

# Seroprevalence of hepatitis B and C among barbers and their clients in the Rabat region of Morocco

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## الانتشار المصلي لالتهاب الكبد "بي" و"سي" في الحلاقين وزبائنهم في منطقة الرباط بالمغرب

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**الخلاصة:** أجريت دراسة مستعرضة في منطقة الرباط - سلا - زمور - زعير في المغرب عام 2007 على 267 حلاقاً و529 من زبائنهم، جميعهم من الرجال وليس لديهم سابقة تلقيح ضد فيروس التهاب الكبد "بي". وقد بلغ إجمالي معدل انتشار إيجابية المصل لفيروس التهاب الكبد "بي" بين الحلاقين 28.1٪، و25.1٪ بين الزبائن؛ وبلغ انتشار إيجابية المصل للمستضد السطحي لفيروس التهاب الكبد "بي" بين الحلاقين 1.9٪، و1.7٪ بين الزبائن. واشتملت عوامل اختطار الإصابة بفيروس التهاب الكبد "بي" كبر العمر، وانخفاض مستوى التعليم، والمعيشة في المناطق الحضرية، والزواج، وسوابق نقل الدم، وعدم وجود علاقات جنسية مغايرة، والأعراض المرضية ذات الصلة بالكبد. ودلت المشاهدات على أن إيجابية المصل لفيروس التهاب الكبد "بي" كانت أقل في دكاكين الحلاقة النظيفة والتي تستخدم الشب كمطهر. وبلغ معدل التفاعل السلسلي للبوليميراز لفيروس التهاب الكبد "سي" في الحلاقين 1.1٪ وفي الزبائن 1.3٪ فقط، وارتبط ذلك بزيادة العمر، وإدمان المخدرات، وسوابق إجراء الجراحات، وأعراض مرض الكبد. ولم يكن الحلاقون وعي بأن فيروس التهاب الكبد "بي" و"سي" هما عاملان مسببان لمرض الكبد أو اليرقان، اللهم إلا أقل من 1٪ منهم.

**ABSTRACT** A cross-sectional seroepidemiological study was conducted in the Rabat-Salé-Zemmour-Zaër region of Morocco in 2007 among 267 barbers and 529 clients, all men with no history of hepatitis B (HBV) vaccination. The overall prevalence of HBV seropositivity was 28.1% in barbers and 25.1% in clients; 1.9% and 1.7% respectively had active HBV (HBsAg positive). Risk factors for HBV included older age, low educational level, urban living, being married, history of transfusion, lack of current heterosexual relationship and liver-associated symptoms. Observations showed that HBV seropositivity was lower in clean barbershops and those using alum as an antiseptic. The rate of PCR-confirmed hepatitis C virus (HCV) was only 1.1% and 1.3% in barbers and clients respectively, and was associated with increased age, drug use, history of surgery and symptoms of liver disease. Less than 1% of barbers were aware of HBV or HCV as causative agents of liver disease or jaundice.

## Séroprévalence de l'hépatite B et C chez les barbiers et leurs clients dans la Région de Rabat (Maroc)

**RÉSUMÉ** Une étude séro-épidémiologique transversale a été menée dans la Région de Rabat-Salé-Zemmour-Zaër (Maroc) en 2007 auprès de 267 barbiers et 529 clients. Aucun d'entre eux n'avait été vacciné contre l'hépatite B. La prévalence globale de la séropositivité pour l'hépatite B était de 28,1 % chez les barbiers et 25,1 % chez les clients ; 1,9 % et 1,7 % d'entre eux respectivement étaient porteurs d'une infection active par le virus de l'hépatite B (Ag HBs positifs). Les facteurs de risque pour le virus de l'hépatite B comprenaient un âge avancé, un niveau d'études faible, un lieu de résidence urbain, le fait d'être marié, des antécédents de transfusion sanguine, l'absence de relation hétérosexuelle au moment de l'étude et la présence de symptômes hépatiques. Les observations ont révélé que la séropositivité pour l'hépatite B était plus faible dans les établissements propres et dans les salons utilisant de l'alun en antiseptique. Le taux des infections par le virus de l'hépatite C confirmées par amplification génique (PCR) était de seulement 1,1 %, et 1,3 % chez les barbiers et les clients, respectivement, et était associé à un âge avancé, la consommation de drogues, des antécédents de chirurgie et les symptômes d'une affection hépatique. Moins d'un pour cent (1 %) des barbiers savaient que les virus de l'hépatite B et C étaient des agents pathogènes des affections hépatiques et des ictères.

