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The relationship of breast cancer deaths with age groups and urbanization of the population: a multi-country analysis

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ABSTRACT

Aim: In this retrospective observational study, it was aimed to evaluate the relationship between breast cancer deaths and demographic properties of countries.

Material and Method: The research was conducted on World Health Organization (WHO) 10th International Classification of Diseases (ICD-10) mortality list and World Bank Country Reports (WBCR). Total breast cancer-related deaths, age groups and urban population rates of 14 countries between 1996 and 2017 were evaluated.

Results: Both uncontrolled and controlled correlation analysis results showed that population age distribution had a significant correlation with total breast cancer-related deaths ($p<0.01$). Population percentage at 0-14 ages had a negative correlation with breast cancer-related deaths, whereas other age groups had positive correlations. Correlation between the urban population and total breast cancer-related deaths was insignificant at an uncontrolled level ($p>0.05$). Generalized Linear Model (GLM) results showed that only the country had a significant effect on total breast cancer related deaths ($p<0.05$). However, age group effects were insignificant at the multivariate level ($p>0.05$).

Conclusion: Although reasons such as age and urbanization play an important role among breast cancer risk factors, it is found that they do not affect mortality rates. A total of 22 years of WHO data and 14 country results showed that deaths due to breast cancer are only related to the country. Therefore, countries can minimize deaths due to breast cancer by carrying out more effective struggles, early diagnosis, treatment and awareness activities.

Keywords: Breast cancer, mortality, age, urban population

INTRODUCTION

Breast cancer, which is characterized by malignant lesions in the breast tissue, is a type of cancer especially seen in women. Breast cancer, which has a high prevalence and incidence all over the world, is also an important public health problem (1-3).

Despite advances in imaging, diagnosis and treatment methods, breast cancer still has high mortality rates today (4-7). Early diagnosis in breast cancer is of vital importance in reducing the treatment process and mortality (8-11). For early diagnosis, first of all, it is necessary to reveal which variables are affected by the disease, risk factors and risk levels.

Although studies have been conducted on environmental risk factors and age in breast cancer in the literature (12-14), these studies are mostly clinical or meta-analysis studies. On the other hand, the results of these studies reveal the need for a wider monitoring and analysis of the disease.

In this observational study, it was aimed to evaluate relationship between breast cancer deaths and demographic properties of countries.

MATERIAL AND METHOD

For this study, World Bank data, which is available as open access on the internet, was used. Since patient files and records are not used, there is no need for an ethics committee. No human/animal participant is avaible so no ethics approve is mandatory. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

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The research was conducted on World Health Organization (WHO) 10th International Classification of Diseases (ICD-10) mortality list and World Bank Country Reports (WBCR). Total breast cancer-related deaths, age groups and urban population rates of 14 countries between 1996 and 2017 were evaluated. Parameters used in the research and related data repositories were:

- -1036- Malignant neoplasm of breast-WHO ICD-10
- -Population ages 0-14, female (% of female population)-WBCR
- -Population ages 15-64, female (% of female population) -WBCR
- -Population ages 65 and above, female (% of female population) -WBCR
- -Urban population (% of total population)
- -WBCR

Since the country populations were different, rates were used in the research, in order to eliminate effects of country differences. Female proportions were used for age, since breast cancer related deaths are more common in female, and very rare in males. Since the research is conducted on public data, no ethical approval is needed.

Frequency analysis was used for description of normally distributed data. Scale parameters were described with mean percentages. Kolmogorov Smirnov Test was used for normality of scale parameters. Spearman's rho correlation and partial correlation analysis were used for relationship between total breast cancer-related deaths and cofounders. Generalized Linear Model (GLM) was used for multivariate level analysis. SPSS 17.0 for windows was used for analysis at 95% confidence interval with 0.05 significance level.

RESULTS

In 1999, a sharp increase in total death was reported around the world, whereas its rate was low during 1996-1998 periods. After this peak, level of total breast cancer related deaths was in high trend, except in 2015. In 2015, a sharp decrease was reported, followed by a sharp increase (**Figure 1**).

Russian Federation has the highest breast cancer caused death rates among other countries in which breast cancer-related deaths were reported by WHO ICD-10 Mortality list. Ukraine is the second country having high breast cancer related deaths, followed by Kazakhstan, Belarus and Azerbaijan (**Figure 2**).

Population at 0-14 age percentage was the highest in Syrian Arab Republic, at 15-64 ages percentage was the highest in Russian Federation, and at 65 or above age percentage was the highest at Ukraine. Urbanization percentage was the highest in San Marino, followed by Andorra, and Belarus (**Table 1**).

Figure 1. Total breast cancer caused deaths according to years for all countries

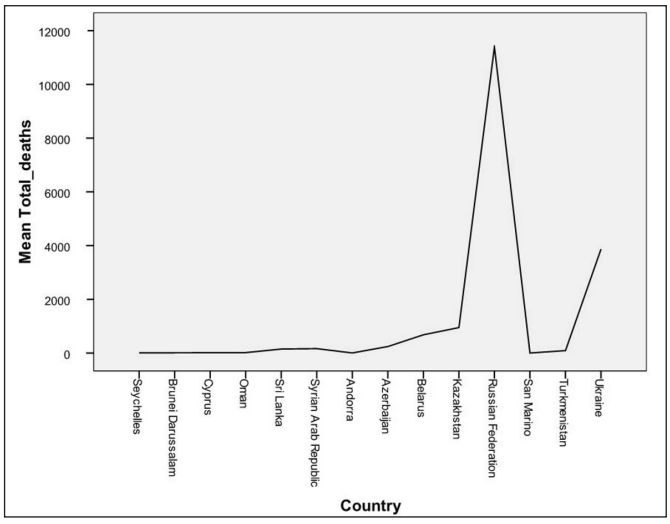

Figure 2. Total breast cancer caused deaths according to countries (1996-2017)

