

HBV on adolescents using drug: prevalence, risks, vaccination

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ABSTRACT

Objective: It has been reported that drug abuse and sexual intercourse have equal level of effects on HBV contamination. Drug abuse prevalence increases in adolescence period in Turkey. In the present study, it is aimed to determine the prevalence of HBV infection and risk factors of it among adolescent drug users, which is one of the most important health problems of our country. **Methods:** In the study, the medical records of the patients who were hospitalized between October 2004 and November 2007 at the inpatient service of Ege University Child and Adolescent Addiction Investigation and Practice Center (EGEBAM) were evaluated. Two hundred and six patients had been hospitalized within this period. Of 206 patients, 188 patients whose serological results were available were reviewed in terms of socio demographic features (n=188), clinical properties (n=188) and risk factors (n=41). For the comparison of categorical variables, cross tabs and chi-square test, and for the risk assessment logistic regression analysis were used. P value less than 0.05 ($p < 0.05$) was considered to be statistically significant. **Results:** All of the 188 subjects recruited in the study were male and the mean age was 16.4 ± 1.4 . It was found that; 69.1% (n=130) of the subjects were using cannabis, 56.4% (n=106) were using inhalant, 46.8% (n=88) were using ecstasy and 42.6% (n=80) were using alcohol. Forty-five subjects (23.9%) among the patients had been contaminated with the virus. Contamination via immunization way was found to be 14.9% (n=28) and contamination via virus infection was 9% (n=17). Anti-Hbc positivity was smaller among the patients with higher education status of the mother ($p=0.005$), of the father ($p=0.010$) and higher parent economic levels ($p < 0.001$), compared to ones with lower parent education status and economic levels. Anti-Hbc positivity was found to be smaller among the patients with 3 or less siblings compared to the ones with 4 or more siblings. Immunization via vaccination was found to be higher among the patient with higher income levels ($p=0.033$). **Discussion:** HBV infection prevalence among drug using adolescents in our country is smaller than other countries. Nevertheless, while evaluating these results it should not be ignored that; HBV prevalence increases parallel to age and cases in other countries in similar age groups use more frequently intravenous drugs. (*Anatolian Journal of Psychiatry* 2008; 9:208-216)

Key words: substance use disorder, adolescence, HBV

INTRODUCTION

HBV is an important public health problem. Hepatitis B virus (HBV) is a DNA virus which belongs to Hepadnavirus family.¹ This virus causes a wide clinical disease spectrum ranging from asymptomatic infections to hepat-

ocellular cancer.^{2,3} More than 2 million people in the world are serologically proven to have HBV infection at the time or in the past.

Viral hepatitis generally presents with an asymptomatic course. Thus the most appropriate way to assess the HBV epidemiology is

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is the evaluation of seroprevalence.⁴ The diagnosis of HBV is quite complex due to its rich antigenic structure. During laboratory assessments, surface antigen against the envelope around the virus (HBsAg), the antigen against nucleocapsid inside the virus (HBcAg) and the antibodies against these antigens (anti-HBs, anti-HBc) are evaluated. Classically HBsAg is detected in the blood within the incubation period, 2-4 weeks after the elevation of hepatic enzymes or 3-5 weeks before the occurrence of clinical symptoms. HBsAg in the blood disappears 2-6 weeks after the remission of the disease. After some time (after the window period) protective anti-HBs is detected in the blood. The presence of HBsAg in the blood 6 months after the acute infection is a sign for the chronicity of the disease. HBcAg is not detected in the blood alone. In the routine laboratory evaluations it is detected in the blood later than HBsAg and stays for a long time in the blood.⁵ These findings are used in the diagnosis of this disease and the assessment of seroprevalence.

