Bladder Cancer in Estonia, 1968–1992: Incidence, Mortality, Prevalence and Survival

Gennadi Timberg,[1] Mati Rahu,[2] Kaja Gornoi,[2] Tiiu Aareleid[2] and Alex Baburin[2]

From the [1]University Hospital, University of Tartu, Tartu, Estonia and [2]Department of Epidemiology and Biostatistics, institute of Experimental and Clinical Medicine, Tallinn, Estonia

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This paper summarizes what is known about the occurrence and survival of bladder cancer in Estonia from 1968 to 1992. In 1988–92 the age standardized (world standard) incidence rate of bladder cancer was 11.1 per 100,000 person-years in males and 2.0 in females, and the age standardized mortality rate was 8.2 and 2.7, respectively; by July 1, 1990 the age standardized prevalence rate was 41.5 and 14.7, respectively. Between 1968–72 and 1988–92, incidence increased by 1.26 times (95% confidence interval 1.09 to 1.46) among males; incidence rates for females did not show a consistent trend. The time trends in mortality generally paralleled the trends in incidence. Higher rates of bladder cancer were found among males in five large towns. For patients diagnosed in 1983–87, the five-year relative survival was 32.4% (95% confidence interval 27.0 to 37.8) for males and 32.5% (23.8 to 41.2) for females; throughout the 20 years there was no improvement in survival. As the survival rates are less favorable than those in the Nordic countries, further hospital-based studies are needed to investigate the relation between survival and clinical characteristics.

Key words: bladder cancer, incidence, mortality, prevalence, survival, time trend, Estonia.

Gennadi Timberg, University Hospital, University of Tartu, L. Puusepa 8, EE2400 Tartu, Estonia. Tel: +372 7 448 250. Fax: +372 7 448 106)

As a result of political and economical changes since **1991,** it has been possible to start and develop collaborative research projects in cancer epidemiology between the Baltic countries and other temtories, particularly the Nordic countries (1, 2, 19). In this situation, quite often neither the involved nor the potential researchers have basic background information on the occurrence of cancer of separate sites among the population from the Baltic countries. Lack of adequate information has hampered joint initiatives and, presumably, has discouraged to take a next step from an embryonic stage of collaboration. Up to now, very limited data has been published on the patterns of urinary bladder cancer in Estonia, although this cancer site among males is frequent **(23).** At the same time, taking advantage *of* the long-term cancer registration in Estonia **(22)** it is reasonable to summarize the data for **25** years and characterize the bladder cancer patterns in this area as one of the Baltic countries. The purpose of this study is to present descriptive data for bladder cancer occurrence in Estonia between **1968–92.**

MATERIAL AND METHODS

The data on incident cases and deaths from **1968** to **1992** were obtained from the Estonian Cancer Registry (ECR), which is population based and covers the whole of Estonia (area **45,216 km^2,** population **1.6** million in **1992).** The registry was founded in **1978,** but its data is retrospective to **1968 (22).**

Although mortality statistics is the responsibility of the Estonian State Statistical Office, due to limitations in tabulated site coverage and procedures of manual analysis in the earlier period **(16),** for the purposes of the present project mortality data were derived from the ECR. The underlying cause of death in the records of the ECR is usually the one on the death certificate, resulting in the record linkage between the ECR's files and the certificates. As in Estonia cancer patients are followed up until death or emigration, data on prevalence and survival are available, too.

The estimates of the resident population of Estonia from **1968** to **1992** were derived from the diskettes accompanying the corresponding monographs (5, 6).

