

## PUBLIC HEALTH ASPECTS OF RENAL DISEASES IN THE REPUBLIC OF MACEDONIA 1983–2007

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**Abstract:** *Objective:* to present the situation and burden of renal diseases and dialysis in the Republic of Macedonia in the period 1983–2007.

*Methodology:* A descriptive-statistical method has been applied with retrospective analysis of data for the period 1983–2007. Data from standard reports from ambulatory, dispensary and hospital services in the Republic of Macedonia, mortality statistics for the Republic of Macedonia, data from the World Health Organization and other professional literature and materials have been used.

*Results and discussion:* Morbidity data from ambulatory and dispensary services in the period 1997–2007 show that renal diseases have increased by 64.7%, with rates rising from 319.5/10,000 population in 1997 to 514.5/10,000 in 2007. There has also been a rise in hospital health care for renal diseases, which is mainly due to the increase of chronic renal failure patients. Renal failure in-patient morbidity has increased from 3.5/10,000 in 1983 to 8.2/10,000 in 2006. Mortality from urinary system diseases in the period 1983–2007 also increased from 8.2/100,000 in 1983 to 14.0/100,000 in 2007. The vast majority of all mortality cases are due to renal failure. At the same time, chronic renal failure represents a significant economic burden to the society.

*Conclusions and recommendations:* The treatment of urinary system diseases, and especially of chronic renal failure, requires costly diagnostic procedures and treatment and long-term rehabilitation and these cause negative economic effects, long-term absenteeism, disability and premature death. It is necessary to stress the measures for health protection and promotion, as well as all levels of prevention of renal diseases.

**Key words:** renal diseases, renal failure, morbidity, mortality, public health.

### *1. Introduction*

Diseases of the urinary system are a serious health and social medicine problem, considering the high incidence and prevalence rates, expensive and long-term treatment, negative economic effects due to high treatment costs, frequent and long-term absenteeism, disability and premature death [1].

More than 500 million people in the world – or almost 10% of the adult population – have some kind of renal disease. It is anticipated that by year 2015 around 35 million people in the world will die from chronic kidney diseases (CKD) and from cardiovascular diseases; renal diseases are pandemic in the world and according to World Health Organization [2] data 1.5 million people need dialysis to survive.

Globally, the most common causes of CKD used to be nephritic or inflammatory renal diseases, urinary tract obstructions and congenital malformations such as polycystic kidney disease. In recent times, this pattern has been changing in both developed and developing countries as diabetes and hypertension have become main causes of CKD, both of them being main causes of cardiovascular diseases.

In 2002 in Australia 16% of new cases of renal disease were caused by hypertension, 26% by diabetic nephropathy, and 27% by glomerulonephritis [3]. In Great Britain, the rate of hospitalisation for renal diseases was 2.88% of all hospital-treated cases in 2002–03, and this grew to 3.5% in 2008–09 [4]. In the USA, the prevalence of chronic kidney disease was 16.8% of the U.S. population aged  $\geq 20$  years [5].

Chronic renal failure is a progressive, chronic and irreversible reduction of glomerular filtration caused by irreversible deterioration and loss of nephrons, accompanied by varying degrees of azotaemia or uraemic symptoms, irrespective of the etiology or anatomical localization of the disease [6].

Terminal renal failure is the end-stage of chronic renal failure when the glomerular filtration is so reduced that life without dialysis is impossible. Terminal renal disease is defined as reduced renal function (less than 10% of normal capacity) that requires dialysis or a kidney transplant for the patient to live [7].

### *2. Objective*

The objective of this article is to present the situation and burden of renal diseases in the Republic of Macedonia in the period 1983–2007, especially the situation with regard to chronic renal failure, end-stage renal disease (ESRD) and dialysis through hospital and ambulatory-dispensary morbidity data analysis as well as mortality data analysis, and the opportunities of the health system for the early detection, prevention and treatment of these diseases.

### 3. *Material and methods*

We used the following data sources for the preparation of this article:

- **standard reports** from ambulatory and dispensary and hospital services in the Republic of Macedonia, which are processed by social medicine departments in the ten Centres for Public Health and the Institute for Public Health in Skopje;
- **mortality statistics** – data acquired from the State Statistical Office of the Republic of Macedonia, processed at the Institute for Public Health – Skopje;
- **Health for all (HFA) – Data base** – data from the World Health Organization (WHO);
- **Professional materials prepared by the Institute for Public Health, Skopje** for analysis of lost working ability and years of life lost in diseased patients;
- **Professional literature** for the preparation of recommendations with proposals for prevention, early detection, treatment and rehabilitation of renal diseases.

A descriptive-statistical method has been applied with retrospective analysis of data for the period 1983–2007. Data have been processed giving a presentation of morbidity and mortality, structure of diseases, frequency of occurrence, burden of diseases presented through DALY (Disability-adjusted life years) and YLL (Years of potential life lost), as well as economic costs of dialyses and transplantations.

A comparative analysis of our data and the data of some other European countries was performed, while the network of centres for dialysis, its development and patient load is presented, based on a conducted survey.

