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Research Article

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ABSTRACT

Background: **Health care workers are a high-risk group for acquiring Health care-associated infections and for transmission to their patients and close contacts.**
Objective: The aims of this study were to evaluate the level of knowledge, attitude and self-reported behavior of HCWs in relation to HBV, HCV and other HAIs and to identify factors that determine them in primary health care, Kuwait.
Methods: **This study was a cross-sectional survey that was conducted in all primary health center located in two randomly selected heath regions in Kuwait. An anonymous self-administered questionnaire was distributed to all currently working health care workers in the selected centers.**
Results: **Out of 48 questions, the mean percentage of correct answer was 57.7% with a mean knowledge score = 28.3 ± 7.1. Out of 14 attitude statements, mean percentage of positive attitude was 10.2 ± 2.7. Out of 23 behavior statements, 82.8% reported satisfactory practice with a mean behavior score = 12.4±5.8. Multivariate logistic regression revealed that the pharmacists were at five times risk of giving low knowledge level compared to the nurses and non-Arab nationalities and those earning monthly income ≥1500 KD were more knowledgeable. Female gender and lower knowledge score were associated with negative attitude. Females, laboratory technicians and participants with negative attitude were more liable to practice unsatisfactory behavior.**
Conclusions: **Health care workers in primary health care showed fair level of knowledge and positive attitude, but poor practice. This clearly indicated the urgency to implement initiatives for improving healthcare policies regarding HAIs.**

Keywords: knowledge, attitude, practice, health associated infection, primary health workers.

INTRODUCTION

Occupational blood-borne infections (BBIs) are associated with significant morbidity and mortality. Health care workers (HCWs) are exposed to hazardous BBIs such as infection with hepatitis B virus (HBV), hepatitis C virus (HCV) and human immune deficiency virus (HIV). HBV and HCV infections are serious public health problems that can have consequences in terms of psychological and occupational diseases (*Bahadori and Sadigh, 2010*). They are common causes of occupational diseases transmitted from patients to HCWs and vice versa, and also to HCWs' families. Fortunately, most occupational transmissions can be prevented by standard precautions *(Gounden and Moodley, 2000).*

In their occupational environment, HCWs are exposed to multiple BBIs such as HBV and HCV. Centers for Disease Control and Prevention (CDC) reported that 3.9 million individuals are contaminated with HCV, and that 2.7 million of these infections will become chronic *(CDC MMWR, 2003).* It has been estimated that 14.4% and 1.4% of

hospital workers are infected with HBV and HCV, respectively *(Polish et al., 1993).* Physicians, dentists, nurses, laboratory staff, and dialysis center personnel are at high risk of acquiring infection. The highest prevalence of HBV is seen in dentists *(Nagao and Matsuoka, 2008).* In other studies, nurses were most commonly exposed to infection (41%), followed by physicians (31%) (*Bosques-Padilla et al., 2010*).

Transmission from HCWs to patients is rare, and only few cases have been reported. (*Bosques-Padilla et al., 2010*).Transmission of HBV and HCV from patients to HCWs has been known for many years; however, the roots of transmission have not been recognized completely *(Moloughney, 2001).* Data from a case-control study conducted in several European countries including France, Italy, Spain, United Kingdom, and Switzerland showed that HBV and HCV transmission among HCWs was significantly correlated with factors such as the type of procedure (*Yazdanpanah et al., 2005*). In Tehran, northern Iran, approximately 1.8% of HCWs became serologically HCV-positive after percutaneous exposure *(Bahadori and Sadigh, 2010).*

Unnecessary injections, the frequent use of unsterile needles and inappropriate hazardous waste disposal are the major BBIs risk factors in developing countries. There is an association between the prevalence of BBIs and the frequency of injections (*Sagoe-Moses et al., 2001).* The risk of blood-borne transmission among HCWs and patients depends on factors related to individual infectivity such as viral load, the clinical context, technical skill and the health care settings environment (*Communicable Diseases Network Australia, 2005*).

Hepatitis was one of the most common occupational disease among HCWs. High risk group included nurses, doctors, and pathology workers. The personnel that were infected most frequently were those working in inpatient wards and intensive care units (*Ahn and Lim, 2008*).

A large literature review showed that the existing literature on HAIs primarily focuses on hospital sites and may not be applicable to other health care settings, such as PHC centers (*Porta et al., 1999*). However, PHC workers are also at risk of infection with BBIs because of occupational exposure to blood and inadequate knowledge about the risks to which they are exposed *(Monge et al., 2001; Krishnan et al., 2007).* Furthermore, PHC HCWs represent a growing occupational group around the world, requiring specific policies to protect their health. Therefore, the objectives of this study were to evaluate the level of knowledge, attitude and self-reported behavior of HCWs in relation to HBV, HCV and other HAIs, and to identify factors that determine them.

