

Risk perception and precautions taken by health care workers for HIV infection in haemodialysis units in Egypt

I.A. Kabbash,¹ N.M. El-Sayed,² A.N. Al-Nawawy,³ M.El-S. Abou Salem,⁴ B. El-Deek⁵ and N.M. Hassan¹

مدى إدراك العاملين بالرعاية الصحية لاختطار العدوى بفيروس الإيدز في وحدات الديال الدموي في مصر، والاحتياطات المتخذة من قبلهم لتفاديها
إبراهيم علي كباش، نصر محمد السيد، علي نعمان النواوي، محمود السيد أبو سالم، باسم بشير الديك، نديرة منصور حسن

الخلاصة: أُجريت دراسة مقطعية في 32 وحدة من وحدات الديال الدموي في منطقة دلتا النيل، في مصر، بُعِيَة تقييم معارف وممارسات 317 من العاملين بالرعاية الصحية تجاه مخاطر العدوى بفيروس الإيدز. وقد أشار 48.6% من عِيَة الدراسة، إلى التعرُّض المسبق للإصابات الناجمة عن وخز الإبر خلال العام المنصرم. وتبيّن بشكل يُعتد به إحصائياً أن لدى العاملين في الوحدات الحكومية معلومات أكثر من العاملين في الوحدات الخصوصية، بشأن العدوى المنقولة بالدم، والاحتياطات العامة لتناول الدم، والتخلص الآمن من المواد الملوثة، كما أنهم على دراية بما يمثله المصابون بفيروس الإيدز العددي الأعراض من مخاطر. وقد تبيّن أن التدريب المسبق يؤثر على المعارف، بغض النظر عن سنوات الخبرة. إلا أنه على الرغم من مستوى المعارف الجيد، فإن مستوى أداء العاملين الصحيين كان متدنياً من حيث الاحتياطات العامة لتناول الدم في وحدات الديال الدموي، وكان أشد تدنياً في القطاع الخاص.

ABSTRACT A cross-sectional study was made in 32 haemodialysis units in the the Nile delta, Egypt to evaluate knowledge and practices towards risk of HIV infection by 317 health care workers. Exposure to needle-stick injury was reported by 48.6% in the previous year. Significantly more workers in government units than in private units had good knowledge of bloodborne infections, universal blood precautions and safe disposal of contaminated items, and recognized asymptomatic HIV patients as a risk. Previous training, but not years of experience, influenced knowledge. Despite good knowledge, the performance of health workers was poor for universal blood precautions, and was worse in private haemodialysis units.

Perception des risques et précautions prises par les personnels soignants face à l'infection à VIH dans les unités d'hémodialyse en Égypte

RÉSUMÉ Afin d'évaluer les connaissances et les pratiques des personnels soignants face aux risques d'infection par le VIH, il a été mené une étude transversale au sein de 32 unités d'hémodialyse dans de la région du delta du Nil (Égypte). Sur 317 soignants, 48,6 % ont déclaré avoir déjà été exposés à une blessure par piqûre d'aiguille au cours de l'année écoulée. Par rapport aux personnels des unités du secteur privé, les personnels des services publics se sont avérés significativement mieux informés des infections hématogènes, des précautions universelles pour la prévention de la transmission de pathogènes à diffusion hématogène et des règles de sécurité pour la manipulation et l'élimination des déchets contaminés ; ils étaient également significativement plus nombreux à identifier les patients VIH-positifs comme un risque. Le degré de connaissance est apparu dépendant de l'acquisition antérieure d'une formation spécifique et non des années d'expérience. En dépit d'un bon niveau de connaissances, l'application des précautions universelles par les personnels soignants s'est révélée médiocre, la situation étant encore plus grave dans les unités d'hémodialyse privées.

¹Department of Public Health, Faculty of Medicine, University of Tanta, Tanta, Egypt (Correspondence to I.A. Kabbash: Kabbash-ia@maktoob.com).