At the Department of Epidemiology and Biostatistics, Institute of Experimental and Clinical Medicine, incidence, mortality, prevalence and survival rates were calculated. Standardization by age was carried out for incidence, mortality and prevalence rates on the basis of the world population **(20).** Standardization was applied to all ages together and for the age group **35–64.** To show the change over time age-standardized

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Table I. *Incidence and mortality for bladder cancer in Estonia, 1968–92, males and females*

Incidence/mortality measures	Sex	Period 1968–72	1973–77	1978–82	1983–87	1988–92	1988–92/1968–72 rate ratio (95% CI)[a]
Average number of cases per year	M	59	55	67	91	95	
	F	26	21	24	34	36	
Incidence rate per 100,000 person-years	M	9.5	8.3	12.8	12.8	13.0	1.37
	F	3.5	2.7	3.0	4.2	4.3	1.23
Age-standardized incidence rate per 100,000 person-years[b]							
all ages	M	8.8	7.5	11.4	11.4	11.1	1.26 (1.09–1.46)
	F	2.0	1.4	1.5	2.0	2.0	1.04 (0.82–1.33)
35-64 years	M	10.8	9.8	12.2	14.3	15.5	1.44 (1.34–1.54)
	F	2.5	1.8	1.9	1.7	2.2	0.89 (0.77–1.02)
Average number of deaths per year	M	40	39	43	64	60	
	F	21	17	17	23	23	
Mortality rate per 100,000 person-years	M	6.5	6.0	6.3	8.9	8.2	1.26
	F	2.8	2.2	2.1	2.8	2.1	0.96
Age-standardized mortality rate per 100,000 person-years[b]							
all ages	M	6.0	5.2	5.5	8.0	7.0	1.18 (0.99–1.42)
	F	1.4	1.0	1.0	1.2	1.3	0.88 (0.66–1.17)
35-64 years	M	5.3	4.5	5.5	7.2	8.1	1.53 (1.36–1.72)
	F	1.2	1.0	0.8	0.8	1.0	0.81 (0.63–1.04)

[a] Rate ratios are calculated on the basis of unrounded rates.
[b] World population was used as standard.

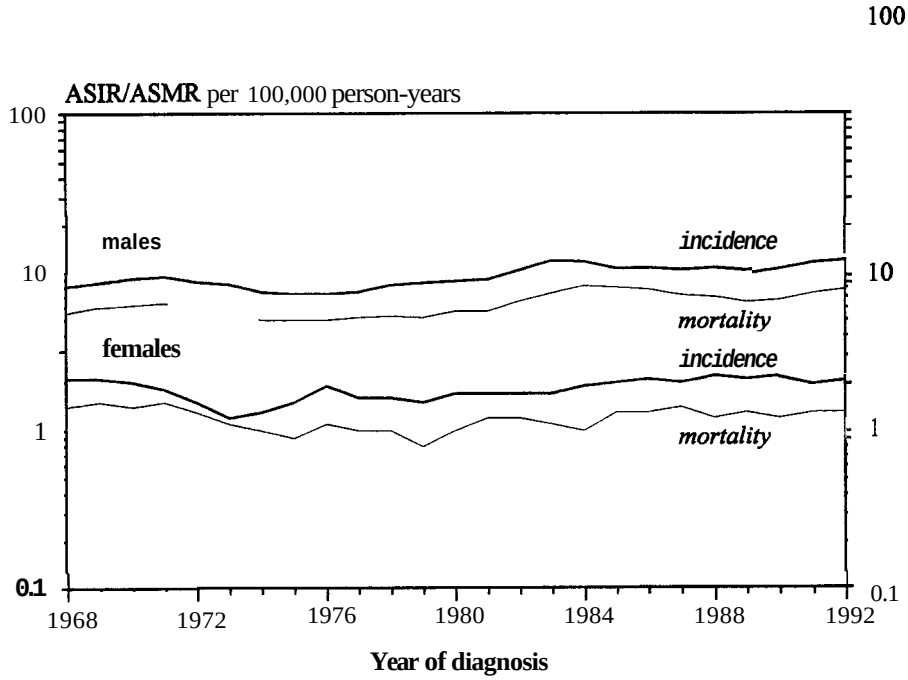

Fig. **I. Time trends in age-standardized incidence (ASIR, world population) and mortality rates (ASMR, world population) for bladder cancer in Estonia, 1968–92, males and females. Rates are presented as three-year moving averages.**