HBV prevalence and the transmission pathways of the disease differ between the different geographic areas.⁶ Half of the world population lives in the risky areas.⁵ A large number of people living in the areas where HBV is endemic meet with this disease in the early stages of life. In these places, it is being reported that, HBsAg is more frequent than 10%. In the most regions of the world, the prevalence of HBsAg is about 2-10%.⁷ Considering the endemicity, Turkey is a moderate level risky place. The prevalence of chronic HBV infection prevalence is 3.5% in the western parts and 7% in the eastern parts of the country. One third of the Turkish population carries anti-HBs. Every year 100 000 new HBV cases are recorded in Turkey.⁵ HBV is seen more frequently in the people who have high risk sexual intercourse and intravenous drug users.⁸ It has been reported that HBsAg prevalence is 60-80% in the intravenous drug users (IVDU), and 7% of these people are detected to have HBsAg (+) chronically.⁹ But in our country, there is no study evaluating the HBV prevalence in the adolescents with Substance Use Disorder (SUD) other than parenteral route.

Adolescents with SUD are under great risk for HBV. Young age is an important risk factor. Shared injector use and sexual intercourse without protection are other risky behaviors.¹⁰ Substance use and sexuality is informed to

have an equal amount of effect in the contamination of HBV. Blood and body liquids play an important role for the transmission of HBV.¹¹

In the studies searching for the substance use in adolescents in Turkey, intravenous drug use is found to be common in most of the users. These users mostly consume cannabis, alcohol, inhalants and stimulant.¹² Parallel to the spreading of SUD, prevalence of various comorbid diseases increase. In this study HBV frequency and risk factors in the substance using adolescents in our country are evaluated.

METHODS

The medical records of the patients who were hospitalized between October 2004 and November 2007 at the inpatient service of Ege University Child and Adolescent Addiction Investigation and Practice Center (EGEBAM) were evaluated. Two hundred and six patients had been hospitalized in this period. Serological evaluation results for HBV were available in the medical records of 188 cases. The results of 8 cases were not present since these patients have been discharged from the treatment center before the laboratory investigations completed. A research form has been completed for 188 cases. In this form, some sociodemographic (i.e. age, education year, attendance to school, parental marital status, education level of the mother and father, number of siblings, level of income, living place, dwelling type, social insurance, street life, forensic problem, working history), clinical (i.e. age of onset for first substance use, age at the time of first treatment, time passed till the treatment, age at the time of first cigarette use, the type of first substance used, the type of substances used, family history, comorbid diagnoses) and risk factors (frequent sexual partner, condom use in vaginal intercourse, condom use in anal intercourse, shared tooth brush, surgical interventions, blood transfer, sexually transmitted disease, history of HBV, HCV, HIV in the family) were interrogated. 41 cases were detected to have answered the questions about the risk factors. All the questions other than risk factors were determined to have been answered by all of the cases who took part in the study.

The most frequently evaluated serologic marker in the HBV scanning tests is anti-Hbc. This marker usually appears in the early stages of the disease a short time after HBsAg. It stays in

the blood for a quite long period of life, usually lifelong.⁵ Immunization via vaccination is detected if HBsAg and anti-Hbc is (-) and anti HBs is (+).^{5,10} In this study contamination with HBV is assessed if anti-Hbc is (+) and immunization via vaccination is assessed if HBsAg and anti-Hbc is (-) and anti HBs is (+).

Statistical analysis

SPSS 13.0 package program was used for the statistical assessments. For the comparison of categorical variables Cross Tab and Chi-

Square Test and for the detection of risk factors among independent variables logistic regression analyses were used. Statistical significance was considered to be $p < 0.05$.

RESULTS

All of the 188 patients participated in the study were male and their mean age was 16.4 ± 1.4 years. Total education year of the cases was