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## Introduction

Hepatitis B (HBV) and C virus (HCV) infections are a serious global public health problem [1,2]. They are leading causes of chronic hepatitis, cirrhosis and hepatocellular carcinoma [3,4]. Worldwide, 2 billion people have been infected with HBV over their lifetime; of these, more than 350 million have chronic infection [2]. An estimated 170 million persons are chronically infected with HCV, and 3 to 4 million are newly infected each year [1]. Although treatment regimens exist for HBV and HCV, their efficacy is suboptimal, and problems with the cost and availability limits their use in low-resource settings [5]. Therefore, prevention is the best, and sometimes only, strategy for combating HBV and HCV. HBV vaccination is 95% effective in preventing HBV, but there is currently no effective vaccine against HCV.

In Morocco, HBV vaccination was introduced in 1999, and today, over 90% of infants are vaccinated. However, adults are still at risk for both HBV and HCV. In particular, acquisition and transmission of bloodborne pathogens has been shown to be an occupational risk among traditional barbers in many countries [6–12]. In Morocco, barbers are commonly exposed inadvertently to the blood and body fluids of their customers [13,14]. The objectives of our study were to determine the prevalence of HBV and HCV among traditional barbers and their clients in the Rabat region of Morocco, to determine their risk factors for HBV and HCV and to assess their knowledge of this occupational risk.

## Methods

### Study design and sample

A cross-sectional epidemiological study evaluating risk factors for HBV and HCV and seropositivity for these viruses was conducted during 2007

in traditional barbershops in the Rabat–Salé–Zemmour–Zaër region of Morocco. Men who provide traditional barber services were identified and enrolled in the study, and 2 clients who received services from each barber were also enrolled.

To be able to estimate the seroprevalence of HBV among barbers and clients with a precision of 5%, given a population prevalence of HBsAg among blood donors of 3% and a barber:client ratio of 1:2, we estimated that we would need to enrol 286 traditional barbers and 571 clients. Participants were chosen from 3 provinces in this region. Barbers providing shaving and haircut services at rotating daily open markets in rural areas or at standing but unregistered barbershops in periurban or urban areas were chosen for the study. Specifically, in Khemisset, a rural province, all barbers were invited to participate. In Salé and Témara-Skhirat, urban provinces, barbers in areas of low socioeconomic level were chosen preferentially.

### Data collection

Questionnaires were administered by trained study personnel to elucidate the medical and socioeconomic risk factors for hepatitis. The questionnaire was supplied by the World Health Organization Eastern Mediterranean Regional Office (EMRO). It was designed and tested for a multi-country project on hepatitis in Egypt, Pakistan and Morocco as part of the Special Programme for Research and Training in Tropical Diseases (TDR) [7,11]. Some minor adaptations were made to suit the local context. In addition, a subset of barbers and clients were observed under routine conditions to evaluate the conditions of their shops and their shaving practices.

Serum hepatitis tests including hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), hepatitis B core antibody (anti-HBc) and hepatitis C antibody (anti-HCV) were performed. Polymerase chain reaction (PCR) assay was performed

on samples from subjects with positive anti-HCV tests to detect hepatitis C viral RNA for confirmation of HCV infection.

Subjects with positive serological tests were referred to the university hospital in Rabat for further evaluation and treatment. This study was approved by the Directorate of Epidemiology and Disease Control of the Ministry of Health of Morocco. All subjects gave written informed consent for participation.

### Definitions

HBV seropositivity was defined as a positive HBsAg or anti-HBs test, indicating past or current infection with HBV in this unvaccinated population. Subjects with a positive anti-HCV test confirmed by PCR were considered to have current active hepatitis C.

