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Serologic Evaluation for Hepatitis B and C among Healthcare Workers in Southern Gaza Strip (Palestine).

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دراسة مدى الإصابة بفيروس التهاب الكبد من نوع B و C لدى العاملين في القطاع الصحي بجنوب قطاع غزة – فلسطين

ملخص: قد أجريت الدراسة على 399 من العاملين في القطاع الصحي الحكومي بالمنطقة الجنوبيـــة بقطـــاع غـــزة. أكدت النتائج أن نسبة انتشار الفيروس B بين العاملين كانت (2,8%) بينما نسبة الإصابة بالفيروس C هي (1,3%) و لم نجد بين العاملين مصاباً بالفيروس B و C معاً ، بالإضافة إلى ذلك فإن (18,7%) من المصابين بالفيروس B أو C أعطت نتائج عالية لفحص أنزيم ALT . وأكدت الدراسة أن هناك علاقة وطيدة بين الوخز بالإبر المستخدمة و الإصابة بالفيروسات. وأن نسبة الإصابة بالفيروس B بين غير المطعمين من العاملين كانت (4,1%) تقريباً وهي ضعف نسبة الذين تلقوا تطعيمًا ضد هذا الفيروس (2%). على كل حال فإن الذين تلقوا أقل مـــن 3 جرعـــات مـــن التطعيم كانت نسبة إصابتهم (3,9%) أعلى من هؤلاء الذين تلقوا 3 تطعيمات و الذين نسبة إصابتهم (1,5%) .
وقد توصلت الدراسة إلى أنه من أجل منع حدوث إصابات جديدة يجب التركيز على التزود بأدوات متخصصـــة فـــي التحكم بالإصابة ورفع نسبة التطعيم بين العاملين في القطاع الصحي. بالإضافة إلى ذلك فإننا نحتاج إلى تحديد اكبـــر لخطورة انتقال الفيروس B و C في المستشفيات و المراكز الصحية.

الكلمات المفتاحية: التهاب الكبد B و C

Abstract: A cross sectional study of 399 healthcare personnel was conducted in governmental healthcare settings of the southern region of Gaza Strip. The results revealed that, the prevalence of HBsAg was 2.8% among health workers and 1.3% for anti-HCV. None of the samples was found to be positive for both HBsAg and anti-HCV. Furthermore, 18.7% of the reactive cases (HbsAg or anti-HCV) have shown elevation in the liver enzyme ALT. Needle injection showed a highly significant association as a main risk factor for infection. The rate of infection among non-vaccinated health workers was approximately twice (4.1%) that among vaccinated participants (2.0%). However, among those who had less than 3 doses regimen of vaccine, the rate of infection was higher (3.9%) than those who had received the 3 doses (1.5%). All healthcare workers should be offered full HBV coverage vaccination. In addition, there is a need to better determination of the risk for HBsAg and anti-HCV transmission in selected settings.

Key words: Hepatitis B and C, health workers.

INTRODUCTION

Viral hepatitis is one of the major public health problems worldwide [1/2]. An estimated 300 million people worldwide carry the hepatitis B virus (HBV) [2/2]. Healthcare personnel are at increased risk of occupational acquisition of hepatitis [3/2]. A high prevalence (16.7%) of HBsAg was reported among healthcare personnel in Taiwan [4/2]. Turkey and Pakistan

have a low prevalence rate, with 3.0% and 2.4%, respectively [5/2 and 6/2]. The overall prevalence rate of HBsAg in Palestine is 3.4% [7/2]. It is 3.46% in Gaza Strip [8/2] and 4.3% among blood donors in the southern area of Gaza Strip [9/2]. The incidence rate of HBsAg infection decreased from 233 to 56 per 100,000 per annum in the year of 1990-1999. The decline started in 1994 and continued afterwards [10/2].

Regarding hepatitis C virus (anti-HCV), Tibbs & Smith (2001) [11/2] reported that, the chronic carriers of anti-HCV represent approximately 3% of the world population. Rates of infection among healthcare workers varied in different parts of the world, from up to 5.6% in Pakistani health workers [6/2] to 0.3% in Turkey [5/2]. Whereas, in France, the prevalence of anti-HCV in hospital-based health workers is 1.0% [12/2].

