

1-1-2011

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Recommended Citation

ÖNER, SEVA; YAPICI, GÜLÇİN; ŞAŞMAZ, CAFERİ TAYYAR; KURT, AHMET ÖNER; and BUĞDAYCI, RESUL (2011) "Hepatitis B, hepatitis C, HIV, and VDRL seroprevalence of blood donors in Mersin, Turkey," *Turkish Journal of Medical Sciences*: Vol. 41: No. 2, Article 20. <https://doi.org/10.3906/sag-0906-64>
Available at: <https://journals.tubitak.gov.tr/medical/vol41/iss2/20>

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Hepatitis B, hepatitis C, HIV, and VDRL seroprevalence of blood donors in Mersin, Turkey*

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Aim: The aim of this study was to determine the seroprevalence and affecting factors of Hepatitis B surface antigen (HbsAg), hepatitis C virus antibody (anti-HCV), anti human immunodeficiency virus (anti-HIV), and VDRL in blood donors in Mersin.

Materials and methods: This was a retrospective, descriptive study. All blood centers in Mersin were included in the study. The medical records of 30,716 blood donors were evaluated. The data were analyzed using descriptive analysis, linear-by-linear association test, and the Pearson chi-square significance test.

Results: Of the donors, 691 (2.2%) had positive HbsAg, 125 (0.4%) had positive anti-HCV, and 46 (0.1%) had positive VDRL test. The confirmation test was positive in 1 participant out of 54 (0.2%), whose anti-HIV test was positive. Of the participants, 862 (2.8%) showed at least 1 positive test result. In one participant, both HbsAg and anti-HCV tests were positive.

Conclusion: There was at least 1 blood-borne disease seropositivity in 2.8% of the donors. Seroprevalence increased with age in males.

Key words: Blood donors, HbsAg, anti-HCV, anti-HIV, VDRL

Mersin, Türkiye’de kan donörlerinde hepatitis B, hepatitis C, HIV ve VDRL seroprevalansı

Amaç: Bu çalışmanın amacı, Mersin’de kan donörlerinde Hepatitis B surface antigen (HbsAg), Hepatitis C virus antibody (anti-HCV), anti Human Immunodeficiency Virus (anti-HIV) ve VDRL seroprevalanslarını ve etkileyen faktörleri belirlemektir.

Yöntem ve gereç: Bu çalışma retrospektif tanımlayıcı bir çalışmadır. Çalışmaya Mersin’deki tüm kan merkezleri alındı ve 30716 donörün kayıtları değerlendirildi. Verilerin analizinde tanımlayıcı istatistikler, Linear by linear association test ve Pearson Ki-kare önemlilik testleri kullanıldı.

Bulgular: Donörlerin 691’inde (% 2,2) HbsAg pozitif, 125’inde (% 0,4) anti-HCV pozitif, 46’sında (% 0,1) VDRL pozitif. Anti-HIV pozitif olan 54 kişinin (% 0,2) birinde doğrulama testi pozitif. Araştırmaya alınanların 862’sinde (% 2,8) en az bir tane test pozitifliği vardı. Bir kişide hem HbsAg hemde anti-HCV pozitifliği.

Sonuç: Donörlerin % 2,8’inde en az bir kanla bulaşan enfeksiyon seropozitifliği tespit edilmiştir. Seroprevalans erkeklerde yaşla beraber artmaktadır.

Anahtar sözcükler: Kan donörleri, HbsAg, anti HCV, anti HIV, VDRL

Received: 26.06.2009 – Accepted: 11.06.2010

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* This project was presented in Xlth National Public Health Congress as poster presentation.

Introduction

Medical treatment aims at rescuing lives and health promotion. However, medical treatment methods may sometimes be directly or indirectly harmful for the patients and may even cause death (1). One out of 2 people in the world needs blood transfusion at least once or more. Some of the clinical conditions where blood transfusion is necessary are surgical and traumatic causes, leukemia, thalassemia, hemophilia, severe anemia, and pregnancy complications. The last 2 are more common causes in developing countries (2).

World Health Organization (WHO) Global Database on Blood Safety report for 2000-2001 stated that 500,000 women died during pregnancy or withing 12 months after delivery. Of these deaths, 25% were due to massive obstetrical bleeding. Road traffic accidents were the second leading cause for serious injuries in the 5-29 age group. These causes increase the need for blood transfusion due to traumatic reasons (3).