### Serological testing

Blood samples were centrifuged at provincial laboratories, and serum samples were transported to the National Institute of Hygiene and stored at  $-20^{\circ}\text{C}$  until analysis. HBsAg, anti-HBs and anti-HBc infection markers were determined using commercially available enzyme-linked immunosorbent assays (ELISA) (Dia Pro Diagnostic Bioprobes). Samples that were positive by ELISA were confirmed by the neutralization test according to the manufacturer's instructions. Antibodies to HCV were tested using ELISA (Diagnostic Bioprobes). For those with a positive test, HCV RNA by reverse transcription was performed to confirm HCV infection (Cobas Ampliprep/Cobas Amplicor).

### Statistical analysis

Data analyses were performed in *Epi-Info*, version 3.3.2, except for multivariate logistic regressions, which were performed using *STATA* software, version 10.0 (StataCorp LP). Demographic, medical and shop characteristics were compared using Pearson chi-squared

or Fisher exact tests for categorical variables. Because there were no significant differences in HBV and HCV seromarker positivity comparing barbers with clients, these groups were combined for the purposes of HBV and HCV risk factor analysis. Variables known to be risk factors for HBV as well as factors found to be associated with HBV in univariate analyses were included in a multivariable logistic regression model. Multivariable logistic regression analysis was not performed for HCV seropositivity because of the low number of cases. Significance tests were 2-sided, with *P*-values of < 0.05 considered statistically significant.

## Results

### Population and shop characteristics

A total of 267 barbers and 529 clients were identified and included in the study. Of the barbers, 75 (28.1%) were seropositive for HBV and 3 (1.1%) were positive for HCV (Table 1). Among clients, the prevalence was similar: 133 (25.1%) were positive for HBV and 7 (1.3%) positive for HCV. Active HBV, as evidenced by a positive HBsAg, was present in 1.9% of barbers and 1.7% of clients.

The mean ages of barbers and clients were 41 and 43 years respectively. The majority of study participants (69.9%) were illiterate or had only completed

primary school education, and most (94.2%) had low socioeconomic status, earning less than 1500 dirhams per month. The majority (56.6%) of barbershops were located in a rural setting (Table 2).

Information about barber shop characteristics and shaving practices was collected by direct observation for 546 subjects. New razors were used 96.3% of the time (Table 3).

### Knowledge and beliefs about HBV and HCV and their transmission

Among barbers and clients combined, 539/796 (67.7%) were familiar with jaundice as a sign of liver disease. Less than 1% of barbers had heard of HBV or HCV infection. Those familiar with viral hepatitis reported that their main information sources about this disease were word of mouth (38.1%), television (20.0%), radio (8.7%) and, less commonly, print media (2.0%). Almost all the study participants (barbers and their clients) (97.0%) did not know the modes of transmission of viral hepatitis. Among clients, 100% reported that they insisted that barbers use new blades but 47.1% reported trusting the other shaving conditions to the barber.

### Risk factors for HBV and HCV

Among traditional barbers and their clients, the odds of HBV seropositivity were higher in individuals with the following characteristics: age > 45 years,

low educational level, urban address, married status, history of blood transfusion, not currently in a heterosexual relationship (with wife or girlfriend) and symptoms of liver disease (Table 4). In the final multivariable model, adjusting for history of surgery or recent dental procedures, increased age (OR 1.63, 95% CI: 1.29–2.06), urban living (OR 1.47, 95% CI: 1.12–1.92) and lack of current heterosexual relationship (OR 1.59, 95% CI: 1.09–2.31) were independent risk factors for hepatitis B.

Observation of barber's shop characteristics and shaving techniques is shown in Table 3. In a multivariate model, after adjusting for use of a new razor, barbers still had a lower risk of HBV with use of alum as an antiseptic (RR 0.81, 95% CI: 0.30–0.92) and in well-decorated shops (RR 0.44, 95% CI: 0.21–0.89).

In univariate analyses, HCV was associated with increased age and low level of education (Table 5). Multivariate analysis could not be performed due to the small number of subjects with positive HCV.

Surprisingly, observations showed that the use of disinfectant on cuts was associated with increased risk of HCV seropositivity (RR 7.71); other barber practices and shop conditions were not statistically significantly associated with HCV in the univariate analyses (Table 3).

