

**SCREENING FOR HEPATITIS B, C AND HIV INFECTION AMONG  
PATIENTS ON HAEMODIALYSIS  
(CROSS SECTIONAL ANALYSIS AMONG PATIENTS  
FROM TWO DIALYSIS UNITS IN THE PERIOD JANUARY TO JULY 2005)**

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**Abstract:** *The aim* of the work was to detect the serum prevalence of HBV, HCV and HIV infections in patents with ESRD (end stage renal disease) on haemodialysis treatment from two dialysis units.

**Material and methods:** 178 patients from two haemodialysis units in Skopje (Department of Nephrology and HDC Zelezara) who received haemodialysis treatment over the period January to July 2005 were involved in a cross-sectional analysis. Patients were aged 31 to 77 (mean 54) years. Serum samples were used for: detection of markers for hepatitis B – HBs antigen (Ag), HBsT antibody (Ab) and HBcT Ab with chemiluminescent enzyme immunoassay; detection of HIV Ab and HCV Ab with the ELISA method; detection of HCV RNA with qualitative PCR. Statistical analysis was done only of patients with complete serological investigations (HCV, HBV and HIV).

**Results:** Detectable markers for HBV infections were found in 43 patients (24.16%). Of these, 3 patients (1.68%) had positive HbsAg. Previous exposure to HBV was seen in 40 patients (22.47%). 57 patients (32.02%) had detectable markers (HCV Ab and/or HCV RNA) for HCV infections. 39 patients (21.91%) had detectable HCV RNA. 24 patients were positive for HBV and HCV markers. The total number of patients with anti HCV Ab was 56 (31.46%). All investigated patients were negative for anti HIV Ab. There is a positive correlation between AST elevation and HCV RNA ( $r = 0.342$ ,  $p = 0.023$ ) as well between AST elevation and HBsT ( $r = 0.300$ ,  $p = 0.048$ ). A positive correlation was found between ALT elevation and HCV RNA ( $r = 0.374$ ,  $p =$

0.012). A Chi square test found significance between the time on dialysis and detection of HCV RNA (chi-square 7.771,  $p = 0.05$ ).

*Conclusion:* The results of our survey presented a prevalence of 24,16% of HBV and a prevalence of 32.02% of HCV in patients with renal failure on haemodialysis programmes from two dialysis units for the six month period. HIV was not detected among the investigated patients. Immunoenzyme tests were the method of choice for the screening programme. The use of the PCR for detection of nucleic acid of viruses that can be the cause of infection for these persons is especially important. Timely detection of HBV, HCV and HIV infection among haemodialysis patients is necessary for the due performance of therapy, as well as for taking preventive measures for the protection of other patients and staff in the haemodialysis unit.

**Key words:** Hepatitis B, Hepatitis C, HIV, renal failure, haemodialysis.

### *Introduction*

Viral hepatitis B and C (HBV and HCV), as well as HIV infection are some of the reasons for the growing morbidity and mortality among patients (pts) with end stage renal disease (ESRD) on haemodialysis (HD) treatment. One characteristic of the renal failure (RF) is immunological dysfunction presented with a lack of capability of the patient to eliminate the virus.

Patients and personnels in the haemodialysis units are at high risk for HBV and HCV infections. It is characteristic of pts with RF and acute viral hepatitis to be without icterus and to present lower or even normal transaminases, unlike pts with normal renal function and acute viral hepatitis. HBV and HCV are the most frequent reasons for chronic hepatitis associated with cirrhosis and hepatocellular carcinoma. Predicting factors for cirrhosis are: male sex, age > 40, and consumption of alcohol > 30g/day, diabetes, obesity, co-infection of HBV with HCV or with HIV [1, 2].

The parenteral way of transmission through contaminated blood, which is common for blood-transmitted viruses, is the reason for investigation for HIV among haemodialysis patients.