The overall prevalence rate of anti-HCV in Palestine was 0.3% [7/2]. In Gaza Strip, it was 0.37% [8/2]. Whereas, it was 0.66% among blood donors in the southern area of Gaza Strip [9/2].

Healthcare workers have been considered at high risk for hepatitis B and C infection. The problem of needle injection and sharps injuries remains a major issue. Transmission of HBsAg and anti-HCV by needle injection is well documented [13/2]. Lanphear *et al.* (1994) [14/2] reported that, the average incidence of anti-HCV seroconversion after accidental needle injection or sharps exposures from an anti-HCV positive source was 1.8%.

The prevalence of hepatitis B and C among healthcare workers in Gaza Strip is not known yet. This study is conducted to determine the prevalence of hepatitis B and C among this high-risk group in southern Gaza Strip, Palestine. This may help in developing policies to tackle such problems among healthcare workers.

MATERIALS AND METHODS

A cross sectional study was conducted among 399 healthcare personnel in the southern region of Gaza Strip during the period from February to August 2003.

Southern Gaza Strip is located in the south of Palestine. The healthcare personnel are working at three governmental hospitals and 14 primary healthcare centers in southern Gaza Strip [7/3].

All studied personnels were interviewed by using a brief study questionnaire that focused on demographic characteristic and certain potential risk factors for liver disease. They included gender, age, marital status, occupation, place of work, past blood transfusion or surgical procedures, history of jaundice, history of needle injection and previous vaccination for HBV.

In this study, all participants had signed an informed consent in Arabic. Blood samples were obtained in a vaccutainer plain tube and immediately transported to the laboratory of Khan Younis hospital. Sera were separated from the cellular blood components coded and stored at –80°C for future diagnosis.

For HBsAg, sensitive enzyme immunoassay (ELISA) was used to detect the presence of HBsAg in freshly collected serum by using closed system from Abbott production (Abbott's Diagnostics, North Chicago, IL, USA) using quantum II instrument. All the methods and techniques strictly followed the manufacturer's recommendations.

The results of the samples were compared to the cut off rate and considered reactive at > the cut off rate (0.03). However, all specimens that considered reactive initially were retested in duplicate using the same procedure. If the specimen is reactive in either of the repeated tests, the sample is considered repeatabley reactive [15/3, 16/3, and 17/3].

Viral hepatitis B- markers (anti-HBs, anti-HBc total, anti-HBc IgM, anti-HBe and HBeAg) were done for all reactive HBsAg by using Abbot AxSYM system as described by the manufacturer. The result of samples was calculated by the mean rate of two index calibrator replicates.

Abbott IMx HCV version 3.0 assay was used to detect the total antibody to hepatitis C virus (anti-HCV). The assay is based on the microparticle enzyme immunoassay technology for the detection of total antibody to Hepatitis C virus (anti- HCV) which is considered as an aid in the diagnosis of HCV. The results are compared to the cut off rate and considered reactive for anti-HCV at sample/cut off > the cut off rate (1.0). Specimens that are initially reactive were retested in duplicate using the same procedure [18/3 and 19/3].

Alanine Aminotransferase was done for all the reactive samples, using the diagnostic reagent of DiaSys. Reference range for adult women is <31 U/l and for adult men is <41 U/l [20/3].

Data analysis

The collected data and results of the work were analyzed using the SPSS, where, Chi-square test was applied. P-value of $\leq$ 0.05 were considered statistically significant.

Out of the 399 participants, 290 (72.7%) work at hospitals, while, 109 (27.3%) work at primary healthcare units. Majority are nurses149 (37.3%) followed by physicians 95 (23.8%) and technicians 47 (11.8%).

The overall sex distribution of the subjects was 277 (69.4%) males and 122 (30.6%) females. The participants' ages ranged between 21 and 58 years (mean, 38.5 $\pm$ 8.8 years), with a work duration mean of 10.5 $\pm$ 8.6 years.

Regarding the marital status, 357 (89.5%) of the participants are married and the rest, 42 (10.5%) are single. However, all reactive cases were recorded among married participants.

