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DIALYSIS AND APHAERESIS IN THE REPUBLIC OF MACEDONIA "A SUCCESS STORY"

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A b s t r a c t: The first haemodialysis (HD) in the Republic of Macedonia (RM) was performed in 1959 in a patient with acute renal failure (ARF) using Kolff-Brigham rotating drum artificial kidney at the Blood Transfusion Institute in Skopje. In 1965 the Renal Unit at the Dept. of Medicine, Medical Faculty, Skopje obtained a modern, new artificial "Websinger" kidney with sigma motor pump and possibilities for use of disposable Kolff "twin coil" dialyser. Between 1959 and 1971, HD was performed only in patients with ARF. In May 1971 at the Renal Unit, a Unit for chronic HD was founded and the program of maintenance haemodialysis (MHD) was started with five Stuttgart Fresenius machines and 12 patients dialysed on twin coil dialyzers. 1173 patients were treated in 18 HDC in the RM in 2007. 320 machines were used; 299 (93%) for bicarbonate HD and 21 (7%) for acetate HD. In all centers the water for HD was processsed by reverse osmosis. There was no reuse of dialysers. All patients received the same treatment. The patients received epoetin (recombinant human erythropoetin – α and β) to maintain hemoglobin between 100 and 120 g/L. Our patients received epoetin between 62% and 100 % in HDC according the individual need. The Cimino – Brescia arterial-venous fistula was typically used as permanent vascular access. Prevalence of the HBV in patients on MHD varied between 6–28% in different centers. Prevalence of HCV in patients on MHD was between 37–78% in some centers. Nosocomial infection is probably one of causes of the so high prevalence of HCV in our patients. We do not have HIV infection in patients on MHD. The survival rate of our patients treated with MHD was 60% at 5 years, 37% at 10 years, 25% at 15 years and 9% at 20 years. PD was started in 1995 in children and in 1996 in adults. Now, there are 24 adult patients treated with PD. Since 1985 membrane PE has been in regular use. Most therapeutic

procedures were performed on patients from the Dept. of Neurology. 1216 patients were on RRT in 2005. On HD were 1077 (89%), with transplanted kidney 121 (10%) and on PD – 18 (1%). 601, 4 patients were on RRT per million of population. The activity of the Macedonian nephrology societies helped a lot in the development of the nephrology and dialysis inviting distinguished nephrologists from Europe and the world and transferring the achievement of the world in our practice. Having in mind that CKD, ESRD and RRT are a great burden for the health budget, we need early diagnosis and treatment of CKD, i.e. prevention of kidney disease.

Key words: dialysis, aphaeresis**,** maintenance haemodialysis, renal replacement therapy, chronic kidney disease.

Beginning of Dialysis

The first haemodialysis (HD) in the Republic of Macedonia (RM) was performed in 1959 on a patient with acute renal failure (ARF) using a Kolff-Brigham rotating drum artificial kidney at the Blood Transfusion Institute in Skopje. Doctors from the renal unit of the Department of Medicine and the Blood Transfusion Institute performed several HDs on one patient with ARF.

Figure 1 – Kolff-Brigham "rotating drum" artificial kidney
Слика 1 – Вештачки бубрег Kolff-Brigham "rotating drum"

In 1965 the Renal Unit at the Department of Medicine, Medical Faculty, Skopje obtained a modern, new artificial "Websinger" kidney with a

sigma motor pump and possibilities of use of a disposable Kolff "twin coil" dialyser. In the period between 1959 and 1971, HD was performed only on patients with ARF. Septic criminal abortions, shock after trauma and surgery were the main causes of ARF. During that time we learned the technique of dialysis, how to create vascular access, arterial-venous shunts (AVS), anticoagulant therapy and how to manage many complications in patients with ARF on HD. The first vascular accesses (VA) for HD were done by surgeons.

Professors Hrisoho and Arsov and Doctors B. Guceva, G. Masin and M. Polenakovic from the Department of Medicine performed the HD and Dr. S. Gucev from the Department of Surgery, Skopje and Dr. Balabanic from Belgrade, Serbia performed the vascular access. We published our experience with 17 patients in the treatment of ARF with HD in 1971 in the journal *Macedonian Medical Review* [1]. Nowadays, the Intensive Nephrology Care Section at the Nephrology Department treats patients with ARF and this is conducted by K. Cakalaroski.

Maintenance haemodialyis

A Section for chronic HD was founded in May 1971 at the Renal Unit Department of Medicine and the programme of maintenance haemodialysis was started with five Stuttgart Fresenius machines and 12 patients dialysed on twin coil dialyzers. G. Masin was nominated to be head of the Section. After him, R. Grozdanovski and A. Sikole were Heads of the Section.

In January 1975 a Nephrology Department was founded at the Medical Faculty in Skopje as the first institution of such a type in former Yugoslavia. The Nephrology Department was the driving force for the further development of nephrology in the Republic of Macedonia. D. Hrisoho was the first Director of the Department, and its subsequent Directors were G. Masin, M. Polenakovic, K. Zafirovska and currently A. Sikole.

