

## Regional comparison of cancer incidence

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**Background.** Due to specific war and post-war situation in Balkan region, differences in the number, type, development, biological course, treatment of malignant tumours and its outcome are possible. In order to perceive the situation realistically, it is necessary to gather continuously exact data about malignant tumours and compare them with the data from other European and world countries. The aim of the study was to collect and analyse the data on cancer incidence in the region of Sarajevo city, which represents a symbol of difficult times in the recent past, and to compare it to the incidence in the neighbouring countries.

**Patients and methods.** Data on all newly diagnosed cancer cases, permanent residents of Sarajevo Canton, in the years 1999 and 2000 were collected. Crude incidence rate has been calculated according to the years observed, gender and localizations of the disease. The data were compared to the cancer registries of Slovenia and Croatia and were observed in the light of specific local situation.

**Results.** The crude cancer incidence of all sites but skin was the highest in both years and by both genders in Croatia. The incidence of the most common tumours (lung and breast cancer) was similar in all three countries. The differences in the incidence between both genders in the Sarajevo canton were registered in laryngeal and urinary bladder cancer, as well as in bone and cartilage sarcoma. Cervical cancer had extremely high incidence and was high up on the incidence list in the Sarajevo canton, which correlates with the data in developing countries. The incidence of other tumours in the post-war period is reaching expected numbers.

**Conclusions.** It is difficult to identify whether the war and post-war stress, irregular and insufficient nutrition during and after the siege of the city of Sarajevo or some other factor influenced the cancer incidence among exposed population.

The prevalence of smoking in the whole region is extremely high, in Bosnia and Herzegovina almost complete, which can influence not only the incidence of lung cancer but also laryngeal and urinary bladder cancer.

*Key words:* neoplasms- epidemiology; incidence; Bosnia - Hercegovina cancer incidence

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### Introduction

Malignant tumours represent one of the major health problems today; their occurrence and severity are constantly increasing.

According to the available data, malignant tumours are the leading cause of death in most countries in Europe and rank second, after cardiovascular diseases.<sup>1,2</sup>

The war in Balkan (1991-1996) had dire consequences leading to a great number of victims, destroyed infrastructure, industry, environment, health capacities and equipment. Health situation in several countries has significantly worsened.<sup>3,4</sup> Due to specific war and post-war situation, the differences in the number, type, development, biological course, treatment of malignant tumours, and in the outcome are possible. Actual situation related to the use of ammunition containing depleted uranium has raised additional questions about its influence on human health. Contamination with the debris from depleted uranium shells could have increased the risk of developing cancer and kidney damage. The so-called Balkan-syndrome is often linked with depleted uranium contamination.<sup>5-8</sup> Consequently, eventual increase in cancer incidence in Bosnia and Herzegovina is possible.

It has been very often publicly mentioned that the number of malignant tumours in Bosnia and Herzegovina is enormously increasing and that we are faced with cancer epidemic. But the information on cancers, cancer rates and trends is incomplete in Bosnia and Herzegovina. Bosnia and Herzegovina does not have a proper cancer registry for the population nor does it have precise data on its incidence. The claims made about the increases in many types of cancers were based on clinical observations, but were not substantiated by the information on cancer rates relating the number of cases to the population these cancers come from.<sup>9,10</sup>

In order to perceive the situation realistically and to avoid panic and ignorant attitude, it is necessary to gather continuously exact data about malignant tumours, not only to detect risk factors, or follow them up and

control them, but also to be able to compare them with the data from other European countries and countries worldwide.

The above observations, strong fear from malignant tumours, and frequent disinformation, motivated the authors to investigate and to define a true situation regarding malignant tumours at least in part of Bosnia and Herzegovina. We chose the canton of Sarajevo relying on the fact that it would be possible to obtain the complete data about malignant tumours there because patients had rarely been treated in other places or cities (diagnostics and treatment for cancer are available in Sarajevo; there are no political or organizational obstacles in sending patients to oncology departments). Beside that, the number of citizens in the observed period of time was stable and known. Those facts helped us, to conduct the study and to reach basic indicators about the incidence and type of malignant tumours during the period of 1999 - 2000.