SUBJECTS AND METHODS

The health care system in Kuwait is divided into five regional health authorities. PHC is provided through 92 centers distributed in the health regions proportionate to their population. This study was a cross sectional descriptive survey that was conducted from March to December 2011 in all PHC centers located in two randomly selected health regions (Capital and Farwaniya). Data were collected from HCWs working in these centers.

Data of this study was collected through a specially designed questionnaire that was derived from other published studies dealing with the same topic as well as from our own experience (*Parmeggiani et al., 2010)*. The questionnaire comprised four sections of questions, first: personal and occupational characteristics included eleven questions, second: 47 questions were used to explore knowledge levels about the risks of acquiring and/or transmitting HBV or HCV or certain HAIs for/to a patient and standard precautions for prevention; third: 14 questions determined attitudes toward precautionary guidelines and perception of the risk of acquiring HAI and HBV or HCV infections; fourth: 23 self-reported behavior questions explored practice of standard precautions. In the knowledge section, correct answers were based on reviewing of the available literature as well as policies and guidelines (Brinsley et al., 2005; Greig, 2011). A positive answer was assigned one point, whereas a negative or missed answer was given zero. Regarding attitude, participants were asked to what extent they agreed or disagreed (using a two-point scale_ 1 for agree and zero for disagree). The means of the total score from the 47 knowledge questions, 14 attitude questions and 23 self-reported behavior questions were used as the discriminant level. Accordingly participants were classified as having satisfactory knowledge or not, with positive or negative attitudes, and with acceptable behavior or not.

A pilot study was carried out on 30 physicians and nurses (not included in the final study). This study was formulated to test the clarity, applicability of the study tools, identify the difficulties that may be faced during the application. Also, the time needed for filling the questionnaire by the staff was estimated during this pilot study. The necessary modifications according to the results obtained were done.

All the necessary approvals for carrying out the research were obtained. The Ethical Committee of the Kuwaiti Ministry of Health approved the research. A written format explaining the purpose of the research was prepared and signed by the physician before filling the questionnaire. In addition, the purpose and importance of the research were discussed with the director of the health center.

Statistical analysis

The Statistical Package for Social Sciences (SPSS-17) was used for data processing. Simple descriptive statistics were used (mean ± standard deviation for quantitative variables and frequency with percentage distribution for categorized variables). Comparison was based on a series of univariate analyses using Chi square test (χ^2 test) for categorical variables and one way ANOVA, or student *t*-test for quantitative ones. For the possible confounding effect of the variables, multiple logistic regression analysis was used for the final analysis to predict factors which may be associated with the low knowledge level, negative attitude and unaccepted behavior. Results of the analyses were expressed in terms of odds ratios (OR) together with 95% confidence intervals (95% CLs). All the explanatory variables included in the model were categorized into two or more levels (R = reference category): age groups: <30[R], 30-49, ≥50; gender: male [R], female; years in current job: <10[R], 10-, 20-, ≥30; nationality: Kuwaiti [R], non- Kuwaiti Arab, non-Arabs; jobs: nurse [R], physician, laboratory technician, pharmacist, other; working hours per week: <10 [R], 10-, 20-, ≥30; marital status: single [R], married widow/divorced; education: secondary [R], university, higher; income: <500 [R], 500, 1000, 1500-, ≥2000; family history of HAV: no [R], yes; family history of HBV or HCV: no [R], yes.

RESULTS

Recruitment efforts resulted in participation of 534 persons with a response rate of 55%. Table 1 showed their socio-demographic and personal characteristics.

Table 1: Personal characteristics of heath care workers

Variables	No.	%	Variables	No.	%
Age (Year)			**Nationality**		
<30	124	23.2	Kuwaiti	169	31.6
30-	230	43.1	Non-Kuwaiti Arab	162	30.3
40-	122	22.8	Non-Arab	203	38.0
≥ 50	58	10.9	**Marital status**		
Gender			Single	66	12.4
Male	162	30.3	Married	458	85.8
Female	372	69.7	Widow or divorced	10	1.9
Working duration (Year)			**Education**		
<10	260	48.7	Secondary	97	18.2
10-	184	34.5	University	287	53.7
20-	62	11.6	Higher	150	28.1
≥30	28	5.2	**Income (KD)**		
Working hours per week			<500	226	42.3
<40	106	19.9	500-999	123	23.0
40-	283	53.0	1000-1499	96	18.0
45-	122	22.8	1500-1999	48	9.0
≥50	23	4.3	≥2000	41	7.7
Job			**Family history of HAV**		
Nurse	277	51.9	No	522	97.8
Physician	152	28.5	Yes	12	2.2
Laboratory technician	52	9.7	**Family history of HBV or HCV**		
Pharmacist	28	5.2	No	518	97.0
Other	25	4.7	Yes	16	3.0
			Total	**534**	**100.0**