### 4. *Results and discussion*

#### 4.1. *Morbidity*

According to data from ambulatory and dispensary services [8] in 2007, there were 105,145 registered cases with diseases of the urinary system out of 3,153,320 registered cases in total. Compared to 1997, this group of diseases has increased by 64.7%, with the rate of 514.5% in 2007. The proportion of urinary system diseases in the total of registered diseases in primary health care also increased in this 10-year period, from 2.7% to 3.3% (Table 1).

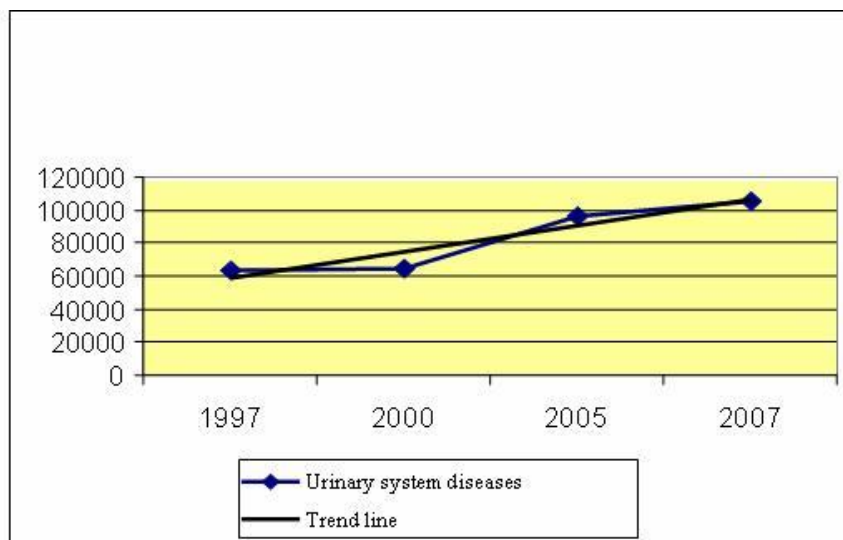
Table 1 – Табела 1

*Morbidity per 10,000 population from urinary system diseases in ambulatory and dispensary services in R. Macedonia, period 1997–2007*

*Морбидитетот на 10.000 жители од заболувања на уринарниот систем во амбулантно-поликлиничката дејност во Р. Македонија, период 1997–2007*

Year	Total registered diseases in ambulatory and dispensary services	Total registered urinary system diseases	Rate per 10,000 population	Proportion in total diseases (in %)
1997	2,378,774	63,840	319.5	2.7
1998	2,482,440	72,126	359.3	2.9
1999	2,605,243	75,627	373.5	2.9
2000	2,471,860	64,620	318.2	2.6
2005	3,185,571	96,473	473.6	3.0
2006	2,542,599	86,387	423.4	3.3
2007	3,153,320	105,145	514.5	3.3

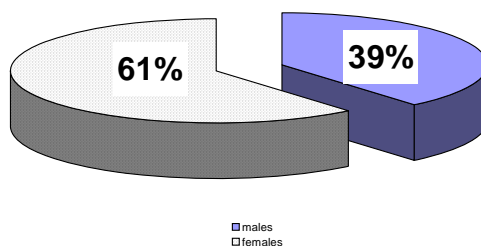
Source: Institute of Public Health – Skopje.



Source: Institute of Public Health, Skopje.

*Figure 1 – Morbidity trend from urinary system diseases in ambulatory and dispensary services in R. Macedonia, 1997–2007*

*Слика 1 – Тренд на морбидитетот од болести на уринарниот систем во амбулантно-поликлиничката дејност во Р. Македонија, 1997–2007*



Source: Institute of Public Health, Skopje.

*Figure 2 – Structure by gender of urinary system diseases in ambulatory and dispensary services in R. Macedonia, 2007*  
*Слика 2 – Структура на болестии на уринарниот систем според полојќи во амбулантно-поликлиничката дејност во Р. Македонија, 2007*

Table 2 – Табела 2

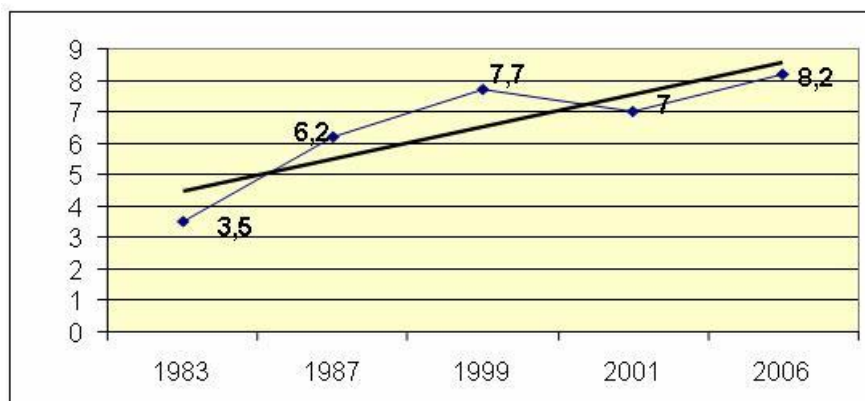
*Most common diagnoses of urinary system diseases (N00-N39), rate per 10,000 population and average length of stay in hospital and in-patient services in R. Macedonia, 2006*  
*Најчестии дијагнози од болестии на уринарниот систем (N00-N39), стапка на 10.000 жители и просечно траење на лекување, во болничко-стационарна дејност во Р.М., 2006*