Besides, Sarajevo went through difficult times. It was under siege that was the longest since World War II and suffered from ruthless horrors of war. During the war, approximately 3 tons of depleted uranium munitions were used against armoured targets, predominantly in the surroundings of Sarajevo.<sup>8,11</sup> Its citizens' health was jeopardized by numerous factors, some of which are:

Stressful situations during the war and after the war which could influence the appearance of certain diseases, including malignant tumours;

Difficult communication due to the siege and blockades which prevented early detection and treatment of diseases;

Quantitatively and qualitatively insufficient nutrition due to the siege, war conditions and difficult economic situation after the war;

Increasing trend of smoking and, after the war, increased consumption of alcoholic beverages;

Possible increase of radioactivity due to ammunition containing depleted uranium used in the wider region of the city and possible effect of chemical weapon;

A shift in the population's attitude toward their own health.

### Material and methods

We collected the data on newly diagnosed cancer cases in the Canton of Sarajevo during the period from January 1<sup>st</sup>, 1999 until December 31<sup>st</sup>, 2000. All data relate to permanent residents of the 6 municipalities in Sarajevo at the time of diagnosis.

Cases have been confirmed microscopically or clinically. Intraepithelial tumours of cervix and urinary bladder have not been included in this analysis.

The main source of information was the reports filled in by doctors from hospitals or outpatient departments where disease had been diagnosed and/or treated. These reports, which were legally binding, were printed on the form no. 3-35-86 as "The report of malignant tumours". The collection of data was related to histological diagnoses of newly discovered tumours and was done at the Institute for Pathology at the Medical Faculty (Sarajevo University Hospital) and at the Department for Pathology at the Sarajevo General Hospital. The data on mortality (deaths caused by malignant tumours) were collected from obligatory reports written on DEM 2 death certificates.

Institute for Statistics of the Federation of Bosnia and Herzegovina provided the data of the number of citizens in the Sarajevo canton.<sup>12</sup> For the study, the population number was estimated in the middle of a certain year (Table 1).

Crude incidence (per 100 000 population of a certain gender and of all ages) of malignant tumours in the years 1999 and 2000 was calculated, regarding site and gender. The da-

ta were compared to those from the Cancer Registry of Slovenia 1999 and 2000, Cancer Registry of Croatia 1999 and 2000 and regional indicators and predictions.<sup>13-17</sup>

### Results

During the period of 1999-2000, 2,897 new cases of malignant tumours (1496 among males and 1401 among females) were registered in the Sarajevo Canton. Fifteen cases (0.5 %) were registered only on the basis of death certificate. Pathohistologically or cytologically proven tumours were found in 2,571 patients (88.75 %). The number of new cancer cases by year of diagnosis and sex is presented in Table 2.

The crude incidence rate in males was 432/100 000 in 1999 and 384/100 000 in 2000 and in females 390/100 000 in 1999 and 354/100 000 in 2000. Compared to Slovenia, the incidence rate in our country was lower.

If non-melanoma skin cancer is excluded, the crude incidence rate in 2000 in Canton Sarajevo was 339/100 000 males and 286/100 000 females, respectively. The estimated incidence from GLOBOCAN 2000 is 309.3 new cases per 100.000 men and 267.9 cases per 100 000 women in Bosnia and Herzegovina.<sup>13</sup>

Crude incidence rates of most important cancer sites in males and females in Southern Europe, Slovenia, Croatia and Canton Sarajevo are presented in Tables 3 and 4.