An estimated number of 350 million persons are infected with HBV [3]. The prevalence is in the range of 1% in some developed countries up to 15% in developing countries [4]. In the Republic of Macedonia from 1983 until the end of 2006, according epidemiological data from the Institute for Public Health of R. Macedonia (IPH), 4187 persons with HBV infections were registered. 3% of the world population is infected with HCV and more than 170 million people are chronic carriers, the WHO referred. HCV prevalence in developed countries is between 1–2% [5]. IPH published that in the Republic of Macedonia from 1996 until the end of 2006, 429 persons with HCV infections were registered.

The precise number of persons with HBV and HCV co-infection is unknown, but it seems to be more frequent in geographical regions where two infections reach a high endemic level, such as South-East Asia and the Mediterranean region [6]. In general, HBV and HCV co-infection is present in 3.7% patients on haemodialysis and in 66% of HIV positive persons [7, 8].

At present around 33.2 million people in the world live with HIV/AIDS [9]. In R. Macedonia from 1987 until the end of 2007 102 persons were registered with HIV/AIDS. None of the persons detected with HIV/AIDS was on haemodialysis treatment.

Nowadays, the haemodialysis units have developed practice patterns and infection control measures designed to reduce HBV, HCV and HIV transmission. But the risks cannot be eliminated completely and these infections persist within haemodialysis units.

The aim was to detect the serum prevalence of HBV, HCV and HIV infections in pts with ESRD on haemodialysis treatment in two haemodialysis units in Skopje.

### *Material and methods*

178 patients from two haemodialysis units (Department of Nephrology and Haemodialysis Center Zelezara) in Skopje who received haemodialysis treatment for the period January to July 2005 were involved in this cross-sectional analysis. Patients were aged 31 to 77 years (mean age 54 years).

From serum samples the following analysis were done:

1. Detection of markers for hepatitis B – HBs antigen (Ag), HBsT antibody (Ab) (total antibodies against HBs antigen) and HBcT Ab (total antibodies against HBc antigen) with an Immulite processor. The Immulite (DPC – Diagnostic Products Corporation, Los Angeles, USA) processor is completely automatized for solid-phase two-step chemiluminescent enzyme immunoassay. This enzyme system has a lower level of detection ( $10^{-21}$ ) compared with the conventional ELISA ( $10^{-19}$ ).
2. Detection of HIV Ab and HCV Ab by the ELISA method. With ELISA, Ab present in the serum against virus (HCV or HIV) are captured to the recombinant Ag bond on the bottom of the microtiter plate. Enzygnost Anti-HIV ½ plus (Dade Boehring Marburg GmbH, Marburg Germany) kit and ELISA anti HCV (Human GmbH, Wiesbaden, Germany) kit were used according manufacturer recommendation.
3. Detection of HCV ribonucleic acid (RNA) with qualitative Reverse Transcriptase (RT) – Polymerase chain reaction (PCR) as a gold standard for the detection of active HCV infection. We applied a

ready-for-use nested RT-PCR kit (Absolute™ HCV RT-PCR kit, BioSewoom Inc., Seoul, Korea), according manufacturer recommendation, with primers for the detection of the HCV polyprotein region 5'UTR, with low level of detection 25 IU/ml which is the reason for it to be considered as an ultra-sensitive test. There are two separate reactions. The first reaction for reverse transcriptions at a temperature (T) of 42°C and first PCR. The second reaction is nested PCR. The electrophoresis is done on 1.5% agarose gel. A band of 145bp with any intensity is considered as a positive result (Fig. 1).

