Seroprevalence and risk factors for hepatitis B and C virus infection in Damietta Governorate, Egypt

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الانتشار المصلي وعوامل اختطار العدوى بفيروس التهاب الكبد B و C في محافظة دمياط بمصر

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الخلاصة: لا تزال العدوى بفيروسَيْ التهاب الكبد B و C واحدةً من أكبر مشاكل الصحة العامة في مصر، وهناك حاجة إلى بيانات عن عوامل الاختطار الخاصة بالعدوى. وقد هدف الباحثون إلى تحديد انتشار الإيجابية المصلية لضد فيروس التهاب الكبد C وللمستضد السطحي لالتهاب الكبد B في محافظة دمياط بمصر، وإلى تقييم عوامل الاختطار المحتملة بالنسبة للعدوى وتأثير التلقيح ضد التهاب الكبد B على الانتشار المصلي. فتم إجراء دراسة منزلية مستعرضة لـ 2977 شخصاً، كان حوالي 20٪ منهم ملقحين ضد التهاب الكبد B. فكان 1.1٪ منهم فقط مصابين بالعدوى بفيروس التهاب الكبد B و 9.3٪ مصابين بالعدوى بفيروس التهاب الكبد C، ووجدت عدوى بكليهما لدى 12 مريضاً (0.4٪) (جميعهم غير ملقحين). وكانت عوامل الاختطار الرئيسية لكلا الفيروسَيْن HCV و HBV هي: التعرض لإجراءات طب الأسنان وللجراحة والغُرَز ومعالجة داء البلهارسيَّات ومخالطة شخص مصاب بالعدوى. وكان انتشار فيروس التهاب الكبد B وفيروس التهاب الكبد C في دمياط أقل من المعدل القومي، وربّما كان ذلك بسبب تأثير التلقيح الروتيني الإلزامي ضد التهاب الكبد B لدى من هم بأعمار < 19 عاماً. ويرى الباحثون أن هناك حاجة إلى تثقيف عامة الناس بشأن طرق انتقال العدوى بفيروس التهاب الكبد B وفيروس التهاب الكبد C، وبشأن تجنب السلوكيات المحفوفة بالمخاطر.

ABSTRACT Hepatitis B and C virus (HBV and HCV) infections remain major public health problems in Egypt and data are needed on risk factors for infection. This study determined the prevalence of anti-HCV and HBV surface antigen seropositivity in Damietta Governorate, Egypt, and evaluated potential risk factors for infection and the impact of HBV vaccination on seroprevalence. A household, cross-sectional study was conducted of 2977 individuals. About 20% were vaccinated against HBV. Only 1.1% were infected with HBV and 9.3% with HCV; both infections coexisted in 12 people (0.4%) (all unvaccinated). The main risk factors for both HCV and HBV were exposure to dental procedures, surgery, stitches, schistosomiasis treatment and contact with infected person. HBV and HCV prevalences in Damietta were lower than the national rate, likely due to the routine compulsory HBV vaccination in those aged < 19 years. There is a need to educate the general population about HBV and HCV transmission routes and avoidance of risky behaviours.

Séroprévalence et facteurs de risque pour l'infection par le virus de l'hépatite B et C dans le gouvernorat de Damiette (Égypte)

RÉSUMÉ L'infection par le virus de l'hépatite B et C (VHB et VHC) reste un problème de santé publique majeur en Égypte et des données sur les facteurs de risque pour cette infection sont nécessaires. L'étude a permis de déterminer la prévalence de la séropositivité à l'antigène de surface du VHB et VHC dans le gouvernorat de Damiette (Égypte), et d'évaluer les facteurs de risque potentiels d'une infection ainsi que l'impact de la vaccination contre le VHB sur la séroprévalence. Une étude transversale auprès des ménages a été menée impliquant 2977 personnes. Environ 20 % étaient vaccinés contre le virus de l'hépatite B. Seul 1,1 % était infecté par le virus de l'hépatite B et 9,3 % par le virus de l'hépatite C ; les deux infections coexistaient chez 12 patients (0,4 %), tous étant non vaccinés. Les interventions dentaires et chirurgicales, les points de suture, le traitement de la schistosomiase ainsi que le contact avec des personnes infectées étaient des facteurs de risque majeurs pour les deux infections par le virus de l'hépatite B et C. La prévalence du virus de l'hépatite B et C à Damiette était inférieure aux taux nationaux, peut-être en raison de l'influence de la vaccination systématique obligatoire contre le virus de l'hépatite B chez les moins de 19 ans. Il est nécessaire d'éduquer la population générale aux modes de transmission du virus de l'hépatite B et C et aux moyens d'éviter les comportements à risque.