Their mean age was 36.8±9 years. Female predominated male participants (69.7% versus 30.3%). Nurses and physicians made up the majority of respondents interviewed accounting for 51.9% and 28.5% respectively whereas

laboratory technicians, pharmacists, and other professions accounted for 19.6% of all respondents. Kuwaiti and Arabs were more or less similarly presented, accounting for 31.6% and 30.3% respectively, while the non-Arab constituted 38.0%. More than three-quarters of the respondents (81.8%) had university or higher educational level, 85.8% were married, and 65.3% had monthly income <1000 KD whereas only 7.7% had ≥ 2000 KD income. The mean years spent by participants in the current job was 11.5±8.6, with 48.7% of the them worked in their jobs for less than 10 years and the mean number of working hours / week ranged from 30 to 100 (42.5±6.1).Only 2.2% had a family history of hepatitis A infection and 3.0% of HBV.

Table 2: Proportions of participants answered correctly statements regarding HBV, HCV and other HAIs

Statements	n = 534	%	Statements	n = 534	%
HCW can acquire from a patient			**HCW can transmit to a patient**		
HBV	407	76.2	HBV	308	57.7
HCV	388	72.7	HCV	291	54.5
HIV	358	67.0	HIV	279	52.2
Influenza	418	78.3	Influenza	459	86.0
Measles	267	50.0	Measles	240	44.9
Mumps	216	40.4	Mumps	217	40.6
Rubella	174	32.6	Rubella	148	27.7
Tetanus (F)	471	88.2	Tetanus (F)	476	89.1
Tuberculosis	383	71.7	Tuberculosis	358	67.0
Varicella	257	48.1	Varicella	233	43.6
Which of the following infections can be serious			**Routes of transmission of HBV and HCV**		
HBV	395	74.0	Blood and blood products	492	92.1
HCV	401	75.1	Needles and sharps	493	92.3
HIV	466	87.3	Sexual intercourse	416	77.9
Influenza	88	16.5	Faeco-oral (F)	151	28.3
Measles	86	16.1	Contaminated (F)water	106	19.9
Mumps	82	15.4			
Rubella	80	15.0	**Ways of preventing HBV or HCV**		
Tetanus	373	69.9	Vaccination	237	44.4
Tuberculosis	317	59.4	Proper disposal of sharps, needles and blood	485	90.8
Varicella	93	17.4	Avoid needle/sharps injury	492	92.1
			Avoid casual sex or/and multiple sexual partners	396	74.2
HBV can be transmitted as a nosocomial infection	265	49.6	Avoid drinking contaminated water (F)	160	30.0
			Avoid food not well cooked (F)	137	25.7
HBV is also widely transmitted like HIV/AIDS	395	74.0			
			Knowledge of HBV		
HCW are at risk of HBV / HCV by virtue of their work	455	85.2	Are you aware of HBV	435	81.5
			Doses of Hepatitis B Vaccine required for complete protection	352	65.9
			Expected Interval between last dose and dose preceding it	237	44.4

HAIS = health associated infection, HCW = Health care worker, (F) = false

Table 2 showed the percentage of participants who answered correctly certain statements regarding blood born infection. The average percentage of correct answers for all statements was 57.7%, from 32.6% to 88.2% of the participants answered correctly the questions about infections that HCWs can acquire from the patient, 27.7% to 89.1% knew the infections that HCWs can transmit to patients. From 15.0% to 87.3% knew the list of serious diseases. Regarding mode of infection, 92.1% knew that hepatitis B or C is contracted through blood contact, 92.3% knew that needles and sharps are also a method of transmission, and 77.9% of HCWs knew that HBV or HCV can be spread through sexual intercourse. However, some deficits were identified in their knowledge level as only 44.4% of HCWs answered correctly about the importance of vaccination and the expected interval between its doses, and less than a third of the participants answered correctly for contaminated water and well-cooked food.

