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ARAŞTIRMA YAZISI / *ORIGINAL ARTICLE*

Seroprevalence of Hepatitis B and Hepatitis C: A Community Based Study Conducted in İzmir, Turkey

Hepatit B ve Hepatit C Seroprevalansı: İzmir, Türkiye'de Yapılan bir Toplum Temelli Çalışma

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ABSTRACT

AIM: *To determine the seroprevalence rate and associated risk factors of hepatitis B and C virus infections in İzmir, Turkey.*

METHODS: *In this community-based cross-sectional study, 2737 healthy individuals over 14 years of age were included using a random sampling method. Serum samples were collected to study the presence of HBsAg, Anti-HBs, Anti-HBc total and Anti-HCV using the ELISA method. Data dealing with the socio-demographic characteristics and the risk factors for the infections was collected with a questionnaire.*

RESULTS: *HBsAg positivity was found in 2.8%. Anti-HBs positivity and Anti-HBc total seropositivity were determined in 32.4%and 31.4%, respectively. Anti-HCV positivity was found in 0.3%. Illiteracy, previous hepatitis history, and family history of hepatitis were risk factors for HBsAg seropositivity in İzmir. However, the risk factors did not affect the seropositivity rate of HCV.*

CONCLUSION: *İzmir has a lower intermediate endemicity for HBV infection. Socioeconomic and environmental risk factors are important for HBV infection.*

Key words: *hepatitis B; hepatitis C; prevalence*

ÖZET

AMAÇ: *İzmir, Türkiye'de hepatit B ve C virüsü enfeksiyonları seroprevalansı ve birlikte görülen risk faktörlerini belirlemek.*

YÖNTEM: *Bu toplum temelli çalışmada, randomize örnekleme yöntemiyle 2737 sağlıklı birey yer aldı. Serum örnekleri Elisa metoduyla HBsAg, Anti-HBs, Anti-HBc total ve Anti-HCV varlığını tespit için toplandı. Sosyo-demografik özellikler ve enfeksiyon için risk faktörü için veriler anket kullanılarak toplandı.*

BULGULAR: *HBsAg pozitivitesi %2,8 bulundu. Anti-HBs ve Anti-HBc total seropozitivite oranları sırasıyla %32,4 and %31,4'tü. Anti-HCV pozitivitesi ise %0,3'tü. Okur yazar olmamak, hepatit geçirmiş olmak ve aile hikayesinde hepatit olması, İzmir'de hepatit seropozitifliği için risk faktörü olarak bulundu. Ancak, risk faktörleri HCV seropozitiflik oranını etkilemedi.*

SONUÇ: *İzmir'de HBV enfeksiyonu düşük orta derecede endemiktir. Sosyoekonomik ve çevresel risk faktörleri HBV enfeksiyonu için önemlidir.*

Anahtar kelimeler: *hepatit B; hepatit C; prevalans*

Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are both considered as public health problems, and they are among the major causes of mortality and morbidity, particularly in developing countries. The fatality of these diseases is well known; 600.000 HBV-related deaths are estimated to occur annually and 73% of all liver cancer deaths worldwide are due to hepatitis viruses, with much higher proportions in low and middle income countries[1].

HBV has the potential to deteriorate the health seriously. With its carrier rate of 20%, it has become one of the most contagious agents threatening public health. Insufficient coverage of HBV vaccination, sharing blood-contaminated equipment by drug users, unsafe blood transfusions, and inadequate health precautions are major risk factors for hepatitis B virus infection in most developing countries[2,3].

Currently, 400 million individuals around the world are infected with hepatitis B. Approximately 40% of them are associated with cirrhosis or hepatocellular carcinoma. In addition, one third of the global population has been exposed to hepatitis B virus. Transmission routes of HBV can be classified in 4 major groups; parenteral,

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perinatal, horizontal and sexual. HBsAg infection levels have traditionally been described according to three categories of endemicity indicating the proportion of the population being seropositive for HBsAg as low (<2%), lower intermediate (2–4%), higher intermediate (5–7%) and high (≥8%)[1,4,5].

Clinical manifestations of acute icteric hepatitis may develop in about 25% of cases with HCV infection. In around 70% of infected cases (range 50–85%) chronic RNA positive disease develops. Cirrhosis develops over a 20-year period. The possibility of developing cirrhosis is less than 5% and 20% in cases infected before and after 40 years of age, respectively[6].