Table 1. Sociodemographic characteristics

Characteristics		Anti HBc (+)				Only Anti HBS (+)			
		n	%	χ^2	p	n	%	χ^2	p
Age	15≤	3	7.3	0.19	0.663	10	24.4	3.73	0.053
	16≥	14	9.5			18	12.2		
Education year	1-5 year	4	14.3	2.74	0.254	3	10.7	2.11	0.349
	6-8 year	10	10.5			12	12.6		
	9-15 year	3	4.6			13	20.0		
Attendance to school	Present	1	2.1	3.80	0.051	5	10.4	1.02	0.313
	Absent	16	11.4			23	16.4		
Street life	Present	11	12.4	2.26	0.133	13	14.6	0.01	0.917
	Absent	6	6.1			15	15.2		
Forensic problem	Present	8	9.5	0.04	0.836	9	10.7	2.09	0.148
	Absent	9	8.7			19	18.3		
Working history	Present	13	9.2	0.02	0.883	21	14.9	0	1
	Absent	4	8.5			7	14.9		
Parental marital status	Together	10	7.7	0.93	0.334	17	13.1	1.10	0.295
	Separate	7	12.1			11	19.0		
Mother education	Literate or illit.	10	18.5	8.06	0.005	6	11.1	0.92	0.336
	En az ilkokul	7	5.3			22	16.7		
Father education	OY veya değil	6	20.7	6.67	0.010	2	6.9	2.07	0.150
	At least prim. sch.	9	8.5			26	17.6		
Sibling number	3≤	6	5.0	6.59	0.010	21	17.5	1.78	0.182
	4≥	11	16.2			7	10.3		
Income level	High+middle	3	2.5	17.80	0.000	23	19.0	4.54	0.033
	Low	14	20.9			5	7.5		
Social insurance	Present	5	4.6	6.57	0.010	21	19.3	3.65	0.056
	Absent	12	15.6			7	9.1		
Residence area	Urban	15	9.6	0.14	0.704	24	15.0	0.01	0.922
	Rural	2	7.1			4	14.3		
Domicile type	Shanty house	10	10.4	0.45	0.502	13	13.5	0.28	0.595
	Not shanty h.	7	7.6			15	16.3		

7.8±2.4 years. The age at the time of first substance use was 13.5±2.1 years. Cases recruited for the treatment 32±25 months later than they used substance for the first time. There was no parenteral drug user among the cases. 95% of the cases were using cigarette. 100% of them were using a substance other than cigarette, 156 (83%) were using a second substance, 101 (53.7%) were using a third substance and 50 (26.6%) of them were using fourth substance. As the substance preferences of the cases were evaluated, it was determined that, 69.1% (n=130) were using cannabis, 56.4% (n=106) were using inhalant, 46.8% (n=88) were using ecstasy and 42.6% (n=80) were using alcohol.

Among the cases 45 (23.9%) had encountered with HBV. Encounter with the virus was via immunization among 14.9% (n=28). Another 9% received virus via disease 9% (n=17).

In terms of sociodemographic properties; we found statistically significant difference for the parameters of mother and father education level, sibling number, income level and social insurance. Anti- HBc positivity was found to be 18.5% in the group whose mothers were literate or illiterate and 5.3% in the group whose mothers completed their education at primary school level (p=0.005). For the group that we evaluated the father's education level, these frequencies were as 20.7% and 8.5% (p=0.010) respectively. Anti HBc was determined to be

Table 2. Clinic characteristics

Characteristics		Anti HBc (+)				Only Anti HBS (+)			
		n	%	χ^2	p	n	%	χ^2	p
Age for the first substance use	14≤	12	10.3	0.625	0.429	19	16.4	0.527	0.468
	15≥	5	6.9			9	12.5		
Age for the treatment referral	15≤	4	7.3	0.296	0.586	11	20.0	1.599	0.206
	16≥	12	9.8			17	12.8		
Time passed until the treatment	24≤	9	8.3	0.155	0.694	16	14.8	0.001	0.972
	25≥	8	10.0			12	15.0		
Age for first cigarette use	≤14	17	18.1	0.003	0.959	7	7.4	0.476	0.490
	≥15	5	18.5			1	3.7		
Substance use in the family	Present	12	10.5	0.775	0.379	19	16.7	0.718	0.397
	Absent	5	6.8			9	12.2		
Psychiatric disease history in the family	Present	1	1.8	5.107	0.024	15	26.8	8.899	0.003
	Absent	16	12.1			13	9.8		
Comorbid diagnosis	Present	12	13.0	3.506	0.061	14	15.2	0.015	0.903
	Absent	5	5.2			14	14.6		
Initial substance used	Cannabis	8	8.7	1.434	0.698	13	14.1	0.696	0.874
	Inhalant	7	11.7			9	15.0		
	Alcohol	2	7.1			4	14.3		
	Others	0	0			2	25.0		
Inhalant use	Present	12	11.3	1.534	0.216	14	13.2	0.545	0.460
	Absent	5	6.1			14	17.1		
Cannabis use	Present	12	9.2	0.018	0.893	20	15.4	0.080	0.777
	Absent	5	8.6			8	13.8		
Alcohol use	Present	7	8.8	0.014	0.904	12	15.0	0.001	0.972
	Absent	10	9.3			16	14.8		
Extasy use	Present	7	8.0	0.238	0.626	15	17.0	0.604	0.437
	Absent	10	10.0			13	13.0		