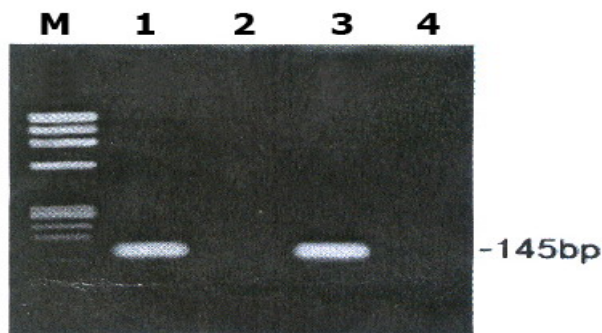


Figure 1 – Representative electrophoregram on 1.5% agarose gel representing a patient positive for the presence of HCV RNA (Line 3); negative patient (Line 2); Lines 1 and 4 are positive and negative control, respectively. M – ladder

Слика 1 – Рејрезентативен електрофореграм на 1,5% агарозен гел покажува пациент позитивен за присуство на ХЦВ РНК (линија 3); негативен пациент (линија 2); Линиите 1 и 4 се позитивна и негативна контрола. М – скала

Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were measured by standard laboratory techniques using an automatic analyzer. The normal range for AST is 10–34 U/ml, and for ALT is 10–45 U/mL.

Statistical analysis. Each value was expressed as the mean  $\pm$  Standard Deviation. The relation between two groups was analysed by the Pearson correlation test. A p value less than 0.05 was considered statistically significant. The Chi square test was built in a manner of finding a significance between the time on dialysis and detection of HCV and HBV. All statistical calculations were performed with SPSS 16.0 software (SPSS Inc.).

### Results

Detectable markers for HBV infections were found in 43 pts (24.16%). Of these, 3 pts (168%) had positive HBsAg as a marker for active HBV infections.

Previous exposure to HBV was seen in 40 of the examined pts (22.47%). Seven pts (3.93%) were positive only for HBsAb, 13 (7.30%) were positive only for HBcAb, and 20 pts (11.23%) were positive for HBsAb and HbcAb. 10pts (5.62%), isolated anti HBcAb positive individuals, were positive for HCV markers (HCV RNA and HCV Ab).

57 pts (32.02%) had detectable markers for HCV infections. 39 pts (21.91%) had detectable HCV RNA, as a marker for active HCV infections, with or without a presence of HCV Ab. Of these, 15 pts (8.43%) were positive only for HCV markers (HCV RNA and HCV Ab), and 24 pts (13.48%) were positive for HBV and HCV markers. In 2 pts (1.12%) an active HCV infection was present with an active HBV infection. In addition to active HCV infection 22 of the pts (12.36%) had markers of past HBV infection.

The total number of pts with anti HCV Ab was 56 (31.46%). In 18 pts (10. 11%) HCV Ab was the only marker of HCV infection. Of these, in 5 pts (2.81%) HCV Ab was the unique marker of hepatitis. In 1 patient HCV Ab and HBs Ag were detected. Furthermore, 12 pts (6.74%) had detectable HCV Ab and markers of past HBV infection. Positive HCV RNA was shown in 38 pts (21.34%) of those with HCV Ab.

63 pts, in all, were negative for anti HIV Ab. Examined markers and results are presented in Table 1.

Table 1 – Табела 1.

*Examined markers and results*  
*Испитивани маркери и нивни резултати*

| Positive examined markers     | Number of patients | Explanation (interpretation)          |
|-------------------------------|--------------------|---------------------------------------|
| HBs Ag, HBcT, HCV Ab, HCV RNK | 2                  | Active HBV<br>Active HCV              |
| HBs Ag, HBcT, HCV Ab          | 1                  | Active HBV<br>Inactive HCV            |
| HBsT, HBcT                    | 3                  | Past HBV                              |
| HBsT, HBcT, HCV Ab            | 8                  | Past HBV<br>Inactive HCV              |
| HBsT, HBcT, HCV RNK           | 1                  | Past HBV<br>Active HCV                |
| HBsT, HBcT, HCV Ab<br>HCV RNK | 8                  | Past HBV<br>Active HCV                |
| HBsT, HCV Ab                  | 2                  | Past (vaccination)HBV<br>Inactive HCV |
| HBsT, HCV Ab,<br>HCV RNK      | 5                  | Past (vaccination)HBV<br>Active HCV   |
| HBcT                          | 3                  | Contact with HBV                      |
| HBcT, HCV Ab                  | 2                  | Contact with HBV<br>Inactive HCV      |
| HBcT, HCV Ab, HCV RNK         | 8                  | Contact with HBV<br>Active HCV        |
| HCV Ab                        | 5                  | Inactive HCV                          |
| HCV Ab, HCV RNK               | 15                 | Active HCV                            |

