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Breast cancer mortality in urban and rural female population in Poland in years 2002-2011

Abstract

Introduction. Variation in female breast cancer incidence and mortality between urban and rural areas is one of the inequalities in the health of the Polish population.

Aim. The aim of the study was to analyse the differences in breast cancer mortality among urban and rural female population in Poland in years 2002-2011.

Material and Methods. The study material was based on the data from the Central Statistical Office of Poland on the number of breast cancer deaths registered in Poland for the period 2002-2011. Mortality rates for urban and rural populations: crude and age-specific, as well as age-standardised (ASR) were calculated and expressed per 100 000 women at risk. Mortality differences related to the place of residence were presented with the use of urban/rural ratio. Time trends for mortality rates in urban and rural population in years 2002-2011 were analysed. The changes in mortality rates were evaluated using the joinpoint model.

Results. Average annual ASR in urban areas amounted 15.6/100 000 (crude 29.2/100 000), in rural – 12.4/100 000 (crude 20.9/100 000). Urban/rural ratio for ASR was 1.26 [95% CI: 1.13 to 1.39] and for crude rate it was 1.39 [95% CI: 1.31 to 1.48]. ASR in urban area significantly decreased by 1.0% per year [95% CI: 1.6 to -0.5]), in rural areas mortality decreased only by 0.3% per year.

Conclusions. Breast cancer mortality in Poland was markedly higher in urban female population. However, age-standardised mortality rate was slowly decreased among women living in urban areas. In rural areas the mortality trend decreased slightly and those changes were statistically insignificant.

Keywords: breast cancer, mortality, inequalities in health, urban and rural population.

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INTRODUCTION

In Poland, breast cancer is the first reason of cancer incidence with 15 784 new cancer cases diagnosed, and the second cause of cancer deaths overall among women with 5 226 breast cancer deaths in 2010 [1].

Variation in female breast cancer incidence and mortality between urban and rural areas is one of the inequalities in the health of the Polish population. Differential epidemiological patterns of breast cancer have been observed between urban and rural populations around the world. They are mainly related to the exposure to risk factors that have changed due to different trends in lifestyle in different populations [2-4]. The analysis of differences of mortality in urban and rural populations is an important tool to monitor breast cancer control, as well as to evaluate the outcomes of modifications in the population lifestyle, environmental risks and the effectiveness of health care.

AIM

The aim of the study was to analyse the differences in breast cancer mortality among urban and rural female population in Poland in years 2002-2011.

MATERIALS AND METHODS

The study material was based on the data from the Central Statistical Office of Poland on the number of breast cancer deaths registered in Poland for the period 2002-2011 [5]. The data included information about the age at death in 5-year age groups and place of residence: urban – rural. The ‘urban area’ was defined as an area having the status of a town established in accordance with the relevant legal act.

Causes of deaths were coded according to the 10th revision of the International Classification of Diseases [6].

Mortality rates: crude and age-specific mortality, as well as age-standardised mortality (ASR) were also calculated

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and expressed per 100 000 women at risk. Standardization for age was performed by the direct method using the World Standard Population as the reference. Mortality rates were calculated separately for urban and rural population.

Mortality differences related to the place of residence urban – rural were presented with the use of urban/rural ratio. A confidence interval of 95% for urban/rural ratio was calculated with the Poisson approximation method.

Trend analysis

Time trends for crude, age-specific and age-standardised mortality rates for breast cancer in urban and rural female population in years 2002-2011 were analysed. The changes in mortality rates were evaluated using the joinpoint model. This method is an extension of linear regression model, in which the time trend is determined by the joined segments (joinpoints) at which changes in time trends occur in a statistically significant way ($p < 0.05$) [7].

On the basis of the linear regression model, in which the natural logarithm of mortality rate was a dependent variable and the calendar year was an independent variable: ($y = a + bx$, where $y = \ln(\text{mortality rate})$, $x = \text{calendar year}$).

Annual Percent Change (APC) of mortality rates for each trend was determined according to the following formula: $APC = 100 * (\exp^b - 1)$.

A confidence interval of 95% (95% CI) was set in order to estimate the statistical significance of APC level in the analysed period.