Table 1 Distribution of hepatitis B and C virus infection markers among barbers (*n* = 267) and their clients (*n* = 529)

Positivity	Barbers		Clients		RR (95% CI)	<i>P</i> -value <sup>a</sup>
	No. of cases	%	No. of cases	%		
HBsAg and anti-HBc	5	1.9	9	1.7	1.10 (0.37–3.25)	0.86
Anti-HBs and anti-HBc	28	10.5	63	11.9	0.88 (0.57–1.34)	0.55
Only anti-HBc	61	22.8	112	21.2	1.07 (0.81–1.42)	0.58
Only anti-HBs	42	15.7	83	15.7	1.00 (0.71–1.40)	0.98
HBV seropositive	75	28.1	133	25.1	1.11 (0.87–1.42)	0.37
HCV seropositive	3	1.1	7	1.3	0.84 (0.22–3.25)	0.81

<sup>a</sup>Chi-squared test.

RR = relative risk; CI = confidence interval.

HBsAg = hepatitis B surface antigen; anti-HBc = hepatitis B core antibody; anti-HBs = hepatitis B surface antibody; HBV = hepatitis B virus; HCV = hepatitis C virus.

**Table 2 Sociodemographic characteristics of barbers (n = 267) and their clients (n = 529)**

Characteristic	Barbers		Clients		Total <sup>a</sup>	
	No.	%	No.	%	No.	%
<b>Age (years)</b>						
15–29	89	33.6	157	30.8	246	31.8
30–44	83	31.3	132	25.9	215	27.8
45–75	93	35.1	220	43.2	313	40.4
<b>Level of education</b>						
University	4	1.5	9	1.7	13	1.7
Secondary	89	34.2	133	25.5	222	28.4
Primary	52	20.0	93	17.9	145	18.6
No education	115	44.2	286	54.9	401	51.3
<b>Area of residence</b>						
Urban	37	14.0	51	9.9	88	11.3
Suburban	87	33.0	164	31.7	251	32.1
Rural	140	53.0	302	58.4	442	56.6
<b>Marital status</b>						
Unmarried/ divorced	90	34.0	165	32.5	255	33.0
Married	175	66.0	343	67.5	518	67.9
<b>Monthly income</b>						
< US\$ 150	202	97.6	370	92.5	572	94.2
≥ US\$ 150	5	2.4	30	7.5	35	5.8

<sup>a</sup>Data missing in some categories.

## Discussion

The prevalence of HBV and HCV infection varies from country to country and even from one region to another, depending on environmental factors and host characteristics. The prevalence of HBV and HCV has been widely investigated in many occupational groups, but relatively few data are available on the prevalence in barbers who regularly come into contact with blood and body fluids of clients and may be expected to have an elevated risk of exposure to bloodborne pathogens [15,16]. In our study, 28.1% of traditional barbers and 25.1% of their clients had evidence of current or past HBV infection (all were unvaccinated against HBV), 1.9% and 1.7% respectively had active HBV and 1.1% of barbers and 1.3% of clients had chronic HCV. Our study corroborates a previous study in Casablanca in Morocco, in 2001, which showed that 2% of

barbers were positive for HBsAg, indicative of active hepatitis B, and 5% were positive for HCV antibody, indicative of chronic hepatitis C [14]. Given the highly infectious nature of hepatitis B, the rarity of vaccination and, thus, high susceptibility to HBV among Moroccan adults and the very large proportion of the population using traditional barber services, the fact that over a quarter of barbers have or have had hepatitis B is concerning.

Based on epidemiological data demonstrating an HBsAg seroprevalence of 3.7% in blood donors and 3.1% in health care workers [9], Morocco is classified as a country with moderate hepatitis B burden. Given that HBsAg seroprevalence is similar in barbers and in the general population in Morocco [13], working as a barber may not present a significant increased threat of active HBV in Morocco. This is in contrast to studies in China, Turkey, Egypt

and Italy showing an increased risk of HBV among traditional barbers or their clients [9,15,17,18]. HBV seropositivity among barbers and clients aged 45–70 years was significantly higher than among younger age groups. Higher rates of HBV in older individuals probably reflect the increased time at risk for the disease over a lifetime.

