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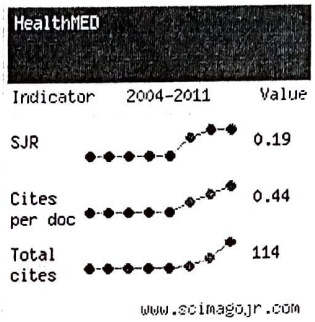

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Prevalence of HIV, Hepatitis B and C infections among inmates in prisons in the Republic of Macedonia

Tanja Jovanovska[1], Biljana Kocic[2], Viktorija Prodanovska-Stojcevska[1], Rozalinda Isjanovska[3]

[1] Medical College, University St. Kliment Ohridski Bitola, R. Macedonia,
[2] Faculty of Medicine, University of Nis, Serbia,
[3] Faculty of Medicine, University of Skopje, R. Macedonia.

Abstract

HIV, hepatitis B (HBV) and hepatitis C (HCV) infections are serious problem at prison population confirmed by the fact that in numerous countries prevalence of these infections is many times higher among prisoners than at general population. The study was aimed at confirming prevalence of HIV, hepatitis B and hepatitis C among prisoners in Bitola's and Prilep's prisons, existing of coinfection and risk factors related to that. In cross sectional study 550 prisoners were included, giving answers to structured questionnaire and in order to analyze blood for HIV, HBV and HCV, rapid blood tests were used in detecting antibodies. Prevalence of HCV is 0.37, HBV 0.15 and HIV prevalence is 0.0036. Co infection prevalence of HCV/HBV is 0.009 from the total number of examinees. Prevalence of total co infection of HCV, HBV and HIV is 0.0018, and total co infection of HCV and HIV is 0.0018. At examines statistical significant connection is registered between risky behavior and HCV, HBV and HIV positive, between intravenous drug using, joint equipment, tattooing, not using sterile needle at tattooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for $p<0.05$.Performing of screening for blood born and sexual transmitted disease is necessary in prisons and undertaking of all measures to prevent further spreading of infections among inmates.

Key words: Hepatitis B, Hepatitis C, HIV, drug abuse, inmates.

Introduction

HIV, hepatitis B and hepatitis C infections are serious public health threat in incarcerated population, which is confiremed by the fact that in numerous countries prevalence of these infections is many times higher among prisoners than in general population. Before admission to correctional institutions people often have history of drug addiction, joint equipment using, risky sexual behaviors (1,2). These risky behaviors frequently continue during imprisonment leading to possibility of transsmision of blood-born viruses such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) in this group of people. (3). High prevalence of the above mentioned viruses is also due to other risk factors such as: inadequate prison health services, previous imprisonment, tattooing (4,5,6).

Prisons are rather convenient for spreading of diseases and there are for their studying and intervention (7). Because of that, a better knowledge of the prevalence rates of these infections in prisons would help better preventive measures undertaking of better planning (8,9).

This study was aimed at: confirming the prevalence of HIV, hepatitis B and C infections in inmates, existing the co infection as well and confirming widespread of behavioral risk factors of occurring the above mentioned infections.

Material and methods

A cross sectional study of prevalence and risk factors for occurring HIV, hepatitis C and hepatitis B infection among inmates was conducted. The research was performed in 3 correctional institutions in the Republic of Macedonia, in Skopje, Bitola and Prilep in the period from July to December 2011. The study sample consisted of 550 examinees, 300 from the prison Idrizovo in Skopje (males), 50 females from prison Idrizovo, 100 from prison in Bitola and 100 from prison in Prilep.

Criteria for including in the research were: age (18 and more) and minimum 3 months stay in correctional facillitiy.

Criteria for excluding were age (less than 18), time at stay less than 3 months, illiteracy, mental ineligibility.

Core questionnaire was used as a research instrument, composed on the base of similar researches, and as a medical diagnostic tool were used rapid tests for detection HIV, hepatitis B and hepatitis C infections. All participants signed an informed consent and provided a blood sample.