AST and ALT values were measured in 44 pts. The value of AST was from 16.00 to 79.80 U/ml (mean 31.80 with Std. Deviation of 15.62). The value of ALT was from 16 to 93 (mean 41.46 with Std. Deviation of 19.74). An elevated level of AST was present in 14 pts (7.86%), and an elevated level of ALT in 15 pts (8,43%). 13 pts (7,30%) among those with elevated ALT and AST were HCV RNA positive. There was a positive correlation between AST elevation and HCV RNA ( $r = 0.342$ ,  $p = 0.023$ ) as well between AST elevation and HBsT ( $r = 0.300$ ,  $p = 0.048$ ). There was a positive correlation between ALT elevation and HCV RNA ( $r = 0.374$ ,  $p = 0.012$ ). The correlation among HCV RNA and AST and ALT levels is presented in Figure 2.

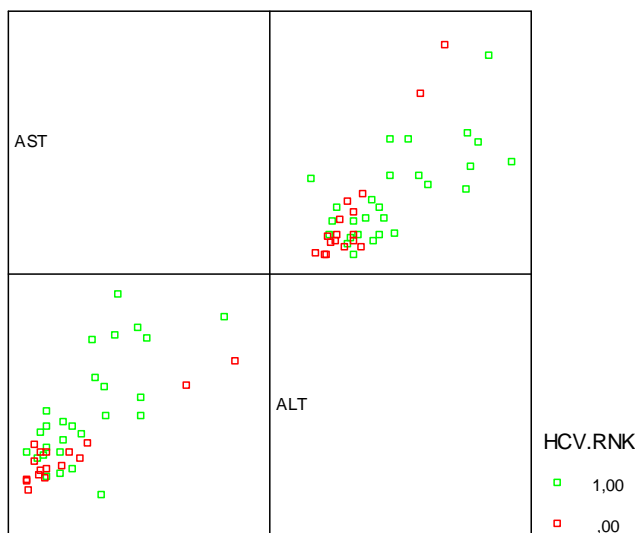


Figure 2 – Correlation of HCV RNK with elevated AST and ALT values  
Графикон 2 – Корелација на ХЦВ РНК со зголемените вредности  
на АСТ и АЛТ

The data for the time of dialysis were available for 44 pts. The mean time on haemodialysis was 14.5 years, with a range of 3–26 years. According to the time on dialysis, patients were divided into 4 groups (Table 2).

In the 1st group active HCV infection was present in 4 pts, active HBV in 2 pts, past HCV in 6, and there were 3 pts with past HBV infections. In group II active HCV was present in 5 pts, past HCV in 5 and past HBV in 5 pts. In group III active HCV was present in 7 pts, past HCV in 4 and past HBV in 7 pts. In group IV active HCV was present in 10 pts, past HCV in 1 and past HBV in 9 pts.

The Chi square test found a significance between the time on dialysis and detection of HCV RNA (chi-square 7.771,  $p = 0.05$ ).

Table 2 – Табела 2

*Groups of pts according the time on dialysis*  
*Групи на пациенти согласно времето на дијализа*