Table 1. Age structure and the urban population percentages of countries (1996-2017 mean percentages)

Country	Population ages between 0-14	Population ages between 15-64	Population ages between 65 or above	Urban population
Seychelles	24.03	67.03	8.94	52.84
Brunei Darussalam	28.77	68.27	2.96	72.50
Cyprus	22.17	66.40	11.44	68.59
Oman	32.09	64.81	3.10	74.62
Sri Lanka	26.36	67.07	6.57	18.38
Syrian Arab Republic	39.46	57.02	3.51	53.19
Andorra	-	-	-	88.55
Azerbaijan	27.31	65.48	7.21	51.85
Belarus	14.22	67.80	17.99	73.89
Kazakhstan	22.89	68.00	9.11	56.65
Russian Federation	14.60	68.57	16.82	73.56
San Marino	-	-	-	96.36
Turkmenistan	30.96	64.01	5.02	47.88
Ukraine	13.17	67.31	19.52	68.46
Total	23.25	69.49	10.46	61.11

Both uncontrolled and controlled correlation analysis results showed that population age distribution had a significant correlation with total breast cancer related deaths (p<0.01). Population percentage at 0-14 ages had a negative correlation with breast cancer related deaths, whereas other age groups had a positive correlation. The urban population had significant correlation with total breast cancer-related deaths, according to controlled correlation (p<0.01). However, correlation between urban population and total breast cancer-related deaths was insignificant at an uncontrolled level (p>0.05) (**Table 2**).

Table 2. Spearman's rho and partial controlled correlation analysis results between total deaths and demographic properties

Total deaths	Uncontrolled		Controlled[a]	
	r	p	r	p
Population ages between 0-14	-0.442**	0.000	-0.463**	0.000
Population ages between 15-64	0.268**	0.000	0.314**	0.000
Population ages between 65 or above	0.443**	0.000	0.443**	0.000
Urban population	0.100	0.160	0.289**	0.000

a. Controlled for year, gender and country ** p<0.01

Generalized Linear Model (GLM) results showed that only country had a significant effect on total breast cancer-related deaths (p<0.05). However, age group effects were insignificant at multivariate level (p>0.05) (**Table 3**).

DISCUSSION

Although there are extensive research and diagnostic studies on breast cancer today, it is still one of the important causes of death. In addition to deaths due to breast cancer, the treatment process of the disease in advanced stages emerges as an important problem both in terms of the patient's quality of life and public health (15-18). Although clinical studies and meta-analyzes have been conducted on this problem, there have not been sufficient studies that take a picture and evaluate the disease in general.

Family history and gender are the leading risk factors in studies on breast cancer (19-25). In our study, gender was one of the most important risk factors and the disease was mostly female. The proportion of male patients was statistically negligible when compared with the data of all countries.

The most important finding in our study is the findings regarding the relationship between age and breast cancer. Although there are not enough studies in the literature to establish a direct relationship between age and breast cancer, the general opinion is that breast cancer and breast cancer deaths are more common in older ages. In our study, this information in the literature was supported by the correlation analysis results. However, according to the multivariate analysis results, it was seen that only the country was an effective parameter in deaths due to breast cancer. However, it is a known fact that environmental factors play a role in the etiology of cancer. Although there is no relevant scientific data in the literature, the Chernobyl disaster, in which radiation leakage occurred, is one of the first factors that come to mind, especially in the background of the increase in the disease in countries such as Russia and Ukraine. This situation shows that the results of studies establishing a relationship between age and deaths due to breast cancer are local and that there is no such relationship in the general picture.

Another point that needs to be emphasized in the study is that the relationship between WHO and WB data is not at a sufficient level and therefore sufficient studies cannot be done globally. This is the most important limitation of both the research and the studies and field practices in terms of public health. Other limitations of the study are that the mortality rates due to breast cancer are taken only from any official institution, the related risk factors are not known sufficiently and there are no comorbidities.

Although reasons such as age and urbanization play an important role among breast cancer risk factors, it is found that they do not affect mortality rates. A total of 22 years of WHO data and 14 country results showed that deaths due to breast cancer are only related to the country. Therefore, countries can minimize deaths due to breast cancer by carrying out more effective struggle, early diagnosis, treatment and awareness activities.

Table 3. Generalized Linear Model (GLM) results for breast cancer-related deaths and demographic factors

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test	
			Lower	Upper	Wald Chi-Square	p
(Intercept)	4737841.64	8372728.99	-11672405.63	21148088.91	0.32	0.571
Population ages between 0-14	-44725.77	83579.98	-208539.52	119087.98	0.29	0.593
Population ages between 15-64	-44532.77	83557.36	-208302.19	119236.66	0.28	0.594
Population ages between 65 or above	-44434.21	83594.19	-208275.81	119407.39	0.28	0.595
Urban population	58.68	32.02	-4.08	121.44	3.36	0.067
Year	-142.55	93.36	-325.53	40.42	2.33	0.127
Country	1.07	0.53	0.02	2.12	4.02	0.045
(Scale)	31448109.56	3243624.84	25692112.09	38493666.51		

ETHICAL DECLARATIONS

Ethics Committee Approval: This study is retrospective observational research. No human/animal participant is avaible so no ethics approve is mandatory.

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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