Albeit the vital importance of transfusion, transfusion related diseases may be life-threatening. Hepatitis was the first disease related to transfusion and was first described by Beeson in 1943. Hepatitis B virus (HBV) antigen was found in 1965, hepatitis A virus (HAV) was identified in 1973, and hepatitis C virus (HCV) was found in 1988. In order to prevent transmission of these diseases by transfusion, Food and Drug Administration (FDA) of the United States of America recommends serological tests in all donors of whole blood and its components for syphilis, HbsAg, anti-human immunodeficiency virus (anti-HIV), anti-human T-lymphotropic virus (HTLV)-1, and anti-HCV, and anti-hepatitis B core antigen (antiHbc) (4).

WHO estimates that approximately 2 billion people are infected by HBV in the world and that 350 million are chronic HBV carriers. Each year 4 million acute clinical cases are seen in the world and 25% of these become carriers, potential sources of infection. One million people die every year due to chronic active hepatitis, cirrhosis, or primary liver carcinoma (5). WHO estimates that 3% of the world population has HCV infection. There are 4 million carriers only in Europe (6).

It was estimated that there were 2.2 million people with HIV/AIDS in 52 European countries by the end of 2005 and of these 1.6 million were living in Eastern Europe and Middle Asia countries (7). It was estimated that 45 million new HIV infections would occur by 2010 in the world. If precautions are neglected, more than 4 million of these infection cases will be caused by healthcare services (unsafe blood transfusion, injections, and other interventions) (1). Of HIV infections in the world, 5%-10% is transmitted by contaminated blood and blood products (8).

In developed countries, 94% of blood is collected from non-remunerated volunteers, whereas in the countries with low or medium income, more than 43% of the donors are remunerated or are family/replacement donors (3). According to the Turkish legislation of blood and blood products, which was put into practice in 1983, it is obligatory to examine all donated blood for HbsAg, VDRL/RPR, and malaria. In 1985, anti-HIV and in 1996, anti-HCV were added to the list. In 1997, malaria was excluded from the list of screened infections. Today, it is obligatory to examine all donor blood for HbsAg, anti-HCV, anti-HIV, and VDRL, and to complete a donor questionnaire (9).

The aim of this study was to determine the seroprevalence and the affecting factors for HbsAg, anti-HCV, anti-HIV, and VDRL in blood donors in Mersin.

Materials and methods

This study was conducted between November 2006 and February 2008 in Mersin, a southern city of Turkey in the Mediterranean region. The study was approved by the Local Ethics Committee and other official institutions. This investigation was planned as a retrospective descriptive study based on official records. Seven centers (Blood Centers of Mersin University Faculty of Medicine Hospital, Mersin, Toros, Erdemli, Silifke, and Tarsus State Hospitals, and Mersin Red Crescent Blood Center) were included in the study. The donor forms and serological test results of all donors between January 1, 2006 and December 31, 2006 were assessed.

Evaluation stages of individuals applying for donation in blood centers:

Filling out the Donor Query Form: A form inquiring about the following details is filled by the donors: the general health of the donor, phobias about needle, blood, etc., donation history in the last 2 or 3 months, vaccine, medication, dental interventions, medical care in the last year, history of chronic diseases, blood and blood products transfusion in the last year or organ transplantation, operation, rabies vaccination, cancer, hematological disease, hemorrhagic diathesis, hepatitis, tuberculosis, malaria, syphilis, AIDS, psoriasis, history of acne, drug addiction, history of risky sexual behavior, tattooing, acupuncture, history of ear-piercing, receiving growth hormone, rapid weight loss and history of unexpected disease findings, abortus, curettage and history of pregnancy for women. Information is evaluated by a physician. The donation is then accepted, temporarily rejected, or permanently rejected. Physical examination and laboratory analysis of the accepted donors are performed and recorded onto the donor form.

Donor Record Form: This form includes socio-demographic information, such as city of birth, age, blood type, address, sex, education, profession, marital status, being a relative of the patient receiving the transfusion or a voluntary donor, donation number, date of the last donation, information of received blood quantity and type, place of donation: in a centre or in an ambulatory service, information of screening test results, reason for not using the donation (if not used), weight, body temperature, pulse rate, blood pressure, hemoglobin, hematocrit, leukocyte, and platelet count, physical examination, and laboratory findings.