incidence rate (ASIR) ratios and age-standardized mortality rate (ASMR) ratios were calculated as the 1987–92/1968–72 ratio. The 95% confidence interval (CI) for the rate ratios were calculated as described by Boyle and Parkin **(4).** To examine the regional differences in bladder cancer incidence, age-standardized rates for 15 counties and 5 large towns were calculated for the period 1968–92; the region / whole Estonia ratios of the ASIR's and related 95% confidence limits were found and visualized on the Figures.

After having excluded 95 cases of bladder cancer, diagnosed after death, the basic material for survival analysis consisted of 1793 cases (1289 males and 504 females), i.e., 95% of the total of 1888, diagnosed from 1968 to 1987. Of these, 9 males (0.7%) and 6 females (1.2%) were lost to follow up, mainly as a result of patient emigration. For these patients, the date of the

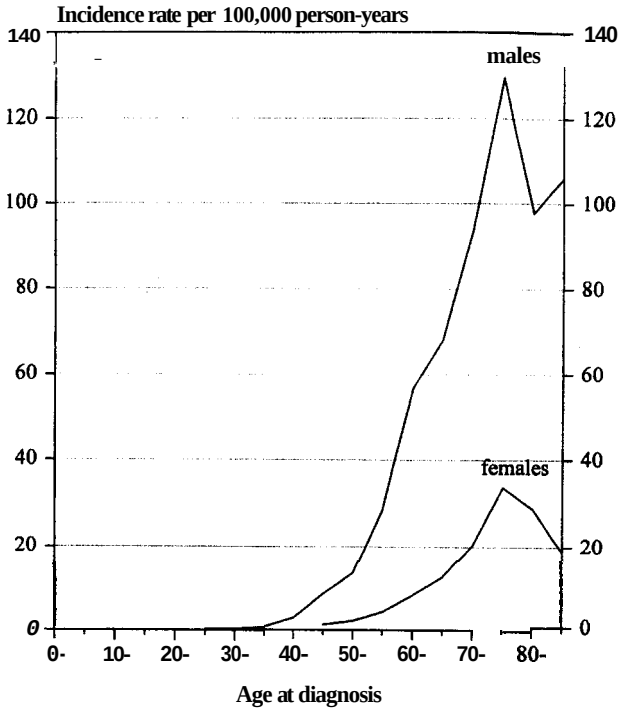

Fig. **2. Age-specific incidence rates for bladder cancer in Estonia, 1988–92, males and females.**

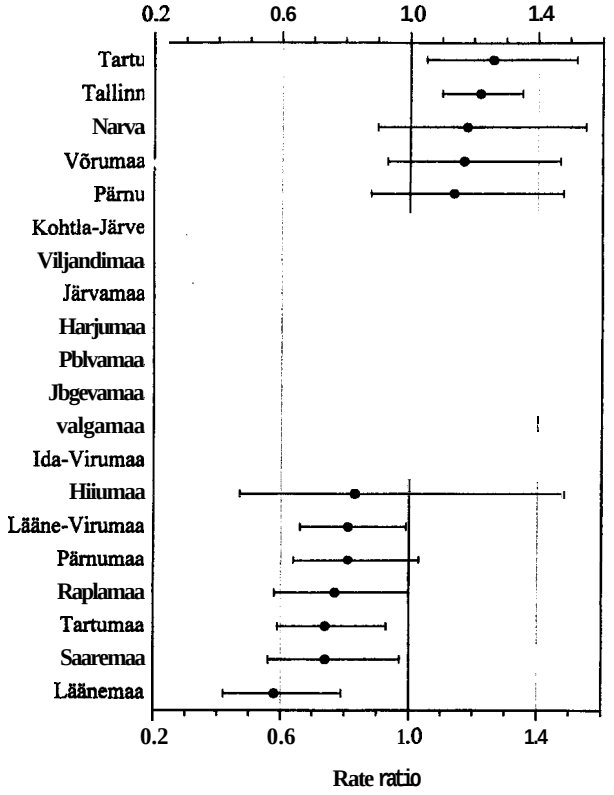

Fig. 3. **Rate ratio of age-standardized incidence (ASIR, world population) and 95% confidence interval for bladder cancer in the counties and large towns in Estonia, 1968–92, males. (ASIR for the whole of Estonia is equal to 1.)**