The first (living donor) renal transplantation was performed in 1977.

Patients with kidney diseases are examined in outpatients clinics as well as treated in the wards of the Department. All type of vascular accesses, renal biopsies, bone biopsies, kidney ultrasound and other investigations are performed every day at the Nephrology Department at the Medical Faculty.

In 1986 the Department of Nephrology extended its working capacity by founding a separate dialysis centre in the polyclinic at Chair, in Skopje.

All doctors and renal nurses as well as technicians (engineers) were educated for HD at the Nephrology Department.

Table I lists the HD centres in the Republic of Macedonia in 2007.

Table 1 – Табела 1

Haemodialysis in adults in year 2007 in the Republic of Macedonia
Хемодијализа кај возрасни во 2007 год. во Република Македонија

HD Center	Founded year	Patients on HD in 2007	No of machines	Bicarbonate	Acetate	rhu EPO	HBV prevalence	HCV prevalence	MD	Renal nurses	Engineer	Technician
Dept. Of Nephrology, Skopje	1971	165	42	100%(42)	/	86%	9.7%	66%	7	31	1	3
HDC Struga	1978	195	55	100%(55)	/	88%	9.5%	59%	12	60	1	3
HDC Bitola	1980	47	12	92%(11)	8%(1)	96%	/	45%	1	9	1	/
HDC Military Hospital Sk.	1981	64	16	100%(16)	/	86%	6.0%	47%	1	18	/	1
HDC Gostivar	1982	43	14	100%(14)	/	98%	28%	37%	3	15	/	2
HDC Stip	1984	52	18	100%(18)	/	92%	7%	56%	2	11	1	/
HDC Prilep	1985	60	16	69%(11)	31%(5)	87%	8%	40%	5	17	/	1
HDC Kumanovo	1986	56	15	100%(15)	/	100%	9%	45%	2	15	/	/
HDC Strumica	1986	45	13	100%(13)		100%	28%	62%	2	12	/	1
HDC Veles	1987	43	13	92%(12)	8%(1)	79%	14%	40%	2	9	/	/
HDC Tetovo	1989	82	17	100%(17)	/	100%	7.4%	37%	3	15	2	4
HDC Kavadarci	1989	40	12	42%(5)	58%(7)	90%	18%	53%	2	8	/	1
HDC Kocani	1991	34	9	100%(9)	/	100%	29%	76%	2	6	1	1
HDC Gevgelija	1991	32	6	100%(6)	/	62%	6%	78%	4	12	1	/
HDC Debar	1991	9	6	50%(3)	50%(3)	100%	11%	/	1	4	1	1
HDC Zelezara, Skopje	1996	152	38	100%(38)	/	100%	12%	24%	6	24	/	3
HDC Delcevo	2000	33	11	58%(7)	12%(4)	97%	12%	64%	3	10	1	1
HDC Kriva Palanka	2004	21	7	100%(7)	/	95%	ND	ND	2	7	1	/
Total: 18 HDC		1173	320	93% (299)	7%(21)	62–100%	6–28%	37–78%	60	283	11	22

HD – haemodialysis; HDC – haemodialysis center; HBV – hepatitis B virus; HCV – hepatitis C virus; MD – medical doctor

– Centers for Haemodialysis in R. Macedonia

Area:	Population:
25.713 km^2	**2.022.547 (2002 census)**

Figure 2 – Map and Centers for Haemodialysis in R. Macedonia
Слика 2 – Мапа и центри за хемодијализа во Р. Македонија

To date a network of 18 HD centres has been developed in the Republic of Macedonia. The average distance between the centres and the patients' place of residence is 30–50 km, in order to facilitate their access to treatment and to work. All patients who have had symptoms indicating the need for treatment with haemodialysis have been accepted on MHD. The Government pays all the expenses of the treatment and the salaries of the staff.

In 1993 we had 727 patients being treated with MHD, in 2000–1.019 patients; 56% of them male and 44% female patients. The youngest patient was aged 9 and the oldest was 82 years old [2, 3, 4].

In 2007, 1173 patients were treated in 18 dialysis centres in the Republic of Macedonia. 320 machines were used; 299 (93%) for bicarbonate HD and 21 (7%) for acetate HD. We need new HD machines, because a high per-

centage of them are very old. In all centres the water for HD is processed by reverse osmosis. During the recent period of 26 years with maintenance HD we have had experience of different dialysis machines such as Gambro, Fresenius, B. Braun-Secura, Hospal Monitral, Cobe, Drake-Willock, Dasco and Ready. We have also had experience of cellulosis and synthetic membranes. There has been no reuse of dialysers.

All patients received the same treatment. Standard acetate or bicarbonate HD treatment was offered. The dialysis duration was 12–15 hours per week (4–5 hours, three times per week). Cellulose membranes of 1.0–1.3 m^2 were used and in recent years also synthetic membranes (polysulfon – F6-HPS, F7-HPS, F8-HPS Fresenius and polyamid Gambro – Polyflux 14 L). Most of the machines were Gambro AK 10, Gambro AK 100 models (Gambro, Lund, Sweden) and Fresenius (4800 S и 4800 B).