The role of HCV in chronic hepatitis has gradually increased in Turkey in recent years. Ökten reported that HBV infection is still important; however contribution of HCV has risen from 23% to 38.1% during the last decade. In other words, the contribution of HBV to cirrhosis decreased from 56.6% to 45.9% and the contribution of HCV rose from 25.2% to 45.9%[7,8].

Prevalence of HCV infection around the world is predicted to be around 2.2–3%. This means that approximately 130–170 million individuals are HCV-positive worldwide North America has the lowest HCV prevalence (less than 1%), in contrary countries with high prevalence are located in Asia and Africa[6,9].

HBsAg is the main clinical marker indicating acute or chronic infection. The prevalence and the endemicity of HBV infection is defined with the presence of HBsAg[1]. Antibodies against HCV are detected by sensitive and specific enzyme immunoassay tests to define the HCV infection[10].

The large reservoir of patients worldwide who are chronically infected with HBV creates an enormous disease burden[11]. Turkey is in a non-endemic area for HCV infection; however has an intermediate seroprevalence level for HBV infection. In a previous study, HBsAg and Anti-HCV antibodies were positive in 4.0% and 0.95% of the included 5471 Turkish subjects, respectively[12]. Turkish surveillance system notifies HBV and HCV; however inadequate notifications may exist. Durusoy reported laboratory notification rates of 12% and 1–4% for HBV and HCV, respectively[13].

In this study we aimed to determine the seroprevalence rate and associated risk factors of hepatitis B and C virus infections in İzmir, Turkey.

Methods

This community-based cross-sectional study was conducted in İzmir located in the Aegean region of Turkey, between January and March 2010. The study was approved by the Ethics Committee of the İzmir Provincial Directorate of Health. All participants gave written consents before filling the questionnaires.

Survey design and sample size

The population of İzmir was 3,739,353. The required responding sample size was calculated using the EpiInfo computer program (Centers for Disease Control and Prevention, Atlanta, Ga., USA). This led to a sample size of 2737 individuals with a confidence interval of 95%, a sample error of 2% and a design effect of 2, in case where the estimated seroprevalence of HBsAg was considered to be 2.5%.

There were a total of 29 counties in the province. The size of the sample in each stratum (county) was calculated in proportion to the population. A total of 2737 healthy individuals over 14 years of age living in İzmir, selected using data from the İzmir Health Directorate by a random selection method, were determined as the target group. In cases where these individuals were inaccessible or rejected participation in the study, two substitutes for each individual were determined, again using a random selection method.

There has been an HBV vaccination program for neonates in Turkey since 1998. This group of vaccinated young people were excluded.

The questionnaire included questions regarding socio-demographic characteristics (age, gender, place of abode, educational level, family size and the socioeconomic level) and risk factors related with hepatitis virus contamination.

Serology

Blood samples of 8cc were obtained from participants using the Vacuette® Standard tube holder (BD vacutainer, Becton Dickinson, UK). All samples were centrifuged and the isolated serum was stored at -20°C. Presence of HBsAg, Anti-HBs, Anti-HBc total and Anti-HCV were tested using the ELISA (Diasorin, Italy) method.

Statistical analysis

Data was evaluated using the SPSS 14.0 software program. Differences between personal characteristics

were evaluated in terms of seropositivity. In data analysis, the chi-square test was used. Multivariate logistic regression analyses were performed to identify risk factors for hepatitis B virus sero-markers. In this model, the significant variables from the univariate analysis were included. $p<0.05$ was considered significant.

Results

Socio-demographic characteristics of the 2737 participant were summarized in Table 1. Most individuals were living in urban areas. The mean age was 44.05±16.83 (15–94). Most of the participants were married women graduated from elementary school. They were housewives in the low income group. The household number was 4 (1–13).

HBsAg, Anti-HBs, Anti-HBc total and Anti-HCV were positive in 2.8% (n=85), 32.4% (n=886), 31.4% (n=860) and 0.3% (n=7) of the participants, respectively. Anti-HBc total alone (presence of Anti-HBc total in the absence of HBsAg and Anti-HBs) was found 11.8% (n=323). The rates of seroprevalence of hepatitis markers in gender and age groups are summarized in Graphs 1–4.