²Ministry of Health and Population, Cairo, Egypt.

³Department of Public Health, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

⁴Department of Public Health, Faculty of Medicine, University of Menoufia, Menoufia, Egypt.

⁵Department of Public Health, Faculty of Medicine, University of Mansoura, Mansoura, Egypt.

Received: 05/04/05; accepted: 28/07/05

Introduction

The HIV/AIDS epidemic continues spreading in the countries of the Eastern Mediterranean Region (EMR) of the World Health Organization (WHO) including Egypt [1]. Estimates at the end of 2004 showed that 92 000 people became newly infected with HIV/AIDS. In most countries of EMR, the epidemic is still in its early stages, which boosts the chances that effective prevention efforts can limit further spread of the virus [2]. In Egypt, the prevalence of HIV/AIDS is extremely low: results from the National AIDS Control Programme Surveillance revealed that the prevalence is around 0.03% in the general population, and among people with high-risk behaviours the prevalence ranges from 0.05% to 0.56%. However, the incidence of HIV is increasing and the pattern of spread is now indigenous [3].

The most common risk of occupational HIV infection among health care workers is from accidental puncture with needle-sticks and other sharp devices after contact with HIV infected people. In addition, exposure through direct contact with body fluids and tissues that may contain the virus are also a risk, as blood is the only fluid known to be associated with HIV transmission in health care settings [4,5].

Haemodialysis patients are at high risk of contracting bloodborne diseases including HIV/AIDS from other patients or from health care workers working without strict supervision [6]. In Egypt, 3 major outbreaks of HIV infection in haemodialysis units have occurred: the first outbreak, in 1990, resulted in 95 cases of infection in Cairo and Fayoum governorates; in 1993 the second outbreak was reported in Gharbia governorate where 72 cases of HIV infection were diagnosed in haemodialysis units; lastly, the third outbreak in 1997 was again in Cairo with 51 cases of HIV infection (personal

communication, National HIV/AIDS Control Programme) [7]. Poor infection control practices that resulted in sharing of syringes among patients were observed at centres involved in these outbreaks (personal communication, National HIV/AIDS Control Programme) [7].

The present study was carried out in the main cities of the Nile delta region of Egypt. The objective was to evaluate the perception of health care workers in haemodialysis units towards risks of transmission of HIV infection among haemodialysis patients and precautions taken to prevent it.

Methods

Sample selection and sample size

A cross-sectional study was conducted in 32 haemodialysis units in 5 cities: Tanta, Mahalla El-Koubra, Mansoura, Shebin El-Koum and Kafr El-Sheikh. These cities represent the capital cities of 4 governorates—Gharbia, Menoufia, Dakahlia and Kafr El-Sheikh—plus the second city in Gharbia governorate. The selection of these cities was based on the observation that almost all large haemodialysis units in these governorates are located in these cities. Units for inclusion in the study were selected from the remaining units using random numbers to give a fair representation of the total number of dialysis units, whether government or private, in each governorate. Table 1 shows details of the distribution of dialysis units and the selected sample.

Study tools

Two questionnaire sheets were designed to collect data. The first questionnaire collected data about knowledge and attitude of nurses and physicians towards transmission of infection with HIV and other blood pathogens between patients and from patients

Table 1 Selection of haemodialysis units in the target governorates

Variable	Gharbia governorate	Dakahlia governorate	Menoufia governorate	Kafr El-Sheikh governorate
<i>No. of haemodialysis units</i>				
Government	9	16	8	10
Private	21	24	8	6
Total	30	40	16	16
<i>No. of units in target cities</i>	21	13	7	6
<i>No. of selected units in this study</i>	10	11	6	5

to health care workers. The questionnaire was designed in the Arabic language to be self-administered by health care workers included in the study sample. The second sheet was an observation checklist for the performance of nurses during haemodialysis sessions. The observational checklist was filled in by members of the research team in 3 separate sessions. Some environmental and administration aspects of the units (e.g. disposal and collection of waste material) were also observed.