The questionnaire is composed of two segments; The first segment comprised data referring general demographic characteristics and socio- economic status (11 questions), second segment comprised of questions referring to habits and risk sexual behaviors and intravenous drug use (18 questions).

As a medical diagnostic tool were used rapid detecting tests for HCV, HBV and HIV. Hexagon HCV is intended for the rapid, qualitative detection of IgG antibodies to the hepatitis C virus in human serum plasma or whole blood. The onsite HIV1/2 Ab plus Combo rapid test is a lateral flow immunoassay for the simultaneous detection and differentiation of anti-HIV1 and anti-HIV2 antibodies in human serum plasma or whole blood. On site HBV5 Parameter rapid test is chromatographic test for qualitative detection of HbsAg, HbsAb, HbeAb, HbeAg and HbcAb in human serum or plasma.

Filling up the questionnaire was anonymous, voluntarily in accordance to previous written approval by the Ethical Committee and Executive Sanction Board of the Ministry of Justice in the Republic of Macedonia.

Statistical analysis

Statistical analysis was made with specific software for its purpose. Descriptive statistics were used to describe the basic features of the data in the study and provide simple summaries about the sample. The distribution of the frequencies was used for individual values using percentages. Pearson chi-square test for statistical significance and odds ratio values.

Results

Within the investigated group of 550 prisoners, 300 examinees (54,50%) are from Skoje's prison males, 50 females (9,10%), 100 (18,20%) from Bitola's prison, and 100 (18,20%) from Prilep's prison, testing was done with rapid detection tests of HCV, HBV and HIV and filling up the questionnaires as well. Average age of all male prisoners is 32.0 years with SD±8.0 (min.17, max 64), and females 35.5±11.3 (min.18, max62.0).

The majority of inmetes from both genderes have a limited education (57.6% males and 48.0% females). Highschool have 37.6% males and 44.0% females. Higher and faculty education is registered in 4.8% males and 8.0% females. Percentage difference registered between limited education versus other degrees of education at males is statistical significant for p=0.00000. Percentage difference registered between limited and highschool education versus faculty education at females is statistical significant for p=0.000

In Table 1 is presented prevalence of HCV, HBV and HIV. Total prevalence of HCV is 0.37 and accordingly to gender – 0.39 at males and 0.18 at females. Total prevalence of HBV is 0.15 and accordingly to gender- 0.15 at males and 0.1 at females. Total prevalence of HIV is 0.0036 and accordingly to gender- 0.004 at males.

Table 1. Prevalence of infected with HCV, HBVand HIV

Virus	total prevalence	males prevalence	females prevalence
HCV	0.37	0.39	0.18
HBV	0.15	0.15	0.1
HIV	0.0036	0.004	/

Prevalence of total co infection of HCV and HBV is 0.009 and accordingly to gender 0.102 at males and 0.02 at females. Prevalence of total co infection of HCV, HBV and HIV is 0.0018 and accordingly to gender 0.002 at males. Prevalence of total co infection of HCV and HIV is 0.0018 and accordingly the gender- 0.002 at males.

Distribution of HCV positive accordingly to risk behavior is presented in table 2. 91.6% are intravenous drug users and 72.0% from them used joint equipment (syringe or needle). 73.0% are tattooed and 74.7% from them didn't use sterile needle. At sexual intercourses only 4.9% used condom with constant partner and with non constant partner 13.3%.

Table 2. Distibution HCV+ persons related risky behaviour

risky behaviour		number	%
i.v. drug using	ne	17	8.4
	yes	186	91.6
place of taking for the first time	out of prison	161	86.6
	in prison	25	23.4
Joint equipment	ne	52	28.0
	yes	134	72.0
tatooing	no	53	26.1
	yes	150	73.9
strerile needle for tatoo	no	112	74.7
	yes	38	25.3
sexual intercourse	no	7	3.4
	yes	196	96.6
constant partner	no	100	49.3
	da	96	47.3
	missing	7	3.4
sexual intercourse with person who isn't constant partner	ne	127	62.6
	yes	69	34.0
	missing	7	3.4
homosexual intercourse	ne	153	75.4
	yes	43	21.2
	missing	7	3.4
sexual intercourse with intravenous drug user	ne	147	72.4
	yes	27	13.3
	missing	29	14.3
condom with constant partner	ne	169	83.3
	yes	10	4.9
	missing	24	11.8
condom with non constant partner	ne	147	72.4
	yes	27	13.3
	missing	29	14.3

In table 3 is showed connection between risky behavior and HCV positive. At examines statistical significant connection is registered between risky behavior and HCV positive, between intravenous drug using, joint equipment, tattooing, not using sterile needle at tattooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for $p<0.05$.