Donor Record Form Evaluation: The donor age should be between 18 and 65 years. The intervals between whole blood donations should be at least 2 months.

On physical examination, the donor should be 50 kg or over, body temperature should not be over 37.5 °C, cardiac pulse rate should range between 50 and 100/min; systolic blood pressure should be between 100 mmHg and 180 mmHg. Diastolic blood pressure should be between 50 mmHg and 100 mmHg. Injection sites showing intravenous drug addiction or erythema are investigated. In case these findings exist and if the donor exhibits narcotic drug or alcohol intoxication findings, she/he is rejected.

Laboratory: Minimum level for hemoglobin is 12.5 g/dL, and for hematocrit it is 38%. The leukocyte count should be at between 5000 and 10,000/mm³.

Blood donation is acquired from accepted individuals and donated blood is tested for HbsAg, anti-HCV, anti-HIV, and syphilis (VDRL or RPR card test). Confirmatory test is performed on blood that is found to be reactive. Blood reactive for anti-HIV is sent to Refik Saydam Hygiene Centre for Western Blot confirmation test. If the result is reactive, the test results are sent to the provincial directorate of health, while the individual is informed and referred to the infectious diseases clinic. On confirmation of other reactive tests, the same serum sample is studied again using the same method. If the repeated result is negative, a third test is performed; when the result comes out to be negative at 2 consecutive tests, the result is accepted as “negative”. When the repeated result is reactive again, it is accepted as “reactive”. Test results are recorded onto serology record forms along with identity information. Reactive results are also reported to the provincial directorate of health and the individual is informed and referred to the infectious disease clinic.

In our study, donor record forms, socio-demographic details (sex, age, educational, occupational and marital status, blood group, and being a volunteer or patient relative), and the number of donations were recorded onto computer. The results of HbsAg, anti-HCV, anti-HIV, and VDRL were recorded using the serological test results registry. All data of 30,723 donors were installed using a computer. Seven individuals, whose laboratory results could not be located, were excluded from the study. Analysis was performed using the data that belonged to 30,716 donors.

The classification and definitions used in the study: With regard to professions of the donors, housewives, students, and unemployed individuals are classified as “unemployed”.

Statistical analysis

Data were analyzed using the descriptive analysis, linear-by-linear association test, and the Pearson chi-square significance test for comparison of variables. The level of significance was set as $P \leq 0.05$.

Results

Of the 30,716 donors, 29,587 (96.3%) were male, and 1129 (3.7%) were female. The mean age of the donors was 34.6 ± 10.0 (min = 18, max = 65); 10,071 (32.8%) were in the 18-29 age group, and 8825 (28.7%) were ≥ 40 years of age. It was observed that 3315 (53.0%) were primary school graduates, 1045 (16.7%) were university graduates, 2817 (74.7%) were married, 2146 (46.0%) were traders, and 1213 (26.0%) were workers; 548 (8.3%) donated for the first time, 6060 (91.7%) for second time or more, 7705 (28.8%) were volunteers, and 19,094 (71.2%) were patient relatives (Table 1).

While 691 (2.2%) donors were tested positive for HbsAg, 125 (0.4%) tested positive for anti-HCV, and 46 (0.1%) tested positive for VDRL. Of the 54 (0.2%) participants whose anti-HIV tests were positive, only 1 showed a positive confirmation test. Among the donors, 862 (2.8%) showed at least 1 positive test result. In 1 patient, both HbsAg and anti-HCV tests were positive.

The anti-HCV positivity was higher in unemployed participants than in other occupational groups ($P < 0.001$, $\chi^2 = 26.5$).

A positive HbsAg result or any other positive result was more common in donors in Mersin city center than in donors of the other towns ($P = 0.002$, $\chi^2 = 14.8$, $P = 0.003$, $\chi^2 = 13.9$). The probability of any positive test result increased in men as the age increased ($P = 0.046$, linear-by-linear association = 6.2). This trend was not valid for women.

There was no significant relationship between a positive result for HbsAg, anti-HCV, anti-HIV and VDRL/RPR tests and age groups, sex, educational status, marital status, and the number of donations (Table 2).