ICD-10	Diagnosis	Number	Rate	Average length of stay
N20	CALCULUS OF KIDNEY AND URETER	1,588	7.78	5.66
N18	CHRONIC RENAL FAILURE	1,572	7.71	21.16
N23	UNSPECIFIED RENAL COLIC	1,119	5.48	4.03
N30	CYSTITIS	466	2.28	5.74
N10	ACUTE TUBULO-INTERSTITIAL NEPHRITIS	288	1.41	8.1
N21	CALCULUS OF LOWER URINARY TRACT	230	1.13	6.06
N35	URETHRAL STRICTURE	157	0.77	5.85
N13	OBSTRUCTIVE AND REFLUX UROPATHY	148	0.73	8.68
N11	CHRONIC TUBULO-INTERSTITIAL NEPHRITIS	122	0.60	7.37
N17	ACUTE RENAL FAILURE	104	0.51	10
N03	CHRONIC NEPHRITIC SYNDROME	55	0.27	10.13
N04	NEPHROTIC SYNDROME	47	0.23	17.43
N00	ACUTE NEPHRITIC SYNDROME	30	0.15	9

Source: Institute of Public Health, Skopje.

In hospital and in-patient health care, the number of patients treated for urinary system diseases is about 4.000–5.000 per year [9]. The morbidity rate per 10,000 population is around 22. In the recent past there has been a slight increase in these diseases, which is mainly due to the increase of chronic renal failure patients.

There are around 1,000–1,600 patients treated for renal failure, which is a morbidity rate of 5–8 cases per 10,000 population. Of these, 4–6 per 10,000 population are chronic renal failure patients, which is equivalent to 800–1,200 cases per year.



Source: Institute of Public Health, Skopje

*Figure 3 – Morbidity trend of renal failure in hospital and in-patient services*

*in R. Macedonia, 1983–2006, rate per 10,000 population*

*Слика 3 – Тренд на болнички морбидитет од бубрежна инсуфициенција во Р. Македонија, период 1983–2006 година, стапка на 10.000 жители*

#### 4.2. Mortality

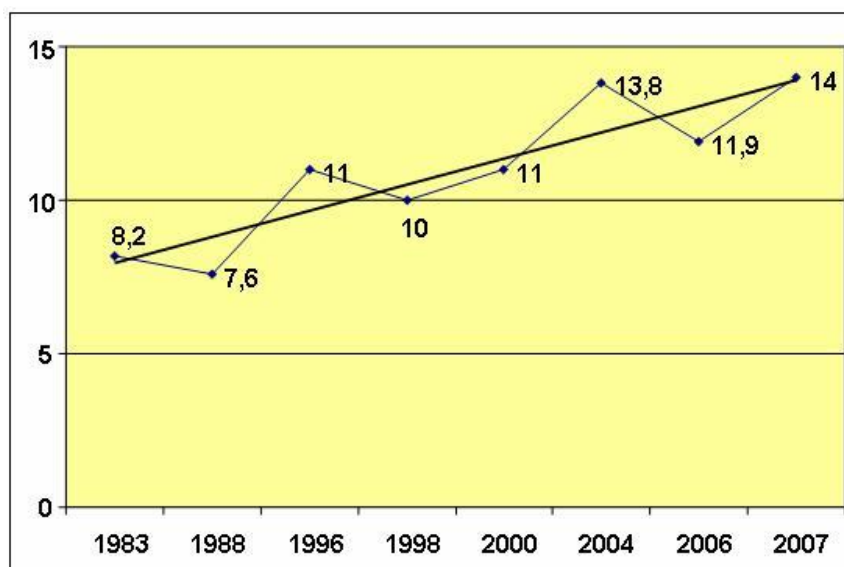
The number of deaths from urinary system diseases in the period 1983–2007 was increasing. In 1983 there were 164 deaths from these diseases, in 2000 there were 222 registered deaths, while in 2007 there were 287 death cases. In 2007, the mortality rate had increased to 14.0 per 100,000 population from 8.2 per 100,000 population in 1983 [10].

Table 3 – Табела 3

*Mortality per 100,000 population and proportion of deaths from urinary system diseases in R. Macedonia, period 1983–2007*  
*Морталитетот на 100.000 жители и учество на болестите на уринарниот систем во вкупно умреније во Р. Македонија, период 1983–2007*

Year	1983	1988	1992	1996	1998	2000	2004	2007
<b>Total deaths</b>	14,391	14,565	16,022	16,063	16,870	17,253	17,944	19,594
<b>Deaths from urinary system diseases</b>	164	163	170	219	212	222	280	287
<b>% of total deaths</b>	1.1	1.1	1.1	1.4	1.3	1.3	1.6	1.5
<b>Rate per 100,000 population</b>	8.2	7.6	8.3	11	10.6	11	13.8	14.0

Sources: State Statistical Office and Institute of Public Health – Skopje.