According to cross sectional relation, intravenous drug using is a risk factor for infection with HCV- OR=56, 86(31,03<OR<105,444), using joint equipment is a risk factor for HCV infection- OR=5,29(2,68<OR<10,51), tattooing is a risk factor for HCV infection - OR=2,83(1,91<OR<4,20), intercourses with non constant partners is risk factor with HCV-2,11(1,39<OR<3,19), homosexual intercourses increases the risk for HCV infection - OR=4,45(2,45<OR<8,15), and sexual intercourses with intravenous drug users increases the risk for HCV infection- OR=19,53 (5,54<OR<82,13).

Distribution of HBV positive accordingly to risk behavior is shown in table 4. 77.5% are intravenous drug users from whom 74.2% used joint equipment (syringe or needle). 71.25% are tattooed and from them 64.9% didn't use sterile needle. At sexual intercourses condom with constant partner used only 6.25% and with non constant partner 12.5%. Connection between risky behavior and HBV positive is shown in table 5. At examinees is registered statistical significant connection between risky behavior and HBV positive,

Table 3. Presentation of connection between risky behaviour and HCV+

risky behaviour	Pearson Chi-square	p=
i.v. drug using	296.190	0.00000
place of taking for the first time	0.902094	0.342223
Joint equipment	29.1768,	0.00000
tatooing	30.1526	0.00000
strerile needle for tatoo	46.7385	0.00000
sexual intercourse (vaginal or anal)	0.324479	0.568929
constant partner	13.1337	0.000290
sexual intercourse	14.0120	0.000182
homosexual intercourse	30.4533	0.000000
sexual intercourse with intravenous drug user	30.4533	0.000000
condom with constant partner	0.590494	0.442230
condom with non constant partner	3.77166	0.151709

Table 4. Distribution HBV+ persons related risky behavior

risky behaviour		Number	%
i.v. drug using	ne	18	22.5
	yes	62	77.5
place of taking for the first time	out of prison	50	80.6
	in prison	12	19.4
Joint equipment	ne	16	25.8
	yes	46	74.2
tatooing	no	23	28.75
	yes	57	71.25
strerile needle for tatoo	no	37	64.9
	yes	20	35.1
sexual intercourse	no	2	2.5
	yes	78	97.5
constant partner	no	40	50.0
	da	38	47.5
	missing	2	2.5
sexual intercourse with person who isn't constant partner	ne	47	58.75
	yes	31	38.75
	missing	2	2.5
homosexual intercourse	ne	60	75.0
	yes	18	22.5
	missing	2	2.5
sexual intercourse with intravenous drug user	ne	62	77.5
	yes	10	12.5
	missing	8	10.0
condom with constant partner	ne	65	81.25
	yes	5	6.25
	missing	10	12.5
condom with non constant partner	ne	59	73.75
	yes	11	13.75
	missing	10	12.5

Table 5. Presentation of connection between risky behaviour and HBV+

risky behaviour	Pearson Chi-square	p=
i.v. drug using	42.6387	0,000000
place of taking for the first time	3,46929	0,062521
Joint equipment	4,69130	0,030318
tatooing	5,96032	0,014633
strerile needle for tatoo	3,06296	0.080099
sexual intercourse (vaginal or anal)	0,056834	0,811573
constant partner	4,07396	0,043552
sexual intercourse	9,13775	0,002505
homosexual intercourse	11.1090	0,000859
sexual intercourse with intravenous drug user	9,11150	0,002541
condom with constant partner	0,023105	0,879185
condom with non constant partner	2,101550	0,601851

between intravenous drug using, joint equipment, tatooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for $p<0.05$.