RESULTS

The data analysis in Table (1) reveals that, the prevalence of HBsAg among health workers is 2.8% and 1.3% for anti-HCV. None of the health workers was found to be reactive for both HBsAg and anti-HCV. However, 18.7% of the reactive cases (HBsAg or anti-HCV) show elevations in ALT liver enzyme.

The history of the participants revealed that, 58.6% had been tested for HBsAg at initial stage of their work and 0.85% of them are reactive. 63.2% of the subject were vaccinated against hepatitis B. From those, 79.8% had complete hepatitis B vaccination schedule and 20.2% did not complete the three doses of vaccine.

Table (1) shows the rate of infection among hospital participants is 2.4% for HBsAg and 1.0% for anti-HCV. Whereas, among primary healthcare participants, it is 3.7% for HBsAg and 1.8% for anti-HCV.

On the other hand, 11.5% of participants who had previous blood transfusion were reactive for HBsAg. While, 3.8% were reactive for anti-HCV.

Previous needle injections show highly significant association for HBsAg and anti-HCV infection ($P < 0.001$). Whereas, no significant association have been reported among most other studied risk factors.

Table (1): The relation between the prevalence of HBsAg and anti-HCV and definite participants' characteristics.

Variables	HBsAg		anti-HCV	
	R* n***(%)	NR** n (%)	R n (%)	NR n (%)
Work place				
Hospitals	7 (2.4)	283 (97.6)	3 (1.0)	287 (99.0)
Primary healthcare	4 (3.7)	105 (96.3)	2 (1.8)	107 (98.2)
Average prevalence	**11 (2.8)**	**388 (97.2)**	**5 (1.3)**	**394 (98.7)**
Jaundice history				
Yes	0 (0.0)	4 (100.0)	0 (0.0)	4 (100.0)
No	11 (2.8)	384 (97.2)	5 (1.3)	390 (98.7)
Previous surgery				
Yes	4 (2.9)	135 (97.1)	3 (2.2)	136 (97.8)
No	7 (2.7)	253 (97.3)	2 (0.8)	258 (99.2)
If yes				
Before work	4 (5.4)	70 (94.6)	2 (2.7)	72 (97.3)
During work	0 (0.0)	65 (100.0)	1 (1.5)	64 (98.5)
Blood transfusion				
Yes	3 (11.5)	23 (88.5)	1 (3.8)	25 (96.2)
No	8 (2.1)	365 (97.9)	4 (1.1)	369 (98.9)
If yes				
Before work	1 (9.1)	10 (90.9)	0 (0.0)	11 (100.0)
During work	2 (13.3)	13 (86.7)	1 (6.7)	14 (93.3)
Vaccination				
Yes	5 (2.0)	247 (98.0)	3 (1.2)	249 (98.8)
No	6 (4.1)	141 (95.9)	2 (1.4)	145 (98.6)
If vaccinated				
Complete vaccine	3 (1.5)	198 (98.5)	2 (1.0)	199 (99.0)
< 3 doses	2 (3.9)	49 (96.1)	1 (2.0)	50 (98.0)

* R=reactive **NR=non reactive *** (n), reflects the number of cases

The results of viral hepatitis B- markers for all HBsAg reactive cases showed that, anti-HBc total and anti-HBe were positive. While, anti-HBs, anti-HBc IgM and HBeAg were negative. That's mean, all the reactive cases (11) were in chronic carrier stage (Table 2).

Table (2): Hepatitis B status of the eleven reactive cases of healthcare workers.

Group	Status	HBV serological markers					
		HBsAg	HBeAg	anti-HBe	anti-HBc total	anti-HBc IgM	anti-HBs
I.	Susceptible	+	-	+	+	-	-
II.	A. Acute infection (Incubation period)	+	-	+	+	-	-
	B. Acute infection (Acute phase)	+	-	+	+	-	-
III.	Chronic infection	+	-	+	+	-	-
IV.	Recovery or convalescence	+	-	+	+	-	-

+ : Positive result

- : Negative result

The prevalence of HBsAg and anti-HCV among hospital sections' participants is illustrated in Table (3). The highest prevalence of HBsAg (42.9%) was in the radiology section. While, the highest prevalence of anti-HCV (33.3%) was in operation, surgery and pediatric sections.