positive in 5% of the group with sibling number three and less and 16.2% in the group with sibling number 4 and more ($p=0.010$). In the group with high or middle income level, 2.5% were anti-HBc (+) and in the group with low income level 20.9% were anti-HBc (+) ($p<0.010$). Anti-HBc was detected in 2.1% of the cases who were attending school and in 11.4% of those who did not attend school. The difference in terms of school attendance was close to statistical significance level ($p=0.051$) (Table 1).

When similar parameters were assessed for the immunization via the vaccination way; it was determined that vaccination rates were higher in the group with high income level (19%) than the group with low income level (7.5%) ($p=0.033$). In the group whose members' ages was 15 and smaller vaccination ratio was higher (24.4%) than the group with ages 16 and above (12.2%) (Table 1).

As we assessed risk factors according to clinical

properties of the cases, statistically significant difference was detected only in terms of psychiatric disease history in the family ($p=0.024$). Anti-Hbc was found to be positive in 1.8% of the cases who had family history for psychiatric disorders and in 12.1% of the cases who did not have any family history for psychiatric disorders. When we evaluated comorbid diagnoses, the cases that had comorbid diagnoses were found to have a larger rate for anti-HBc positivity (13%) than the cases who did not have any comorbid diagnoses (5.2%). However the difference did not reach statistical significance level ($p=0.061$) (Table 2).

When we evaluated the immunization via vaccination route in terms of clinical properties; difference between groups was detected only according to psychiatric disease history in the family ($p=0.003$). Vaccination rate was higher among the ones who had family history for psychiatric disorder (26.8%) compared to ones who did not have any (9.8%) (Table 2). There

Table 3. Risky behaviors

Risky behaviors		Anti HBc (+)				Only Anti HBS (+)			
		n	%	χ^2	p	n	%	χ^2	p
Frequent sexual partner	Present	-	-	2.208	0.137	3	14.3	4.668	0.031
	Absent	2	10.0			9	45.0		
Condom use in vaginal intercourse	Present	1	5.0	0.001	0.972	6	30.0	0.010	0.920
	Absent	1	4.8			6	28.6		
Condom use in anal intercourse	Present	1	9.1	0.339	0.560	3	27.3	0.129	0.720
	Absent	1	4.2			8	33.3		
Shared tooth brush	Present	-	-	1.090	0.296	2	14.3	2.305	0.129
	Absent	2	7.4			10	37.0		
Surgical intervention	Present	-	-	0.771	0.380	2	18.2	0.893	0.345
	Absent	2	6.7			10	33.3		
Blood transfer	Present	-	0	0.108	0.743	1	50.0	0.437	0.509
	Absent	2	5.1			11	28.2		
HBV, HCV, HIV in the family	Present	-	0	0.108	0.743	1	50.0	0.437	0.509
	Absent	2	5.1			11	28.2		
Sexually transmitted disease	Present	-	-	0.227	0.634	0	0	1.834	0.176
	Absent	2	5.4			12	29.3		

was not statistical difference among the groups in terms of risky behaviors (Table 3).

In the logistic regression analysis, the cases

whose parents were separated ($p=0.020$), who had mothers with an education at an illiterate or literate level ($p=0.016$), who had no social

insurance ($p=0.039$) and the ones with sibling number of 4 and more ($p=0.003$) were determined to be risky in terms of HBV.

