

## Epidemiology of burns in Lithuania during 1991–2004

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**Key words:** burns; epidemiology; Lithuania.

**Summary.** The objective of this article is to overview and present the burn incidence and burn care in Lithuania.

**Materials and methods.** In this study, data from the period of 1991–2004 were collected from the Lithuanian Department of Statistics, Department of Fire and Rescue, Lithuanian Health Information Center, State Patient Fund, health care institutions, burn care facilities.

**Results.** In the 14-year period, 9459 persons per year (2.6/1000 population) in average sustained burn injuries. The majority of burned patients (74.8%) were adults and 25.2% were children; 21.5% of all burned patients were hospitalized (2013 inpatients per year). The number of hospitalizations per 100 000 individuals has decreased from 65.6 to 39.5, but it is still very high and worrying. Among all the patients admitted to hospitals, 67% were males and 33% females, with a male-to-female ratio of 2:1. The length of hospitalization decreased from 16.2 to 12.7 days. The number of fire-related deaths for the 14-year period was 289 deaths per year (8 per 100 000 persons). The number of deaths among inpatients was 63.6 deaths per year, the age being an important factor in mortality rates. Although the mortality of inpatients has increased in recent years, the mortality in the age group up to 14 years has decreased to 0. Children made up 24.6% of burn patients; among those admitted to hospital, they accounted for 41.1%. Mortality rates for males and females were almost the same.

**Conclusions.** The number of burns is decreasing. The hospitalization rate and hospitalization time are becoming shorter. In the last few years, patients suffer from more severe burns, while children sustain more severe burns requiring hospitalization. Children and working-age persons make up 91.9% of hospitalized burn patients. Number of deaths in fire accidents is increasing.

### Introduction

Lithuania is an Eastern European country located on the coast of the Baltic Sea in the neighborhood of Latvia, Poland, Belarus, and the Kaliningrad region of the Russian Federation. Occupied by the Soviet Union just before the World War II, the country restored its independence in 1990. The development of the national medical system improving economic situation of the state, international contacts, and cooperation with international organizations led to positive changes in burn care.

The population of Lithuania in 1989 was 3.68 million and decreased to 3.44 million in 2004. The capital of Lithuania is Vilnius (800 000 inhabitants), and other major cities are Kaunas (400 000 inhabitants), Klaipėda (200 000), Šiauliai (150 000), and Panevėžys (130 000). Nearly 66% of the population lives in urban areas and 33% – in rural. The main economic activities in Lithuania are agriculture and forestry, construction and industry (textiles, chemical), food and services industry (1).

Serious burn injuries during the past decade were gunpowder explosion in the Soviet Army ammunition depot in 1993 (1 dead, 14 injured), biogas explosion in Kaunas water purification enterprise in 1999 (1 dead, 13 injured), and fire in Ukmergė foam rubber factory in 2003 (1 dead, 7 injured).

During the period of independence between the World War I and World War II, burn injuries were rare, and patients were treated in local hospitals. After the World War II, burn patients were treated in trauma departments of community hospitals. The establishment of the Burn Center in the Hospital of Kaunas University of Medicine on December 12, 1972, is treated as a beginning of specialized surgery of burns. Since the very beginning, the facility had 40 beds (25 for adults and 15 for children) and was handled by trauma surgeons and nurses. Headed by Laima Merkšaitienė and later by Jurijus Klebanovas, the staff of the facility successfully implemented modern methods of the wound care, surgery, and intensive care. In 1993, the Burn Center of the Hospital of Kaunas University

of Medicine was accredited as the National Burn Center. Later activities of this center were expanded, and on the basis of the center, the Department of Plastic Surgery and Burns was developed. Implementation of modern methods of resuscitation, early burn wound excision and grafting, nasogastric feeding, infection control, nursing, and early rehabilitation resulted in a better survival and shorter treatment of patients in the hospital. The number of beds was reduced to 35 in 2001 (2).