The analysis of trends and APC was calculated using the Joinpoint Regression Programme (Version 4.0.4 – May 2013) [8].

RESULTS

As presented in Table 1, mortality rates were markedly higher in urban than rural areas, and average annual ASR amounted respectively to: urban – 15.6/100 000 (crude 29.2/100 000), rural – 12.4/100 000 (crude 20.9/100 000). As it can be seen in Table 3 urban/rural ratio for ASR was 1.26 [95% CI: 1.13 to 1.39] and for crude rate it was 1.39 [95% CI: 1.31 to 1.48].

The highest mortality rates were observed in the oldest age group, respectively: urban 104.4/100 000, rural 76.0/100 000 (Table 2). The largest differences between urban and rural areas could also be observed in the oldest age group, which is reflected by the urban/rural ratio, which amounted to 1.38 [95% CI: 1.16 to 1.42]. In the age group 50-69 years mortality rate was also higher in urban areas, and urban/rural ratio amounted to 1.24 [95% CI: 1.13 to 1.35] (Table 3).

As presented in Table 4, crude mortality rate for breast cancer in the period under study significantly increased in urban ($APC = +1.1\%$; [95% CI: 0.5 to 1.7]) and rural areas ($APC = +1.4\%$; [CI: 0.6 to 2.1]). The trend was reverse for ASR in urban area ($APC = -1.0\%$; [95% CI: -1.6 to -0.5]). In the youngest age group mortality significantly decreased both in urban ($APC = -4.0\%$; [95% CI: -5.3 to -2.7]) and rural areas ($APC = -2.3\%$; [95% CI: -4.0 to -0.7]). In age group 50-69 years mortality rate significantly decreased only in urban areas ($APC = -0.9\%$; [95% CI: -1.5 to -0.3]). In the oldest age group mortality rates decreased in urban female population

TABLE 1. Breast cancer mortality among urban and rural female population in Poland, years 2002-2011.

	No. of deaths	CR ^b	ASR	No. of deaths	CR ^b	ASR
	Urban			Rural		
2002	3403	27.5	16.3	1422	19.3	12.5
2003	3430	27.8	16.0	1512	20.5	13.0
2004	3424	27.8	15.7	1463	19.8	12.2
2005	3572	29.0	16.1	1540	20.8	12.4
2006	3718	30.3	16.2	1494	20.2	11.9
2007	3636	29.6	15.4	1619	21.8	12.8
2008	3708	30.2	15.6	1654	22.2	12.8
2009	3662	29.9	15.1	1580	21.1	12.0
2010	3233	29.2	14.5	1631	21.6	12.3
2011	3753	30.5	15.1	1684	22.2	12.3
2002-2011a	3554	29.2	15.6	1560	20.9	12.4

a – the annual average for 2002-2010, b – crude rate

TABLE 2. Age-specific breast cancer mortality rates among urban and rural female population in Poland, years 2002-2011.

Age group	15-49		50-69		70+		15-49		50-69		70+	
	No. of deaths	CR	No. of deaths	CR	No. of deaths	CR	No. of deaths	CR	No. of deaths	CR	No. of deaths	CR
	Urban						Rural					
2002	526	8.2	1563	55.2	1314	104.6	233	6.5	616	44.2	573	65.1
2003	483	7.6	1580	54.1	1367	106.1	222	6.1	640	45.3	650	73.0
2004	449	7.1	1586	52.9	1389	104.9	216	5.9	615	42.8	632	70.1
2005	433	7.0	1680	54.5	1459	107.1	216	5.9	603	41.1	721	79.1
2006	422	6.9	1739	55.2	1557	111.1	218	5.9	608	40.6	668	72.4
2007	353	5.9	1700	52.7	1583	110.2	203	5.5	702	45.8	714	76.9
2008	359	6.1	1777	54.0	1572	107.2	228	6.2	651	41.4	775	83.0
2009	325	5.6	1749	52.3	1588	106.1	174	4.7	698	43.4	708	75.6
2010	325	5.6	1674	49.4	1234	81.7	201	5.4	666	41.1	764	81.5
2011	365	6.0	1758	51.1	1630	105.3	192	5.2	715	42.6	777	82.9
2002-2011a	404	6.6	1681	53.1	1323	104.4	210	5.7	651	42.8	698	76.0

a – the annual average for 2002-2011

TABLE 3. Urban/rural ratio of breast cancer mortality rates in Poland, years 2002-2011.