Sources: State Statistical Office and Institute of Public Health, Skopje

*Figure 4 – Mortality rate per 100,000 population, urinary system diseases in R. Macedonia, period 1983–2007*

*Слика 4 – Тренд на движење на стапка на морталитетот на 100 000 жители од болести на уринарниот систем во Р. Македонија, период 1983–2007*

Renal failure mortality is increasing and in the period 2001–07 it increased by 26%. The proportion of renal failure in total mortality from urinary system diseases was slightly reduced from 99,1% in 2001 to 98,6% in 2007.

Table 4 – Табела 4

*Mortality from urinary system diseases and renal failure, by gender and rate per 100,000 population in R. Macedonia, 2001–07*  
*Морталитетот од болести на уринарен систем и бубрежна инсуфициенција, по пол и стапка на 100.000 население во Р. Македонија, 2001–2007*

ICD-10	Diagnosis	Gender	2007		2006		2005		2004		2003		2002		2001		Index 2007/2001
			No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	
N00- N39	Urinary system diseases	males	165	16.1	142	13.9	143	14.0	167	16.4	136	13.4	130	12.8	126	12.4	130,95
		females	122	12	100	9.8	105	10.3	113	11.2	108	10.7	89	8.8	99	9.7	123,23
		total	287	14	242	11.9	248	12.2	280	13.8	244	12.0	219	10.8	225	11.1	127,56
N17- N19	Renal failure	males	163	15.9	141	13.8	140	13.7	165	16.2	134	13.2	130	12.8	124	12.2	131,45
		females	120	11.7	96	9.4	104	10.2	111	11.0	108	10.7	86	8.6	99	9.7	121,21
		total	283	13.8	237	11.6	244	12.0	276	13.6	242	11.9	216	10.7	223	11.0	126,91

Sources: State Statistical Office and Institute of Public Health, Skopje.

Table 5 – Табела 5

*Mortality from urinary system diseases (N00-N39) by diagnoses and mortality rate per 100,000 population in R. Macedonia, 2007*  
*Морталитетот од болести на уринарниот систем (N00-N39) според одделни дијагнози и стапка на морталитетот на 100.000 население во Р. Македонија, 2007*

ICD-10	Diagnosis	Number	Rate per 100.000
N11	CHRONIC TUBULO-INTERSTITIAL NEPHRITIS	1	0.0
N13	OBSTRUCTIVE AND REFLUX UROPATHY	2	0.1
N17	ACUTE RENAL FAILURE	37	1.8
N18	CHRONIC RENAL FAILURE	210	10.3
N19	UNSPECIFIED RENAL FAILURE	36	1.8
N39	OTHER DISORDERS OF URINARY SYSTEM	1	0.0
	<b>Total</b>	287	14.0

Sources: State Statistical Office and Institute of Public Health, Skopje.



Globally, the burden of urinary system diseases worldwide expressed in DALYs (Disability-adjusted life years) in 2004 was 14,754 thousand DALYs which represents 1% of the total burden of diseases in the world. In Europe, this burden is 1,319 thousand DALYs. The following three tables present the burden of diseases by defined causes of death in 2003.

Table 6 – Табела 6

*Mortality and disability by causes of death, male and female, R. Macedonia, 2003*  
*Морталитет и онеспособеност по дефинирани причини за смрт, кај мажи и жени, Р. Македонија, 2003 г.*

R. Macedonia	Males		Females		Total	
CAUSE OF DEATH:	Total DALY	DALY per 1000	Total DALY	DALY per 1000	Total DALY	DALY per 1000
Malignant diseases	43461	42.9	40827	40.3	84288	41.6
Cardiovascular diseases	17489	17.2	22121	21.8	39610	19.5
Diabetes mellitus	3950	3.9	5875	5.8	9824	4.8
Renal diseases	2337	2.3	1871	1.8	4208	2.1
All causes	123.461	121.4	102.923	101.2	226.384	111.3

Sources: State Statistical Office and Institute of Public Health, Skopje

Table 7 – Табела 7

*YLL (Years of potential life lost) in males in R. Macedonia in 2003 – distribution by specified causes of death*  
*YLL (Years of potential life lost – години загубен живот) кај мажи по кај Р. Македонија во 2003 година – дистрибуција по дефинирани причини за смрт*

MALES				
CAUSE OF DEATH:	Deaths	Deaths per 1000	Total YLL	YLL per 1000
Malignant diseases	1.787	1.76	20.792	20.5
Cardiovascular diseases	4.880	4.8	37.697	37.2
Diabetes mellitus	225	0.22	2.023	2
Renal diseases	178	0.18	1.572	1.6
All causes	10.198	10	121.359	119.3

Sources: State Statistical Office and Institute of Public Health, Skopje.