|                                 | I group<br>(Less than 5<br>years) | II group<br>(From 6 to<br>10 years) | III group<br>(From 11 to<br>15 years) | IV group<br>(More than<br>16 years) | Total |
|---------------------------------|-----------------------------------|-------------------------------------|---------------------------------------|-------------------------------------|-------|
| Active<br>HCV                   | 2                                 | 4                                   | 2                                     | 1                                   | 9     |
| Past HCV                        |                                   | 2                                   | 2                                     | 1                                   | 5     |
| Past HBV                        | 3                                 | 1                                   |                                       |                                     | 4     |
| Active<br>HCV and<br>active HBV | 1                                 |                                     |                                       |                                     | 1     |
| Active<br>HCV and<br>past HBV   | 1                                 | 1                                   | 5                                     | 9                                   | 16    |
| Active<br>HBV and<br>past HCV   | 1                                 |                                     |                                       |                                     | 1     |
| Past HCV<br>and past<br>HBV     | 2                                 | 3                                   | 2                                     |                                     | 7     |
| Total                           | 10                                | 11                                  | 11                                    | 12                                  | 44    |

### *Discussion*

In our study we used immunoenzyme assays as examination methods recommended for screening programmes for HBV and HCV [10, 11]. Tests for detection of antibodies for HCV as initial ones are recommended in the strategies for testing [12].

Gretch and Pawlosky recommend the HCV RNA test before HCV Ab testing for HCV in immunocompromised patients, such as patients on haemodialysis; or in persons with suspected acute infections before seroconversion when the Ab test is negative; in differentiation between acute and past infections; and in estimation of the antiviral response [13, 14, 15].

We had prevalence of 1.68% HBs Ag detection vs. 4% HBs Ag detection in the study of Souza and collaborators. They approved a 45% prevalence of HBV infection in 100 examined pts on dialysis compared with an overall prevalence of 24.16% in our study [16]. According to the Dialysis Outcomes and Practice Patterns Study (DOPPS), a cross-sectional observational study of adult HD pts randomly selected from 308 dialysis facilities in 7 countries worldwide,

the mean HBV prevalence was 3.0% with a median of 1.9%, and an HBV prevalence of 0% to 5% in 78.5% of the facilities. [36]. The rate of serum HBs Ag seropositivity on maintenance haemodialysis in the developed world is currently low (0–10%) but outbreaks of acute HBV infection continue to occur in this setting [37]. From the study of dialysis and aphaeresis in the R. Macedonia the prevalence of HBV among pts on HD varied between 6 and 28% in different centres [39].

More than 60% of haemodialysis pts with HBV infection develop chronic hepatitis with the persistence of HBs Ag and infectivity [17]. To be able to demonstrate the development of chronic hepatitis in this group of patients, further longitudinal investigations should be done.

Isolated hepatitis cor Ab (HBc Ab) could be unspecific, because of: a candid HBV infection when all others markers were below detection level (it could be proved only with PCR detection of the HBV DNA); it could be an unique serological marker for past self-limited HBV infection; it could also be a sign of acute HBV infection in the window phase; or as an HBV–HDV (hepatitis D virus) co-infection during which HBV has suppressed replication. HBc Ab is a sign of exposure to a live virus and can represent a potential danger for the transfer of HBV. Isolated detection of HBc Ab is reported in 3–20% of the blood donor population or healthy persons, depending on the HBV prevalence among the general population [18, 19]. Souza and collaborators report 2% isolated detection of HBc Ab [16].

According to Berger and collaborators studies there is a statistically significant association between isolated anti-HBc seropositivity found in 37.5% and HCV co-infection found in 65.4% [20, 21]. These appearances suggest the need for anti HCV testing among persons who have an isolated antibody to hepatitis B cor antigen [20].

Only HBs Ab, which is a result of an immune response of the organism to HBV infection or vaccination against HBV, can neutralize HBV and allow good protection. In the study we had pts positive only for HBs Ab and negative for all other markers for HBV infection, which can lead us to the conclusion that those pts could have been vaccinated or their HBc Ab has disappeared [22]. Markers for past infection with a live virus were also detected. Divergent results were reported by Souza, where HBs Ab and HBc Ab were positive in 39%, as well as in 2.7% of pts reported by Yakaryilmaz [37, 38].