Table 3: Participants' mean knowledge score for HBV, HCV and HAIs according to different variables

Variables	Mean ± SD	P	Variables	Mean ± SD	P
Age in years			**Nationality**		
<30	27.8 ± 6.5	0.543	K	27.1 ± 7.2	0.035
30-	28.0 ± 7.1		Non-Kuwaiti Arab	27.0 ± 7.6	
40-	26.9 ± 7.6		Non-Arab	28.7 ± 6.6	
50+	27.9 ± 7.4		**Marital status**		
Gender			Single	27.3 ± 6.2	0.892
male	27.3 ± 7.8	0.433	Married	27.8 ± 7.3	
female	27.9 ± 6.8		Widow or divorced	28.1 ± 6.3	
Working years			**Education**		
<10	27.6 ± 6.9	0.942	Secondary	28.3 ± 7.6	0.416
10-	27.6 ± 7.4		University	27.3 ± 7.1	
20-	28.1 ± 7.7		Higher	28.0 ± 6.9	
≥30	28.1 ± 6.2		**Income**		
Working hours/week			<500	27.8 ± 7.1	0.313
<40	27.5 ± 7.0	0.719	500-999	27.3 ± 7.5	
40-	27.8 ± 7.2		1000-1499	27.1 ± 7.4	
45-	27.4 ± 7.5		1500-1999	27.9 ± 6.4	
≥50	29.2 ± 5.6		≥2000	29.8 ± 6.3	
Job			**Family history of HAV**		
Nurse	28.0 ± 7.0	0.001	No	27.7 ± 7.1	0.552
Physician	28.1 ± 6.9		Yes	28.9 ± 6.1	
Laboratory technician	28.8 ± 7.6		**Family history of HBV or HCV**		
pharmacist	22.6 ± 5.7		No	27.7±7.2	0.586
other	25.4 ± 7.7		Yes	26.8±5.3	
			Overall knowledge score	**28.3±7.1**	

Table 3 presented the mean knowledge score for different groups of participants. The overall, mean knowledge score was 28.3 ± 7.1 from a total score of 48 questions. The highest mean scores were recorded for age group 30-39 (29.0±7.1), laboratory technicians (28.8±7.6), non-Arab, (28.7±6.6), working years ≥ 30 years (28.1±7.7), working hours per week ≥50 (28.1±5.6), monthly income ≥ 2000 KD (29.8±6.3), and positive family history of HAV (28.9±6.1). No significant difference was detected except for job and nationality.

Table 4: Factors associated with low knowledge score, results of multiple logistic regression analysis

Variable	OR	95% CI
Job		
Nurses	1	
Physicians	0.7	(0.4-1.2)
Lab technicians	0.7	(0.4-1.5)
Pharmacists	4.8	(1.2 -18.6)
Other	1.2	(0.5-3.2)
Nationality		
K	1	
Non-Kuwaiti Arab	0.9	(0.39-1.4)
Non-Arab	0.4	(0.2-0.9)
Income (KD)		
<500	1	
500-999	0.9	(0.5-1.7)
1000-1499	0.6	(0.3-1.4)
1500-1999	0.4	(0.1-0.9)
≥2000	0.2	(0.1-0.8)

Results of multivariate logistic regression, in table 4, revealed that the pharmacists were at about five times risk of giving low knowledge level as compared to the nurses (OR = 4.8, 95% CI: 1.2-18.6), and non-Arab nationalities and earning monthly income 1500-1999 or ≥ 2000 KD were proved to be protective factors (OR = 0.4, 95% CIs: 0.2-0.9), (OR = 0.4, 95%, CIs: 0.1-0.9), and (OR = 0.3, 95%, CIs: 0.1-0.8) respectively.

Table 5: Attitude of the participants towards HBV and HCV and HAIs

Attitude	No.	%
Attitude towards HAIs		
– Hands hygiene after removing gloves is a HAIs control measure	312	58.4
– Changing mask before going to another patient is a HAIs control measure	453	84.8
– Wearing gloves, mask, and protective eyewear are a HAIs control measures	380	71.2
– Invasive procedures are a risk factor for HAIs	288	53.9
– HCWs' hands are a vehicle for transmission of nosocomial pathogens	433	81.1
– The use of guidelines for HAIs control practices reduce the risk	439	82.2
– Hands hygiene measures reduce the risk of HAIs among patients	467	87.5
– Hands hygiene measures reduce the risk of HAIs among HCWs	453	84.8
Attitudes towards HBV and HCV		
– Your job puts you at risk of hepatitis B or C infection	430	80.5
– Your lifestyle puts you at risk of hepatitis B or C infection	108	20.2
– You need to be protected from hepatitis B or C infection	465	87.1
– A health worker can infect patients with hepatitis B or C infection	365	68.4
– Considered it necessary to receive vaccine	461	86.3
– Your children received hepatitis B Vaccine	372	69.7
Total	**534**	**100.0**