Table 8 – Табела 8

*YLL (Years of potential life lost) in females in R. Macedonia in 2003 – distribution by specified causes of death*

*YLL (Years of potential life lost – години загубен живот) кај женски пол за Р. Македонија во 2003 година – дистрибуција по дефинирани причини за смрт*

FEMALES				
CAUSE OF DEATH:	Deaths	Deaths per 1000	Total YLL	YLL per 1000
Malignant diseases	1,208	1	16,222	16
Cardiovascular diseases	4,789	5	34,928	34.5
Diabetes mellitus	309	0.3	3,436	3.4
Renal diseases	108	0.1	1,201	1.2
All causes	8,588	8.4	99,008	97.4

Sources: State Statistical Office and Institute of Public Health, Skopje.

#### *4.3. Patients on dialysis and transplantations completed*

The number of people in need of dialysis treatment is increasing, both in the world and in our country. For this reason, there are 18 units in R. Macedonia performing dialysis. They are well distributed in the country, generally as units within the internal medicine departments of the general hospitals. Larger dialysis centres are the Nephrology Institute in Struga and the Nephrology Clinic in Skopje. By conducting a special survey in 2002, the number of patients on dialysis was obtained, the number of patients deceased on dialysis, and completed transplantations. According to this survey, there were more male patients on dialysis than females. The age structure was identical with the age structure registered in ambulatory and dispensary and hospital services. Patients in older age groups (60 and over) predominate, but unfortunately there were more and more patients under the age of 35 requiring dialysis.

According to data from the information on the status of renal failure from the centres for public health, as well as data from the survey, it is evident that in almost all the dialysis centres the majority of patients come from the same township as the dialysis centre, while patients from smaller communities gravitate towards them. In 2002, one of the problems arose from the situation in the capital, Skopje, which lacks capacities, so a fraction of the patients were forced to undergo dialysis at the Nephrology Institute in Struga, which entails additional economic, accommodation and other costs for the patients. The majority of patients (around 90%) require three dialyses per week. The most common diseases that arise from patients being on dialysis are: glomerulonephritis, pyelo-

nephritis, polycystic kidney disease, nephroangiosclerosis, diabetes and hypertension. Most common co-morbid conditions are: anaemia, hepatitis C, chronic cardiomyopathy and renal osteodystrophy. Patients are treated with erythropoietin, iron, immunization against hepatitis B, etc. The number of deaths in dialysis patients is around 10%.

Kidney transplantation is substitution therapy that replaces the non-functional kidney with a healthy organ from a close relative – living donor (sibling, parent) – or cadaver. The majority of presented transplants have been done from a living donor, the rest of them from a cadaver.

Table 9 presents the status of haemodialysis in Macedonia in year 2007 [11].

Table 9 – Табела 9

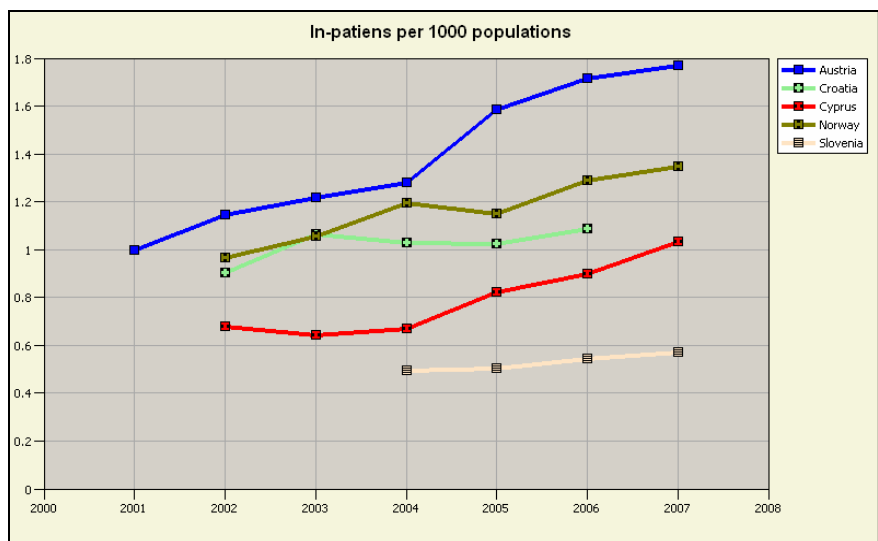
*Haemodialysis in adults in 2007 in the Republic of Macedonia  
Хемодијализа кај возрасни во 2007 година во Република Македонија*

HD Center	Founded year	Patients on HD in 2007	No of machines
Dept. Of Nephrology, Skopje	1971	165	42
HDC Struga	1978	195	55
HDC Bitola	1980	47	12
HDC Military Hospital Sk.	1981	64	16
HDC Gostivar	1982	43	14
HDC Stip	1984	52	18
HDC Prilep	1985	60	16
HDC Kumanovo	1986	56	15
HDC Strumica	1986	45	13
HDC Veles	1987	43	13
HDC Tetovo	1989	82	17
HDC Kavadarci	1989	40	12
HDC Kocani	1991	34	9
HDC Gevgelija	1991	32	6
HDC Debar	1991	9	6
HDC Zelezara, Skopje	1996	152	38
HDC Delcevo	2000	33	11
HDC Kriva Palanka	2004	21	7
<b>Total: 18 HDC</b>		<b>1,173</b>	<b>320</b>

Source: Polenakovic M., Oncevski A., Stojkovski Lj. *et al.* (2008). Dialysis and aphaeresis in the Republic of Macedonia: "A Success Story". *Prilozi*; 29(2): 95–118.