The HCV seropositivity rates in our study were similar to the prevalence in the general population in Morocco [13]. This seroprevalence is significantly lower than that found by Zahraoui-Mahadji et al. in Casablanca (5%) [2] and among barbers elsewhere [11,17]. Individuals giving or receiving traditional barber services have been shown to be at higher risk of HCV in most, but not all, settings [6,7,10,12,19]. In spite of the poor hygiene conditions in many barbershops in this study, we observed a near-universal practice of changing of blades between clients. In Janjua et al.'s study 45.8% of Pakistani barbers reused razors, presumably contributing to the dissemination of the virus [20]. It is unclear how long using new blades for each client has been a routine part of shaving practices in Morocco. However, the spread of HCV can be promoted by the sharing of razor blades within families or by using instruments cleaned only by antiseptics that do not destroy HCV [14]. Attention to sterility of blades for facial shaving is clearly crucial.

Knowing that traditional barbers and their clients may be at higher risk for HBV or HCV is useful information from a public health standpoint, and identifying additional risk factors for HBV and HCV in these groups may further inform strategies to minimize the incidence of these diseases in the population. Our analysis showed that older age, urban living and lack of a current heterosexual relationship were risk factors for HBV. The associations between some factors, such as marriage or low educational status, and HBV in univariate analyses, were likely confounded by

**Table 3** Observed shaving practices of barbers and characteristics of barbershops and the risk of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection (combined data, *n* = 796)

Variable	Total by category	HBV risk factors				HCV risk factors			
		HBV positive	%	RR (95% CI)	<i>P</i> -value <sup>a</sup>	HCV positive	%	RR (95% CI)	<i>P</i> -value <sup>b</sup>
<b>Barber shaving practices</b>									
<b>Washes the razor with antiseptic solution</b>									
Yes	234	53	22.6	1.00 (0.73–1.38)	0.99	5	2.1	2.03 (0.48–8.40)	0.26
No	283	64	22.6			3	1.1		
<b>Uses a new razor for each client</b>									
Yes	502	109	21.7	0.55 (0.33–1.27)	0.25	7	1.4	–	0.78
No	18	6	33.3			0	0.0		
<b>Sterilizes instruments properly</b>									
Yes	309	68	22.0	1.04 (0.72–1.46)	0.86	2	0.6	0.39 (0.06–2.34)	0.26
No	183	39	21.3			3	1.6		
<b>Uses alum as antiseptic for skin cuts</b>									
Yes	407	83	20.4	0.56 (0.45–0.93)	0.02	6	1.5	1.31 (0.16–11.1)	0.63
No	89	28	31.5			1	1.1		
<b>Disinfects skin cuts properly</b>									
Yes	123	33	26.8	1.45 (0.92–1.89)	0.12	5	4.1	7.71 (1.46–37.9)	0.01
No	366	74	20.2			2	0.5		
<b>Barbershop characteristics</b>									
<b>Shop situated at an open-air market area</b>									
Yes	346	97	28.0	1.92 (1.16–2.37)	0.004	6	1.7	3.44 (0.41–28.0)	0.21
No	196	33	16.8			1	0.5		
<b>Shop clean and neat</b>									
Yes	204	31	15.2	0.42 (0.35–0.73)	< 0.001	1	0.5	0.23 (0.02–1.92)	0.13
No	341	102	29.9			7	2.1		
<b>Shop decorated and attractive</b>									
Yes	95	13	13.7	0.45 (0.30–0.88)	0.01	1	1.1	0.66 (0.08–5.35)	0.57
No	443	116	26.2			7	1.6		
<b>Shop with good bathing facilities</b>									
Yes	158	26	16.5	0.52 (0.40–0.88)	0.007	2	1.3	0.78 (0.16–3.85)	0.56
No	373	102	27.3			6	1.6		
<b>Shop with adequate sink for washing hands and face</b>									
Yes	160	26	16.3	0.60 (0.40–0.89)	0.008	1	0.6	0.39 (0.04–3.21)	0.32
No	375	101	26.9			6	1.6		

<sup>a</sup>Chi-squared test; <sup>b</sup>Fisher test/corrected Yates.

RR = relative risk; CI = confidence interval; – = undefined.

age and were not statistically significant in the multivariate model. Interestingly, in our study, being in a current heterosexual relationship was protective against HBV, perhaps because this group largely consisted of married men at low risk of sexual acquisition of HBV. Risk factors for HCV included, not surprisingly, drug use, history of surgery and older age.