According to cross sectional relation, intravenous drug using is a risk factor for HCV- OR=5,55 (3,09<OR<10,8), using joint equipment is a risk factor for HCV infection- OR=2.02 (1,92<OR<4,03), tattooing is a risk factor for HCV infection - OR=1,89(1,10<OR<3,28). According to cross sectional relation having homesexual intercourses increases the risk for HBV infection – OR=2,73 (1,42<OR<5,23). Sexual intercourses with intravenous drug users also increases the risk for HBV infection- OR=3,26 (1,35<OR<7,75).

Two persons are HIV positive and both are intravenous drug users tatooed without sterile needle, practised vaginal and anal sexual intercourse without condom.

Discussion

This research is conducted in three correctional facilitates in the Republic of Macedonia (Prison in Skopje, Prilep and Bitola) indicates significant higher prevalence of HCV and HBV infections at prisoners referring to general population. In the Republic of Macedonia is that 1,5% from general population are infected or around 30.000 are HCV positive cases. Up to recent knowledge, 5% to 7% of the population in the Republic of Macedonia is infected with hepatitis B virus, and the last year 142 cases of HIV-AIDS are registered, only this year 10 new cases

Data obtained by the research comprising 550 examines being condemned to prison using rapid detection tests for HCV, HBV and HIV indicated relatively high prevalence of hepatitis C and hepatitis B. Prevalence of HCV is 0,37, HBV 0,15 and HIV prevalence is 0.0036. Confection prevalence of HCV/HBV is 0.009, HCV/HBV/HIV 0.0018 and HCV/HIV 0.0018 from the total number of examinees.

Researches done in prison institutions in neighbor countries and wider indicated similar results e.g. in the Republic of Croatia prevalence of HBV, HCV and HIV in general population is 8-11%, 0,8-1,3% and 0,002% (10,11) being significantly higher in risky population, intravenous drug users (35%, 56%, 0,8%) and in homosexuals (29,6%, 7,3%, 4,6%.(12). Prevalence of HCV in Croatia prisons is 12,5% and comparing to general population is significantly higher (13). But that percentage is lower than in the USA (16-41%) (14) and much lower than in Ireland 37%(15). In intravenous drug users in Croatia prisons, HCV prevalence is 51,5%, being lower than in mostly other countries where that percentage is from 56%-74,8%.(16) Results indicated intravenous drug users population is with the highest risk in prisons(17). It's well known that high proportion of prisoners in many countries inject drugs leading to higher possibility of transmission the virus within prisons. According to the research done in Serbia the prevalence of HCV infection among HIV

positive patients was 58, 13% with 225/387 (18). Study results from 5617 voluntary blood donors performed in order to confirm risky behavior for STD at military population in Serbia indicate presence of 36 infected (19 with HCV, 16 with HBV and 1 with syphilis. (19)

In Bulgaria national report referring to 2008 shows high percentage of HCV (13,5%) and HBV (11,8%) in prisoners – due to illegal using drugs and high certainty of tattooing (20). A cross sectional study was done in Hungary's prisons. The rata of HCV was significantly higher among intravenous drug users (22,5%) (21).

It should be noted that in USA prevalence of HCV among prisoners is at least seven times higher than in general population (22,23), whereas prevalence of HBV at least twice higher. Key contribution for higher prevalence of these infections is injecting drugs.

According to the research done in bout prisons in the Republic of Macedonia from total number of examinees, 59 (36%) were intravenous drug users and 21 (36%) from them never used joint equipment (needle and syringe), 3 (5%) at the last taking drug shared the equipment, whereas 35 (59%) shared equipment in the past. From the total number of prisoners, 26 (16%) had tattoo in prison, whereas 89 (55%) out of prison. From all tattooed 115, 13 (11%) used no sterile needle, 8 (7%) used sterile but not always, 64 (56%) have always used sterile needle and 30 (26%) have no idea whether the needle was or was not sterile. Statistical significance is registered referring HCV and HBV status and intravenous drug using and tattoo.