#### 4.4. Situation with renal diseases in Europe

Urinary system diseases constitute a considerable burden of disease in the population of R. Macedonia, as a cause of morbidity, mortality, associated consequences and long-term treatment of the diseased. The ambulatory and dispensary and hospital data analysis has shown a growing trend in urinary system diseases and consequently a growing trend in renal failure. There is a similar growth trend in Europe. In Austria, the renal failure in-patient rate in the period 2001–07 increased from 0.99 per 1000 population to 1.77 per 1000 population; in Slovenia there has been an increase from 0.49/1000 population in 2004 to 0.57/1000 population in 2007; in Croatia from 0.90 in 2002 to 1.08 in 2006; in Cyprus it has grown from 0.67 in 2002 to 1.03 in 2007, and in Norway from 0.96 in 2002 to 1.34 in 2007 [12].

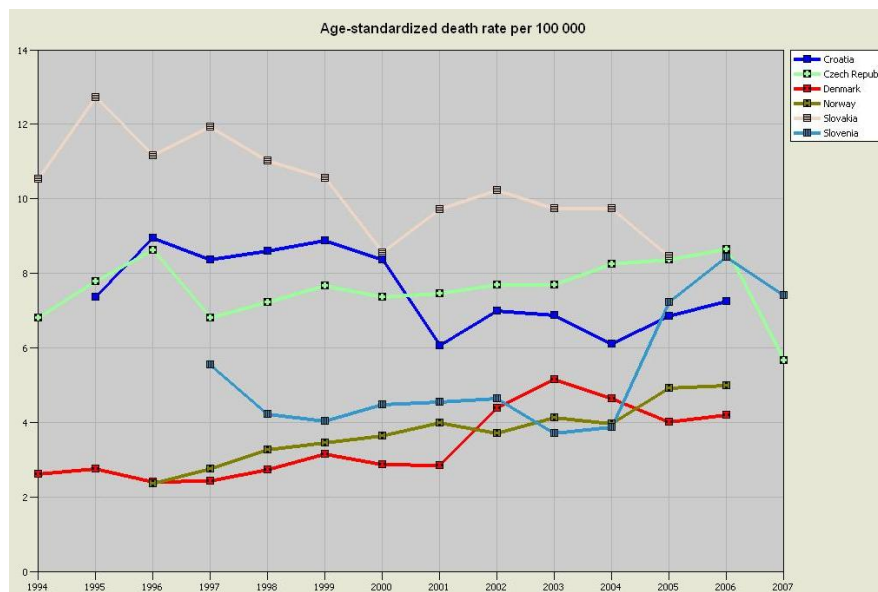


Source: European hospital morbidity database. Copenhagen, WHO Regional Office for Europe, [2009].

*Figure 5 – Renal failure hospitalisation rate*  
*Слика 5 – Слика на хоспитализација од бубрежна инсуфициенција*

In Macedonia, deaths from urinary system diseases are increasing, with renal failure being the main cause of death in this disease group. In Europe, according to renal failure mortality data, some countries are experiencing a growing trend (Slovenia from 5.55/100,000 population in 1998 to 7.41/100,000 in 2007; Denmark from 2.62 per 100,000 population in 1994 to 4.19 in 2006; Norway from 2.35/100,000 in 1996 to 4.98 in 2006), while in other countries

the trend is constant or is even decreasing (Czech Republic from 6.81/100,000 in 1994 to 5.67 in 2007; Croatia from 7.36/100,000 in 1995 to 7.25 in 2006; Slovakia from 10.53/100,000 in 1994 to 8.46 in 2005) [13].



Source: European detailed mortality database (DMDB). Copenhagen, WHO Regional Office for Europe, [2009].

Figure 6 – Renal failure age – standardised death rate

Слика 6 – Стандардизирани стајки на смртности од бубрежна инсуфицијенција

#### 4.5. Health care

Health care for people suffering from these diseases is provided at all three levels: primary, secondary and tertiary, both in the public and private health sectors.

Primary health care is provided in the ambulatory and dispensary services, while secondary health care is provided in specialist services, more precisely at the internal medicine units in the hospitals and in centres for dialysis.

Until 2002, there were 18 dialysis units, including the dialysis department within the Nephrology Clinic. These units are located in: Skopje (Clinic, Zhelezara, Chair and Military Hospital), Tetovo, Gostivar, Debar, Struga (Nephrology Institute), Prilep, Bitola, Gevgelija, Veles, Kumanovo, Kriva Palanka, Shtip, Kochani, Delchevo, Strumica and Kavadarci. Tertiary health care is provided by the Nephrology Clinic in Skopje, the Urology Clinic and the Republic Institute for Transfusion Medicine as the ultimate professional and scientific

organizations, applying the most advanced diagnostic and therapeutic procedures in the diagnosis and treatment of urinary diseases.

There are sections for renal transplantation within the Urology Clinic and Nephrology Clinic where all necessary investigations are performed and the indication for transplantation is set up and transplant patients are treated and followed up after transplantation.