last contact was used as the end of follow-up. For other patients, the closing date was December 31, 1992.

To analyze survival of bladder cancer patients observed and relative survival rates were calculated. The relative survival rate is the ratio of the observed and the expected survival rates; the latter was calculated from the population life tables for Estonia, provided by the Estonian State Statistical Office. Expected survival probabilities were calculated using the method of Hakulinen (9). The survival analysis was performed with the pertinent computer program (10).

RESULTS

Incidence

2541 new cases of bladder cancer were registered in Estonia during the period 1968–92, and 1834 of them among males and 707 among females. In 1988–92, the proportion of bladder cancers among all incident cases of cancer (including skin cancers) was 3.8% for males and 1.4% for females. Crude incidence rates show an increase from 1968–72 to 1988–92 for both sexes (Table I). The age-standardized incidence rates are generally increasing for males (Fig. 1), and have been relatively stable for females. The highest incidence rates have been observed for males (130 per 100 000) and females (34 per 100 000) in the age group 75–79 years (Fig. 2). The trend for the age group 35-64 years shows a 44% increase for males and a small decrease for females. For males, age-standardized rates are more than five times higher than those for females.

Due to a small number of cases it is complicated to interpret geographical distribution of bladder cancer in Estonia (Fig. 3 and 4). However, regional differences reveal that men living in large towns (Tallinn, Tartu, Narva, Kohtla-Järve and Pärnu) are more affected than those in rural areas. Among women, urban predominance cannot be observed.

Mortality

On the whole, 1730 deaths from bladder cancer were registered during the period 1968–92, of whom 1230 were males and 500 females. Cancer of urinary bladder caused 3.4% of all cancer-related deaths in males and 1.6% in females in 1988–92. Age-standardized mortality rates increased for males and slightly decreased for females, this trend is similar and even more pronounced for the age group 35-64 years (Table 1 and Fig. 1). For males, in recent decades, mortality rates are about three times higher than those for females.

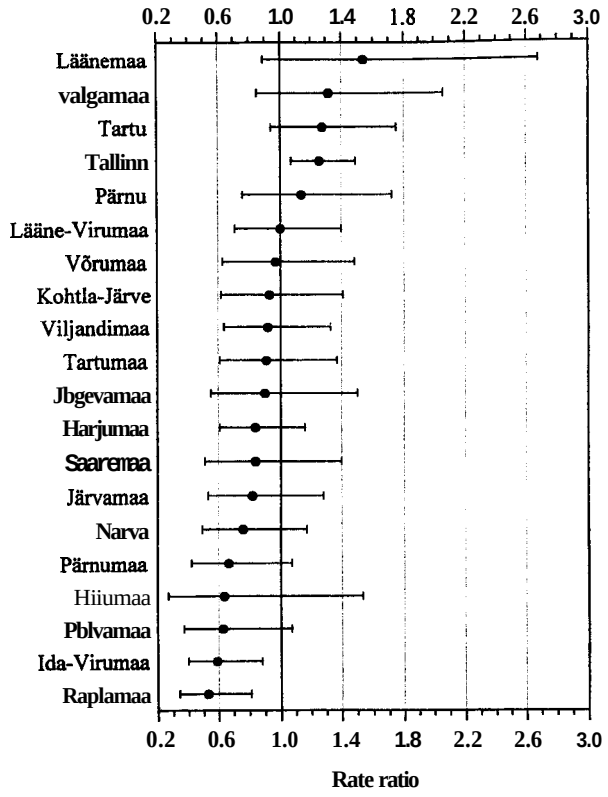

Fig. **4. Rate ratio of age-standardized incidence (ASIR, world population) and 95% confidence interval for bladder cancer in the counties and large towns in Estonia, 1968–92, females. (ASIR for the whole of Estonia is equal to 1.)**