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Received: 18/11/13; accepted: 25/05/14

Introduction

The human hepatitis B and C viruses (HBV and HCV) are major health problems worldwide and cause a wide spectrum of clinical manifestations ranging from an apparently healthy carrier state to acute self-limited or fulminant hepatitis and later to chronic liver disease which is frequently associated with liver cirrhosis that ultimately develops into hepatocellular carcinoma (the 5th most common cancer in the world) (*1*,*2*). HBV and HCV are biologically different viruses. HBV contains a DNA genome while HCV is an RNA virus. Their routes of transmission are similar, however, which raises the possibility of co-infection and super-infection of hepatocytes (*3*). In hepatitis C the rate of progression from chronic hepatitis through cirrhosis to cancer is dramatically higher than that in hepatitis B. The pathogenesis of dual infection and biological interactions between HBV and HCV has not yet been clearly established (*4*).

The epidemiology and specific risk factors for HBV and HCV infections in developing countries are quite different from those of developed countries and, given the high prevalence of HCV, it is of utmost importance to identify risk factors for infection so that intervention programmes may be appropriately focused (*5*). In Egypt, the situation is especially concerning. Hepatitis B and C are major public health problems, and will remain so for some time, and the prevalence of hepatitis C is the highest in the world. The national prevalence of positive HCV antibodies has been estimated to be between 10.0–15.0% in rural areas, with some age groups suffering rates of up to 50%. The incidence is estimated to be 2–6 per 1000 per year (*6*). In addition, HBV and HCV infection rates differ in different settings, and prognosis may be worse in conjunction with schistosomiasis in Egypt (*7*).

HCV genotype 4 represents over 90% of cases in Egypt. Genotype 4 has an intermediate resistance to treatment and for this reason Egyptian patients must undergo longer courses of treatment: 48 weeks instead of the 24 weeks recommended for patients infected with genotypes 2 and 3 (*8*). In Egypt, the major route of exposure appears to be due to injection therapy and inadequate infection control practices. Also, other non-medical routes have become more common, such as tattooing, circumcision and other medical procedures performed by non-medical personnel. In addition, household transmission, vertical transmission and sexual transmission are routes that are also under investigation (*7*). However, the significance and weights of these risk factors in different governorates have not been specifically reported in the literature. Prior to 1994 the major risk factor associated with HCV infection was blood transfusion and before 1986 it was a history of anti-schistosomial injection treatment. Thus, farmers and rural populations were at greatest risk, and this is supported by the higher prevalence of HCV in the Nile Delta and rural areas (*6*).

Egypt is still battling with viral hepatitis and needs to activate and prioritize the national control strategy with regular surveillance and monitoring, enhancement of infection control practices, awareness campaigns, full vaccination coverage, proper patient management and successful research programming in order to combat the hepatitis B and C epidemic. Hence, we aimed to determine the prevalence of anti-HCV and hepatitis B virus surface antigen (HBsAg) seropositivity in the Damietta Governorate of Egypt, and evaluate potential risk factors for transmission of infection as well as the impact of HBV vaccination on seroprevalence.

Methods

Study design and setting

The practical part of the study was carried out in the period from December 2011 to September 2012 in Damietta Governorate, located in the north Nile Delta area, which is composed of 5 districts including rural and urban societies: Kafr Saad, Fareskour, El Zarqa, Damietta and Kafr El Batikh (*9*). Using multistage random sampling, 1 village or city (as a cluster) was chosen from each district. Thus, the sample consisted of 3 villages (El Swalem, Sharbus, Shermissah) and 2 cities (Ezbet Elborg, Kafr El Batikh) representing the 5 districts respectively. In these selected areas a household survey was conducted by choosing all residents of 1 in every 3 houses, excluding infants and children aged < 5 years, to avoid inconvenience to parents and difficulties in blood sampling.