Discussion

Majority of the donors (96.3%) were male. This was 51.5% in the USA, 52.9% in Georgia, 93% in Jordan, and 91% in Kuwait (10-13). In Turkey, women are usually housewives and this may lead them to avoid outdoor activities. Moreover, women have lower hemoglobin levels and a higher number of vasovagal reactions. This may cause the high rate of refusal for women donors.

Table 1. Demographic characteristics and reason and number of donations.

Demographic details	n	%
Sex (n = 30,716)		
Male	29,587	96.3
Female	1129	3.7
Age groups (n = 28,395)		
18-29	10,071	35.5
30-39	9499	33.4
≥ 40	8825	31.1
Educational status (n = 6253)		
Primary school	3315	53.0
High school	1893	30.3
University	1045	16.7
Marital status (n = 3769)		
Married	2817	74.7
Single	952	25.3
Occupational status (n = 4664)		
Unemployed	202	4.3
Government employee	811	17.4
Worker	1213	26.0
Trader	2146	46.0
Technician	292	6.3
Number of donations (n = 6608)		
The first time	548	8.3
≥ 2	6060	91.7
Reason for donation (n = 26,799)		
Volunteer	7705	28.8
Patient relative	19,094	71.2
Region (n = 30,716)		
Mersin city centre	27,132	88.3
Silifke	1834	6.0
Tarsus	999	3.3
Erdemli	751	2.4

The HbsAg prevalence was reported as 3.4% in Georgia, 1.7% in Jordan, 1.1%-3.5% in Kuwait, 2.16% in Pakistan, and 2.1% in Achaia in southwest Greece (11-15). The WHO declared that Turkey is an intermediate (2%-7%) endemic region for hepatitis B carriers (6). In a national study, Emekdas et al. found that HbsAg positivity was 4.19% (2.4-11.5%) in 6,240,130 donors in 22 blood centers between 1996 and 2004 (16). In other regional studies, this rate was found to be 2.5%-8.7%, while it was 2.4%-9.1% in community-based studies (17-27). Our results are consistent with these studies.

Table 2. Distribution of positive test results by independent variables.

		HBSAg		Anti HCV		VDRL		Any positive test result	
		n	%**	n	%**	n	%**	n	%**
Sex									
Male	n = 29,587	665	2.2	122	0.4	46	0.2	833	2.8
Female	n = 1129	26	2.3	3	0.3	0	0.0	29	2.6
Age groups									
18-29	n = 10,071	208	2.1	40	0.4	9	0.1	257	2.6
30-39	n = 9499	208	2.2	37	0.4	19	0.2	264	2.8
≥40	n = 8825	224	2.5	34	0.4	16	0.2	275	3.1
Educational status									
Primary school	n = 3315	73	2.2	8	0.2	6	0.2	87	2.6
High school	n = 1893	34	1.8	4	0.2	3	0.2	41	2.2
University	n = 1045	17	1.6	4	0.4	1	0.1	22	2.1
Marital status									
Married	n = 2817	57	2.0	9	0.3	5	0.2	71	2.5
Single	n = 952	24	2.5	4	0.4	0	0.0	28	2.9
Occupational status									
Unemployed*	n = 202	4	2.0	4	2.0*	0	0.0	8	4.0
Government employee	n = 811	11	1.4	3	0.4	2	0.2	16	2.0
Worker	n = 1213	26	2.1	2	0.2	2	0.2	30	2.5
Trader	n = 2146	42	2.0	2	0.1	5	0.2	49	2.3
Technician	n = 292	3	1.0	1	0.3	0	0.0	4	1.4
Number of donations									
The first time	n = 548	8	1.5	1	0.2	0	0.0	9	1.6
≥2	n = 6060	160	2.6	21	0.3	3	0.0	185	3.1
Reason for donation									
Volunteer	n = 7705	199	2.6	27	0.4	3	0.0	230	3.0
Patient relative	n = 19,094	404	2.1	78	0.4	36	0.2	517	2.7
Region									
Mersin city centre*	n = 27,132	642	2.4*	115	0.4	39	0.1	796	2.9*
Tarsus	n = 1834	27	1.5	4	0.2	2	0.1	33	1.8
Silifke	n = 999	11	1.1	4	0.4	3	0.3	18	1.8
Erdemli	n = 751	11	1.5	2	0.3	2	0.3	15	2.0

*P < 0.05 ** : Percent of row

We found that HbsAg or any other positive results were higher in donors in the Mersin city centre than those donors in other towns. In a national field study, HbsAg positivity was found as 2.6% in rural and 2.85% in urban regions (23), which is in line with the findings of the current study.