The average length of stay in hospital and in-patient health organizations for genitourinary diseases is 11 days, making 130,000 hospital days on average. Of these, renal failure patients make up 35% or around 45,000 hospital days. The average length of stay of these patients is 30–31 days.

The length of stay is longest in patients with chronic renal failure, as compared to other renal diseases. In 1995, the average length of stay for chronic renal failure patients was 33.2 days, as opposed to an average of 9 days for treatment of urolithiasis, 10 days for renal infections, etc.

According to the information on renal diseases for the period 1983–87, the average length of stay for chronic renal failure increased by 72.6%, from 23 days in 1983 to 42 days in 1987. However, tendencies for rationalization of hospital health care in the following period up to 2001 have led to a decrease in the average length of stay for chronic renal failure.

#### *4.5.1. Dialyses performed*

Apart from hospital health care indicators, the following data can be used as indicators of the quality of health care for patients with renal diseases: dialyses performed, average number of patients on dialysis per dialysis machine as an indicator of their utilization, and number of dialyses per patient per week.

The basic criterion for the onset of dialysis treatment is chronic renal failure at end-stage, meaning an entire absence of renal function. The only method for replenishment of the renal function is dialysis, a process that lowers the concentration of degradation products (deuration and elimination of water excess) from the blood, which enables the patient to live.

According to evidence based medicine, each patient should be dialyzed 156 times per year to successfully treat them and enable them to carry out normal every-day activities. Each dialysis requires: one dialyser (used one-time), dissipation materials, medicines for the dialysis process and material expenses. Also, regular laboratory analyses and diagnostic examinations are required, which are set by norms and standards for dialysis guidance.

In Macedonia in 1991, a total of 101,990 dialyses were performed. 90% of patients received dialysis three times per week ( $3 \times 52$  weeks = 156 dialyses per year). On average, there were 4–5 patients to one dialysis machine.

Peritoneal dialysis is performed at the Nephrology Clinic in Skopje. In 2002, a total of 7 patients were treated, 5 males and 2 females. All of them were treated with the CAPD system of Gemini 10 double bags, produced by Gambro. The causes of chronic renal failure development in these patients were: diabetes in 2 patients, hypertensive nephropathy in 2 patients, systemic lupus erythematoses in 2 patients and interstitial pyelonephritis in 1 patient.

According to the National Programme for providing costs for dialysis-treated patients [14] in all the units mentioned above, there will be an expected 1175 domestic patients on dialysis in 2009 and 20 foreign patients on the chronic dialysis programme, in accordance with the bilateral agreement between the Macedonian and Albanian governments for co-operation in health and medical sciences.

According to the incidence of the disease, the average annual incidence growth is 11%, while the average annual prevalence growth is 5% and equals 108,7 per 1,000,000 population. Based on the anticipated 1,175 patients requiring dialysis and the additional 20 foreign patients, a total of 186,420 dialyses are expected to be performed in 2009.

#### *4.6. Economic costs*

To calculate the total funds required for the uninsured patients, foreign citizens and co-payment for all the patients on a chronic dialysis programme, it is necessary to calculate the average cost of a single dialysis, which depends on the type of dialysis and the health status of the patient.

In 1993, 226,800,000.00 denars were spent on all the dialyses performed and the cost per dialysis was 2,951.40 denars. In 2000, the Programme for providing costs for dialysis-treated patients forecast 6,340.00 denars per dialysis or a total of 1,117,615.200.00 denars for 176,820 dialyses. A part of these funds was disbursed through the State Budget (4.2% of total funds), while the rest was provided by the Health Insurance fund.

Transplantation costs relate to human resources, facilities and technical possibilities, but also procurement of anti-rejection medicines. The most successful such medicines being used are Sandimmun and Immuran, and the cost for them per transplant is around 1,454,000.00 denars.

The 2009 Programme for providing costs for dialysis-treated patients sets 4,400.00 denars as the cost per dialysis per patient. The annual cost for a patient who requires 156 dialyses per year is 686,400.00 denars.

#### *4.7. Registration*

Registration of chronic renal failure is regulated with the new Law on Health Records in Health [15] and formerly with the Law on Health Records in Health of the Socialist Republic of Macedonia [16], according to which registration of renal failure is established through special individual registration forms for

renal failure that use the Register of Renal Failure in Macedonia as a basis. However, until now the number of registered patients has not been in correlation with the real number of patients suffering from renal failure. Despite all the efforts and interventions by the Institute of Public Health and the 10 Centres for public health for the improvement of registration of chronic diseases of social-medical importance, unsatisfactory results have been achieved.

### *5. Conclusions and recommendations*

Urinary system diseases and especially chronic renal failure with their increasing trend tend to occupy a more significant position within the population's pathology. There is a growing morbidity trend, a growing mortality trend and a rise in economic costs. Chronic renal failure represents a significant medical and social-economic issue for both the patient and his or her family and the community as a whole, because of life-long illness combined with frequent check-ups, dialysis on a regular basis, in some cases transplantation, long-term absenteeism, disability and sometimes premature death.