In 2002, the pediatric burn facility was shifted to the Department of Pediatric Surgery. Today, the Burn Center has 25 beds and provides complete care for burn patients. Patients suffering from postburn deformities and contractures are treated here in later post-burn period as well as other patients requiring reconstructive surgery, suffering from large soft tissue defects, pressure sores, chronic ulcers, *etc.* The importance is supported by the fact that other countries are also seeking to establish such units (3).

Parallel to the Burn Center in the Hospital of Kaunas University of Medicine in 1993, a burn unit of 10 pediatric beds was established in the Department of Trauma of the Vilnius University Pediatric Hospital. It was headed by Jonas Vencius. In 1985, a burn unit of 10 adult beds in the Department of Trauma was set up in the Vilnius Railway Hospital (headed by Vytautas Duoba). Later, this particular facility was relocated to the Vilnius University Hospital (10 adult beds) in the Department of General Surgery and was managed by Augustinas Rimas.

The Lithuanian Society for Burn Injuries was

founded in 1994, and it holds its quadrennial meetings and other activities (burn prevention campaigns and education programs). Lithuania is represented in such international organizations as the International Society for Burn Injuries, European Burn Association, and European Pediatric Burn Club.

### Materials and methods

Official data were collected by the Lithuanian Department of Statistics, Department of Fire and Rescue, Lithuanian Health Information Center, State Patient Fund, health care institutions, burn care facilities.

As the objective of this paper was to overview and present the burn incidence and burn care in Lithuania, various data have been collected: the total number of patients suffering from burns, changes in the number of inpatients, burn-related mortality rates, and data of hospitalization, length of stay, distribution by age groups, and gender-specific data.

### Results

During 1991–2004, 132 428 persons sustained burn injuries, 9459 persons per year in average. The highest number of burned patients was 12 568 in 1993. Another increase in the number of burned patients was in 1999. The lowest number of burned patients was registered in 2004 ( $n=7513$ ); 74.8% were adults and 25.2% were children. This number varies marginally over all years presented (Fig. 1). Although the total number of burns is decreasing during the last 5 years, incidence of burns (per 1000 inhabitants) due to decreasing population size remains constant at 2.4,

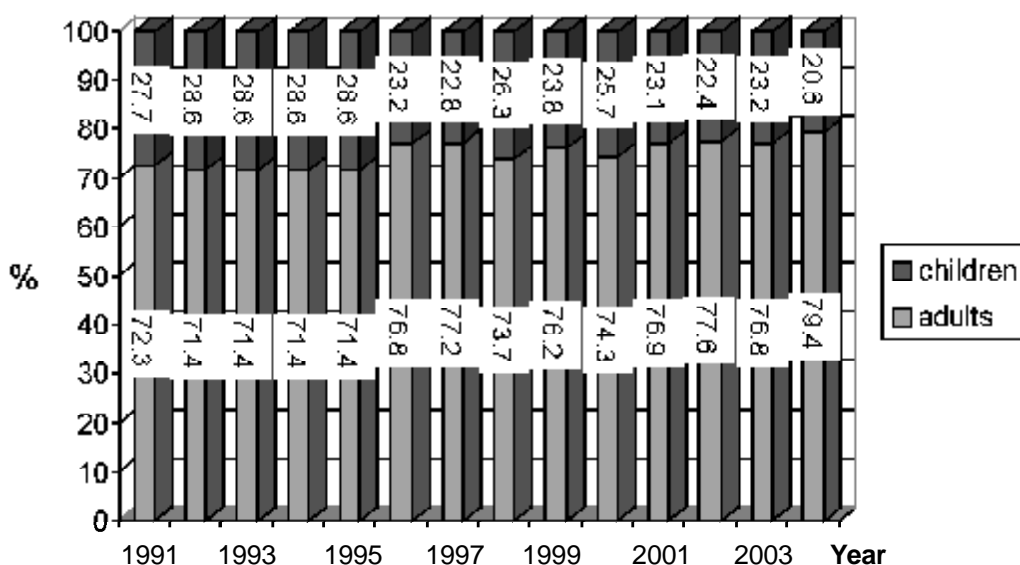
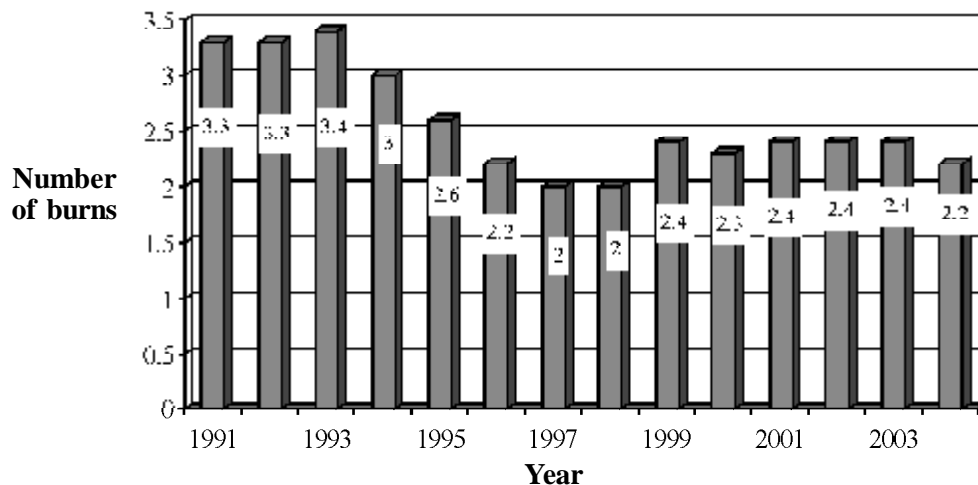