The major risk factor for Hepatitis C is parenteral exposure, primarily due to blood products and needle sharing in drug addicts. The WHO has stated anti-HCV positivity as 0.3%-0.5% in volunteer donors in the USA. The Far East, the Mediterranean, Africa and the East European countries are regions with

high prevalence of anti-HCV. It has been reported that 20% of blood donors in Egypt have anti-HCV positivity. This figure is over 5% in some communities in Italy, 6.9% in Georgia, 4.2% in Pakistan, 2.1% in Kuwait, and 0.5% in Greece (7,11,13-15). Turkey is a low endemic region for HCV. Anti-HCV positivity is lower than HBsAg positivity. Emekdas et al. found anti-HCV positivity as 0.41% (0.21%-0.95%) (16). In Turkey, anti-HCV prevalence was determined to be 0.02%-5.2% in donor studies, whereas it was 0.02%-2.6% in field studies (17-21,24,26,28). We found higher anti-HCV positivity in unemployed individuals than in other occupational groups. This result may be coincidental as the number of participants with occupational data was very few.

The prevalence for syphilis was 2.4% in donors in Georgia, and 0.75% in Pakistan (11,14). In Turkey, the prevalence of syphilis was determined as 0.02% in Kocaeli, 0.31% in Çanakkale, and 0.47% in Trabzon provinces (17-19). There was no positive result in a study in Mersin (20). We found VDRL test positivity as 0.1% in our study.

Anti-HIV positivity was found in 3 out of 4970 donors in Georgia, in 1 out of 26,874 donors in Kuwait, in 0.004% in Pakistan, and in 6.2 in 100,000 person-years in Canada (11,13,14,29). In national studies, anti-HIV prevalence was found to be quite low. In a study in Trabzon, 20 donors out of 33,766 donors had suspected anti-HIV, 3 out of 5350 donors in Afyon, and 8 out of 29,049 donors in Kocaeli had anti-HIV positivity; however, they gave negative test results in the confirmation tests (17,19,21). There was no anti-HIV positive donor in a study in Çanakkale (18). A previous study in Mersin revealed that 0.13% of the donors had anti-HIV positivity and negative results for anti-HIV confirmation test (20). In our study, 0.2% had anti-HIV positivity, and 1 donor showed a positive result in the anti-HIV confirmation test. Our results were consistent with other national studies.

Previous studies found that the incidence of blood-transmitted infections was 2 or 3 times higher in first-time donors than multi-time donors (29,30).

We found no correlation between the number of blood donation and the prevalence of blood-borne disease.

Gogos et al. found higher infection rates in males than females (15). In Turkey, Altındis et al. did not find a sex difference (26). In our study, there were no significant differences in the results for HbsAg, anti-HCV, anti-HIV and VDRL/RPR tests by gender. However, positive test results were higher as the age increased in males. This trend was not observed in females. The reason for this may be the exposure to risks being more common in males.

WHO recommend that voluntary, unremunerated blood donors from low risk population are selected for blood donation. Family/replacement and paid blood donation are associated with higher prevalence of transfusion-transmitted infections (8). However, family/replacement blood donors systems are applied in many countries. It was reported that 84.7% of donations in Kuwait were for the purpose of replacement, and 15.3% of donors were volunteers (13). In Pakistan, 99% of donors were patient relatives or friends (14). In our study, 71.2% of donors were patient relatives and 28.8% were volunteers.

We believe that the community should be educated regarding the prevention from blood-borne and sexually transmitted diseases, and voluntary donation should be promoted by active studies in order to attenuate transfusion-related infections. Nevertheless, since women are in the low risk group, we think that it would be beneficial to include women in these studies intensively.

The limitation of our study is due to lack of information in the donor query forms, some variables could only be evaluated in limited numbers.

Acknowledgements

We would like to thank the directors of blood centers in Mersin University Faculty of Medicine Hospital, Mersin, Toros, Tarsus, Erdemli, and Silifke State Hospitals, and Mersin Red Crescent Blood Center for their support in data collection.

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