The patients received epoietin (rhu Erythropoetin – α и β) to maintain haemoglobin between 100 and 120 g/L, and regularly took iron, vitamin supplements and Ca CO_3 used to maintain serum PO_4 levels below 1.8 mmol/L.

Our MHC patients received rhu EPO between 62% and 100% (table I) according to their individual need [5].

The blood flow rate was 250–280 ml/min and the dialysate flow rate was 500 ml/min. The Cimino-Brescia arterial-venous fistula was typically used for permanent vascular access. Only a few patients, less than 3%, had subclavian catheters or an arterio-venous graft. The recommended diet was low salt intake with mean protein intake of approximately 1 g/kg body weight per day. The diet was dependent on the economic situation of the patient.

The prevalence of HBV in patients on MHD is between 6–28% in different centres. There has been some decline in prevalence. The prevalence of HCV in patients on MHD is between 37–78% in some centres (table I). Nosocomial infection is probably one of the causes of this high prevalence of HCV in our patients [6, 7, 8]. We do not have HIV infection in patients on MHD.

We need more rigorous hygienic measure in our centres for MHD, more space for the patients and the staff and new machines for treatment on MHD. In each MHD centre there are mainly technicians and in some centres also engineers for inspection and repair of the machines.

60 MD and 283 renal nurses are devoted to the management and treatment of patients with terminal renal insufficiency with MHD.

Survival of patients on maintenance haemodialysis

The survival rate of our patients treated with MHD was 60% at 5 years, 37 % at 10 years, 25 % at 15 years and 9% at 20 years. Female patients' survi-

val was superior to male. Patients aged under 40 at the start of the dialysis had a better survival probability compared to the older patients. Patients with diabetes mellitus and nephroangiosclerosis had a lower survival rate compared to patients with glomerulonephritis and with adult dominant polycystic kidney disease. Cardiac death was the most common cause of death (52%) in patients involved in the study [9, 10]. Death is the most severe consequence of inadequate dialysis and can be used as an index of the adequacy of the dialysis therapy. Treatment factors that may improve outcomes include an early start of dialysis therapy, a high dose of dialysis (Kt/V over 1.2), correction of anaemia, adequate protein and caloric intake, control of calcium and phosphate metabolism and the use of biocompatible dialyzers [11].

Vascular accesses for patients on maintenance haemodialysis

The first vascular accesses (VA) for haemodialysis were done by surgeons, but since 1976 they have been carried out by nephrologists in the Vascular Access Section at the Nephrology Department conducted by A. Oncevski.

The most frequently used VA for HD are catheters (Table II). Their number and importance, as a temporary VA, increases every year, so that arterial-venous shunts have been reduced and completely stopped.

Femoral catheters are always the first choice for temporary VA and are absolutely predominant numerically compared to subclavian catheters or jugular catheters. Femoral subcutaneously tunnelled catheters are also dominant as a type of permanent VA [11].

Vascular grafts are not often used on our patients on HD, due to medical and financial reasons. The medical reasons are clear: we prefer the natural blood vessels and use every opportunity for arterial-venous fistula (AVF) and when all available blood vessels have been used, we decide to use a synthetic graft. The financial reasons are even clearer: vascular grafts are expensive and cannot be easily obtained. The results of the use of the grafts are similar to the results from other world centres: an average survival of 2 years, maximal of 9 years and minimal 4 months. We perform percutaneous transluminal angioplastic as a routine in stenosis and trombectomies or thrombolysis with streptokinase in graft thrombosis.

The native arterial-venous fistula is a gold standard and the most frequent permanent vascular access used in our Department for HD. The quality that it provides, durability and the few complications make it very near to an “ideal VA”.

We believe that particular attention should be paid to our doctrinal attitude on the preventive creation of AVF. In all patients with preterminal chronic renal failures (CRF) (calculated creatinine clearance under 25 ml/min for patients with diabetic nephropathy, or below 20 ml/min for patients with other renal disease) it is necessary to create a native AVF. We believe that this attitude is justified because the patient is haemodinamically and clinically stable, is more fit, and haemostatis, blood cell count, fluid and electrolyte balance and metabolism can be maintained at healthy levels. The AVF that is formed in such conditions has a chance of a better development and formation than in terminal CRF with uraemic complications.

It is even more important that most of the preventive AVF were done in out-patient settings.

Table 2 – Табела 2

Results of Vascular Access Section
Резултати на Одделот за васкуларни пристапи

	2003y	2004y	2005y	2006y
Arterio-venous fistula	199	203	226	238
Vascular grafts	10	12	4	5
Tunelised catheters for hemodialysis	63	75	58	63
– femoral	31	41	28	34
– subclavian	22	24	27	23
– jugular	10	10	3	6
Temporary catheters for HD	466	484	553	551
– femoral	443	452	508	510
– subclavian	23	31	45	41
– jugular	/	1	/	/
Total number of different interventions in the operating room	775	813	875	891

Peritoneal dialysis

Peritoneal dialysis (PD) in the Republic of Macedonia began its continuous development in 1995 when the Continuous ambulatory peritoneal dialysis (CAPD) treatment of two children with terminal renal insufficiency began at the Paediatric Nephrology Department of the Children's Hospital at the Medical Faculty in Skopje. In the following year, 1996, the first two adult patients were treated with CAPD at the Nephrology Department in Skopje.