Data collection

The data were collected by an interview questionnaire which included: sociodemographic data (age, sex, residence, marital status, education and occupation); history of hepatitis B vaccination; risk factors (history of previous exposure to surgical operations, dental procedures, stitches, blood transfusion, schistosomiasis treatment, contaminated needles or puncture, endoscopic examination, suction tube, cauterization or renal dialysis); and risky behaviours [shared use of toothbrushes or shaving razors, wet cupping (*higama*), tattooing or sexual intercourse outside of marriage]. *Higama* is a traditional therapy whereby blood is drawn by vacuum from a small skin incision.

Serology

Viral serology included HBsAg, hepatitis C antibodies (HCV-Ab) and hepatitis B core antibody (HBcAb) for positive HBsAg. Participants were analysed in 2 age groups that reflected vaccination status: < 19 years (i.e. HBV vaccinated, confirmed by history taking) and age ≥ 19 years (i.e. unvaccinated, as vaccination against HBV was only enrolled in compulsory immunization in Egypt after 1991).

Blood specimens were collected by venepuncture and allowed to clot. Serum was separated by centrifugation then was kept frozen at –20 °C until assay. Estimation of HBsAg and anti-HCV was done using ELISA kits (Fortress Diagnostic Ltd). Estimation of anti-HBc was done using competitive immunoassay (enzyme-linked immunosorbent assay) by a 1-step *in vitro* diagnostic kit for the detection of total antibodies to hepatitis B virus core antigen. The assay was intended to investigate acute or chronic HBV infection and to identify subjects with previous exposure to HBV.

Ethical issues

The ethical and administrative issues were considered and the study was approved by the institutional review board of Al-Azhar University. Verbal consent was taken from the heads of households after simple explanation about the purpose of the study and the benefit they would get and that personal and medical data would be confidential and used for scientific research only. In addition, the serological results were provided to the subjects on completion and kept strictly confidential. Any infected subjects and their household were provided with appropriate information on the prevention of further spread of these infections and were referred to the nearest government medical facility for guidance.

Statistical analysis of data

Statistical analysis was carried out using the *SPSS* computer package, version 17.0. The collected data were statistically managed as follows. For descriptive statistics the mean and standard deviation (SD) were used for quantitative variables. The number and percentage were used for qualitative variables. For analytic statistics the chi-squared test was used to assess the differences in frequency of qualitative variables, while Fisher exact test was applied if any expected cell values in a 2 × 2 table was < 5. Logistic regression analysis was done to predict and rank the relationship between different studied variables. The statistical methods were verified, assuming a significant level of $P < 0.05$.

Results

Sociodemographic characteristics of the study sample

The total number of subjects selected was 2977, of whom 619 (20.8%) were assumed to be HBV vaccinated (i.e. age < 19 years). However, among older subjects (age ≥ 19 years), only 87 of 2358 (3.7%) had been vaccinated (single dose). The mean age of the total sample was 33.9 (SD 15.6) years, range 5–82 years; 54.5% were males, 71.1% lived in rural areas and 62.8% were married. More than half of participants (53.1%) were not enrolled in the education system, including those who were illiterate, could just read and write or were still below the age of school entry. Students represented 20.6% and those who were not working comprised 39.8% of the total sample (Table 1).

Risk factors & risky behaviours of the study sample

As regards the risk factors and risky behaviours of the study sample, more than half of them (56.7%) had been exposed to dental procedures, 34.6% had undergone surgery, 33.2% had received stitches, 18.1% had received bilharzia treatment (intravenous and/or oral therapy), 17.2% had a history of contact with infected persons, 13.6% had shared shaving razors and 9.9% had history of blood transfusion. A minority of them (< 5.0%) had been exposed to endoscopic examination, wet cupping, shared toothbrushes, contaminated needle-stick, cauterization, extramarital intercourse, acupuncture, tattoos, intubation for suction or renal dialysis.