**Table 1.** Estimated population by gender in the Sarajevo canton during the period 1999-2000

Year	Males	Females	Total
1999	178 951	201 932	380 883
2000	183 161	207 373	390 534

**Table 2.** Number of malignant tumours in the Sarajevo canton in the years 1999-2000: all sites; by gender

Years	Males	Females	Total
1999	791	766	1557
2000	705	645	1350
Total	1496	1401	2897

**Table 3.** Crude cancer incidence per 100,000 males of all ages in the years 1999 and 2000 according GLOBACON 2000,<sup>13</sup> Cancer Registry of Slovenia,<sup>14,15</sup> Cancer Registries of Croatia<sup>16,17</sup> and the Sarajevo canton

Cancer Primary site	Southern Europe 2000	Slovenia		Croatia		Sarajevo canton	
		1999	2000	1999	2000	1999	2000
Oral cavity	13.7	11.8	13.0	17.1	15	7.3	9.27
Nasopharynx	1.2	0.4	0.4	0.8	1.0	0.6	0.0
Other pharynges	6.9	15	11.9	13.2	15.8	1.0	7.6
Oesophagus	7.3	8	7.3	9.1	8.2	1.1	1.1
Stomach	32.5	32.5	29.3	39.7	34.3	21	16.2
Colon / Rectum	55.1	59.2	60.5	71	73.0	40.8	41.5
Liver	16.5	7.8	7.4	12	11.0	9.5	12.6
Pancreas	11.5	11	12.1	15.3	14.2	2.8	4.9
Larynx	<b>13.78</b>	<b>9.2</b>	<b>11.5</b>	<b>20.2</b>	<b>17.9</b>	<b>46.9</b>	<b>27.3</b>
Lung	95.9	85.0	85.9	115.6	121.8	106.2	90.1
Melanoma of skin	5.2	11	12.3	9.9	11.1	18.6	14.5
Prostate	44.7	44.1	40.8	41.1	43.8	24.0	20.0
Testis	5.0	8.8	8.8	7.2	7.0	2.8	4.4
<b>Bladder</b>	<b>41.6</b>	<b>15.0</b>	<b>14.9</b>	<b>31.1</b>	<b>33.0</b>	<b>27.8</b>	<b>38.8</b>
Kidney	13.4	11	10.8	16.2	15.7	10.6	6.3
Brain/nervous system	8.9	8.4	5.4	15.1	15.4	10.4	13.9
Thyroid	1.5	3.0	2.8	3.5	3.7	2.8	1.1
Non-Hodgkin lymphoma	13.2	8	9.9	12.6	10.8	4.4	4.5
Hodgkin Disease	2.9	1.5	2.1	4.3	3.6	3.8	7.8
Multiple myeloma	4.7	4.3	3.3	5.3	4.4	1.1	2.8
Leukaemia	11.3	8.1	1.4	17.7	14.9	10.6	5.8
<b>Bone/ cartilage</b>		<b>1</b>	<b>0.9</b>	<b>5.9</b>	<b>4.9</b>	<b>8.4</b>	<b>7.9</b>
<b>Soft tissue sarcoma</b>		<b>1.3</b>	<b>2.4</b>	<b>3.5</b>	<b>2.9</b>	<b>1.68</b>	<b>0.54</b>
<b>All sites but skin</b>	<b>443.4</b>	<b>402.7</b>	<b>393.9</b>	<b>533.3</b>	<b>523.9</b>	<b>390</b>	<b>354</b>

## Discussion

The aim of our study was to analyse the cancer incidence in Canton Sarajevo and compare it with neighbouring countries. When trying to explain the differences, it is important to emphasise, that they may be real, but also due to different practices in reporting.

Compared to Slovenia, in Canton Sarajevo the incidence of all cancer sites was rather lower.