Table 5 illustrated participants' attitude toward HAIs, HBV, and HCV. The percentage of participants that reported positive attitude towards different protection guidelines ranged from 53.9% to 87.5%. It was shown that 80.5% believed that their job puts them at risk of HBV and HCV infection, 87.1% believed that they need to be protected from Hepatitis B infection, 86.3% considered it is necessary to receive vaccine. However, lower percentages of participants believed that a health worker can infect patients with HBV or HCV (68.4%), 20.2% believed that their lifestyle puts them at risk of infection with these viruses (table 6).

Table 6: Participants' mean attitude score for HBV, HCV and HAIs according to different variables

Variables	Mean ± SD	P	Variables	Mean ± SD	P
Age in years			**Nationality**		
<30	10.3±2.6	0.755	K	10.7±2.1	0.003
30-	10.1±2.9		Arab	10.2±2.5	
40-	10.2±2.5		Non-Arab	9.7±3.3	
≥50	9.8±2.9		**Marital status**		
Gender			single	10.2±2.9	0.400
Male	10.7±2.3	0.003	married	10.2±2.7	
Female	9.9±2.9		widow or divorced	9.0±2.8	
Working years			**Education**		
<10	10.1±2.8	0.601	Secondary	8.8±3.9	<0.001
10-	10.3±2.5		University	10.5±2.5	
20-	10.4±2.7		Higher	10.4±2.0	
≥30	9.6±3.4		**Income in KD**		
Working hours per week			<500	9.3±3.4	<0.000
<40	10.6±2.0	<0.000	500-999	11.0±2.0	
40-	9.6±3.1		1000-1499	10.8±2.0	
45-	11.0±2.1		1500-1999	10.9±2.0	
≥50	10.4±2.1		≥2000	10.1±1.6	
Job			**Family history of HAV**		
Nurses	9.6±3.3	<0.001	No	10.2±2.7	0.921
Physicians	10.4±2.0		Yes	10.1±2.9	
Laboratory technicians	11.2±1.6		**Family history of HBV or HCV**		
Pharmacists	11.1±2.0		No	10.2±2.7	0.752
Other	11.3±1.7		Yes	10.4±2.9	
			Overall attitude score	**10.2±2.7**	

As shown in table 6, from 14 statements, the overall mean attitude score was 10.2 ± 2.7. The highest attitude scores were reported by males (10.7±2.3), physicians (11.2±1.6), Kuwaiti (10.7±2.1), working hours per week ≥ 50 (10.4±2.1), university education (10.5±2.5), and higher education (10.9±1.6). After adjustment, only female gender and lower knowledge score were retained as risk factors for negative attitude (OR = 1.8, 95% CI: 1.6-2.9) and (OR = 1.9, 95% CI: 1.2-3.0) respectively.

Table 7: Self-reported behavior of respondents towards HAIs

Practices always or often adopted to reduce the risk of HAIs	No.	%
Hands hygiene measures before starting the working activity	442	82.8
Hands hygiene measures before going to another patient	409	76.6
Wearing gloves when at direct contact with a patient	394	73.8
Hands hygiene measures before wearing gloves	362	67.8
Hands hygiene measures after removing gloves	418	78.3
Changing gloves before going to another patient	385	72.1
Wearing protective eyewear when at direct contact with a patient	135	25.3
Wearing mask when at direct contact with a patient	219	41.0
Recapping needles after using	208	39.0
Placing needles in sharp's containers	391	73.2
Using syringes with retractable needle	237	44.4
Using syringes with protective shield	257	48.1
Using intravenous cannulation with retractable needle	228	42.7
Measures taken to protect against hepatitis infection		
Wearing of gloves	422	79.0
Wearing of goggles	188	35.2
Adequate disposal of sharps	429	80.3
Avoid patients diagnosed With hepatitis B	118	22.1
Multivitamin/Blood Tonic	103	19.3
Use antibiotics after contact	61	11.4
Others	146	27.3
Behavior towards Hepatitis B vaccination		
Ever received hepatitis B Vaccine	399	74.7
Number of doses of vaccine received	335	62.7
Completed vaccination schedule	328	61.4
Total	**534**	**100.0**