Fig. 1. Distribution of adults and children (% of all burned patients)

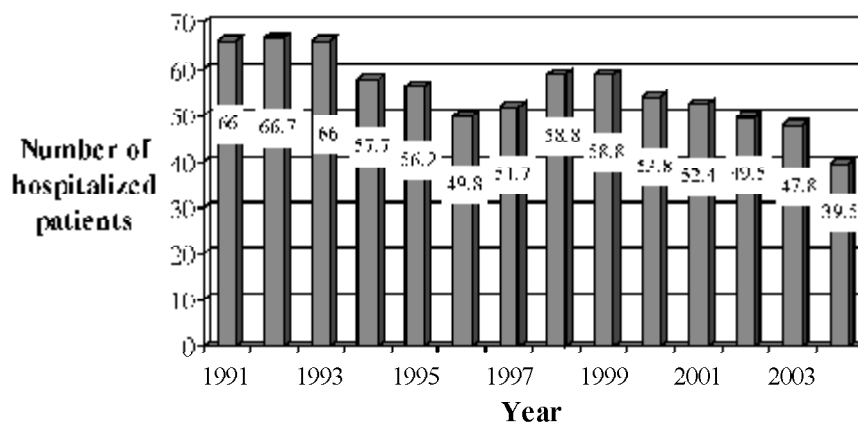


**Fig. 2. Incidence of burns per 1000 population in Lithuania in 1991–2004**

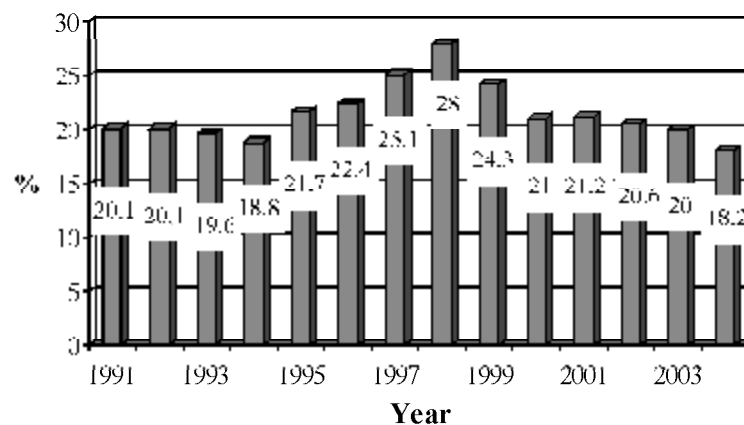
but it is lower than the average for 14 years (2.6/1000 population). The highest burn incidence was recorded in 1991–1992 (3.3/1000 pop.) and the lowest in 1997–1998 (2.0/1000 pop.) (Fig. 2).