The risk of transmission of HBV infection through the blood of one patient to another is usually the result of improper measures taken by the personnel. The clinical implications for the detection of hepatitis in these patients come from the possibility of taking preventive measures for virus transmission: the induction of immunity with HBV vaccine, as the most important way; and therapy with interferon and lamivudine to control viral replication.



The prevalence of chronic hepatitis C determined by antibody testing among pts on haemodialysis is between 6–38%, according Zacks, whereas the prevalence of HCV infection determined by detection of HCV RNA can be 20–30% vs. 13% with anti HCV Ab and 14% with active HCV infection, data from other studies [23, 16]. In our study the prevalence determined by antibody testing was 10.11% and the prevalence determined by detection of HCV RNA was 21.91%.

Among patients on haemodialysis the prevalence of HCV infection varies from 6% in G. Britain to 60% in Poland and East Europe, 8–36% in North America, and 12.1–45.2% in India. In our country the prevalence of HCV among patients on HD was from 37–78% in some centers [39]. In developed countries the incidence and prevalence of HCV infection among patients on haemodialysis is decreasing because of the reduction of post-transfusion HCV infections and measures for control of nosocomial infections. The important factors influencing the prevalence are: the number of transfusions, duration and method of dialysis, physical closeness of infected patients, dialysis machines, dialysis membranes, haemodialysis ultra filtrate and reprocessing of the dialyser [24, 16]. Those are alarming data that point to necessary measures for the detection of routes for transferring HCV infection among the dialysis population with the goal of more rigorous conduct of precautionary measures.

Most patients with HCV infection experience no symptoms, and the remainder have mild or non-specific symptoms. The window period, the time between HCV infection and the appearance of Ab, is 16 weeks. With the new ELISA test the time for detection of seroconversion is between 6–8 weeks, compared with the possibility of detecting HCV RNA with qualitative RT-PCR between 10 and 14 days after infection [25]. The ELISA method is a cheap, highly sensitive and specific method which justifies its use in regular follow-up of the health condition of patients on dialysis. This data suggests the need for HCV RNA detection to document viraemia [25b]. When acute infection is suspected, a negative anti-HCV can be further evaluated by a HCV RNA test. With this, the possibility of timely use of therapeutic measures as well as the strengthening the preventive measures to other patients will be possible. The causes of such a situation are: patient immunosuppression (medicaments, condition etc.) the patient is in the window period, or Ab has disappeared after a certain period of time after infection [26]. If a single negative result for HCV RNA is obtained from a patient positive for HCV Ab, repeated testing should be considered to document the resolution of the HCV infection. Patients can be persistently positive for HCV Ab and negative for HCV RNA, and potentially infectious because of possible occult hepatitis C.

When the goal is the detection of Ag or Ab against some viruses, then the first line tests are immunoenzymatic methods (ELISA, Hemiluminiscent) [27]. But when it is necessary to confirm active replication of the virus (HBV, HCV and HIV) the method of choice is PCR, as a method for detection of

nucleic acids, especially when the investigated person has a compromised humoral immune response, such as are persons with renal failure [28].

The prevalence of HIV infection among the haemodialysis population is different depending on the country and geographical region. In our study we did not detect a presence of HIV among examined samples from haemodialysis pts. Boulaajaj *et al.* examined the frequency of HBV, HCV and HIV among 186 persons on chronic haemodialysis in University Hospital in Casablanca. They came to the data: 76% of pts had HCV infection, the prevalence of HBV was 2%, and no patient was positive for HIV [29].

Ballester *et al.* performed a cross-sectional study with 318 pts in Havana and they found that HCV infection was identified more frequently than HBV and HIV among dialysis pts. In 5.3% of their examined persons the presence of HBs Ag was detected, HBc At were detected in 45% and 51.6% were anti-HCV positive. 3.1% of persons were HCV and HBV co-infected. No HIV positive patient was detected [30]. Our results were comparable with the last two studies on HIV prevalence in haemodialysis pts.