The validity of the items of the 2 study tools were reviewed by 3 experts and the research team. Reliability was tested by test/retest and calculation of Cronbach's alpha and Spearman's rank correlation.

Statistical analysis

The collected data was organized, tabulated and statistically analysed using *SPSS*, version 12. Quantitative data were presented as mean and standard deviation (SD) and Student t-test was used for statistical analysis. For non-parametric data, comparison of mean differences was performed using the Mann-Whitney test. For qualitative data, the number and percentage distribution was calculated and the chi-squared test was used for statistical analysis. When the chi-squared test was not appropriate, the Fisher

exact test was used instead. The level of significance was $P < 0.05$.

Results

This study was conducted in 32 haemodialysis units (18 government and 14 private). The total number of health care workers studied was 317 (33 physicians, 5 head nurse supervisors and 279 nurses working in haemodialysis units).

Background characteristics

The mean age of workers in private units was significantly lower than that in government units: 26.1 (SD = 8.0) years versus 29.1 (SD = 9.3) years. The majority of workers in government units were nurses with a diploma in nursing (81.3%). In private units, 37.8% had qualifications unrelated to medical sciences (secondary schools of commerce, industrial technical schools, and non-medical university qualifications). Both groups were similar in relation to years of experience and previous training.

A significantly higher percentage of government workers reported previous screening for infection with HIV and viral hepatitis compared with private workers (80.0% and 59.8%, respectively). On the

other hand, a significantly higher percentage of private workers reported previous vaccination against hepatitis B virus and availability of facilities needed for infection control (74.4% and 92.7%, respectively) compared with government workers (58.3% and 79.1%, respectively) (Table 2). Exposure to needle puncture in the previous year was reported by 48.9% of health care

workers in government haemodialysis units and 47.6% in private units.

Knowledge

Concerning knowledge of studied health care workers, significantly more government workers recognized hepatitis C as one of the bloodborne infections than did their colleagues in private units (Table 3). For

Table 2 Characteristics of health care workers in the sample by place of work

Characteristic	Place of work				Statistic	P-value
	Government unit (n = 235)		Private unit (n = 82)			
	No.	%	No.	%		
<i>Age (years)</i>					<i>t</i> = 2.818	0.005*
Mean (SD)	29.1(9.3)		26.1(8.0)			
Range	16–58		17–55			
<i>Sex</i>						
Male	26	11.1	19	23.2	$\chi^2 = 7.315$	0.007*
Female	209	88.9	63	76.8		
<i>Education</i>						
Bachelor of medicine or higher	25	10.6	8	9.8		
Bachelor of nursing	18	7.7	5	6.1	$\chi^2 = 94.66$	0.0005*
Diploma of nursing	191	81.3	38	46.3		
Non-medical	1	0.4	31	37.8		
<i>Experience (years)</i>						
< 1	19	8.1	8	9.8		
1–5	128	54.5	53	64.6		
> 5	88	37.4	21	25.6		
Mean (SD)	5.5 (4.9)		5.0 (5.7)		<i>Z</i> = 1.233	0.218
Range	0.1–33		0–30			
<i>Previous training</i>	179	76.2	58	70.7	$\chi^2 = 0.953$	0.329
<i>Previous exposure to needle puncture during last year</i>	115	48.9	39	47.6	$\chi^2 = 0.046$	0.830
<i>Previous blood screening for HIV or viral hepatitis</i>	188	80.0	49	59.8	$\chi^2 = 13.20$	0.0005*
<i>Previous vaccination for hepatitis B</i>	137	58.3	61	74.4	$\chi^2 = 6.714$	0.010*
<i>Availability of facilities needed for infection control</i>	186	79.1	76	92.7	$\chi^2 = 7.765$	0.005*

*Significant, Mann–Whitney test.

SD = standard deviation.