The main self-reported behaviors adopted to reduce the risk of HAIs were listed in table 7. It was shown that 82.8% of the participants practiced hands hygiene measures before starting the working activity, 78.3% adopted hands hygiene measures after removing gloves, 76.6% practiced hands hygiene measures before starting the working activity, 73.8% practiced hands hygiene measures before going to another patient, 73.2% were using syringes with retractable needle, 72.1% adopted changing gloves before going to another patient. For measures taken to protect against hepatitis infection, 80.3% adopted adequate disposal of sharps and 79.0% adopted wearing of gloves. Concerning behavior towards Hepatitis B vaccination, 74.7% received hepatitis B Vaccine and 61.4% completed their vaccination schedule. Out of 23 statements, the mean behavior score was 12.4±5.8. The highest behavior scores were reported by males (11.7±6.2), pharmacists (14.5±4.0), Kuwaiti, (13.8±4.4), working hours per week 45-49 (14.0±4.4), higher education (13.8±4.7), and monthly income > 500 KD. (Table 8).

Table 8: Participants' mean behavior score for HBV, HCV and HAIs according to different variables

Variable	Mean ± SD	P	Variable	Mean ± SD	P
Age in years			**Nationality**		
<30	11.9 ± 5.7	0.422	K	13.8 ± 4.4	<0.00
30-	12.4 ± 6.0		Non-Kuwaiti Arab	13.4 ± 5.1	
40-	13.1 ± 5.2		Non-Arab	10.4 ± 6.8	
≥50	12.0 ± 6.7		**Marital status**		
Gender			Single	12.9 ± 5.6	0.714
Male	13.9 ± 4.5	<0.001	Married	12.3 ± 5.8	
Female	11.7 ± 6.2		Widow or divorced	12.0 ± 7.2	
Working years			**Education**		
<10	11.9 ± 5.9	0.163	Secondary	9.0 ± 7.3	<0.00
10-	13.1 ± 5.4		University	12.8 ± 5.3	
20-	12.6 ± 6.1		Higher	13.8 ± 4.7	
≥30	11.4 ± 7.2		**Income**		
Working hours/week			<500	9.8 ± 6.8	<0.00
<40	13.0 ± 4.9	<0.00	500-999	14.6 ± 3.4	
40-	11.4 ± 6.6		1000-1499	14.3 ± 4.9	
45-	14.0 ± 4.4		1500-1999	14.0 ± 3.6	
≥50	13.9 ± 3.5		≥2000	13.4 ± 4.2	
Job			**Family history of HAV**		
Nurse	10.9 ± 6.5	<0.00	No	12.4 ± 5.8	0.181
Physician	14.2 ± 4.6		Yes	10.2 ± 6.3	
Laboratory technician	13.2 ± 4.2		**Family history of HBV or HCV**		
Pharmacist	14.5 ± 4.0		No	12.4 ± 5.8	0.463
Other	13.8 ± 3.9		Yes	13.4 ± 5.0	
			Total	**12.4 ± 5.8**	

Logistic regression analysis, showed that females as compared to males, laboratory technicians as compared to nurses and participants with negative attitude were more liable to practice unaccepted behavior (OR = 1.6, 95% CI: 1.1-2.5), (OR = 2.4, 95% CI: 1.1-5.2) and (OR = 1.5, 95% CI: 1.1-2.3) respectively. Earning monthly income 500-1500 KD as compared to < 500 KD and working hours per week 45-50 as compared with < 50 hours were proved to be protective variables (OR = 0.4, 95%, CIs: 0.2-0.7) and (OR = 0.4, 95%, CIs: 0.2-0.8) respectively (Table 9).

Table 9: Factors associated with unsatisfactory behavior, results of multiple logistic regression analysis

Variable	OR	95% CI
Gender		
Male	1	
Female	1.6	(1.1-2. 5)
Professional groups		
Nurses	1	
Physicians	0.6	(0.3-1.0)
Lab technicians	2.4	(1.1-5.2)
Pharmacists	0.9	(0.3-2.3)
Other	1.1	(0.4-2.8)
Income (KD)		
<500	1	
500-999	0.4	(0.2-0.7)
1000-1499	0.6	(0.3-1.1)
1500-1999	0.6	(0.3-1.2)
≥2000	0.9	(0.4-2.2)
Working hours/week		
<40	1	
40-	0.8	(0.5-1.4)
45-	0.4	(0.2-0.8)
≥50	0.8	(0.3-2.3)
Total attitude		
Positive	1	
Negative	1.5	(1.1-2.3)

DISCUSSION

The increasing prevalence of hepatitis B, hepatitis C and other HAIs requires compliance with universal precaution guidelines to reduce occupational transmission of infections. HCWs in PHC centers should follow certain universal precautions while attending to all patients. *(Sagoe-Moses et al., 2001).* It is clear that while hospital environments offer more opportunities for risk of transmission of blood-borne viruses, long-term care homes, PHC and other outpatient facilities also need to be aware of the existence of the risk and the simple measures that need to be implemented to avoid exposure *(CDC, 2005).*