In the past period every child needing dialysis has had the opportunity of being treated with PD. That number is 1–3 new patients per year. To date 23 children have been treated with PD in the Republic of Macedonia (14 male and 9 female) at an average age of 10.6 ± 4.0 years. Of these children, 17 have been treated with CAPD and 6 children with automatic peritoneal dialysis (APD). The average time of treatment with PD is 27.7 ± 22.1 months. The most common complications during the treatment are infections, which represent 86 % of all the complications; in 12 children 55 episodes have been observed of acute peritonitis with an incidence of 1 episode of peritonitis per 12 patient months. The outcome of the treatment with PD in the period from 1995 to 2007 is the following: kidney transplantation was performed on 6 children (23%), 5 children (22%) have been transferred onto haemodialysis due to complications, 2 children (9%) were transferred into the adult patients group, and there was a fatal outcome in 3 children (13%). 7 children (30%) are still being treated with PD.

The development of PD in adult patients is slower, mostly due to financial limitations. The number of new patients is 1–15 per year. Thus far 49 adult patients have been treated with PD in the Republic of Macedonia (25 male and 24 female), of an average age of 46.9 ± 17.7 (17–78 years). Of these, 47 patients were treated with CAPD, and 2 patients were treated with APD. The average treatment period with PD is 20.2 ± 20.0 (1–8 months). It is significant to mention that in 32 patients (65%) PD was the first method used for treatment with dialysis and the prevalence of virus C hepatitis in this group of patients is 6.2%, which is significantly lower than in patients on haemodialysis (66%). The most common complication in adult patients on PD is acute peritonitis, with an incidence of 1 episode of peritonitis in 28 patient months. The outcome of treatment with PD in this group of patients is the following: kidney transplantation was performed on 4 patients (8.2%), 11 patients (22.4%) have been transferred onto haemodialysis due to complications, there was a fatal outcome in 10 patiens (20.4%), and there are 24 patients (49%) still on treatment with PD.

Regarding the survival of the method and the survival of the patients on PD, there is no significant difference between the results of both groups of patients, children and adults, compared to the results published in the literature.

In the past 13 years, despite the low representation (1–3% of the total number of patients who need replacement therapy) PD in the Republic of Macedonia has succeeded in promoting itself as a successful, efficient and safe dialysis method.

At the moment, PD is the only type of domestic dialysis in the Republic of Macedonia. In future, it should be insisted that PD becomes the method of first choice in dialysis treatment because it provides safe prevention of the

spread of virus C hepatitis among patients on dialysis. PD is a safe "bridge" towards successful kidney transplantation.

The results of the past period show that PD is an equal member of the integrated approach in renal replacement therapy in the Republic of Macedonia.

Plasmapheresis (PF)

Therapeutic apheresis

Membrane plasma exchange (PE) is a mode of extracorporeal blood purification. Since 1985 membrane PE has been in regular use at the Nephrology Department of the Medical Faculty of Skopje, R. Macedonia.

Table 3 gives the number of PEs in the years 2004 (118), 2005 (88) and 2006 (162), the number of patients treated (71), the average number of PF/patients, the average quantity of plasma filtrate and the diagnosis for PE. PE was performed 2–4 times weekly using Gambro PF 2000 N filters with an adaptation of the Gambro AK 10 dialysis machine or with the Gambro Prizma machine. Blood access was achieved through the femoral vein. Substitution was made with fresh frozen plasma and/or with 20% human albumin combined with Ringer's solution. An average amount of 2150 ml plasma-filtrate per treatment (respectively 30 to 40 ml plasmafiltrate/kg blood weight) was eliminated. Most therapeutic procedures were performed on patients from the Neurology Department. The most frequent patients were those with a diagnosis of Myasthenia gravis and acute polyradiculo-neuropathy.

Table 3 – Табела 3

Plasmapheresis at the University Clinic of Nephrology, Medical Faculty
Плазмафереза на Универзитетската клиника за нефрологија, Медицински факултет

	2004	2005	2006
Total number of PF	118	88	162
Number of treated pts.	21	18	32
Average nr. of PF /pts.	5,6	4,9	5,06
Average quantity of Plasmafiltrate	2200 ml	2260 ml	2320 ml
Dpts. where this treatment was performed for:			
Neurology	15 pts	7 pts	20 pts
Nephrology	5 pts	7 pts	9 pts
Haematology	1pts	3 pts	3 pts
Rheumatology	/	1 pt	/
Diagnosis for PF			
Myasthenia gravis	7 pts	4 pts	3 pts
Ac. Polyradiculoneurit	6 pts	3 pts	10 pts
Ch. Polyneurit	/	/	5 pts
Ac. Rejection after RT	2 pts	3 pts	4 pts
Sy. Moskovich	/	3 pts	2 pts
Haemolytic uremic syndrome after RT	1 pt	/	2 pts
ABO incompatible transplantation – protocol	1 pt	2 pts	1 pt
Rapid progressive GN	/	2 pts	2 pts
Neuritis multiplex	/	1 pt	
Multiple sclerosis	1 pt	/	2 pts
Polymyositis	1 pt	/	/
Wegener-granulomathosis	1 pt	/	/
Multiple myeloma	1 pt		
Thyrotoxicosis	/	/	1 pt

Fig 3 shows the Departments where PF treatment was performed in 2006.