	Urban/Rural ratio of mortality rates				Urban/Rural ratio of age-specific mortality rates					
	Crude	95% CI	ASR	95% CI	15-49	95% CI	50-69	95% CI	70+	95% CI
2002	1.42	1.34-1.51	1.30	1.18-1.43	1.26	1.07-1.46	1.25	1.13-1.37	1.61	1.45-1.76
2003	1.36	1.27-1.44	1.23	1.11-1.35	1.25	1.06-1.44	1.19	1.08-1.31	1.45	1.32-1.59
2004	1.40	1.32-1.49	1.29	1.16-1.42	1.20	1.01-1.40	1.24	1.12-1.35	1.50	1.39-1.60
2005	1.39	1.31-1.48	1.30	1.16-1.43	1.19	0.99-1.30	1.33	1.20-1.45	1.35	1.23-1.47
2006	1.50	1.42-1.60	1.36	1.22-1.50	1.17	0.98-1.36	1.36	1.23-1.67	1.53	1.40-1.67
2007	1.36	1.28-1.44	1.20	1.08-1.33	1.07	0.87-1.24	1.15	1.05-1.25	1.43	1.31-1.56
2008	1.36	1.28-1.44	1.22	1.09-1.35	0.98	0.82-1.14	1.30	1.20-1.43	1.29	1.18-1.40
2009	1.42	1.33-1.50	1.26	1.12-1.39	1.19	0.97-1.41	1.21	1.10-1.31	1.40	1.28-1.53
2010	1.35	1.27-1.43	1.18	1.06-1.32	1.04	0.86-1.22	1.20	1.09-1.31	1.00	0.91-1.09
2011	1.37	1.29-1.45	1.23	1.09-1.35	1.15	1.04-1.47	1.20	1.10-1.30	1.27	1.16-1.38
2002-2011a	1.39	1.31-1.48	1.26	1.13-1.39	1.15	0.96-1.35	1.24	1.13-1.35	1.38	1.16-1.42

a – the annual average for 2002-2011

by 1% on average whereas in rural areas it increased by 2.2% annually. However, those changes were statistically insignificant.

DISCUSSION

Breast cancer in women in Poland is a growing health, social and economic problem, and the effects of breast cancer control are unsatisfactory. The growing number of incidence and deaths caused by breast cancer reflects the threat it poses [1].

A rapid increase of breast cancer threat, which is observed in Poland, is characteristic for countries that go through a phase of economic transformation, and is related to the improvement of social and economic status of the population [9]. It results in modifications of lifestyle and social factors connected with the increase of risk factors for breast cancer incidence, among which: nutrition changes, low physical activity, a decrease in total fertility rate, the increase in exogenous hormones supplementation.

Various epidemiological analyses show that there is a link between the socioeconomic status of women and the risk of breast cancer incidence [2]. It is also proved by the inequalities in breast cancer incidence among the European countries [10]. Countries of a worse socioeconomic condition have relatively low breast cancer incidence (Ukraine, Belarus, Russia), a standardised incidence rates amounts to approximately 40.1/100 000. The breast cancer risk is high in countries with high socioeconomic status (Belgium, France, Holland), where the standardised incidence rate amounts to approximately 100.0/100 000.

A number of research carried out in Europe [11,12], North America [13] and Australia [14] confirm that the risk of breast cancer is related to urbanization and improvement of life conditions. Dissemination of 'urban lifestyle' is characterized by higher exposure to breast cancer incidence risks linked to that kind of lifestyle [13].

Research on incidence and mortality caused by malignant cancers which include the place of residence (urban – rural) has a long tradition in Poland. It has been carried out since the early 60s of the 20th century and covered Warsaw and Cracow cities, in particular, as well as nearby rural

TABLE 4. Trends of breast cancer mortality among urban and rural female populations in Poland, in years 2002-2011.