Prevalence

By July 1, **1990** there were **428** prevalent cases **(305** in males and **123** in females) of bladder cancer in Estonia. Among all prevalent cases of cancer (including skin cancer), bladder cancer occupied **3.9%** in males and **0.7%** in females. The crude prevalence rate (per 100000) was **41.5** among males and **14.7** among females. The age standardized rate for all ages was **36.4** among males and **7.8** among females, and for the **35-64** age group, **48.7** and **7.3,** respectively.

Survival

Fig. **5** shows relative survival rates (RSR) for bladder cancer diagnosed between **1983–87.** The survival curves in both sexes are very close to each other. The one-year and the five-year relative survival rate among the males was **60.0%** and 32.4%, respectively, and among females **58.6%** and **32.5%,** respectively. Throughout the twenty years **(1968–87)** studied there was no evidence of improvement in the five-year observed and relative survival (Table 11). The survival rates by age groups over time are not presented because of the small number of cases, causing substantial fluctuation of the rates.

DISCUSSION

In Estonia in the period **1988–92,** incident cases of cancer of the urinary bladder ranked eighth among males and fifteenth among females **(27).** Comparison of the age-standardized incidence rates for **1983–87** reveals **(20, 23)** that among the Nordic and the Baltic countries, the level of incidence is quite close in Finland, Estonia, Latvia and Lithuania, but it is much higher in Denmark, Norway, Iceland and Sweden. These large discrepancies are known and they reflect, first of all, different practices of recording papillomas (20).

Certainly, the general quality of cancer registration may affect bladder cancer incidence rates in Estonia considerably. Thus, the percentage of microscopical confirmation of bladder cancers in **1988–92** was 80 among males and **72** among females (27), which is approximately **15–20%** less than that in the Nordic countries **(20).** These differences in microscopical confirmation are more pronounced in older age groups which suggests that a sharp decrease in age-specific rates in the ages over **75** years may be due to some underdiagnosis or/and underregistration of bladder cancers in Estonia. Although the completeness of cancer registration in Estonia is estimated to be **95–98%** (2), no special studies have been conducted to substantiate this percentage. Clearly, further studies are needed to estimate the completeness and accuracy of bladder cancer registration in Estonia.

Internationally, between the early **1960s** and mid **1980s,** a rise in bladder cancer incidence took place in most countries **(18).** In Estonia, the increase occurred only in males. It implies also that a trend towards increasing male/female ratio was observed in Estonia. The trends in mortality generally paralleled the trends in incidence.

High rates of bladder cancer incidence were seen among males in five large towns of Estonia. Bladder cancer has been frequently associated with cigarette smoking and occupational chemical carcinogens (17, 24). A total of about 50% of bladder cancers in males are estimated to be related to smoking (11), and **21–25%** to occupational exposures **(25).** Elevated bladder cancer incidence for males in large towns of Estonia argue in favor of these factors. However, observed geographical differences must be interpreted cautiously because of small numbers.

For this analysis, we have used official data on cancer deaths obtained from the central statistical office and transferred to the database of the cancer registry. It is difficult to imagine how valid are official mortality rates for bladder cancer in Estonia, but for the purpose of our current investigation they are enough relevant. Generally, limitations in routinely available

Table II. *Five-year observed and relative survival rates for bladder cancer in Estonia, 1968–87, males and females*

Year of diagnosis	Sex	No. of cases[a]	Five-year survival rate (%)		
			Observed	Relative	95% CI[b]
1968–72	M	280	24.1	30.3	23.9–36.8
	F	123	24.6	28.9	19.7–38.0
1973–77	M	261	25.0	32.2	25.3–39.2
	F	99	17.7	21.4	12.0–30.7
1978–82	M	317	21.9	28.1	22.1–34.1
	F	114	22.3	27.1	17.6–36.7
1983–87	M	431	25.3	32.4	27.0–37.8
	F	168	25.0	32.5	23.8–41.2

[a] Number of cases included in survival analysis.
[b] Confidence interval of relative survival rate.