HBV and HCV co-infection can result in suppression of both viruses (the two viruses) or with augmented histological lesions vs. histological lesions with only one virus [31, 32]. Co-infection involving HBV and HCV in our examined group was seen. Polenakovic *et al.* in his 2002 study, stated that of 200 examined sera 54.5% were positive for HCV Ab, 9.5% for HBs Ag, 43% for HBs Ab, 57% for anti-Hbc. HCV-HBV co-infection was found in 9 pts. All pts were negative for HIV [40].

The mean levels of ALT and AST were higher in our study vs. their levels in the study by Behzad-Behbahani. [32b]. A positive correlation was found between ALT level and HCV RNA, and a correlation between AST level and HCV RNA. We found a stronger correlation between HCV RNA and ALT and AST than the study by Kato [32c]. In our study, elevated serum ALT was observed in anti-HCV Ab positive patients, which is in accordance with levels from 4 to 67% previously reported [26]. But we found a smaller percentage of elevated ALT in pts with HCV RNA vs. 12 to 31% in the same paper.

Several investigators have had different results. According Saha, pts treated with HD in the acute course of viral hepatitis have significantly less transaminase concentration than in pts with normal renal function [17]. The major abnormality in the study of Agarwal among HD pts with HCV infection was fluctuating ALT [32d]. Some studies present persistent elevations in ALT levels in 12% to 50% of HD pts, and a higher frequency of persistently normal ALT levels in pts on HD vs. pts without renal failure [23]. Comparing the HCV RNA in infected pts with serum AST and ALT levels revealed an extremely poor correlation ( $r = 0.002$  and  $r = 0.022$  respectively) according Awady [23b].

We did not find a nonsignificant correlation between the time on dialysis and detection of markers for HBV infections. It is evident that HBs antigen was detected only in the first group of pts. These data indicate possible infection with HBV during the first 5 years of dialysis. The positive association between HBV prevalence and years on HD is reported in Burdick's study [23c].

We found significance between the time on dialysis and detection of HCV RNA. In the study of Kato, HCV positive patients had a significantly longer time on haemodialysis than HCV negative pts ( $p < 0.01$ ). However, it is obvious that the number of HCV and HBV infected pts is grouped into four groups of pts. The longer the pts remain on HD, the greater will be the chance of HBV/HCV infection. It is possible that pts who have undergone HD for a long period of time have a longer time at risk of exposure to HBV and HCV than those pts who have been on HD for a shorter amount of time.

Several factors have been identified that independently influence the rate of progression of renal failure: male, age  $> 40$  years at infection, HBV and HCV co-infection, and co-infection with HIV and HD treatment [34b]. Timely detection of HBV, HCV and HIV infection among haemodialysis pts is necessary for timely therapy and prevention of chronic infection, as well as for taking preventive measures for the protection of other patients and staff in the haemodialysis unit.

### *Conclusions*

The results of our survey presented a prevalence of HBV of 24.16% and a prevalence of HCV of 32.02% in patients with ESRD on haemodialysis programmes from two dialysis units over a six months period. HIV was not detected among the investigated patients. There is a positive correlation between AST elevation and HCV RNA, as well between AST elevation and HBsT. A positive correlation was also found between ALT elevation and HCV RNA.

Immunoenzyme tests are the method of choice for the screening programme. Because people with renal failure and haemodialysis have a compromised immune response and antibodies can be undetectable the use of the PCR method for the detection of nucleic acid of viruses that can be the cause of infection is especially important for these persons. Only if all measures are properly taken can the risk for these infections be totally eliminated. This is the reason for regular laboratory investigation in the early phase. This study emphasizes the risk of transmission and the importance of infection control procedures in haemodialysis units. Adequate screening of HBV, HCV and HIV infections and strict enforcement of universal infection control practices are required. The spread of HCV and HBV is mainly related to a lack of strict observance of

appropriate precautionary measures, which are an efficient and possibly sufficient means of prevention. The lack of strict observance of precautionary measures would appear to be likely. Our study demonstrates the need for further longitudinal investigations such as the introduction of HBV DNA testing as well as the implementation of a scheme for retesting and following the markers for these three infections with the involvement of all patients on haemodialysis in R. Macedonia.