Mortality rates	Urban			Rural		
	Time	APC	95% CI	Time	APC	95% CI
Crude	2002-2011	+1.1*	0.5; 1.7	2002-2011	+1.4*	0.6; 2.1
Age-standardised	2002-2011	-1.0*	-1.6; -0.5	2002-2011	-0.3	-1.0; 0.5
Age-specific:						
15-49	2002-2011	-4.0*	-5.3; -2.7	2002-2011	-2.3*	-4.0; -0.7
50-69	2002-2011	-0.9*	-1.5; -0.3	2002-2011	-0.5	-1.5; 0.6
70+	2002-2011	-1.0	-3.2; 1.2	2002-2011	+2.2	0.9; 3.4

*the APC is statically significantly different from zero (p<0.05)

areas. Since the beginning of the research there was higher breast cancer incidence and mortality observed in women in urban areas. In years 1963-1985 the urban/rural incidence ratio amounted to 2.1, whereas the mortality ratio amounted to 1.7. In the 80s of the 20th century there was a decrease in inequalities of incidence and mortality between women in urban and rural areas – both incidence and mortality ratio for urban/rural areas amounted to 1.5 [15]. Research conducted at the beginning of the 21st century in Małopolskie and Podlaskie Provinces showed higher breast cancer incidence among female population in urban areas – the urban/rural ratio was respectively 1.5 and 1.4 [16,17]. In Lodz Province breast cancer mortality rate was 41% higher among urban residents in 2008 [18].

The results of the study confirm that breast cancer mortality is higher in urban female population. The standardised mortality rates in urban areas were on average 26% higher than in rural areas. Statistically significant differences were also observed in 50-69 age group mortality rate was 24% higher whereas the difference in the oldest women was the highest and amounted to 38%.

The results of the study confirm also the decrease of inequalities in breast cancer risk between urban – rural female population. This reflects the slow reduction of the differences in lifestyle residents of urban and rural areas.

In many countries in Europe, North America and Australia breast cancer risk has decreased [19]. Progress in breast cancer control results from dissemination of population cancer screening programmes of early detection based on mammography, which contribute to the increase in the proportion of patients diagnosed with breast cancer and treated at its early stage. At the same time, development of effective diagnostic methods and improvement of treatment standards as well as access to the newest drugs contributed to the improvement of patients' prognosis at all cancer stages, and in some countries, also in the oldest age group [20].

In the European Union countries such as Germany or Great Britain mortality due to breast cancer has been decreasing since the end of the 80s. In Poland decrease in mortality has been observed since the mid 90s. In years 2000-2008 mortality due to breast cancer decreased by 1.5-1.8% per year in France, Germany and Italy. In Spain and Great Britain decrease in mortality amounted to approximately 2.4% per year. In the same period of time, in Poland, mortality decreased slightly and was 0.2% per year [21].

The results of the study confirm in Poland a very slow decrease in mortality due to breast cancer. In the analysed period of time the standardised mortality rate due to breast cancer in urban female population decreased by 1% annually [95% CI: -1.6 to -0.5] whereas in rural population mortality decreased only slightly. The fastest decrease in mortality, both in urban and rural areas, was in the youngest age group. In the age group 50-69 years, which is addressed to by the Population Screening Programme since year 2006, mortality decreased only among urban female population by 0.9% per year [95% CI: -1.5 to -0.3].

The differences related to the decrease in mortality rates in urban and rural female population may be partly explained by different access to healthcare system. Rural population in Poland has often a worse access to healthcare system, e.g. prevention programmes, early diagnostics, which might result in too late cancer detection as well as with delays and problems in proper treatment [22].

In order to explain the reasons for inequalities in breast cancer mortality between urban and rural areas, more population-based studies, including the level of knowledge about cancer and lifestyle, access to health services, socioeconomic inequalities, etc., are needed.

CONCLUSIONS

The results of the presented study show the following:

1. Breast cancer mortality in Poland was markedly higher in urban female population. The biggest differences were observed in the oldest age group. Statistically significant differences were also observed among women in 50-69 age group.
2. Age-standardised mortality rate was slowly, but statistically significant, decreased among women living in urban areas. In rural areas the mortality trend decreased slightly and those changes were statistically insignificant.
3. That the results of the study may be useful for evaluation of health effects of the National Cancer Control Programme in Poland.

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