DISCUSSION

SUD is a problem which increases in adolescence period. Many medical problems accompany with SUD. Problems related with HBV are listed in these medical diseases. To our knowledge there is no study that investigates HBV seroprevalence and risk factors in substance using adolescents in Turkey. In the studies conducted in other countries, the studies, which included IVSU adolescents, stand in the forefront. In Turkey, the cases that referred the adolescent treatment centers prefer to use via oral or inhalation ways.^{12,13} This is the first study that evaluates HBV prevalence and risk factors in orally used or inhalant type narcotic or stimulant drug using adolescents in our country.

There are studies conducted in Turkey, which assessed the prevalence of Anti-HBc, in similar age group patients with our study cases. In a study conducted in Istanbul with 909 children, the mean age of the children who participated in the study was found to be 83.5 ± 51.4 months. The cases that were assessed were divided into three groups according to their ages (6 months-4.9 year old, 5-9.9 year old, 10-15.9 year old) and Anti-HBc prevalence among the groups was found respectively, 18.6%, 13.7%, and 15.4%. No differences among the groups were detected according to their ages.⁴ In a study conducted in Erzurum in 2003, in the children with a mean age of 12.3 ± 2.3 (6-17 years old) HBV seroprevalence was found to be 9.7%.¹⁴ A study was conducted in Melbourne Child Justice Center with 88 cases between the ages of 20-25. In that study 95.5% of the cases were using cigarette, 97.7% were using cannabis, 38.6 were using inhalants, 35.2 were using hallucinogen substance and 45.5% were using other substances. 62.5% of the cases were using parenterally used substances and the rate of shared injector use was 31.8%. 81% of the IVSU adolescents were using heroin and 76% of them were using amphetamine. In the 13.5% of the cases anti-HBc Ag was detected to be positive.¹⁵ In our study, although the cases' mean age was smaller and parenteral substance use was not present, anti-HBc was found to be positive in 9% of the cases. This rate is close to the ratios that were detected in

general population in our country at similar ages.

HBV infection shows vertebral transition characteristics like intravenous substance use, tattooing and unprotected sexual intercourse.¹⁶ In a study it was reported that adolescents who have SUD start using drugs around the age 10 and have their first sexual intercourse in these years. Another important finding was that they begin to use parenteral substances 1 year after their first sexual experience.¹⁵ Having a sexual intercourse in charge of money at least once in life and carrying a sexually transmitted disease increase the risk for HBV infection.¹¹ When we evaluated the risky behaviors, we found that there were no difference for the HBV carrying state, in terms of frequent sexual partner change, condom use in vaginal intercourse, condom use in anal intercourse, shared toothbrush use, HBV, HCV, HIV positivity in the family and sexually transmitted disease. But these characteristics could be evaluated only in 41 cases because of absence of the data in our medical records which is a limitation of the study. When we made an investigation in terms of sex prolonged substance use and not being a white was evaluated as a risk factor in male subjects. In female subjects having more than 50 sexual partners, prison life and injector share were found to create increased risk. HBV ratio was detected as 38% in male homosexuals. Especially in the male homosexuals who have sexual intercourse in charge of money, the risk for having the disease was found to be 4 times greater.¹⁰ In the study that we conducted the absence of female subject makes us unable to perform an assessment according to sex. In the future studies risk factors according to ages should be investigated.

In the 96.6% of the cases who had positive HBV seroprevalence, at least one factor which was accepted as a risk factor for this disease was present. Although it was not statistically significant, HBV was reported to be more frequent in low socioeconomic level.¹⁴ However, in the present study, the rate of Anti-HBc positivity was higher among the cases with parents who had low education level and with sibling number 4 and more. Also there are studies which reported there was no significant relationship between seroprevalence and education level and sibling number.¹⁴ The rates of anti-HBc (+) were found to be lower in the adolescents with high-middle income, as compared to ones with low income and in the

cones who had social insurance when compared to ones who had no social insurance. In the study, which investigated the seroprevalence of HBV in general population in Erzurum in 2003, higher seroprevalence was detected in the ones who had low socioeconomic level compared to ones who had high socioeconomic level.¹⁴ HBV infection was reported to be more frequently seen in places with low socioeconomic level, bad sanitary conditions and crowded areas.¹⁷ However in our study no difference was detected among the ones who live in rural areas and in shanty houses where life and sanitary conditions are worse as compared to ones who live in urban areas and in domiciles other than shanty houses. As an assessment in terms of school attendance was done, together with the finding of lower anti-HBc positivity among the ones who attend school, compared to ones who do not; the difference among the groups were not in a statistically significance level.