Seropositivity for HBsAg and anti-HCV

As regards the laboratory results of infection with viral hepatitis, only 32 participants (1.1%) were seropositive for HBsAg (15 males and 17 females), with a mean age 41.2 (SD 12.2) years and the majority of them (31 subjects) had chronic infection that was confirmed by HBcAb. Seropositivity for anti-HCV was confirmed in 278 (9.3%) of participants (160 males and 118 females), with a mean age of 43.6 (SD 14.4) years. The overall infection rate was 10.0% in the study sample.

Both infections coexisted in 12 patients (5 males and 7 females) and all of them were ≥ 19 years (HBV unvaccinated). They represented 37.5% of those with HBV infection, 4.3% of those with HCV infection and 0.4% of the total participants. Significantly more of the HBV-positive cases (37.5%) than HBV-negative cases (9.0%) were HCV positive (Table 2).

Sociodemographic characteristics of HBV- and HCV-infected cases

Regarding HBV infection, no statistical significant differences were found between negative and positive cases regarding sociodemographic factors of the study sample, except for age and marital status. Those who were ever married and of older age (which reflects HBV vaccination status) were more likely to be HBV positive (Table 3).

In contrast, statistical significant differences were found between negative and positive cases of HCV infection regarding all the studied sociodemographic factors, except for sex. Those who were older age, rural residents, ever married, never been in education and not working or of "other" occupation were more likely to be HCV positive (Table 4).

Risk factors & risky behaviours of HBV- and HCV-infected cases

Concerning risk factors and risky behaviours of those with HBV infection, statistically significant differences were

Table 1 Sociodemographic characteristics of the study sample

Characteristic	Total sample (*n* = 2977)	
	No.	%
Age (years)		
< 19 (HBV vaccinated)	619	20.8
≥ 19 (HBV unvaccinated)[a]	2358	79.2
Sex		
Male	1621	54.5
Female	1356	45.5
Residence		
Urban	861	28.9
Rural	2116	71.1
Marital status		
Below marital age[b]	513	17.2
Single	430	14.4
Married	1869	62.8
Widow	148	5.0
Divorced	17	0.6
Education		
Below school entry age	6	0.2
Illiterate (never been in education)	1073	36.0
Read and write (never been in education)	504	16.9
Enrolled in education system[c]	613	20.6
No longer in education system	781	26.2
Occupation		
Student	613	20.6
Administrator	194	6.5
Other	984	33.1
Not working[d]	1186	39.8

[a]Only 87 of 2358 (3.7%) were vaccinated by single dose but not the mandatory 3 doses so considered not effectively vaccinated; [b]According to Egyptian law: 18 years; [c]From primary to university; [d]Including those below school entry age.

found between those negative and positive for HBV infection with regard to previous exposure to dental procedures, stitches, acupuncture and renal dialysis (Table 5).

Statistically significant differences were found between negative and positive cases of HCV infection regarding previous exposure to dental procedures, surgical operations, schistosomiasis treatment, contact with infected person, shared shaving razors, endoscopic examination, contaminated needle-stick, wet cupping, cauterization and tattooing (Table 6).

Risk factors already found significant in the bivariate analysis were reanalysed by a multivariate analysis. The risk of HBV infection was 2.8, 7.6 and 5.0 times higher among those exposed to previous stitches, renal dialysis and acupuncture respectively and the risk of HCV infection was 3.0, 2.8 and 1.4 times higher among those exposed to schistosomiasis treatment, wet cupping and contact with infected person respectively (Tables 7 and 8).

Table 2 Hepatitis B virus (HBV) and hepatitis C virus (HCV) infection status of the study sample

HCV infection status	HBV infection status				*P*-value
	Negative (*n* = 2945)		Positive (*n* = 32)		
	No.	%	No.	%	
Negative	2679	91.0	20	62.5	< 0.001[a]
Positive	266	9.0	12	37.5	

[a]Fisher exact test.

Discussion

Infection with HBV and HCV are major health problems worldwide, especially in developing countries. Egypt is still battling with the impact of these infections on the population's health due to the high prevalence of the diseases and their effects on longevity and morbidity (including decreases in health status, quality of life and severity and duration of disability), as well as their impact on the economy (including direct healthcare expenditures and indirect costs related to loss of income from premature death or disability). This study tried to estimate the seroprevalence and risk factors for HBV and HCV in Damietta Governorate, located in the north Delta area, and the effect of hepatitis B vaccination on seroprevalence.