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## Резиме

СКРИНИНГ ЗА ХЕПАТИТИС Б, Ц И ХИВ ИНФЕКЦИЈА  
НА ПАЦИЕНТИ НА ХЕМОДИЈАЛИЗА(ПОПРЕЧНА АНАЛИЗА НА ПАЦИЕНТИТЕ ОД ДВА ЦЕНТРИ  
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Целта на истражувањето беше да се одреди серумската преваленца на ХЦВ, ХБВ и ХИВ инфекцијата кај пациентите со бубрежна слабост (БС) на хемодијализен третман во примерок од два центри за дијализа во Скопје.

Материјал и методи: 178 пациенти на хемодијализа од два центри за дијализа (Клиника за нефрологија и Центар за дијализа „Железара“ во Скопје) во периодот од јануари до јули 2005 година беа вклучени во студија на попречна анализа. Пациентите беа на возраст од 31 до 77 години (средна возраст 54 год.). На примерок на серум се вршени следните анализи: детекција на маркери за хепатит Б – ХБс антиген (Аг), ХБсТ антители (Ат) и ХБцТ антители со автоматизиран хемилуминисцентен имуно анализатор, детекција на антители кон ХИВ и антители кон ХЦВ (хепатитис Ц) со ЕЛИСА

метод, и детекција на ХЦВ РНК (рибонуклеинска киселина) со квалитативна ПВР (полимеразноверижна реакција). Статистичката анализата е направена на пациентите со комплетни серолошки испитувања.

*Резултати:* Кај 43 пациенти (24,16%) се детектирани маркери за ХБВ инфекција. Позитивен ХБс Аг е забележан кај 3 пациенти (1,68%). Маркери за мината ХБВ инфекција има кај 40 пациенти (22,47%). Кај 57 пациенти (32,02%) се детектирани маркери за ХЦВ инфекција. Од нив кај 39 (21,91%) пациенти е детектираната РНК на ХЦВ во примерокот. Кај 24 пациенти освен маркери за ХЦВ утврдено е и присуство на маркери за ХБВ инфекција. Вкупниот број на пациенти со анти ХЦВ Аг се 56 (31,46%). Кај сите пациенти не се детектирани антителиа кон ХИВ. Беше најдена позитивна корелација помеѓу нивото на АСТ и ХЦВ РНК ( $r = 0,342$ ,  $p = 0,023$ ), како и помеѓу АСТ и ХБсТ ( $r = 0,300$ ,  $p = 0,048$ ). Позитивна корелација беше најдена помеѓу АЛТ и ХЦВ РНК ( $r = 0,374$ ,  $p = 0,012$ ).  $\chi^2$  тестот најде значајност помеѓу времето на дијализа и детектираната ХЦВ РНК (chi-square 7,771,  $p = 0,05$ ).

*Заклучок:* Резултатите на попречната изведена анализа зборуваат за преваленца на ХБВ од 24,16%, ХЦВ од 32,02% кај пациентите со БС на дијализен третман во примерок од центрите за дијализа во Скопје добиен во период од шест месеци. Кај нашите испитаници не се утврди присуство на ХИВ инфекција. Имуноензимските тестови се метода на избор при скрининг програми. Особено е важна примената на ПВР за детекција на нуклеинските киселини на вирусните причинители кај лицата со БС. Навремено откривање на ХБВ, ХЦВ и ХИВ инфекцијата меѓу пациентите на дијализа е неопходно со цел да се преземе навремена терапија и да се спречи хроничната инфекција, како и преземање на превентивни мерки за заштита на другите пациенти од центарот за дијализа и персоналот.

**Клучни зборови:** Hepatitis B, Hepatitis C, HIV, бубрежна слабост, хемодијализа.

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