Data from federal and state prison reports in the USA indicate almost 65% prisoners declare regular drug using in 2004 (24).

Numerous countries in the world nowadays show significant percentage of drug addicts people entering the prison and the majority of them continue injecting drugs after entering (25, 26).

Comparing to general not imprisoned population; prisoners worldwide continue showing significantly higher prevalence of HIV, HBV and HCV infections (27). Identification of risk factors and risk behavior in prisoners and determination of stigmatization and discrimination level indicates undertaking preventive measures in due time.

Conclusion

Confirmed knowledge of prisons conditions and conducted study of the prevalence of HCV, HBV and HIV infections suggest the necessity of well organized health service-especially; immunization programs, infectious disease screening, treatment, and promotion of living conditions in prisons.

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Corresponding Author
Tanja Jovanovska,
Medical College in Bitola,
University St Kliment Ohridski,
Bitola,
R. Macedonia,
E-mail: tanjajovanovska42@yahoo.com

Analysis of pedal kinematics and surface EMG parameters during WAT

Murat Cilli

Sakarya University, School of Physical Education and Sport, Department of Coaching Education, Sakarya, Turkey.

Abstract

The aim of this study is to understand the activation pattern of the lower limb muscles during 30 s of maximal pedaling performance. Twenty-eight healthy males (age 25.2 ± 7.1 years, height 176.9±5.2 cm, mass 70.1±9.9 kg) volunteered to participate in this investigation. Surface EMG and kinematic parameters of vastus medialis (VM), vastus lateralis (VL) and rectus femoris (RF) muscles were analyzed during the Wingate Anaerobic Test (WAT) consisting of one 30 s sprint. The active phase of muscles determined by the EMG profile includes signal onset and offset times. Integrated EMG (IEMG), median frequencies (MDF), power values and angular displacement of selected muscles were calculated for the active phase in every crank cycle. Significant differences over time were assessed using a one way analysis of variance with repeated measures. Where significant changes occurred, a Schaffer's post-hoc test was applied to identify individual differences over time. While the active participation rates of the examined muscles in a pedal cycle decreased significantly ($p<0.05$), no significant difference was observed in the angular displacement of the examined muscles between the 5 s phases ($p>0.05$). The MDF of the RF, VM and VL muscles decreased and integrated the EMG of selected muscles significantly increased during WAT ($p<0.05$). Calculated power values of each muscle and WAT power results were similar. On the contrary, power produced at each muscle decreases to a similar level through 30 s. Each muscle follows a similar fatigue profile, while the power values decrease during WAT.

Key words: EMG analysis, pedal kinematics, muscle activation, supramaximal exercise.

Introduction

Pedaling is an ideal human locomotor task to study neuromuscular activity and physical fitness because it is a kinematically constrained repetitive movement. The Wingate Anaerobic Test (WAT) is widely used among different test protocols that have been used for the evaluation of aerobic or anaerobic power and the capacity of subjects. The WAT is outlined by Inbar and consists of a subject pedaling at a maximum level against a measured resistance for a short period (1). This test provides a measure of the maximum power output of the subject, the average power and the work done during a short time period and is used to generate a fatigue index. However, links from these global performance measures to changes in muscle EMG activation or pedal kinematics have not been evaluated. Furthermore, the interaction between muscle properties, individual muscle function and the coordination of multiple muscles to perform the task may not be so simple.

The information required to understand the cycling movement includes identifying the lower limb muscles, which are stimulated and precisely knowing their level/timing of activation. Associated with kinetic and kinematic analyses, it represents a means to clarify the role of each of the muscles through the crank cycle. In addition, it is important to know how the coordination strategies adapt to various constraints. Hug and Dorel (2) showed that the level and/or timing of muscle activation and coordination between muscles, mean power spectrum and amplitude of EMG signals change as a function of numerous factors such as power output, pedaling rate, body position, shoe–pedal interface, training status and fatigue. Furthermore, it is not well known whether movement patterns and power produced in each muscle decrease to a similar level or if each muscle follows a characteristic fatigue profile. Although