The reported prevalence of HBsAg ranges from 3.0% to 11.0% in Egypt (*10*). In the present study, the detected total prevalence of HBsAg-positive cases was 1.1%, less than the lowest reported national figure, and the majority of them had chronic infection. This rate was lower than that reported elsewhere in Egypt, in Ismailia (4.7%) (*11*), in Turkey (8.1%) (*12*), among high-risk hospitalized patients in Greece (2.7%) (*13*), in Pakistan

Table 3 **Hepatitis B virus (HBV) infection status of the study sample in relation to sociodemographic factors**

Variable	HBV infection status				χ^2	*P*-value
	Negative (*n* = 2945)		Positive (*n* = 32)			
	No.	%	No.	%		
Age (years)						
< 19	617	21.0	2	6.3		0.046[f]
≥ 19	2328	79.0	30	93.7		
Sex						
Male	1606	54.5	15	46.9		0.476[f]
Female	1339	45.5	17	53.1		
Marital status						
Never married[a]	940	31.9	3	9.4		0.004[f]
Ever married[b]	2005	68.1	29	90.6		
Education						
Never been in education system[c]	1567	53.2	16	50.0		
Enrolled in education system[d]	605	20.5	8	25.0	5.8	0.055
No longer in education system	773	26.2	8	25.0		
Occupation						
Student	605	20.5	8	25.0		
Administrator	193	6.6	1	3.1	5.4	0.093
Other	975	33.1	9	28.1		
Not working[e]	1172	39.8	14	43.8		

[a]Includes singles and those below marriage age; [b]Includes those currently in a marital union as well as divorced and widowed; [c]Includes those below school entry age, illiterate and read and write; [d]From primary to university; [e]Includes those below school entry age.
[f]Fisher exact test.

(2.5%) (*14*) and among children in the Islamic Republic of Iran (1.8%) (*15*). Whether this low prevalence can ascribed, for example, to sociodemographic factors and/or geographical location needs further study.

The study revealed that the prevalence of HCV infection among rural residents in Damietta Governorate was 9.3%. This result agrees with the findings of previous studies among the general population of Egypt that attributed the higher figures in rural areas to the endemicity of schistosomiasis (*16*). There is evidence that large schistosomiasis control campaigns in the past that used repeated mass intravenous therapy with tartar emetic contributed to the establishment of a large reservoir of HCV infection in the population (*17*). Furthermore, other studies have observed that the seroprevalence rates of HCV were much higher in villages in the Nile Delta region compared with Upper Egypt and correlated with the difference in schistosomial infection rates in both regions (*18–20*). Other reports assumed that schistosomiasis-induced immune suppression could increase the persistence of viraemia following acute hepatitis B and C infections and this could partly explain the high prevalence of HCV infection in Egypt (*21,22*). On the other hand, no association was observed between HCV and *Schistosoma mansoni* infection in endemic areas in Brazil (*23*).

Egypt is one of the highest HCV seroprevalence areas, with a prevalence of infection ranging from 10.0% to 25.0% (*24*). In the present study, the detected total seroprevalence of HCV was slightly lower than the lower limit of the recorded national range. This rate also was lower than that reported elsewhere in Egypt in Ismailia, (14.9%) (*11*) but higher than that reported in Greece (4.7%) (*13*), in Turkey (0.5%) (*12*) and in Pakistan (1.6%) (*14*). This could confirm the endemicity of HCV in Egypt.