In a study, which investigated HBV, HCV, HIV seroprevalence among the homeless people who had SUD and severe mental illness; 32.5% of the cases were detected to carry HBV. In the ones with schizophrenic disorder, the ratio for having the disease was determined to be 4 times greater.¹¹ HBV frequency was reported to be 23.4% in the ones with severe mental illness.¹⁸ In this study difference in terms of anti-HBc positivity was not found to be statistically significant among the ones who had comorbid disorder and who did not have.

SUD severity and the frequency of contamination with HBV were reported to be in a linear relationship. Shared injector and IVSU were reported to increase the risk for contamination with HBV 4 times.¹¹ In this study no difference among the groups were detected in terms of used substance types and firstly used substance types. A similar study should be conducted among adolescents with IVSU in the future.

During the last 20 years as well as the world also in Turkey important developments have occurred in terms of vaccination.⁵ Until 1998 any regular vaccination program for HBV has not been applied.¹⁴ Anti HBV vaccination ratios was reported to be less than the developed

countries. In the study of Ertekin et al. (2003), vaccination was found to be done only in the 2.9% of the cases.

In the United States since than 1995, vaccination of the group smaller than 18 years old was determined as a national strategy.¹⁹ Again in the same country, initiation of the application of vaccination and injector change programs resulted in a decrease of ratios for HBV infection.¹⁰ Between 1990 and 2005, ratio for being ill with HBV infection had decreased by 78%. The most decrease has been observed among the vaccinated children and adolescents (96%).²⁰ In the United States, in a study conducted with IVSU adolescents with a mean age of 22 yeras, 22% of the cases were determined to be immunized via vaccination. 28.2% of the adolescents with SUD and forensic problems were detected to be vaccinated against HBV and important amount of these children's vaccinations were done by the child justice system.¹⁵ In our study only 14.9% of the adolescents with SUD were determined to be immunized via vaccination. This is a low ratio. Inattention against the risk factors of HBV may result in irreversible social problems in the long term.²¹ These problems may be avoided by preventive medical services.¹⁵ Some new steps directed to minimize the harm (i.e. peer education, education about the use of clean and new injectors) are now being taken. Such practices could result in, even slight, some improvements.

CONCLUSION

HBV prevalence among substance using adolescents in our country is less than the cases in foreign countries. However, two important points should not be neglected when we are evaluating these results: HBV prevalence increases with age and IVSU is more frequent in the similar age group cases in foreign countries. HBV and SUD both are public health problems. By giving priority to the preventive medicine applications to people in the intersection area of these two problems, a vaccination program directed to the adolescents who are under risk should be planned.