During the whole period, the average number of inpatients was 2013 per year. The highest number of hospitalized patients was 2494 in 1992, while the low-

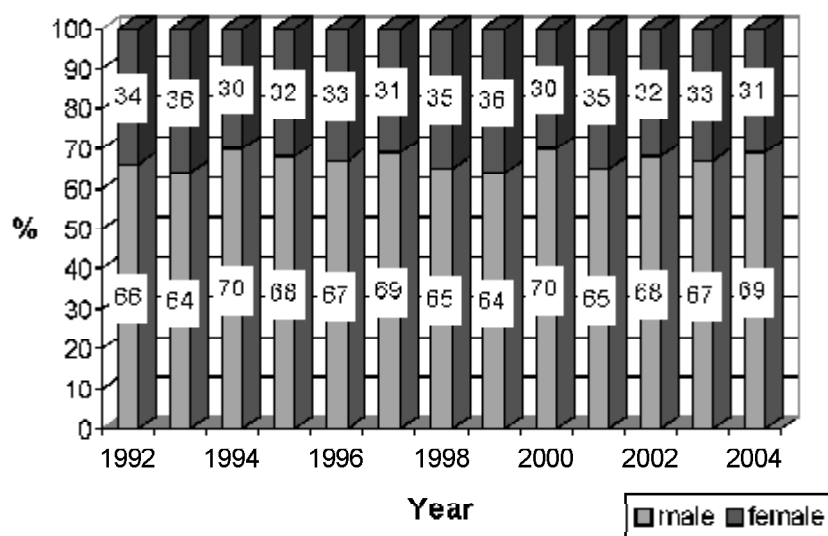
est number was 1361 in 2004. The number of hospitalizations per 100 000 people decreased from 65.6 in 1991 to 39.5 in 2004, with an average of 55.3 (Fig. 3). The percentage of patients who needed hospitalization varied from 28% in 1998 to 18.2% in 2004, with an average of 21.5% (Fig. 4). Males made up 67% of inpatients and females – 33%. These propor-



**Fig. 3. Number of hospitalized patients per 100 000 population in 1991–2004**



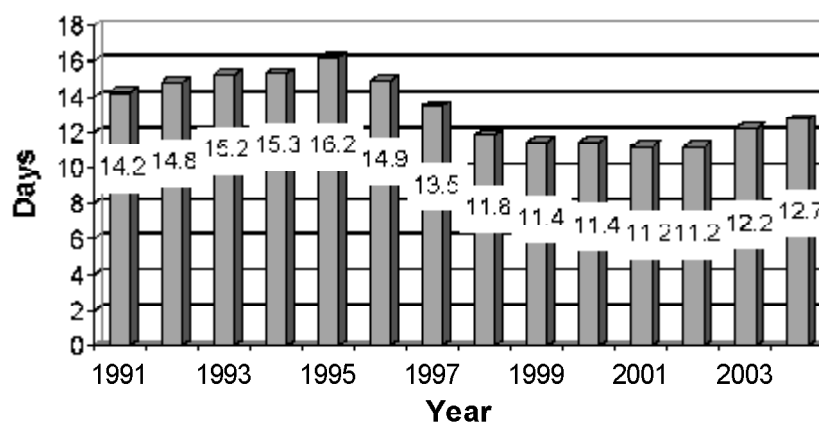
**Fig. 4. Proportion of hospitalization (% of total burn injuries)**



**Fig. 5. Distribution of burned inpatients according to gender (%)**

**Table 1. Distribution of burned inpatients by different age groups (% of hospitalized patients)**

Age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Ave- rage
Up to 14 years	42.1	41.3	38.5	37.7	38.8	39.9	38.6	39.5	43.4	42.7	43.9	43.6	44.7	41.1
15–44 years	33.3	34.5	34.1	35.3	35.7	33.7	34.6	33.3	32.9	32.7	30.8	27.8	29.4	32.9
45–64 years	18.9	17.1	20.3	18.9	17.8	18.3	17.4	17.7	15.9	15.9	16.9	19.1	17.4	17.8
65 years and more	5.7	7.1	7.1	8.1	7.7	8.1	9.4	9.5	7.8	8.7	8.4	9.5	8.5	8.1