The exact incidence of chronic renal failure remains indefinite due to many weaknesses in its registration and record-keeping. Individual registration forms for renal failure are not regularly reported nor are electronic records kept, which are supposed to be delivered to the Centres of Public Health and the Institute of Public Health, where they would be processed, analysed and presented through special software.

#### *5.1. Recommendations*

The treatment of urinary system diseases, and especially of chronic renal failure, requires costly diagnostic procedures and treatment and long-term rehabilitation; these diseases also cause negative economic effects, long-term absenteeism, disability and premature death. Therefore it is necessary to stress the measures for health protection and promotion, as well as secondary prevention.

##### *5.1.1. Primary prevention aimed at preventing disease occurrence*

- Introduction of regular screening tests, such as serum creatinine clearance, and urine protein content, as well as blood pressure monitoring by the primary care physicians.
- Improved dissemination of information to the population, especially to people at high risk of occurrence of such diseases: hypertension, tobacco, alcohol, high blood levels of cholesterol, increased body weight, low intake of liquid, low intake of fruits and vegetables;
- Education for a healthy life style which would prevent the risk of renal diseases;



- Encouraging people with high blood pressure to have regular check-ups or to follow given guidance and further instructions;
- Introducing higher organisational forms for the care of renal disease patients: establishing counselling units that would work on prevention, early detection and monitoring of these diseases.

*5.1.2. Secondary prevention aimed at early detection and treatment*

- Carrying out preventive measures for early detection of renal diseases and prevention of complications;
- Identification of people at high risk of chronic renal failure development (smokers, diabetes, hypertension, obesity, age over 50, family history of renal diseases)
- Medical advice for continuous health care
- Provision of free of charge screening tests for people at risk of renal diseases;
- Introduction of routine urine and blood analyses for disease monitoring (proteins in urine, haematuria, blood creatinin, estimated glomerular filtration rate – eGFR);
- Implementation of a pilot prospective study in a predetermined region in the country, where over a three-year period the above-mentioned analyses would be accomplished as a part of activities for the realization of preventive targets that primary care physicians are mandated to fulfil as an obligation from the capitation payment model (with the Health Insurance Fund), or as an integral part of the preventive systematic check-ups of employees, financed by the budget from the programme or from companies for their own employees).

*5.1.3. Tertiary prevention aimed at successful rehabilitation and re-socialization of the patient*

- Continuous and well-timed rehabilitation that will prolong the patient's life;
- Procurement of more sophisticated equipment in accordance with new technological achievements in medicine.

*5.1.4. Improvement of registration and record-keeping*

- An integrated health information system;
- A uniform registration form created according to international standards and examples recognized by nephrologic associations;
- Uniform software in all health units, dialysis centres and clinics;
- Aggregation of data at a regional level at the Centres of Public Health and then at the national level at the Institute of Public Health.

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## Резиме

**БУБРЕЖНИ ЗАБОЛУВАЊА ВО РЕПУБЛИКА МАКЕДОНИЈА  
ВО ПЕРИОДОТ 1983–2007 ГОДИНА****Косевска Е.,<sup>1</sup> Касапинов Б.,<sup>1</sup> Положани А.,<sup>1</sup> Стамболиева В.,<sup>1</sup>  
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**Цел:** Да се прикаже состојбата и оптовареноста со бубрежните заболувања и дијализата во Република Македонија во периодот 1983–2007.

**Методологија:** Применет е дескриптивно-статистички метод со ретроспективна анализа на податоците за периодот 1983–2007. Употребени беа податоците од стандардните извештаи за амбулантно-поликлинички и болнички услуги во Република Македонија, морталитетната статистика за Република Македонија, податоци од Светската здравствена организација и други стручни материјали и литература.

**Резултати и дискусија:** Податоците од амбулантно-поликлиничкиот морбидитет покажаа дека бубрежните заболувања се зголемени за 64.7%, со зголемување на стапките од 319.5/10 000 жители во 1997 на 514.5/10 000 во 2007. Постои и покачување на болничкиот морбидитет заради бубрежни болести, кое главно се должи на зголемувањето на бројот на пациенти со хронична бубрежна инсуфициенција. Болничкиот морбидитет заради бубрежна инсуфициенција е покачен од 3.5/10000 во 1983 година на 8.2/10000 во 2006. Морталитетот од заболувања на уринарниот систем во периодот 1983–2007 е во покачување, и тоа од 8.2/100 000 во 1983 на 14.0/100 000 во 2007. Најголемиот дел од смртните случаи се должат на бубрежна инсуфициенција. Истовремено, хроничната бубрежна инсуфициенција претставува тежок економски товар за општеството.

**Заклучоци и препораки:** Третманот на болестите на уринарниот систем, а особено на хроничната бубрежна инсуфициенција, побарува скапи дијагностички процедури и терапија и долгорочна рехабилитација, а воедно предизвикуваат негативни економски ефекти, долготрајно отсуство од работа, инвалидитет и предвремена смрт. Неопходно е да се потенцираат мерките за здравствена заштита и промоција, како и нивоата на превенција на бубрежните болести.

**Клучни зборови:** бубрежни болести, бубрежна инсуфициенција, морбидитет, морталитет, јавно здравје.

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