Table (3): Distribution of hepatitis B and C infection among hospital sections' participants.

Section	HBsAg		anti-HCV	
	R n (%)	NR n (%)	R n (%)	NR n (%)
Operation	0 (0.0)	20 (7.1)	1 (33.3)	19 (6.6)
ICU	0 (0.0)	14 (4.9)	0 (0.0)	14 (4.9)
Surgery	1 (14.3)	49 (17.3)	1 (33.3)	49 (17.1)
Pediatrics	2 (28.6)	26 (9.2)	1 (33.3)	27 (9.4)
Gynecology and Obstetrics	1 (14.3)	40 (14.1)	0 (0.0)	41 (14.3)
Internal Medicine	0 (0.0)	25 (8.8)	0 (0.0)	25 (8.7)

Laboratory	0 (0.0)	25 (8.8)	0 (0.0)	25 (8.7)
Radiology	3 (42.9.0)	17 (6.0)	0 (0.0)	20 (7.0)
Pharmacy	0 (0.0)	10 (3.5)	0 (0.0)	10 (3.5)
Dental	0 (0.0)	3 (1.1)	0 (0.0)	3 (1.0)
Emergency	0 (0.0)	36 (12.7)	0 (0.0)	36 (12.5)
Administration	0 (0.0)	18 (6.4)	0 (0.0)	18 (6.3)
Total	7 (100.0)	283 (100.0)	3 (100.0)	287 (100.0)

P-value for HBsAg =0.047
P-value for anti-HCV =0.775

The prevalence of HBsAg varies among different professions. The prevalence among nursing staffs is the highest (45.5%). However, for anti-HCV the highest prevalence (40.0%) is among nursing staffs and physicians (Table 4).

Table (4): Relation between the occupation and rate of hepatitis B and C infection among all participants.

Occupation	**HBsAg**		**Anti-HCV**	
	R **n (%)**	**NR** **n (%)**	**R** **n (%)**	**NR** **n (%)**
Physician	2 (18.2)	93 (24.0)	2 (40.0)	93 (23.6)
Nurse	5 (45.5)	144 (37.1)	2 (40.0)	147 (37.3)
Lab technician	0 (0.0)	31 (8.0)	0 (0.0)	31 (7.9)
Radiology technician	1 (9.1)	15 (3.9)	0 (0.0)	16 (4.1)
Pharmacist	1 (9.1)	23 (5.9)	0 (0.0)	24 (6.1)
Clerical staff	1 (9.1)	46 (11.9)	0 (0.0)	47 (11.9)
Blue worker	1 (9.1)	29 (7.5)	1 (20.0)	29 (7.4)
Dentist	0 (0.0)	7 (1.8)	0 (0.0)	7 (1.8)
Total	**11 (100.0)**	**388 (100.0)**	**5 (100.0)**	**394 (100.0)**

Table (5) shows that, the rate of vaccination among hospital workers is 65.2%, while, it is 57.8% among primary healthcare workers. The highest covered group of vaccination is lab technicians (93.5%), followed by physicians (75.8%) and nurses (75.2%).

Regarding vaccination, the rate of infection of HBsAg among non-vaccinated health workers (4.1%) was approximately twice that among vaccinated participants (2.0%). However, among those who had not completed the doses of vaccine, the rate of infection was higher (3.9%) than those who had received the 3 doses of vaccine (1.5%).

Table (5): The distribution of vaccination rate among the different occupations.

Occupation	Vaccination					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Physician	72	75.8	23	24.2	95	**100.0**
Nurse	112	75.2	37	24.8	149	**100.0**
Lab technician	29	93.5	2	6.5	31	**100.0**
Radiology technician	7	43.8	9	56.3	16	**100.0**
Pharmacist	5	20.8	19	79.2	24	**100.0**
Clerical staff	12	25.5	35	74.5	47	**100.0**
Blue worker	10	33.3	20	66.7	30	**100.0**
Dentist	5	71.4	2	28.6	7	**100.0**
Total	**252**	**63.2**	**147**	**36.8**	**399**	**100.0**

Table (6) illustrates the distribution of the reactive cases according to the age groups, the highest prevalence of HBsAg is among the age groups 41-50 years (4.4%). Whereas, for anti-HCV it is among the age group ≥51 years (3.8%).