**Fig. 6. Average length of hospitalization**

tions slightly vary from year to year (Fig. 5). The distribution of hospitalized patients by age groups is presented in Table 1. It shows that the largest part of those admitted to hospital were children and working-age persons. The length of hospitalization varied from 16.2 days in 1995 to 11.2 days in 2001 and 2002, with an average of 13.3 days (Fig. 6).

During 1991–2004, there were 4048 burn-related

deaths (289 deaths per year and 8 deaths per 100 000 population in average). The highest number of burn-related deaths was recorded in 1994 (10.9/100 000 population) and lowest number – in 1991 (4.4/100 000 population) (Fig. 7). In the total number of fire-related deaths, 3168 persons have been found dead on the scene of accident (226.3 persons per year in average), and 890 people died after admission to the

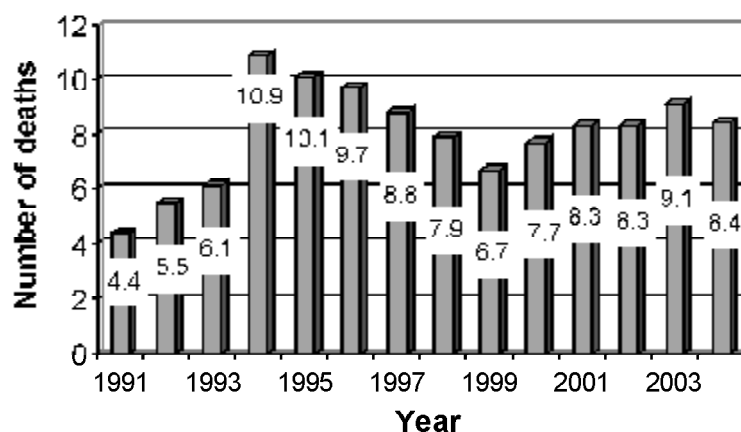


Fig. 7. Number of burn-related deaths per 100 000 population in 1991–2004

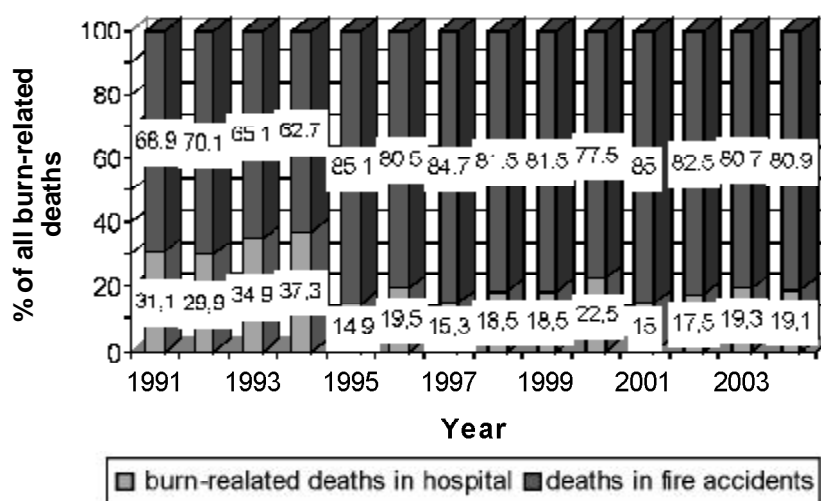


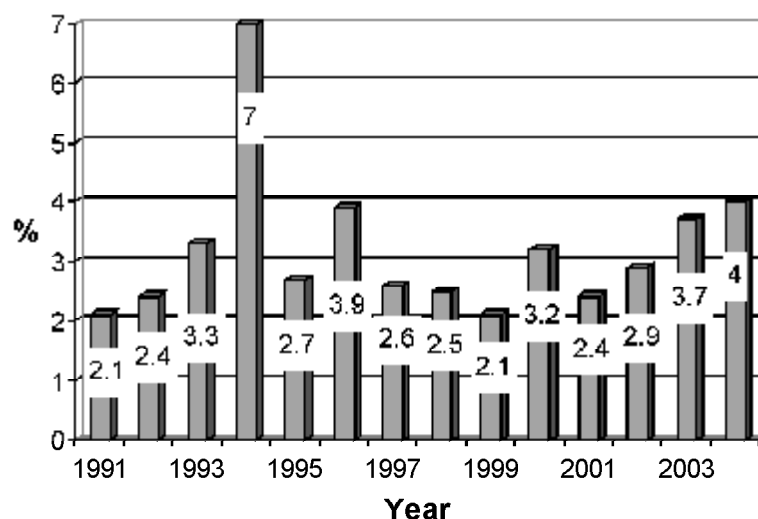
Fig. 8. Numbers of burn-related deaths in hospital and on the scene of accident

hospital (63.6 persons per year in average). The highest number of burn-related deaths among inpatients was 151 in 1994; the lowest number – 43 in 2001. Analysis of changes in the total number of burn-related deaths revealed that hospital death rate recently decreased from 30% to 20% (Fig. 8). The mean mortality rate among inpatients was 3.2%, with the highest rate of 7% registered in 1994, and the lowest rate of 2.1% was observed in 1999 (Fig. 9).

The mortality rates in age groups were different and increased with age. The mortality rate is increasing in each age group, from very low 0.5% in the age group up to 14 years to very high 12.6% in the age group of 65 years and more (Table 2). The difference in mortality rates among age groups is statistically significant ( $P < 0.01$ ). The male mortality rate was 4.4% and female mortality rate was 4.7%. This difference statistically is insignificant.