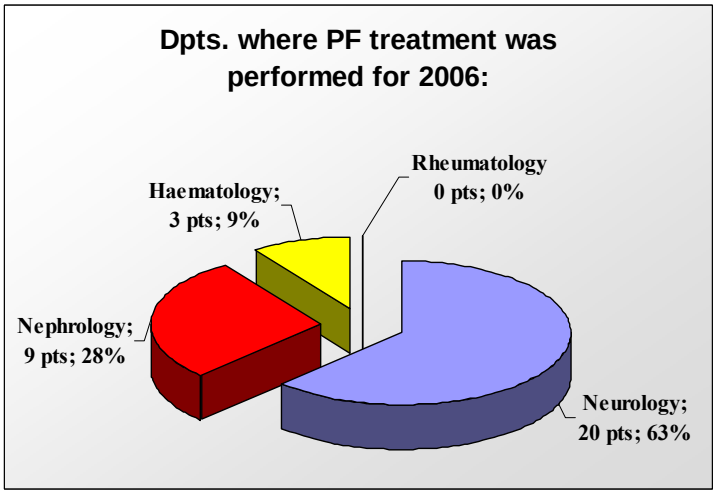

Figure 3 – Departments where PF treatment was performed in 2006

Слика 3 – Клиники каде што беше изведувана плазмафереза во 2006 г.

Renal replacement therapy (RRT)

1216 patients were on RRT in 2005 (Fig. 4). There were 1077 (89%) on HD, 121 (10%) with transplanted kidney, and 18 (1%) on PD. – The gender distribution on RRT in 2005 was: female 486 (40%) and male 730 (60%). 601,4 patients per population of a million, were on RRT (Fig. 5).

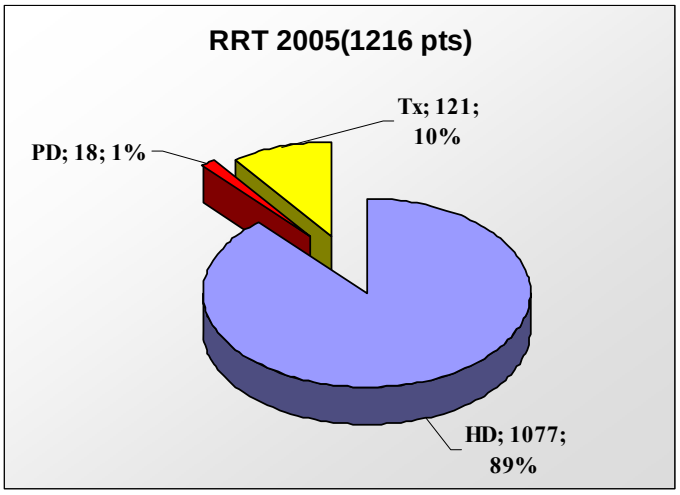

Figure 4 – Renal replacement therapy in 2005 (1216 pts)

Слика 4 – Бубрежно-заместителна терапија во 2005 (1216 пациенти)

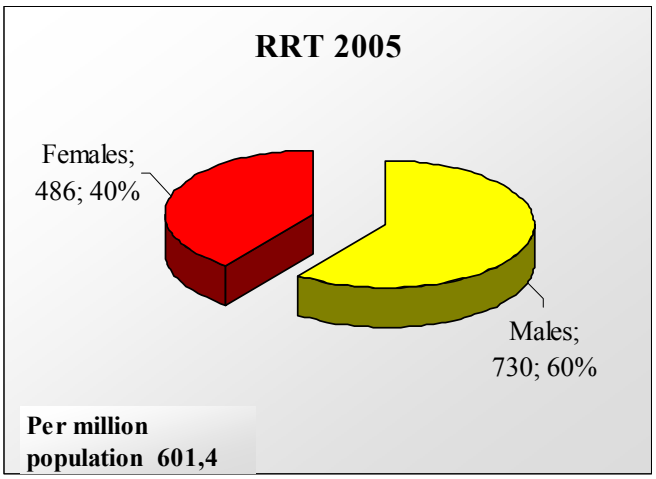

Figure 5 – Renal replacement therapy in 2005 – gender distribution

Слика 5 – Бубрежно-заместителна терапија во 2005 – распределба според полови

Table 4 shows incidence and prevalence counts for 2005, the mean age of patients with ESRD and the cause of renal failure.