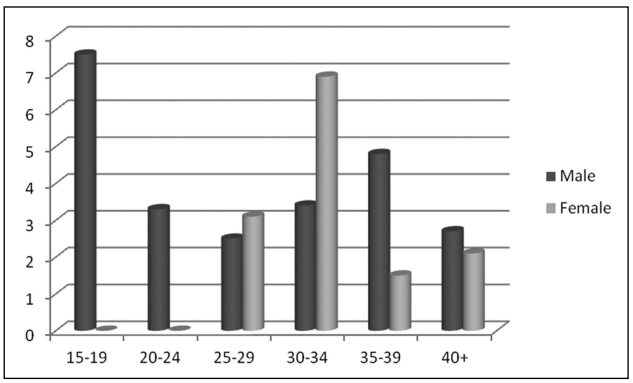
Risk factors associated with the presence of hepatic markers are summarized in Table 2. HBsAg positivity was correlated with education, income, age and family history of hepatitis ($p=0.001$), history of previous hepatitis or jaundice ($p<0.001$), and sharing contaminated equipments ($p=0.006$) (Table 2).

Anti-HBs positivity was correlated with education, income, age, area of abode, marital status, family history of hepatitis, and history of previous hepatitis or jaundice. Anti-HBc total positivity was higher among men, those who were illiterate, and in the lower income group. It was also associated with marriage, previous hepatitis and family history of hepatitis, history of surgery, history of ear piercing, and type of sexual relationship. Anti-HBc total alone was statistically associated with male gender, education, age, income, marriage, previous hepatitis and family history of hepatitis, history of surgery and dental therapy, and history of ear piercing (Table 3).

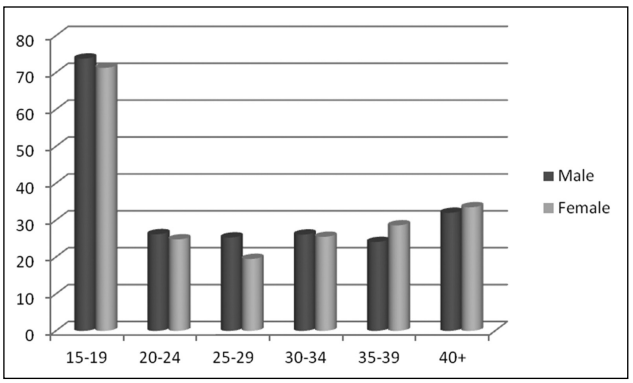
According to multivariate analysis, HBsAg seropositivity was higher in those illiterate, subjects with previous hepatitis history and with family history of hepatitis (Table 3). In addition, income, education, familial

Table 1. *Socio-demographic characteristics of the study population*

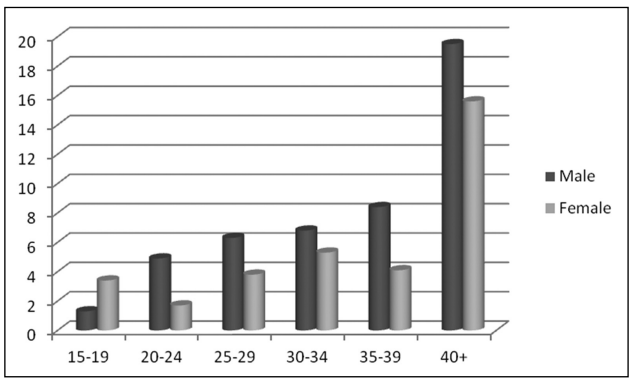
		N	(%)			N	(%)
Gender				Place of residence			
	Male	1020	(37.3)		Rural	851	(31.1)
	Female	1715	(62.7)		Urban	1886	(69.1)
Education				Occupation			
	Illiterate	228	(8.4)		Housewife	1140	(42.4)
	Primary School	1212	(44.7)		Retired	453	(16.6)
	Secondary School	310	(11.4)		Student	148	(5.4)
	High School	564	(20.8)		Client	134	(4.9)
	University	399	(14.7)		Worker	237	(8.7)
					Other	574	(21.4)
Marital status				Income / month			
	Married	2100	(76.7)		<1000	1624	(62.5)
	Single	485	(17.9)		1000–2000	683	(26.3)
	Divorced / Widowed	119	(4.4)		>2000	290	(11.2)
Number of household				Age group			
	1–4	2127	(78.9)		15–19	167	(6.1)
	5–9	545	(20.2)		20–24	182	(6.6)
	10+	24	(0.9)		25–29	238	(8.7)
					30–34	276	(10.1)
					35–39	279	(10.2)
					40+	1559	(57.0)