Table 3 Distribution of health care workers with correct knowledge by place of work

Knowledge item	Place of work				χ^2	P-value
	Government unit (n = 235)		Private unit (n = 82)			
	No.	%	No.	%		
<i>HIV/AIDS is a serious problem in Egypt</i>	205	87.2	60	73.2	8.767	0.003*
<i>Diseases transmitted by blood</i>						
HIV/AIDS	231	98.3	77	93.9	— ^a	0.053
Hepatitis B	232	98.7	78	95.1	— ^a	0.077
Hepatitis C	227	96.9	74	90.2	— ^a	0.037*
<i>Source of information about HIV/AIDS</i>						
Mass media	196	83.4	57	69.5	7.281	0.007*
Scientific meetings	151	64.3	32	39.0	15.86	0.0005*
Educational curriculum	137	58.3	43	52.4	0.850	0.356
Colleagues	80	34.0	11	13.4	12.64	0.0005*
<i>Methods of HIV infection</i>						
<i>Transfusion of contaminated blood/</i>						
blood products	230	97.9	80	97.6	— ^a	1.000
Sexual contact	227	96.9	67	81.7	20.03	0.0005*
Mother to infant	125	53.2	22	26.8	16.99	0.0005*
Contaminated sharps	135	57.4	37	45.1	3.721	0.054
Injecting drug addiction	10	4.3	2	2.4	— ^a	0.738
(Incorrect methods stated)	13	5.5	14	17.1	10.39	0.001*
<i>Equipment in unit liable to be source of infection</i>	226	96.2	68	82.9	15.84	0.0001*
<i>Risk of HIV infection in haemodialysis units</i>						
HIV asymptomatic patients	224	95.3	63	76.8	24.26	0.005*
Few drops of blood contaminating needles	223	64.9	76	92.7	— ^a	0.421
Blood spots on horizontal surfaces	204	86.8	67	81.7	1.275	0.259
<i>Probability of bloodborne infection in haemodialysis units</i>						
Higher	199	84.7	62	75.6	5.859	0.119
Lower	11	4.7	7	8.5		
Not different	19	8.1	7	8.5		
Don't know	6	2.6	6	7.3		
<i>Infection control practices</i>						
Universal blood precautions	229	97.4	72	87.8	— ^a	0.002*
Disposable items that should be disposed safely	230	97.9	74	90.2	— ^a	0.006*
Methods of safe disposal of contaminated articles	232	98.7	66	80.5	35.88	0.0005*
Importance of using gloves	233	99.1	82	100.0	— ^a	1.000
Importance of changing gloves between patients	231	98.3	81	98.8	— ^a	1.000

*P < 0.05.

^aFisher exact test.

both groups the main source of information regarding HIV/AIDS was the mass media. In general, modes of transmission of HIV were better known by government workers compared with private ones, especially for sexual contact and mother-to-infant transmission ($P = 0.0005$). Incorrect methods of HIV transmission were reported by 17.1% of private workers compared with only 5.5% of government workers. Regarding risk of HIV infection in haemodialysis units, HIV asymptomatic patients were significantly more recognized by government workers (95.3%) compared with private ones (76.8%).

On studying the effect of experience on knowledge of studied health care workers, asymptomatic HIV patients were reported as a risk of infection in the haemodialysis units by significantly more experienced nurses (96.3%) than less experienced nurses (87.5%). On the other hand, less experienced nurses reported mother-to-infant transmission significantly more than those with more years of experience (54.8% and 30.3% respectively). The education curriculum was reported as the main source of information by 64.9% of less experienced nurses compared with 41.3% among more experienced nurses; more of the latter reported attending scientific meetings (78.0% versus 47.1% respectively). Other items of knowledge were not found to be significantly affected by differences in duration of experience (Table 4).