One key goal of the present study was to assess knowledge about hepatitis and its mode of transmission. Our study suggests that traditional barbers and their clients in Morocco are unfamiliar with HBV and HCV and are mostly unaware of the transmission of blood-borne pathogens through shaving tools. Since the majority of infections with HBV or HCV are asymptomatic, this is

not a surprising finding. Asymptomatic carriage, however, brings a high risk of primary liver cancer and chronic active hepatitis, which can progress to cirrhosis or death [21,22]. Increased awareness of the risks of unsterile facial shaving practices would help both barbers and their customers avoid this unnecessary but potentially life-threatening risk.

**Table 4 Potential risk factors for hepatitis B virus (HBV) infection among barbers and clients (combined data, n = 796)**

Variable	HBV positive		OR <sup>a</sup> (95% CI) <sup>a</sup>	P-value <sup>a</sup>
	No. of cases	% by risk category		
<b>Age (years)</b>				
15–29	40	16.3	1.00	
30–44	53	24.7	1.68 (1.04–2.74)	< 0.001 <sup>b</sup>
45–70	110	35.1	2.79 (1.82–4.30)	
<b>Level of education</b>				
University	4	30.8		
Secondary	40	18.0		
Primary	37	25.5	0.74 (0.62–0.69)	0.002
No education	123	3.7		
<b>Area of residence</b>				
Urban	37	42.0		
Suburban	52	20.7	1.22 (0.97–1.53)	0.087
Rural	115	26.0		
<b>Marital status</b>				
Unmarried or divorced	50	19.6		
Married	153	29.5	1.72 (1.19–2.47)	0.003
<b>Smoking</b>				
Yes	94	24.1		
No	113	28.0	0.81 (0.59–1.12)	0.20
<b>Alcohol use</b>				
Yes	48	22.2		
No	157	27.7	0.75 (0.52–1.08)	0.12
<b>Drug use</b>				
Yes	17	18.3		
No	181	26.8	0.61 (0.35–1.06)	0.08
<b>History of blood transfusion</b>				
Yes	56	32.6		
No	147	24.7	1.46 (1.01–2.12)	0.04
<b>Used traditional healer</b>				
Yes	47	30.7		
No	144	24.7	1.35 (0.92–2.00)	0.12
<b>History of past surgery</b>				
Yes	73	29.2		
No	29	24.4	1.28 (0.91–1.79)	0.15
<b>History of dental procedure</b>				
Yes	123	25.8		
No	74	26.0	0.99 (0.71–1.38)	0.95
<b>Current heterosexual relationship</b>				
Yes	80	19.8		
No	106	31.1	0.54 (0.39–0.76)	< 0.001
<b>Symptoms of liver disease</b>				
Yes	28	36.8		
No	170	24.9	1.76 (1.07–2.90)	0.025

<sup>a</sup>Logistic regression analysis (global model); <sup>b</sup>Chi-squared test for linear trend.  
OR = odds ratio; CI = confidence interval.

**Table 5 Potential risk factors for hepatitis C virus (HCV) infection among barbers and clients (combined data, n = 796)**

Variable	HCV positive		RR <sup>a</sup> (95% CI) <sup>a</sup>	P-value <sup>b</sup>
	No. of cases	% by risk category		
<b>Age (years)</b>				
15–29	1	0.4	1.00	0.002 <sup>c</sup>
30–44	1	0.5	1.14 (0.07–18.2)	
45–70	8	2.6	6.29 (0.79–49.9)	
<b>Level of education</b>				
University	0	0.0	1.00	0.03 <sup>c</sup>
Secondary	0	0.0	–	
Primary	2	1.4	–	
No education	8	2.0	–	
<b>Area of residence</b>				
Urban	0	0.0	1.00	0.15 <sup>c</sup>
Suburban	2	0.8	–	
Rural	7	1.6	–	
<b>Marital status</b>				
Unmarried or divorced	2	0.8	1.73 (0.36–8.40)	0.49
Married	7	1.4		
<b>Monthly income</b>				
< US\$ 150	8	1.4	–	0.95
≥ US\$ 150	0	0.0		
<b>Smoking</b>				
Yes	5	1.3	1.03 (0.29–3.59)	0.95
No	5	1.2		
<b>Drink alcohol</b>				
Yes	1	0.5	0.29 (0.03–2.29)	0.24
No	9	1.6		
<b>Drug use</b>				
Yes	3	3.2	3.71 (0.92–15.1)	0.06
No	6	0.9		
<b>History of transfusion</b>				
Yes	1	0.6	0.49 (0.06–4.00)	0.50
No	7	1.2		
<b>Traditional healer</b>				
Yes	2	1.3	0.95 (0.20–4.54)	0.73
No	8	1.4		
<b>History of surgery</b>				
Yes	6	2.4	3.22 (0.90–12.5)	0.07
No	4	0.8		
<b>History of dental procedure</b>				
Yes	5	1.0	0.59 (0.17–2.07)	0.41
No	5	1.8		
<b>Current heterosexual relationship</b>				
Yes	3	0.7	0.49 (0.11–2.09)	0.34
No	5	1.5		
<b>Symptoms of liver disease</b>				
Yes	3	3.9	3.97 (1.01–15.7)	0.049
No	7	1.0		