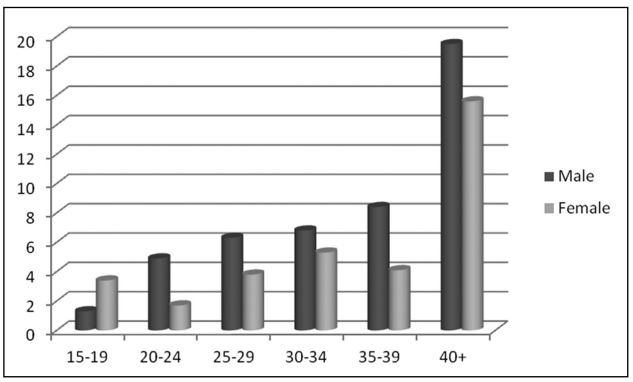
Graph 1. *HBsAg seroprevalence analyzed using age groups and gender.*



Graph 2. *Anti-HBs seroprevalence analyzed using age groups and gender.*



Graph 3. *Anti-HBc seroprevalence analyzed using age groups and gender.*



Graph 4. *Anti-HBc total alone seroprevalence analyzed using age groups and gender.*

Table 2. *Distribution of risk factors for hepatic infection*

	Yes		No	
	N	(%)	N	(%)
History of hepatitis / jaundice	283	(10.4)	2253	(83.1)
Family history of jaundice	497	(18.4)	2070	(76.5)
Staying in communal places	1135	(50.2)	1094	(48.4)
History of surgery	1299	(48.1)	1371	(50.8)
Dental therapy	2072	(76.5)	632	(23.3)
Blood/blood products	134	(9.3)	1272	(88.4)
Being blood brothers	223	(8.4)	2333	(87.5)
Dialysis	7	(1.6)	442	(98.4)
Injecting drug/serum	1830	(67.5)	838	(30.9)
Sharing tooth brush at home	845	(31.2)	1997	(68.6)
Ear-piercing	1634	(60.6)	1064	(39.4)
Tattoo/piercing	73	(2.7)	2600	(97.2)
Manicure/pedicure	355	(12.3)	2325	(87.7)
Shared razor in barber	341	(14.1)	2077	(85.9)
Continuous intravenous drug	34	(1.3)	2670	(98.8)

Sexual activity	Monogamous		Polygamous		Inactive	
	N	(%)	N	(%)	N	(%)
	2034	(78.3)	46	(1.7)	536	(20.0)

*Significant, univariate analysis (P<0.005)

Table 3. *Logistic regression to analyze the relation of risk factors with the markers. P value <0.05 was considered significant.*

	HBsAg	Anti-HBs	Anti-HBc total	Anti-HBc total alone
History of hepatitis	<0.001	0.231	<0.001	0.001
Family history of hepatitis	<0.001	<0.001	0.004	0.116
Manicure/pedicure	0.532	–	–	–
Shared razor in barber	0.339	–	–	–
Education	0.020	0.005	<0.001	0.033
Income	0.113	<0.001	0.001	0.001
Age group	0.199	<0.001	0.757	<0.001
Marital status	–	0.639	0.961	0.863
Place of residence	–	0.175	<0.001	–
History of surgery	–	–	0.380	0.178
Previous dental therapy	–	–	0.453	0.548
History of ear pearcing	–	–	0.999	0.994
Sexual preference	–	–	0.606	–
Gender	–	–	<0.001	0.320
Constant	0.076	0.001	<0.001	<0.001

history of hepatitis and age were all significantly associated with Anti-HBs positivity.

Male gender, illiteracy, lower income and urban residency, history of jaundice or hepatitis and family history of hepatitis were significant risk factors for Anti-HBc total positivity. Risk factors for Anti-HBc total alone were illiteracy, lower income, older age and previous hepatitis history.

No relationship was found between HCV prevalence and socio-demographic characteristics and risk factors.

Discussion

The prevalence of HBsAg of 2.8% in İzmir was in lower intermediate range. Community-based studies dealing with the rate of HBsAg in İzmir are limited. Yazan-Sertöz et al. from İzmir determined that HBsAg positivity rate in 4537 blood donors was 2.3%[14]. Afşar et al. reported that 1.38% of blood donors had HBsAg positivity[15]. Köse et al. reported that 2.2% of the barbers and hairdressing employees in İzmir were positive for HBsAg and 0.4% of them were positive for Anti-HCV[16].

