group and in the reference group, taking into consideration the risk of death of the general population living in the region under study.

Data collection and analysis were in compliance with The Personal Data Protection Act of 29 August 1997 (DzU 1997, No. 133, item 883, as amended) as well as with the regulations and procedures of the National Cancer Registry.

RESULTS

Table 2 presents the breast cancer patient's age structure and stage distribution in urban and rural areas. Proportion of women below the age of 65 was higher in urban areas, with most important differences at age 45–54 amounted, respectively, in urban and rural areas: 34.2% *vs* 24.6%. However, the trend was the opposite at age 65 and older, with a higher proportion of breast cancer diagnosed in rural areas.

The proportion of localised stage of disease in urban areas was higher – 34.9% than among their rural counterparts – 29.1%. However, metastatic at diagnosis was higher in rural areas: 18.2% *vs* 10.1%.

As summarised in Table 3, overall relative age-standardised 5-year survival rates in Podlaskie Voivodship amounted to 69.4%. There was considerable variation in survival rates between urban and rural areas, and the figures were: 72.0% in urban areas and 61.7% for their rural counterparts. Survival rates in rural areas were lower, even if main prognostic factors, age and stage of disease were considered.

The highest survival rates in urban communities were among the youngest patients, whereas in rural areas they were the highest among patients aged 55-64. Moreover, for

Table 2. Age and stage distribution of breast cancer by place of living.

	Urban		Rural	
	No. of women	%	No. of women	%
Age				
15–44	69	15.1	30	14.8
45–54	156	34.2	50	24.6
55–64	103	22.6	42	20.7
65–74	87	19.1	58	28.6
75+	41	9.0	23	11.3
Stage				
local	159	34.9	59	29.1
regional	243	53.3	104	51.2
metastatic	46	10.1	37	18.2
unknown	8	1.8	3	1.5

this age group there was the smallest diversity of survival rates between urban (75.3%) and rural (71.3%) areas. The biggest disproportion occurred between urban (79.8%) and rural (63.1%) communities among patients aged 45–54. The lowest survival rates were present in the oldest group, and amounted to 59.4% – urban and 47.6% rural areas.

Presented data showed an apparent trend in relation to lowering of survival rates with the patient's age when all cases in Podlaskie Voivodship and urban subgroup were analysed. In contrast to the above, in the rural population this trend is disturbed by obviously low survival rates in women aged under 55. Survival rates in this age group are evidently lower than those at age above 55 in the rural population (except age group above 75), and also if compared to women of the some age in urban areas.

There was also a clear correlation between the value of survival rates and stage of disease. The highest rates occurred if cancer was localised at an early stage of disease, namely 94.2% in urban and 82.4% in rural areas, and

Table 3. 5-year relative survival[a] rates in urban and rural population by age and stage of breast cancer.

	Urban		Rural		All cases	
	No. of women	5–YRS[b] (95% Cl)	No. of women	5–YRS[b] (95% Cl)	No. of women	5–YRS[b] (95% Cl)
Overall	456	72.0[c] (55.1–88.9)	203	61.7[c] (38.0–85.4)	659	69.4[c] (55.7–82.1)
Age						
15–44	69	83.0 (73.6–92.5)	30	67.1 (47.8–86.5)	99	78.3 (69.6–87.0)
45–54	156	79.8 (72.9–86.7)	50	63.1 (47.8–78.4)	206	75.8 (69.4–82.1)
55–64	103	75.3 (65.9–84.8)	42	71.3 (55.3–87.3)	145	74.2 (66.2–82.2)
65–74	87	76.0 (64.8–87.1)	58	66.3 (50.9–81.7)	145	72.4 (63.5–81.4)
75+	41	59.4 (33.4–85.5)	23	47.6 (11.9–83.3)	64	56.1 (36.0–76.2)
Stage						
local	159	94.2 (89.2–99.2)	59	82.4 (70.4–94.3)	218	91.4 (86.5–96.2)
regional	243	75.8 (69.5–82.0)	104	65.4 (54.4–76.4)	347	72.7 (67.3–78.1)
metastatic	46	22.5 (8.3–42.7)	37	38.1 (17.2–59.1)	83	31.1 (18.7–43.6)
unknown	8	NC[d]	3	NC[d]	11	NC[d]

[a] in %; [b] 5-year relative survival rate; [c] Age-standardised 5-year relative survival; [d] Not calculated.

Table 4. Multivariate analysis.

	Relative risk RER	95% CI	p
Age			
15–34	1		
35–44	0.83	(0.24–2.87)	0.77
45–54	0.95	(0.29–3.12)	0.93
55–64	0.99	(0.30–3.31)	0.99
65–74	0.90	(0.27–3.03)	0.87
75+	1.34	(0.38–4.71)	0.64
Stage			
local	1		
regional	2.78	(1.74–4.43)	<0.001
metastatic	11.03	(6.66–18.27)	<0.001
Place of living			
urban	1		
rural	1.37	(1.01–1.86)	0.04

the lowest in advanced disease (metastatic), respectively 22.5% *vs* 38.1%. The relative 5-year survival rates were considerably higher in urban than in rural areas, except for metastatic cancer.