<sup>a</sup>Chi-squared test; <sup>b</sup>Fisher test/corrected Yates, <sup>c</sup>Chi-squared test for linear trend  
RR = relative risk; CI = confidence interval; – = undefined.

Facial shaving from barbers has been repeatedly documented as a risk factor for transmission of HBV and HCV in various countries and is well known to cause abrasions and small cuts [23]. When it is done with unsterilized instruments, such as razors or scissors, it can spread bloodborne pathogens [7,24]. According to the observed practices in our study, barbers changed blades for each client. However, barbers had a poor understanding of the processes necessary for complete sterilization of used instruments. Thus, if new blades are not consistently used, as may be the case when barbers are not being observed by a research team, the risk of contamination is still present. Consequently, using alum for disinfecting skin cuts further increases shaving safety. This study also showed that there was a significant association between a lower risk of viral hepatitis and the neatness and cleanliness of the barbershop, as has been demonstrated in other studies [16,25]. These shop characteristics may be markers for overall attention to

cleanliness and sterility that extends to shaving instruments and practices.

Our study had several limitations. We were unable to do a multivariable logistic regression for risk factors for HCV because of the small number of cases. Given the low prevalence of hepatitis C in Morocco, a case-control study may be a good way to look at risk factors for HCV, as has been done by investigators in other settings [7]. Also, barbers may change their behaviour when they know a researcher is watching, so changing blades before each client may be less than 100% in real practice conditions.

In conclusion, current or past infection with HBV (and less commonly HCV) is frequent among barbers and their clients in Morocco, particularly among those over 45 years of age. Despite this, few people were aware of the risk posed by unsafe shaving practices. For these reasons, awareness campaigns are imperative and should be focused on both barbers and the general population. Because barbers are sometimes engaged in other traditional practices

such as circumcision, dentistry and bloodletting, educating barbers about the health risks of HBV and HCV and strategies for minimizing risk of transmission of bloodborne pathogens can help reduce transmission of HBV and HCV both inside and outside the barber shop.

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### **Hepatitis B and C key facts**

#### **Hepatitis B**

Hepatitis B is a liver disease caused by the hepatitis B virus (HBV).

HBV is transmitted through contact with the blood or other body fluids (i.e. semen and vaginal fluid) of an infected person, by for example unsafe injection practices, blood transfusions and sexual contact.

Hepatitis B is not spread through food or water or by casual contact with an infected person.

About 2 billion people worldwide have been infected with HBV and about 350 million live with chronic infection. Around 600 000 people die each year due to the consequences of hepatitis B.

Chronic hepatitis B can be treated with drugs, including interferon and anti-viral medications.

Hepatitis B is preventable with a safe and effective vaccine.

Source: WHO Fact sheets No. 204 and No. 164

#### **Hepatitis C**

Hepatitis C is a liver disease caused by the hepatitis C virus (HCV).

HCV is most commonly transmitted through exposure to infectious blood. It can be transmitted through sex with an infected person and sharing personal items contaminated with infectious blood.

Hepatitis C is not spread through food or water or by casual contact with an infected person.

About 130-170 million people worldwide are chronically infected with HCV, and more than 350 000 people die from hepatitis C-related liver diseases each year.

HCV infection is curable using increasingly effective antiviral medications.

There is currently no vaccine to prevent hepatitis C virus infection.