In a meta-analysis performed by Mıstık et al., the HBsAg positivity rate was reported as 5.1% in approximately 5,420,125 units of blood collected by Red Cross blood centres in 13 years[5]. The community-based studies conducted in Turkey reported various seroprevalence rates. In a study conducted by Kurt et al. the rate of HBsAg positivity was 5.5% among 3515 healthy individuals[17]. Yıldırım et al. found that HBsAg positivity was 5.5% in their study population selected using a random method in Tokat[18]. The seroprevalence of HBsAg was 7.0% in the south-eastern region of Turkey[19]. HBsAg positivity was 2.85% in Bolu[20]. The prevalence of HBsAg, Anti-HBc total and Anti-HBs was found to be 6.0%, 29.3%, and 30.3% respectively, in Malatya[21].

History of previous hepatitis and family history of hepatitis were risk factors for having HBsAg positivity. Similar results were found in some studies conducted in developing countries[22,23]. According to a prevalence study in Turkey, living in urban areas, living in south-eastern region of Turkey, being male, having close contact with an infected person, undergoing oral and dental interventions, having a history of transfusion, begin married, and history of travel abroad are the most common risk factors for Hepatitis B transmission[12]. Kurcer reported that HBV infection was independently associated with the age of 21 or higher, illiteracy, being

farmer and worker, and having multiple sexual partners[21]. Dursun et al. determined that the highest HBV infection prevalence was in the older age group and families with a history of jaundice [24].

Anti-HBc total alone was found in 11.8% in our study. Ramezani et al. described that occult HBV infection is characterised by the presence of HBV infection without detectable HBsAg. These authors found that 2.07% of blood donors had Anti-HBc total alone [25]. Shi et al. suggested that occult HBV infection was associated with an increased risk of hepatocellular carcinoma[26].

In our study Anti-HBs positivity was 31.4%. Esfani reported that many years after recovery from acute hepatitis B, Anti-HBs had fallen to undetectable levels; and after many years of chronic HBV infection, the HBsAg titre had decreased below the detection cut off level[27].

Anti-HBc total alone was found in 11.8 % in our study. A few investigators have analysed Anti-HBc total alone in Turkey. The isolated Anti-HBc total seroprevalence rate was found to be 12.1% in Tokat[18] and 6.1% in Afyon[28]. There are several explanations for an isolated Anti-HBc total positivity, such as remote HBV infection and Anti-HBs that are no longer detectable or recent recovery from acute infection or undetectable levels of HBsAg in chronically infected patients or false positives[29].

In our study, Anti-HCV prevalence was 0.3%. Yildirim et al. determined that Anti-HCV prevalence was 2.1% among healthy individuals in Tokat[18]. Anti-HCV positivity was found to be 0.6% in the south-eastern region of Anatolia[25]. Akcam et al. reported that 1.0% of people were Anti-HCV positive in rural areas of the south-western region of Turkey[30].

HCV infection varies according to geographic regions and time. Anti-HCV seroprevalence was reported as 0.54% in a total of 1,076,495 units of blood[1]. In the study conducted in an İzmir hospital, the prevalence of Anti-HCV among blood donors was 0.42%[16]. Similarly, Yazan-Sertöz et al. found a 0.3% rate of Anti-HCV positivity among 4537 blood donors in İzmir[14]. Among blood donors, 0.35% had Anti-HCV positivity in İzmir[15].

We could not demonstrate any factor that might play a role in HCV transmission. Similar results were found by Dursun et al.[24]. Akcam determined that Anti-HCV positivity was higher in hospitalized individuals[30].

In our study, blood transfusion was not a risk factor for HBV and HCV. All blood donors in Turkey are mandatorily screened for HBV and HCV. Mandatory premarital hepatitis screening is also implemented in Turkey.

There were some limitations of the study. The questions relating to risk factors, especially regarding sexual preference and narcotic drug use might have been answered inaccurately.

Integrating HBV vaccination into the national immunisation programs and providing safe, effective treatment of HBV infection were efficient preventive measures and they were important for reducing the associated HBV-related morbidity and mortality.

The results indicate that the study area has a lower intermediate endemicity for HBV infection.

Conflict of Interest Disclosure

There is no conflict of interest.

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