If melanoma skin cancer is excluded, the incidence in Croatia was the highest in both years and both genders. According to the Cancer Register of Croatia, the crude incidence per 100 000 population in 1999 was 533.3 for men, and 432.1 for women. The same proportion was reported in the year

2000, i.e. 523.9 for men and 424.3 for women, whereas in Slovenia, it was 448.3 for men and 420.4 for women, and in Sarajevo, 384 and 311, respectively.<sup>11,12,15,16</sup> Therefore, the registered crude incidence of cancer in the Sarajevo Canton correlates with the estimations for the whole region of South Europe rather than with the one estimated for Bosnia and Herzegovina. In both genders, the crude incidence is comparable to the one registered in the Republic of Slovenia for the year of 1999 (390 men and 339 women in the Sarajevo Canton; 402 men and 359 women in Slovenia).

In Slovenia, the incidence of cancer of the upper respiratory and digestive organs in the years 1999 and 2000 was 36.4 and 36.8, respectively, in Croatia, 51.3 and 49.7 respec-

**Table 4.** Crude cancer incidence per 100,000 females of all ages in the years 1999 and 2000 according GLOBACON 2000,<sup>13</sup> Cancer Registry of Slovenia,<sup>14,15</sup> Cancer Registries of Croatia<sup>16,17</sup> and of the Sarajevo canton

Cancer Primary site	Southern Europe 2000	Slovenia		Croatia		Sarajevo canton	
		1999	2000	1999	2000	1999	2000
Oral cavity	3.0	<b>3.1</b>	<b>2.6</b>	5.7	<b>3.4</b>	1.5	1.4
Nasopharynx	0.4	0.2	0.4	<b>0.4</b>	<b>0.2</b>	0.5	0.0
Other pharynges	0.7	0.8	1.2	<b>1.5</b>	<b>2.1</b>	0.5	0.5
Oesophagus	1.4	2.2	1.4	<b>1.9</b>	<b>2.3</b>	0.5	0.9
Stomach	20.3	<b>16.3</b>	<b>18.0</b>	<b>21.0</b>	<b>23.2</b>	8.9	5.8
Colon / Rectum	44.3	41.3	47.9	<b>53.0</b>	<b>54.0</b>	28.9	27.2
Liver	7.6	<b>3.5</b>	<b>2.4</b>	<b>7.2</b>	<b>8.0</b>	6.4	5.3
Pancreas	0.1	9.8	11.3	<b>11.6</b>	<b>12.2</b>	2.0	1.0
<b>Larynx</b>	0.9	0.7	1.3	<b>2.0</b>	<b>1.5</b>	<b>8.4</b>	<b>6.3</b>
Lung	15.2	<b>21.2</b>	<b>23.5</b>	<b>23.5</b>	<b>28.0</b>	18.3	22.4
Melanoma of skin	6.9	<b>13.1</b>	<b>11.1</b>	<b>9.1</b>	<b>9.7</b>	14.0	10.8
<b>Brest</b>	<b>88.5</b>	97.8	91.2	110.7	95.0	95.8	77.8
Cervix uteri	<b>13.7</b>	<b>19.9</b>	<b>19.6</b>	17.2	19.0	<b>36.6</b>	<b>35.2</b>
<b>Corpus uteri</b>	<b>23.6</b>	24.8	24.6	25.7	22.6	26.3	22.0
<b>Ovary</b>	<b>13.8</b>	<b>17.0</b>	<b>19.4</b>	22.9	24.6	12.5	14.5
Bladder	<b>8.8</b>	<b>5.1</b>	<b>4.4</b>	9.0	9.0	<b>15.9</b>	<b>8.6</b>
Kidney	6.4	<b>8.1</b>	<b>6.9</b>	<b>9.0</b>	<b>10.7</b>	6.0	5.9
Brain/ nervous system	6.8	<b>3.7</b>	<b>5.4</b>	<b>13.0</b>	<b>12.0</b>	8.9	5.3
Thyroid	6.7	<b>6.7</b>	<b>5.8</b>	<b>12.1</b>	<b>12.0</b>	6.9	6.7
Non-Hodgkin lymphoma	11.0	<b>8.8</b>	<b>11.8</b>	<b>9.8</b>	<b>9.6</b>	5.5	2.4
Hodgkin disease	2.5	<b>1.9</b>	<b>1.6</b>	<b>3.4</b>	<b>3.2</b>	4.5	1.9
Multiple myeloma	4.3	<b>7.1</b>	<b>4.2</b>	<b>6.2</b>	<b>3.4</b>	3.0	1.4
Leukaemia	8.4	<b>3.7</b>	<b>7.9</b>	<b>13.3</b>	<b>11.3</b>	4.9	5.8
Bone/ cartilage	<b>1.3</b>	<b>0.6</b>	<b>3.2</b>	<b>4.4</b>	8.4	3.8	
Soft tissue sarcoma	<b>2.2</b>	<b>3.2</b>	<b>2.6</b>	<b>2.5</b>	<b>2.4</b>	<b>2.8</b>	
<b>All sites but skin</b>	336.9	<b>358.4</b>	<b>363.6</b>	<b>432.1</b>	<b>424.3</b>	<b>339</b>	<b>286</b>