Knowledge, attitude and practice (KAP) studies provide information about the people's awareness of certain topics, their feelings and their performance (*Kaliyaperumal, 2004).* In the present study, the overall, percentage of knowledge correct answers was 57.7%, therefore, HCW level of knowledge in the current study was unsatisfactory because the mean knowledge score was 28.3 ± 7.1 from a total score of 48. Despite the relatively unacceptable level of knowledge in the current study, this finding is importantly higher than results reported by similar surveys. Unfortunately, however, different survey methodologies make direct comparison impossible *(Helfgott et al., 1998; Paudyal et al., 2008).* One explanation for the low level of awareness among HCWs could be lack of appropriate courses in the curricula of medical universities. Another explanation is that many of the participants were not in direct contact with patients or invasive procedures; therefore, their knowledge interest was low.

The transmission of BBIs within the healthcare setting can occur in three directions: from patient to patient; from HCW to patient; and from patient to HCW. Since the vast majority were aware about some infections that a HCW can acquire from a patient (*Bosques-Padilla et al., 2010*). There are few reports of BBIs transmission from infected HCWs to patients and most cases have not been associated with the performance of exposure-prone

procedures but rather with the use of illicit drugs by the HCW *(Williams et al., 2004)*. In contrast, 27.7% to 89.1% knew the infections that HCWs can transmit to patients. Therefore, there are wide areas where the knowledge was lower, particularly regarding infections that a HCW can transmit to a patient. Based on this consideration, this specific population needs to learn more in order to reduce the rate of HAIs. Continuing medical benefits in the PHC environment require continuing educational input.

This study revealed a minor difference in knowledge score between physicians and nurses. Lab technicians, non-Arab HCWs were more likely to have a higher level of knowledge, to have a higher perceived risk, and to use appropriate HAIs' control measures than other professional groups. *Parmeggiani et al. (2010)* in Italy reported that nurses were more likely to have a higher level of knowledge than physicians and they explained that it is possible that such differences may be attributed to the more active involvement in preventive activities regarding HAIs.

According to logistic regression, pharmacists and administrators were at risk of low knowledge; this could be attributed to their indirect ways of contact with the patients and non-contact with invasive procedures. Non-Arab, HCWs with higher income were more knowledgeable than non-Kuwaiti Arab, and Kuwaiti may be due to their kind of education and training as well as most of them were working as physicians or nurses. This finding is inconsistent with the study conducted among HCWs from other developing countries, where doctors had higher scores than nurses *(Paudyal et al., 2008).* There are western studies where nurses and nursing students are more aware of universal precautions than physicians *(Bamigboye and Adesanya, 2006; Tavolacci et al., 2008).*

The disparity between knowledge of doctors and nurses may be explained by the fact that physicians are more involved in medical procedures and infection prevention than their colleagues from western countries, where nurses take most of the responsibilities for routine medical procedures. Nevertheless, many surveys showed that HCWs such as nurses, physicians, medical students and nursing students receive incomplete and variable training in infection control (*Vas et al., 2010).*

A study in Iran revealed that the causes of many infection risks in HCWs were the lack of knowledge about disease and protective systems (*Askarian et al., 2007).* In the current study, more than 90% of the participants were aware that blood and blood products as well as needles and sharps were the main routs of transmission. This is more or less consistent with another KAP study of HBV and HCV in Pakistan where it was found that >85% of the participants were aware of the risk of HBV and HCV transmission. However, In a KAP study of medical groups with 369 participants in Tehran, Zanjan and Ahwaz, Iran, 88.1% of studied groups were vaccinated and their knowledge of disease transmission was unsatisfactory (*Kabir et al., 2010).*

A study in Sharourah, Saudi Arabia, on 70 HCWs showed that the average knowledge score for HCV transmission by needle stick injury (NSI) among nurses and medical assistants was approximately 80% *(Alam, 2002).* In another study in Iran, although the knowledge and attitudes of medical students about HBV and HCV were acceptable and corresponded to the CDC guidelines, their behavior with regards to the infections did not reflect their knowledge and attitude *(Askarian et al., 2006).*

In present study, working activity was found to be a significant determinant of the attitude score about standard precautions and hands hygiene after removing gloves as control measures for HAIs, their perceived risk of acquiring a HAI, using gloves and performing hands hygiene measures. Another key finding was that the attitudes towards HAIs are encouraging, since a high percentage of respondents reported positive global and specific beliefs.