Table 4 – Табела 4

Incidence and prevalence counts, mean age of patients for 2005, and cause of renal failure

Инциденттност и превалентност, средна возраст на пациенти за 2005 и причини за бубрежна инсуфициенција

Incident counts for 2005 ***Total - 198*** Per mill. population – 97,9 113 males (111,3 pmp) 85 females (84,4 pmp)	**Prevalent counts for 2005** ***Total – 1216*** (601,4 per mill.population) 730 males (719,2 pmp) 486 females (482,6 pmp)
Mean age of incident ESRD patients : ***All – 57,3 ± 15,7*** Males 58,2 ± 14,8 Females 56 ± 16,9	**Mean age of prevalent ESRD patients** ***All – 52,4 ± 14,3*** Males – 52,4 ± 14,3 Females – 52,5 ± 14,4
Incident counts by cause of renal failure **GN – 26 (13,1%)** PN – 32 (16,2%) PKD – 7 (3,5%) DM – 42 (21,2%) : DM – 1: 4 (2%); DM – 2: 38 (19,2%) HT – 38 (19,2%) RVD (Renovascular disease): 2 (1,0%) Miscellaneous: 11 (5,6%) Missing 0	**Prevalent counts by cause of renal failure** **GN – 289 (23,8%)** PN – 193 (15,9%) PKD – 100 (8,2%) DM – 107 (8,82%) : DM – 1: 21 (1,7%); DM – 2: 86 (7,1%) HT – 172 (14,1%) RVD (Renovascular disease): 17 (1,4 %) Miscellaneous: 112 (9,2 %) Missing 2 (0,2%)

Fig. 6 shows the registry data for prevalent count of patients with ESRD by cause of renal failure.

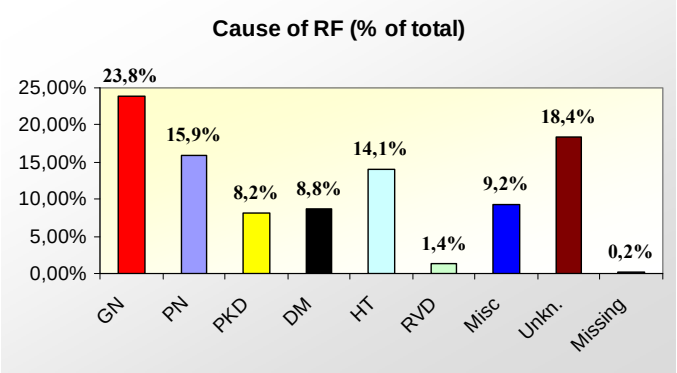

Figure 6 – Registry data for prevalent count of patients with ESRD by cause of renal failure in 2005

Слика 6 – Податоци од регистарот за превалентен број на пациенти со терминална бубрежна болест со причините за бубрежна инсуфициенција во 2005

Influence of the activities of nephrology societies on the development of dialysis in the Republic of Macedonia

The development of dialysis has stimulated the development of nephrology and vice versa.

In 1970, the Nephrology Society was formed as part of the Macedonian Medical Association. D. Hrisoho was the first President.

In 1992, the Macedonian Society of Nephrology, Dialysis, Transplantation, and Artificial Organs (MSNDTAO) was formed. The first President was M. Polenakovic.

In 1993, during the congress of the MSNDTAO, the Balkan of Nephrology, Dialysis, Transplantation, and Artificial Organs Association was formed.

The Nephrology Society has organized several professional and scientific meetings with a good influence on the development of nephrology in the Republic of Macedonia.

Distinguished nephrologists from Europe and the world have influenced the development of nephrology and dialysis in Macedonia and in former Yugoslavia. We shall mention only some of the scientists and the meetings.

The First Scientific Meeting of Yugoslav Nephrologists was held in Struga, 26–28 September 1977. The nephrologists of former Yugoslavia met for the first time with distinguished European and world nephrologists in Struga to

exchange experiences and to learn about the latest achievements in dialysis and nephrology. Among those present were P. Ivanovich and M. Burg (USA), J.S. Cameron (UK), J.L. Funck-Brentano (France), R. Kluthe (Germany), A. Puhlev (Bulgaria), and others.

Figure 7 – V. Danilovic and D. Hrisoho (First Scientific Meeting of Yugoslav Nephrologists)

Слика 7 – В. Даниловиќ и Д. Хрисохо (Прв научен состанок на нефролозите од Југославија)

Figure 8 – R. Kluthe, I. Tadzer, D. Hrisoho, J.L. Funck-Brentano, P. Ivanovich and M. Polenakovic (First Scientific Meeting of Yugoslav Nephrologists) – first row from left to the right

Слика 8 – Р. Клуте, И. Таџер, Д. Хрисохо, Ј. Л. Функ-Брентано, П. Ивановиќ и М. Поленаковиќ (Прв научен состанок на нефролозите од Југославија) – прв ред од лево кон десно

Figure 9 – J. S. Cameron, R. Kluthe, I. Tadzer, D. Hrisoho (First Scientific Meeting of Yugoslav Nephrologists) – from left to right