### Discussion

The number of burned patients in Lithuania is high – the average of 2.6 burned patients per 1000 population and 55.3 admitted patients per 100 000 population. Even the number of patients, admitted to hospital, decreased to 39.5 persons per 100 000 population in 2004, still it is high if compared to other countries (3–12). Although recently the number of burn injuries is decreasing, the incidence of burns per 1000 population remains around 2.4. Regardless quantitative numbers of burn incidents, the number of hospitalizations per 100 000 population is constantly diminishing and correlates with other studies (3, 10, 11, 13). Such a situation shows that in general, people recently sustain less severe burns, which are treated at primary health care offices. Decreasing length of hospital stay is due to an early burn excision and grafting (3, 14). Among all burned patients, only



**Fig. 9. Mortality rates in 1991–2004 (% of hospitalized patients)**

**Table 2. Mortality rates in different age groups in 1992–2004 (%)**

Age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Ave- rage
Up to 14 years	1	1.8	0.4	0	0.3	0.3	0.1	0.1	0	0.1	0	0	0	0.5
15–44 years	2.2	2.2	2.2	2.2	3	1.7	2	1.7	2.6	1.5	3	4.6	2.8	2.2
45–64 years	2.5	5.2	6	5.8	7	5.1	4.5	3.9	7.4	5.1	5.5	6.4	10.1	5.1
65 years and more	14.8	12.2	11.2	10.2	19	12.3	10.2	8.8	15.1	11.5	12.7	12.7	17.2	12.6

25.2% were children, but in the age group up to 14 years, this number reaches 41.1% of all hospitalized patients. This is consistent with other study (10), showing that more children sustain severe burns requiring admission to hospital or a burn unit compared to adults. Children and working-age persons made up 91.9% of hospitalized burn patients. Males accounted for 67% of all admitted patients and females –33%, with a male-to-female ratio of 2:1. In some studies, this ratio was the same (4, 15), and in other study, it was lower (3). The boy-to-girl ratio was found to be nearly the same (1.8:1) (16). Some studies indicated higher mortality rates in females (3, 4, 17). Some other authors have not found this gender disparity (7, 8, 15). In our study, the male mortality rate was 4.4% and that of females – 4.7%, and the difference is statistically insignificant. The mortality rate is increasing in every age group, from very low 0.5% in the age group up to 14 years to very high 12.6% in the age group of 65 years and more; similar progression was found in other studies (3, 4, 6, 12, 13). Elderly people have various concomitant diseases and medical conditions, which complicate the healing of burn injuries. Although children sustain more severe burns than adults, the mortality rate in the age group up to 14 is