The results of the multivariate analysis confirmed that the most crucial prognostic factor for breast cancer patients is the stage of disease. Assuming that localised stage RER = 1, in successive stages it was as follows: regional – 2.78; metastatic – 11.03. The increase of this risk was statistically significant (p < 0.001).

The influence of place of residence in town or rural areas on cancer outcome was also significant in this study (p < 0.04). The relative excess mortality risk for rural residents (RER = 1.37) was higher in comparison to urban patients. The approached age-grouping in this study did not influence patients prognosis.

DISCUSSION

The study presents great differences in breast cancer survival among women in urban and rural areas in Podlaskie Voivodship before the introduction of the National Cancer Control Programme in 2005 [28]. Age-standardised 5-year relative survival breast cancer women in urban areas was 72.0%, while in rural areas it was considerably lower – 61.7%. Overall, in Podlaskie Voivodship, in 2001–2002 survival rates amounted to 69.4% and were below the European average (79.4%), which confirms that Poland (with survival rate 73.7%) belongs to the countries with the one of the lowest survival rates in Europe. In Europe, age-standardised 5-year relative survival ranged from about 80–90% in several Northern European countries (Island, Sweden, Finland) to 70% in Central Europe (Czech Republic, Slovenia, Poland) [27].

Population studies have shown that the main factor affecting breast cancer prognosis is the stage of disease at

diagnosis [26, 29, 30]. The results of uni- and multivariate analyses presented in this paper confirmed this underlying findings. Poor survival among women from Podlaskie Voivodship presented in this study is related mainly to the low proportion of women with a localised stage of disease – 33.1% [17].

The low proportion of early stage of disease in breast cancer women is related to insufficient diagnostic activity performed in the region. This was one of the main reason for introducing the Population Screening Programme within the framework of the National Cancer Control Programme.

The low proportion of early stage in urban and rural areas in Podlaskie Voivodship was characteristic for a population where effective early detection programmes did not exist. The results of certain research on stage at diagnosis of breast and other cancers among Polish women indicate a similar, unfavourable distribution of stage at diagnosis [3, 4, 9]. Urban and rural areas differed significantly as far as the proportion of patients with localised stage was concerned.

The importance of age at diagnosis as a prognostic factor is controversial. Several studies suggested that young women have poorer relative survivals than middle-aged women, and explained by more aggressive tumour characteristics. Population studies indicated the importance of the higher proportion of advanced cancer in the elderly [7, 11, 19].

Results of the multivariate analysis presented in this paper did not confirm the importance of age as a significant prognostic factor. However, in urban areas, the younger age of patients is clearly related to better prognosis. In rural areas, this trend, especially in the youngest women, was bothered by reasons that might be connected with insufficient knowledge about cancer in women population [13], and/or difficult access to early diagnosis or treatment of disease.

For women living in rural areas the highest survival rate was among patients aged 55–64. In this age group, not small survival disproportion among urban and rural patients was anticipated. This might be connected with the local activity promoting early diagnosis in middle age – group women conducted by mobile mammography units in the region.

At the period of study, the majority of breast cancer diagnostic and treatment services were available in urban areas. There were only 10 devices for mammography, which was the lowest in Poland, and most of them were concentrated in urban areas. The results of the multivariate analysis may suggest that differences are correlated with the place of residence, that show a considerably higher death risk (RER = 1.37) for those living in rural areas rather than those in urban population.

Urban–rural inequalities in cancer survival have been reported in many developed countries among patients from the most deprived areas showing poorer outcomes for many cancers [2, 5, 14, 22]. In the US, cancer registry-

-derived relative survival for individual cancer sites was used in models with socio-economic indicators to estimate survival in areas not covered by cancer registration. This study showed that breast, prostate, and also colorectal cancer survival were strongly associated with demographic and socio-economic indicators [20]. People living in socio-economically disadvantaged areas may have poorer access to health care, which may result in delayed diagnosis and poorer treatment [34]. In Poland, people in rural area usually have a lower socio-economic status [15, 32].

To explain the reasons for inequalities in breast cancer 5-year relative survival rates between urban and rural areas, more population-based studies, including level of knowledge about cancer and life style, access to the health services, socio-economic inequalities, etc., are needed [21]. These indicators are basic for planning and monitoring effective intervention in the population.

The results of this study constitute a basic set of information useful for monitoring the Population Screening Programme introduced in Podlaskie Voivodship in 2006.

CONCLUSION

1. Overall 5-year relative survival rates in Podlaskie Voivodship are low and substantially differentiated between the urban and rural population. Poorer prognosis in the rural population can be partially explained by the lower proportion of localised stage of disease and more difficult access to early diagnosis and treatment.

2. The results show that the most neglected groups are young women in rural areas, which indicates the necessity for preventive activities in this group. In the middle-aged group, the local activity promoting early diagnosis conducted by mobile mammography units among the rural population brought very good results

3. Evaluation of the health effects of the National Cancer Control Programme should include systematic monitoring of the population survival rates consisting of prognostic factors disparities between urban and rural areas.

Acknowledgements

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