Слика 9 – Џ. С. Камерон, Р. Клуте, И. Таџер, Д. Хрисохо (Прв научен состанок на нефролозите од Југославија) – од лево кон десно

Figure 10 – Some of the participants at the First Scientific Meeting of Yugoslav Nephrologists

Слика 10 – Дел од учесниците на Првиот научен состанок на нефролозите од Југославија

During the first Congress of the Macedonian Society of Nephrology, Dialysis, Transplantation and Artificial Organs (MSNDTAO), which was held in Ohrid, 7–10 October 1993, the Balkan Association of Nephrology, Dialysis, Transplantation, and Artificial Organs (BANTAO) was formed. The Congress was the next step in the development of dialysis and nephrology in Macedonia [16]. The colleagues H. Klinkmann, P. Ivanovich, J. Vienken and D. Falkenhagen have been supporting the BANTAO since its beginning, with participation at the meetings and by scientific cooperation and education of younger fellows.

Figure 11 – Participants at the first Congress of MSNDTAO (from right to left: D. Nenov (Bulgaria), S. Mujais (USA), V. Siniukhin (Russia), P. Zuccheli (Italy), H. Klinkmann (Germany), L. Sofrevska (Macedonia), T. Mukaetov (Macedonia), M. Polenakovic (Macedonia), J. Srbinovski (Macedonia)

Слика 11 – Учесници на Првиот конгрес на МЗНДТВО (од лево кон десно: Д. Ненов (Бугарија), С. Муџаис (САД), В. Синјукин (Русија), П. Цукели (Италија), Х. Клинкман (Германија), Л. Софревска (Македонија), Т. Мукаетов (Македонија), М. Поленаковиќ (Македонија), Ј. Србиновски (Македонија)

The Second congress of BANTAO was held in Struga, 6–8 September 1997 [17].

In November 2000, the Department of Nephrology of the Ss. Cyril and Methodius University, Skopje, celebrated its 25th Anniversary. The European Society for Artificial Organs (ESAO) took this as an opportunity to organize the Symposium "Artificial Organs 2000". The Symposium took place in Skopje on November 25–26, 2000 at the Macedonian Academy of Sciences and Arts and attarcted many renowned speakers and participants from all over Europe. A special issue of the Journal of Artificial Organs was devoted to this Symposium [18].

Figure 12 – M. Polenakovic, A. Sikole, S. Kovacevski, G. Masin, K. Cakalaroski – Second congress of BANTAO (from left to right)

Слика 12 – М. Поленаковиќ, А. Шиколе, С. Ковачевски, Ѓ. Масин, К. Чакалароски – Втор конгрес на БАНТАО (од лево кон десно)

Fig. 13 – Artificial Organs 2000, MASA, Skopje, R. Macedonia, from left to right: A. Sikole (Macedonia), H. Klinkmann (Germany), D. Falkenhagen (Austria), K. Affeld (Germany),M. Polenakovic (Macedonia), J. Klinkmann (Germany)

Слика 13 – Вештачки органи 2000, МАНУ, Скопје, Р. Македонија, од лево кон десно: А. Шиколе (Македонија), Х. Клинкман (Германија), Д. Фалкенхаген (Австрија), К. Афелд (Германија), М. Поленаковиќ (Македонија), Ј. Клинкман (Германија)

Figure 14 – Artificial Organs 2000, MASA, Skopje, R. Macedonia, from left to right: U. Baurmeister (Germany), S. K. Bowry (Germany), M. Polenakovic (Macedonia), J. Vienken (Germany)

Слика 14 – Вештачки органи 2000, МАНУ, Скопје, Р. Македонија, од лево кон десно: У. Баурмајстер (Германија), С. К. Баури (Германија), М. Поленаковиќ (Македонија), Ј. Финкен (Германија)

Figure 15 – 7th BANTAO Congress, Ohrid, R. Macedonia, 8–11 September 2005, sitting, from left to right: Lj. Djukanovic (Serbia), M. Polenakovic (Macedonia), Ch. P. Stathakis (Greece), D. Nenov (Bulgaria), A. Basci (Turkey)

Слика 15 – 7. конгрес на БАНТАО, Охрид, Р. Македонија, 8–11 септември 2005 г., седат од лево кон десно: Љ. Ѓукановиќ (Србија), М. Поленаковиќ (Македонија), Х. П. Статакис (Грција), Д. Ненов (Бугарија), А. Башчи (Турција)

Figure 16 – 7th BANTAO Congress, Ohrid, R. Macedonia, 8–11 September 2005, sitting, from left to right: J. Floege (Germany), A. Wiecek (Poland), J. Mann (Germany), standing: O. Malenko, G. Spasovski, E. Spasovska and M. Polenakovic – all from R. Macedonia)

Слика 16 –7. конгрес на БАНТАО, Охрид, Р. Македонија, 8–11 септември 2005 г., седат: Ј. Флеге (Германија), А. Вичек (Полска), Ј. Ман (Германија), стојат: О. Маленко, Г. Спасовски, Е. Спасовска и М. Поленаковиќ – сите од Р. Македонија

The 7th BANTAO Congress, held in Ohrid, 8–11 September 2005, marked the further development of nephrology in Macedonia and in the Balkans. A large number of distinguished nephrologists participated with their papers [19].