The most important risk factors for HBV and HCV infections detected in our study were previous exposure to dental procedures (significant for both infections), stitches (significant for HBV infection), surgical operations, contact with infected person and schistosomiasis treatment (significant for HCV infection). This might reflect the role of contaminated surgical procedures, bad sterilization and deficient infection control programmes in our hospitals, private clinics and homes in the transmission of HBV and HCV in Egypt. These results agreed with the report of the National Institutes of Health about HCV infection (*25*), an Iranian study which gave nearly the same

Table 4 Hepatitis C virus (HCV) infection status of the study sample in relation to sociodemographic factors

Variable	HCV infection status				χ^2	*P*-value
	Negative (*n* = 2699)		Positive (*n* = 278)			
	No.	%	No.	%		
Age (years)						
< 19	598	22.2	21	7.6		< 0.001[f]
≥ 19	2101	77.8	257	92.4		
Sex						
Male	1461	54.1	160	57.6		0.28[f]
Female	1238	45.9	118	42.4		
Residence						
Urban	860	31.9	1	0.4		< 0.001[f]
Rural	1839	68.1	277	99.6		
Marital status						
Never married[a]	901	33.4	42	15.1		< 0.001[f]
Ever married[b]	1798	66.6	236	84.9		
Education						
Never been in education system[c]	1406	52.1	177	63.7		
Enrolled in education system[d]	588	21.8	25	9.0	26.6	< 0.001
No longer in education system	705	26.1	76	27.3		
Occupation						
Student	588	21.8	25	9.0		
Administrator	165	6.1	29	10.4	29.7	< 0.001
Other	883	32.7	101	36.3		
Not working[e]	1063	39.4	123	44.2		

[a]Includes singles and those below the marriage age; [b]Includes those currently in a marital union as well as divorced and widowed; [c]Includes those below school entry age, illiterate and read and write; [d]From primary to university; [e]Includes those below school entry age.
[f]Fisher exact test.

results regarding HBV infection (*26*) and a study of the relationship between therapeutic injections using non-sterile needles and the transmission of HBV and HCV (*27*).

Other risk factors, such as exposure to acupuncture (significant in HBV infection), wet cupping, shared shaving razors, endoscopic examination, tattooing and cauterization (significant in HCV infection), played a role in transmission of HBV and HCV in our study, but to a lesser extent. Similar results were reported in the Islamic Republic of Iran (*26*) and in Pakistan (*28*). However, in a country such as Pakistan, which is located in an intermediate HBV prevalence area, blood transfusion is still the major cause of HBV and HCV transmission (*29*).

Vaccination against HBV was enrolled in routine immunization in Egypt since 1991. Our results revealed that the majority of patients infected with HBV (93.7%) were not vaccinated against hepatitis B (i.e. were older than 19 years) and this might reflect the importance of vaccination in preventing the infection. In an Italian study, no infected cases were reported among fully vaccinated children (*30*), implying that increasing the vaccination coverage rate will give full protection against the disease. Though they reported a history of hepatitis B vaccination, 2 subjects (both aged < 19 years) had HBV infection and this might be ascribed to a reporting error, ineffective vaccine or the reported 5% inefficacy rate of the vaccine (*31*).

The implication of this study is that seropositivity was comparatively higher for anti-HCV among the study sample than for HBsAg and the difference between the prevalences of the 2 diseases was statistically significant. This suggests that, with exposure to nearly the same risk factors, the routine use of HBV vaccine might avert the infection to a large extent.

There were some limitations of the study. Due to resource constraints, the study was restricted to serological but not confirmatory tests, as polymerase chain reaction and viral load testing was not performed. The study did not measure the prevalence of these viruses according to acute and chronic infections. Due to religious beliefs, illegal intercourse is not common in the

Table 5 Hepatitis B virus (HBV) infection status of the study sample according to risk factors and risky behaviours

Variable	HBV infection status				*P*-value[a]
	Negative (*n* = 2945)		Positive (*n* = 32)		
	No.	%	No.	%	
Dental procedure	1663	56.5	24	75.0	0.040
Previous stitches	969	32.9	20	62.5	0.001
Surgical operation	1017	34.5	14	43.8	0.270
Schistosomiasis treatment	533	18.1	6	18.8	0.821
Contact with infected person	508	17.2	5	15.6	1.000
Wet cupping	129	4.4	3	9.4	0.171
Acupuncture	44	1.5	3	9.4	0.011
Blood transfusion	293	9.9	2	6.3	0.772
Shared shaving razor	402	13.7	2	6.3	0.301
Shared toothbrush	125	4.2	2	6.3	0.402
Suction tube	45	1.5	2	6.3	0.090
Cauterization	52	1.8	2	6.3	0.113
Renal dialysis	18	0.6	2	6.3	0.024
Endoscopic examination	163	5.5	2	6.3	0.704
Contaminated needle-stick	121	4.1	1	3.1	0.801
Tattoo	27	0.9	1	3.1	0.262
Extramarital sexual intercourse	19	0.7	1	3.1	0.094