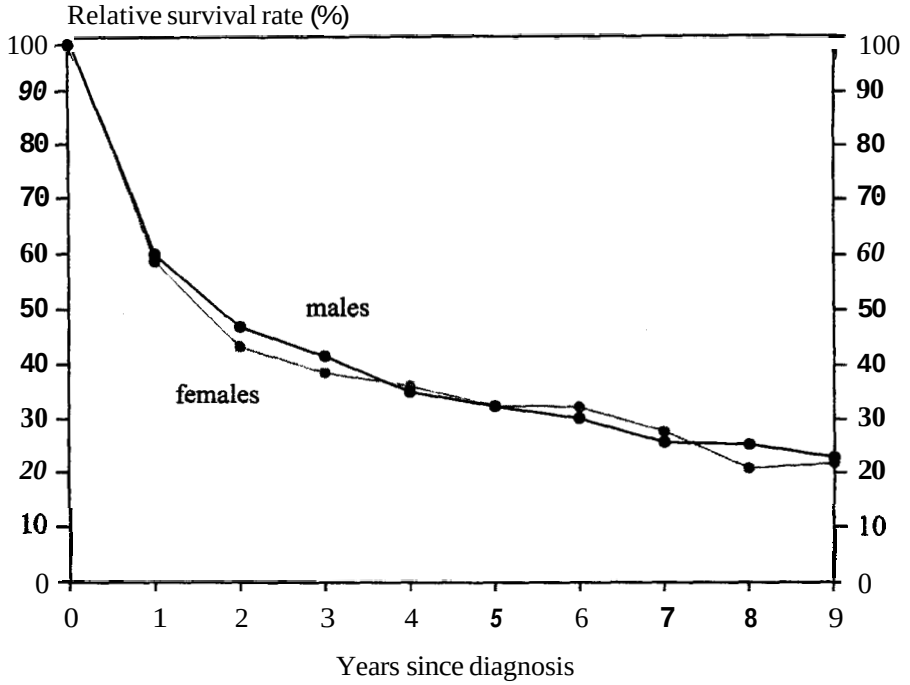

Fig. 5. **Relative survival for bladder cancer in Estonia, 1983–87, males and females.**

mortality statistics are well known and have been frequently discussed (8, 12, 15, 21), and death certificate data are used extensively for many epidemiological studies. In countries, where all the population is not covered by cancer registration, mortality rates have been even used to estimate national incidence rates (13). In Estonia, future studies of the quality and reliability of death certification appear highly required if we want to learn more about interpretation of national and international mortality patterns.

Survival rates for bladder cancer in Estonia are less favorable than those in the Nordic countries like, e.g., Finland (3) and Sweden (26). Lower survival rates for several other cancer sites in Estonia were found in international comparisons, and they could be explained by delay in diagnosis, lower quality of and somewhat restricted access to surgery (7, 14) and/or selective reporting of more malignant tumors. Our descriptive study does not permit direct conclusions regarding the variety of factors affecting bladder cancer survival in Estonia. Further hospital-based studies are needed to investigate the relation between patients' survival and clinical characteristics with special attention to stage of disease, histological type and grade.

One reason for this study was the apparent lack of data on bladder cancer occurrence in Estonia that is available to international readership. The authors hope that the present report will be used as reference material for clinicians, epidemiologists and public health managers involved in national and international projects, particularly in the Baltic and Nordic countries.

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