very low. In the last 3 years, the mortality rate in this age group decreased to 0. If we eliminate the age group up to 14 years, which has a very low mortality rate, the mortality rate for adults (aged 15 years and more) would be 4.5%. Such number is worrying, because in other studies it was found to be smaller (3, 4, 12). A decrease in burn mortality rates is related to the emergency resuscitation, respiratory care and treatment of inhalation injury, control of infection, early burn excision and grafting, and modulation of a hypermetabolic response to trauma is reported in other studies (10, 12, 13, 15). It is worrying is that during previous years, mortality rates have been even increasing. In addition, increasing number of deaths in fire accidents show that either legislation measures should be updated or preventive control is insufficient.

### Conclusions

The number of burns is decreasing. The hospitalization rate and length of hospital stay are becoming shorter. In the last few years, patients suffer from more severe burns, while children sustain more severe burns requiring hospitalization. Children and working-age persons make up 91.9% of hospitalized burn patients. The number of deaths in fire accidents is increasing.

## Nudegimų epidemiologija Lietuvoje (1991–2004)

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**Raktažodžiai:** nudegimai, epidemiologija, Lietuva.

**Santrauka.** *Tyrimo tikslas.* Supažindinti su nudegimų epidemiologija bei gydymu Lietuvoje.

*Tiriamoji medžiaga ir metodai.* Šiam darbui pavartoti duomenys, surinkti iš Lietuvos statistikos departamento, Priešgaisrinės apsaugos ir gelbėjimo departamento, Lietuvos sveikatos informacijos centro, sveikatos gydymo įstaigų, nudegimų centrų.

*Rezultatai.* Per 14 metų per metus vidutiniškai nudegimą patyrė 9459 žmonės (2,6/1000 gyventojų). 74,8 proc. nudegusiųjų buvo suaugę, 25,2 proc. – vaikai. 21,5 proc. visų nudegusiųjų buvo hospitalizuota (vidutiniškai 2013 pacientų per metus). Hospitalizuotų pacientų skaičius 100 tūkst. gyventojų sumažėjo nuo 65,6 iki 39,5, tačiau išlieka aukštas palyginus su kitomis studijomis. Hospitalizuotų pacientų vyrų ir moterų santykis sudarė 2:1. Hospitalizacijos trukmė sutrumpėjo nuo 16,2 iki 12,7 dienos. Vidutinis ugnies sukeltų mirčių skaičius buvo 289 žmonės per metus (8 mirtys 100 tūkst. gyventojų), iš jų 63,6 sudarė hospitalizuoti pacientai. Nudegusiųjų amžius turėjo didelę įtaką mirštamumui. Nudegimą patyrusių hospitalizuotų ligonių mirštamumas pastaraisiais metais padidėjo, tačiau amžiaus grupėje nuo 0 iki 14 metų paskutiniaisiais metais mirusiųjų nebuvo. Lytis mirštamumo rodikliams įtakos neturėjo.

*Išvados.* Nudegimą patyrusių pacientų mažėja. Mažėja hospitalizuojamų pacientų ir trumpėja lovodieniai. Tačiau pastaraisiais metais daugėja pacientų, patiriančių sunkius nudegimus, vaikai patiria sunkesnių nudegimų. 91,9 proc. visų dėl nudegimo hospitalizuojamų pacientų yra vaikai ir darbingo amžiaus žmonės. Taip pat pastaraisiais metais didėja žuvusiųjų gaisruose skaičius.

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Received 15 February 2007, accepted 4 July 2008  
Straipsnis gautas 2007 02 15, priimtas 2008 07 04