[a] *Fisher exact test.*

Table 6 Hepatitis C virus (HCV) infection status of the study sample according to risk factors and risky behaviours

Variable	HCV infection status				*P*-value[a]
	Negative (*n* = 2699)		Positive (*n* = 278)		
	No.	%	No.	%	
Dental procedure	1499	55.5	188	67.6	< 0.001
Surgical operation	908	33.6	123	44.2	0.001
Schistosomiasis treatment	430	15.9	109	39.2	< 0.001
Previous stitches	888	32.9	101	36.3	0.262
Contact with infected person	444	16.5	69	24.8	0.001
Shared shaving razor	347	12.9	57	20.5	0.001
Wet cupping	95	3.5	37	13.3	< 0.001
Blood transfusion	261	9.7	34	12.2	0.173
Endoscopic examination	137	5.1	28	10.1	0.001
Shared toothbrush	114	4.2	13	4.7	0.750
Contaminated needle-stick	104	3.9	18	6.5	0.043
Cauterization	42	1.6	12	4.3	0.003
Tattoo	22	0.8	6	2.2	0.041
Acupuncture	41	1.5	6	2.2	0.442
Suction tube	41	1.5	6	2.2	0.442
Extramarital sexual intercourse	19	0.7	1	0.4	0.501
Renal dialysis	16	0.6	4	1.4	0.114

[a] *Fisher exact test.*

Table 7 Logistic regression analysis of hepatitis B virus surface antigen HBsAg) seropositivity of the study samples *n* = 32) regarding some important risk factors

Risk factor	HBsAg seropositivity			
	B	Exp *B*	95% CI for exp *B*	*P*-value
Previous stitches	1.0	2.8	1.3–5.9	0.008
Renal dialysis	2.0	7.6	1.6–36.4	0.011
Acupuncture	1.6	5.0	1.4–17.8	0.012
Dental procedure	0.6	1.7	0.7–4.1	0.207

CI = confidence interval.

Table 8 Logistic regression analysis of anti-hepatitis C virus HCV seropositivity of the study samples *n* = 278 regarding some important risk factors

Risk factor	Anti-HCV seropositivity			
	B	Exp *B*	95% CI for exp *B*	*P*-value
Schistosomiasis treatment	1.1	3.0	2.2–3.8	< 0.001
Wet cupping	1.0	2.8	1.8–4.3	< 0.001
Contact with infected person	0.3	1.4	1.0–1.9	0.045
Dental procedure	0.2	1.2	0.9–1.6	0.261
Surgical operation	0.2	1.2	0.9–1.6	0.221
Shared shaving razor	0.03	1.0	0.7–1.5	0.865
Endoscopic examination	0.01	1.0	0.6–1.6	0.981
Contaminated needle-stick	–0.2	0.8	0.4–1.6	0.544
Cauterization	0.5	1.6	0.8–3.3	0.168
Tattoo	0.4	1.5	0.6–4.0	0.425

CI = confidence interval.

Egyptian community and we therefore suspected that we might not have received truthful answers to this question. Some members of households refused to participate in the study for different reasons and others were not present at the time of the survey. The actual rates of refusal and non-response were not determined and both were omitted from analysis. Finally, the questionnaire did not fully address socioeconomic factors such as income, which generally is a good indicator of low awareness of viral disease transmission.

Conclusion

The prevalence of HBV and HCV in Damietta Governorate is close to the lowest reported national figure. The prevalence of HBV appears to have declined after the introduction of the HBV vaccine. Those infected with HBV and HCV were exposed to various risk factors for infection by different degrees, with dental and surgical procedures being the most important. Proper sterilization of dental and surgical instruments and activating infection control procedures in health-care settings are important to reduce the risk of infection. There is a need to educate the general population about HBV and HCV transmission routes, risk factors and avoidance of risky behaviours. Further studies addressing the quality and safety of dental and surgical procedures are needed.

Competing interests: None declared.

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