More than 80.0% of HCWs showed positive attitudes towards 9 statements out of 14. In particular, 82.2% indicated that guidelines should be established and followed, 80.5% believed that their job puts them at risk of Hepatitis B or C infection, 87.1% believed that they need to be protected from Hepatitis B infection, moreover, 86.3% considered it is necessary to receive vaccine. The multivariate analysis indicated that being Female or with unsatisfactory level of knowledge were at risk to exhibiting negative attitudes than others, because many of them working as administrators are less involved in medical procedures and infection prevention.

Using standard precautions among HCWs is important. Adherence of HCWs to these precautionary can be low in some settings (*Askarian et al., 2007).* However, the behavior of HCWs can place them at risk for some blood-borne pathogens. Results from this survey indicated that most respondents often or always used gloves and performed hands hygiene measures after removing gloves for the prevention of the HAIs. It was reveals that no differences were observed in reported compliance with recommendations according to age groups and working years of the HCWs. Instead, females, lab technician, HCWs with negative attitudes were independent predictors of noncompliance. This is consistent with other studies *(Parker and Goldman, 2006; Ellison et al., 2007).* Physicians and nurses in Canada self-reported a high rate of hand washing before and after meeting of all patients, and for wearing gloves when examining patients *(Parker and Goldman, 2006).*

A national telephone survey among a group of HCWs throughout England found that 99% routinely used gloves in a major trauma scenario, but only 18% and 21% used face mask and eye protection, respectively *(Sundaram and Parkinson, 2007).* Finally, our values were higher than those in EDs in the United Kingdom and New Zealand, with values of 27% and 58% and of 14% and 12%, respectively, for asepsis in invasive procedures and hands hygiene between patient consultations *(Al-Damouk et al., 2004)*

According to self-reported behavior of the participants, the findings of the current study suggest that HCWs do not have sufficient knowledge of universal precautions. The majority of respondents did not answer universal precaution knowledge questions. Similarly, inadequate knowledge of universal precautions was found among the HCWs in Nepal *(Paudyal et al., 2008).* These levels of knowledge were very low compared to other parts of the world *(Bennett and Mansell, 2004; Reda et al., 2009).* A significant number of HCWs (73%) reported that they use universal precautions. A large majority of respondents (93%) reported that they wash their hands before and after attending to each patient. This hand washing practice was similar to that of western countries *(Stein et al., 2003).*
The level of compliance in this study was similar to a finding from Australia *(Knight and Bodsworth, 1997)* and higher than that reported from the UAE (19%) *(Jacob et al., 2010).* However, when we consider contradictory findings such as beliefs by 79.8% HCWs that gloves are required for any contact with patients, and 46.6% recapped needles, we know that the rate of proper compliance is probably much lower, as documented in a study in Australia *(Knight and Bodsworth, 1997).* In addition, HCWs commonly over-estimate their knowledge and practices of infection prevention *(Knight and Bodsworth, 1997; Kermode et al., 2005; Henry et al., 1992),* the magnitude of which is methodologically difficult to estimate. Partial compliance and suboptimal practices were also reported in other countries such as Nigeria *(Sadoh et al., 2006),* India *(Kermode et al., 2005*) and the UK (*Cutter and Jordan, 2003)* where HCWs make unjustified assessments of risks from and infection status of clients rather than properly and consistently applying standard precautions. The reason for this may be that the knowledge acquired may not necessarily translate into practice of preventive measures or that the trainings provided may be more theoretical than practical and the limited sources of continuous information on standard precautions. Lack of an enabling environment to comply with standard precautions may also contribute to poor compliance.

There are some potential limitations in the design and measurements of this study that should be considered when interpreting the results. First, by its nature as a cross-sectional study, therefore, no direct relationship between variables and outcomes can be proved but substantial evidence has been demonstrated for the association discussed. A second limitation is the self-reported data with the possible potential reporting bias associated with the self-administered questionnaire. Concern always exists about accuracy of compliance to control measures which was based solely upon the subjective views of HCWs.

CONCLUSIONS

HCWs in PHC showed unsatisfactory levels of knowledge, high positive attitudes, and low compliance rate regarding the standard precautions about HBV, HCV and HAIs. The results clearly reveal the urgency to implement initiatives for improving healthcare policies and to stress the need for training courses and to provide a safe-environment for caregivers by establishing or updating infectious disease management policies, ensuring that HCWs have the necessary equipment, and ensuring that all workers follow universal precautions for safe handling of blood and bodily fluids.

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