REFERENCES

1. Novick DM, Haverkos HW, Teller DW. The medically ill substance abuser. JL Lowinson, P Ruiz, RB Millman, JG Langrod (Eds.), *Substance Abuse A Comprehensive Textbook*, third ed., Baltimore, Maryland, Williams and Wilkins, 1997, p.534-550.
2. Moradpour D, Wands JR. Understanding hepatitis B virus infection. *N Engl J Med* 1995; 332:1092-1093.
3. Lee WM. Hepatitis B virus infection. *N Engl J Med* 1997; 337:1733-1745.
4. Sidal M, Unuvar E, Oguz F, Cihan C, Onel D, Badur S. Age-specific seroepidemiology of hepatitis A, B, and E infections among children in Istanbul, Turkey. *Eur J Epidemiol* 2001; 17:141-144.
5. Badur S, Akgün A. Diagnosis of hepatitis B infections and monitoring of treatment. *J Clin Virol* 2001; 21:229-237.
6. Çullu F. Çocukluk çağında A, B, C hepatitleri. K Kılıçturgay, S Badur (Eds.), *Viral Hepatit*, İstanbul, Deniz Ofset, 2001, s.276-295.
7. Taşyaran MA. HBV enfeksiyonu epidemiyolojisi. K Kılıçturgay, S Badur (Eds.), *Viral Hepatit*, İstanbul, Deniz Ofset, 2001, s.121-128.
8. Mast EE, Weinbaum CM, Fiore AE, Alter MJ, Bell BP, Finelli L, et al. Advisory Committee on Immunization Practices (ACIP) Centers for Disease Control and Prevention (CDC). A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: immunization of adults. *MMWR Recomm Rep* 2006; 8:55(RR-16):1-33.
9. Lemberg BD, Shaw-Stiffel TA. Hepatic disease in injection drug users. PD Brown, DP Levine (Eds.), *Infections in Injection Drug Users. Infectious Disease Clinics of North America*, Philadelphia, W.B. Saunders, 2002, p.667-679.
10. Lum PJ, Hahn JA, Shafer KP, Evans JL, Davidson PJ, Stein E, et al. Hepatitis B virus infection and immunization status in a new generation of injection drug users in San Francisco. *J Viral Hepat* 2008; 15:229-236.
11. Klinkenberg WD, Caslyn RJ, Morse GA, Yonker RD, McCudden S, Ketema F, et al. Prevalence of human immunodeficiency virus, hepatitis b and hepatitis c among homeless persons with co-occurring severe mental illness and substance use disorders. *Compr Psychiatry* 2003; 44:293-302.
12. Yüncü Z, Özbaran B, Altıntoprak E, Yıldız U, Aydın C, Coşkunol H. Sokak yaşantısı olmayan madde kullanım bozukluğu olan ergenlerin klinik ve sosyodemografik özellikleri. *Türkiye'de Psikiyatri* 2007; 9:37-43.
13. Yüncü Z, Aydın C, Coşkunol H, Altıntoprak E, Bayram AT. Çocuk ve ergenlere yönelik bir bağımlılık merkezinin 2 yıllık poliklinik kayıtlarının değerlendirilmesi. *Bağımlılık Dergisi* 2006; 7:31-37.
14. Ertekin V, Selimoğlu MA, Altınkaynak S. Seroepidemiology of hepatitis B infection in an urban pediatric population in Turkey. *Public Health* 2003; 117:49-53.
15. Ogilvie EL, Veit F, Crofts N, Thompson SC. Hepatitis infection among adolescents resident in Melbourne Juvenile Justice Centre: risk factors and challenges. *J Adolesc Health* 1999; 25:46-51.
16. MacDonald M, Crofts N, Kaldor J. Transmission of hepatitis C virus: rates, routes, and cofactors. *Epidemiol Rev* 1996; 18:137-148.
17. Toukan AU, Sharaiha ZK, Abu-el-Rub OA, Hmoud MK, Dahbour SS, Abu-Hassan H, et al. The epidemiology of hepatitis B virus among family members in the Middle East. *Am J Epidemiol* 1990; 132:220-232.
18. Rosenberg SD, Goodman LA, Osher FC, Swartz MS, Essock SM, Butterfield MI. Prevalence of hepatitis B, and hepatitis C in people with severe mental illness. *Am J Public Health* 2001; 91:31-37.
19. Centers for Disease Control and Prevention. Hepatitis B vaccination coverage among adults-United States, 2004. *MMWR Morb Mortal Wkly Rep* 2006; 55:509-511.
20. Centers for Disease Control and Prevention. Acute hepatitis B among children and adolescents-United States, 1990-2002. *MMWR Morb Mortal Wkly Rep* 2004; 53:1015-1018.
21. Fuller C, Vlahov D, Ompad DC, Shah N, Arria A, Strathdee SA. High-risk behaviors associated with transition from illicit non-injection to injection drug use among adolescent and young adult drug users: a case-control study. *Drug Alcohol Depend* 2002; 66:189-198.