tively, and 56.6 and 44.73 in the respective years in the Sarajevo canton. The greatest difference is registered in cases of laryngeal cancer where incidence is 2-3 times greater in the Sarajevo Canton than in other countries in the region. The incidence of oral and pharyngeal cancer was lower. Even if we presume that a certain number of cancers of upper respiratory organs were wrongly assigned to advanced laryngeal cancers, this still could not explain extremely and constantly high incidence of this tumour in the Sarajevo canton.

Lung cancer is most common in all three countries, with the incidence comparable to the one predicted by GLOBCAN report. The

lowest incidence was registered in Slovenia, where the prevalence of smokers is lowering.

The incidence of all digestive tract tumours was the highest in Croatia. The incidences in Slovenia and Sarajevo are comparable to the ones predicted by GLOBCAN report. Somewhat lower incidences of stomach and pancreatic cancer were registered in Sarajevo.

The incidence of urinary bladder cancer in Croatia and Sarajevo is 2 times higher than in Slovenia, but still correlates to GLOBCAN estimation for Southern Europe. The prostate cancer incidence in Croatia and Slovenia is at the level of expected values that correlates to GLOBCAN estimation, but in the Sarajevo

canton, it is lower. This can be explained by the fact that, in Bosnia and Herzegovina, no routine screening for PSA is being implemented, therefore only clinically apparent tumours are diagnosed.

In clinical practice, an unusually high number of histologically confirmed bone and cartilage sarcomas from different parts of Bosnia and Herzegovina have been observed, which is illustrated and presented through the data from the Sarajevo canton and for which we don't have an acceptable explanation.

From the given data, it is evident that other tumours of haematopoietic system are not more common in the Sarajevo canton in comparison to what has been expected and to the number of cases registered in Slovenia and Croatia.

In females, breast is the most common cancer site in all three countries. It is important to note that incidence of cervical cancer is the highest in Sarajevo Canton and is comparable to the incidence in undeveloped countries. It certainly reflects the insufficient opportunistic screening.

Among the women in the Sarajevo Canton, higher incidences of laryngeal and urinary bladder cancer were also registered as well as bone sarcomas.

### Conclusions

Several factors may have contributed to cancer incidence in Canton Sarajevo: the war and post-war circumstances with irregular nutrition during and after the siege of the city, heavy smoking and drinking. The incidence of smoking in the whole region, especially in Bosnia and Herzegovina is extremely high, which can influence not only the incidence of lung cancer but also of laryngeal cancer and urinary bladder cancer.

Additional studies are needed to evaluate whether some other factors have been implicated in the aetiology of malignant tumours among exposed population.

It is important to emphasize the need for establishing a national population registry of malignant tumours for the whole Bosnia and Herzegovina, not only to detect, follow-up and control the risk factors but also to be able to compare our data with the data from other European countries and the countries worldwide

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