Table (6): The prevalence of HBsAg and anti-HCV infection versus age groups.

Age group	HBsAg			Anti-HCV		
	R n (%)	NR n (%)	Total n (%)	R n (%)	NR n (%)	Total n (%)
21-30	2 (2.5)	78 (97.5)	**80 (100.0)**	0 (0.0)	80 (100.0)	**80 (100.0)**
31-40	4 (2.3)	172 (97.7)	**176 (100.0)**	1 (0.6)	175 (99.4)	**176 (100.0)**
41-50	4 (4.4)	87 (95.6)	**91 (100.0)**	2 (2.2)	89 (97.8)	**91 (100.0)**
≥ 51	1 (1.9)	51 (98.1)	**52 (100.0)**	2 (3.8)	50 (96.2)	**52 (100.0)**

DISCUSSION

In developing countries, the risk of occupational transmission of blood-borne viruses (particularly HBsAg and anti-HCV) is increased by the excessive handling of contaminated needles, blood and body fluids [21/10]. In southern Gaza Strip, this study reveals that, the prevalence of HBsAg among health workers is 2.8% and 1.3% for anti-HCV. These findings agree with many results concerning hepatitis B infection among health workers

worldwide. Ozsoy *et al.* (2003) [5/10] reported that, hepatitis B infection affecting 3.0% of the healthcare workers in Turkey. In Pakistan it is 2.4% [6/10]. As well as, in Israel, it was 1.9% [22/10]. Higher prevalence (16.7%) was observed in Taiwan [4/10].

Concerning anti-HCV, similar results (1.8%) have been reported by Manian *et al.* (1992) [23/10]. In France, the prevalence among hospital-based health workers is 1.0% [12/10]. However, lower prevalence (0.3%) was found in Turkey [5/10]. Also, it was 0.7% among Swedish healthcare workers [24/10]. Whereas, in Pakistan, higher prevalence (4.0%) have been reported by Hasan and Rehman (1991) [25/10]. In another study in the same country, the ratio was 5.6% [6/10].

By comparing our results with the overall prevalence rate of hepatitis in Gaza Strip (3.46% for HBsAg and 0.37% for anti-HCV) [8/10], the results revealed that, the prevalence of HBsAg infection is approximately similar among health workers. This result is likely due to the high coverage rate of vaccination (65.2%). While, the prevalence of anti-HCV is higher among health workers, as no vaccine is applied yet. Other causes may be due to the exposure to viral infected materials.

Concerning the risk factors of infection, needle injection may be the only main risk factor, because it shows highly significant association for HBsAg and anti-HCV. Moreover, previous blood transfusion had also shown significant association (P-value = 0.005) for HBsAg.

These results are in agreement with that reported by Polish *et al.* (1993), Sundkvist *et al.* (1998), and Aziz *et al.* (2002) [26/11, 13/11, and 6/11] who have reported needle injection as the major issue for transmission of HBsAg and anti-HCV.

Regarding age distribution, the highest prevalence of HBsAg and anti-HCV was among the age groups 41-50 and $\geq$51 years (Table 6). This may be due to, the increased number of service years, thus greater possibility of risky exposure to blood born viruses through exposure to contaminated instruments in healthcare settings. Another cause, may be the reuse of needles and syringes in injection and health services in Gaza Strip before starting the use of disposable syringes. Whereas, there were no significant association (P-value >0.05) between the vaccination and the high rate of infection among these two age groups. Where, 54 (59.3%) of healthcare workers among the age group 41-50 years were vaccinated and 28 (53.8%) were among the age group $\geq$51 years.

Regarding the different professions, nursing staffs show high prevalence of infection for HBsAg and anti-HCV (Table 4). This may be due to

the frequent exposure to possible source of infection such as body fluids, needles and contaminated instruments, which leads to higher risk of infection.

It appears that, no reactive cases were recorded in certain sections as laboratory and dental. These findings might be attributed to the high percentage of vaccination.

We recommend all healthcare workers should be offered full HBV coverage vaccination and provide medical management for persons already infected. In addition, good training in occupational hygiene and how to handle infectious materials is essential for health service workers.

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