Conclusion

In the second half of the last century, nephrology, and especially dialysis and aphaeresis, were greatly developed. Macedonian doctors tried to follow European and world development and to apply in their country, which was not so developed, modern diagnostic and therapeutic modalities in the management of renal patients. With great enthusiasm and the help of the Government, we achieved a good clinical treatment of our patients. But the treatment of patients with ESRD and with terminal renal failure is very expensive, and a great burden on the health budget.

Chronic Kidney Disease (CKD) and Chronic Renal Failure (CRF) are problems throughout the whole world as well as in our country.

What should we do?

Invest much more in the prevention of Kidney Disease.

Detect the patients with CKD among our population.

Early diagnosis of Hypertension and Diabetes Mellitus.

Early diagnosis and prevention of renal disease is imperative.

With the therapy to postpone or to stop the development of (CRF).

Improve the facilities for dialysis, (new equipment, personnel, etc.).

Increase the number of patients on peritoneal dialysis.

Reduce infection, especially Hepatitis C in patients on haemodialysis.

Increase renal transplantation from cadaver and living donors.

Stimulate research, both basic and clinical.

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Р е з и м е

ДИЈАЛИЗА И АФЕРЕЗА ВО РЕПУБЛИКА МАКЕДОНИЈА „УСПЕШНА ПРИКАЗНА“

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Првата хемодијализа (ХД) во Република Македонија (РМ) беше изведена во 1959 г. кај пациент со акутна бубрежна инсуфициенција (АБИ) користејќи "Kolff-Brigham rotating drum", вештачки бубрег во Институтот за трансфузија на крв во Скопје. Во 1965 г. Одделот за нефрологија при Клиниката за интерни болести на Медицинскиот факултет во Скопје доби модерен, нов, вештачки бубрег "Websinger" со сигма мотор и можност за користење на Kolff-ов "twin coil" филтер за хемодијализа. Помеѓу 1959 и 1971 г. ХД се применуваше само кај пациенти со АБИ. Во мај 1971 г. во Одделението за нефрологија беше создадена единица за ХД и беше почната програма на одржувачка хемодијализа (МХД) со пет машини Stuttgart Fresenius и 12 пациенти дијализирани со "twin coil" филтри за ХД. Беа лекувани 1173 пациенти во 18 ХДЦ во РМ во 2007. Беа користени 320 машини; 299 (93%) за бикарбонатна ХД и 21 (7%) за ацетатна ХД. Во сите центри водата за ХД беше обработена со реверзна осмоза. Нема повторна употреба на филтри за ХД. Сите пациенти имаа ист третман. Пациентите добиваа епоетин (рекомбинантен хуман еритропоетин – α и β) за да го одржуваат хемоглобинот помеѓу 100 и 120 гр/л. Нашите пациенти добиваа епоетин во хемодијализните центри помеѓу 62% и 100% според индивидуална потреба. Cimino-Brescia артериовенозна фистула беше типично користена како перманентен васкуларен пристап. Превалентноста на ХБВ кај пациенти на МХД вариираше помеѓу 6–28% во различните центри. Превалентноста на ХЦВ кај пациенти на МХД беше помеѓу 37–78% кај некои центри. Нозокомијалната инфекција е веројатно една од причините за вака висока преваленција на ХЦВ кај нашите пациенти. Немавме ХИВ инфекција кај пациентите на МХД. Степенот на преживувањето кај нашите пациенти лекувани со МХД беше 60% за 5 години, 37% за 10 години, 25% за 15 години и 9% за 20 години. Перитонеалната дијализа (ПД) започна во 1995 г. кај деца, а во 1996 г. кај возрасни. Сега, 24 возрасни пациенти се лекуваат со ПД. Од 1985 г. плазмоферезата е во редовна употреба. Најмногу терапевтски процедури се изведени кај пациенти од Клиниката за нефрологија. 1216 пациенти беа на бубрежно-заместителна терапија во 2005 г. На ХД беа 1077 (89%), со трансплантиран бубрег беа 121 (10%) и на ПД – 18 (1%). 601,4 пациенти беа на бубрежно-заместителна терапија на еден милион население. Активностите на македонските нефролошки здруженија многу помогнале во развојот на нефрологијата и дијализата поканувајќи истакнати нефролози од Европа

и од светот и трансферирајќи ги достигнувањата од светот во нашата практика. Имајќи на ум дека хроничните бубрежни болести, терминалните бубрежни оштетувања и бубрежно-заместителната терапија се големо оптоварување за здравствениот буџет, нам ни треба рано дијагностицирање и третман на хроничните бубрежни болести, т.е. превенција на бубрежните болести.

Клучни зборови: дијализа, аферeза, одржувачка хемодијализа, бубрежно-заместителна терапија, хронични бубрежни болести.

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