Previous training was found have a significant effect on knowledge of HIV/AIDS as a bloodborne infection, mother-to-infant as a method of transmission of infection and the risk of infection from asymptomatic HIV patients in haemodialysis units: those with previous training scored significantly higher on these items (98.3%, 51.1% and 94.5% respectively) than those without training (93.8%, 32.5% and 78.8% respectively)

(Table 5). Knowledge of universal blood precautions and methods of safe disposal were significantly higher among previously trained workers (97.9% and 96.2% respectively) compared with untrained workers (86.3% and 87.5% respectively).

Practices

Studying the practice of nurses in relation to place of work showed a statistically significant difference in favour of workers in private units in relation to washing skin of vascular access and applying sterile bandage over the site of venous and arterial puncture (Table 6). Ever sharing needles between patients was practised by 3.4% of nurses in government units compared with 8.1% in private units. Concerning adherence to universal blood precautions, almost all items were used significantly more by government workers, except for thorough washing of hands before work which was done by 77.0% of private workers compared with 54.1% of government workers. Among government workers, 72.2% and 87.3% wore gowns and gloves respectively, compared with 39.2% and 52.7% of private workers, respectively.

Regarding disposal of soiled materials, using double plastic bag and proper labeling of wastebaskets at the place of collection were done significantly more often in government units than in private ones. Disposal of needles in puncture-proof containers was defective in both types of unit, but was significantly higher in private units (47.3%) than in government ones (31.2%) (Table 6).

The effect of experience on nurses' performance was studied. Actions that were found to improve significantly with increased experience included wearing gowns (57.7% versus 76.5%) and wearing of gloves (73.7% versus 88.2%). Actions that were found to decrease significantly

Table 4 Distribution of health care workers with correct knowledge by years of experience

Knowledge item	Years of experience				χ^2	P-value
	≤ 5 years (n = 208)		> 5 years (n = 109)			
	No.	%	No.	%		
<i>HIV/AIDS is a serious problem in Egypt</i>	173	83.2	92	84.4	0.079	0.779
<i>Diseases transmitted by blood</i>						
HIV/AIDS	202	97.1	106	97.2	— ^a	1.000
Hepatitis B	201	96.6	109	100.0	— ^a	0.100
Hepatitis C	194	93.3	107	98.2	3.577	0.059
<i>Source of information about HIV/AIDS</i>						
Mass media	165	79.3	88	80.7	0.088	0.767
Educational curriculum	135	64.9	45	41.3	16.26	0.0005*
Scientific meetings	98	47.1	85	78.0	27.92	0.0005*
Colleagues	58	27.9	33	30.3	0.200	0.655
<i>Methods of HIV infection</i>						
<i>Transfusion of contaminated blood/</i>						
blood products	202	97.1	108	99.1	— ^a	0.429
Sexual contact	189	90.9	105	96.3	3.174	0.075
Mother to infant	114	54.8	33	30.3	17.31	0.0005*
Contaminated sharps	118	56.7	54	49.5	1.490	0.222
Injecting drug addiction	8	3.8	4	3.7	— ^a	1.000
(Incorrect methods stated)	21	10.1	6	5.5	1.935	0.164
<i>Equipment in unit liable to be source of infection</i>						
	193	92.8	101	92.7	0.002	0.967
<i>Risk of HIV infection in haemodialysis units</i>						
HIV asymptomatic patients	182	87.5	105	96.3	6.509	0.011*
Few drops of blood contaminating needles	194	93.3	105	96.3	1.251	0.263
Blood spots on horizontal surfaces	172	82.7	99	90.8	3.814	0.051
<i>Probability of bloodborne infection in haemodialysis units</i>						
Higher	176	84.6	85	78.0	7.224	0.065
Lower	8	3.9	10	9.2		
Not different	14	6.7	12	11.0		
Don't know	10	4.8	2	1.8		
<i>Infection control practices</i>						
Universal blood precautions	196	94.2	105	96.3	0.658	0.417
Disposable items that should be disposed safely	198	95.2	106	97.2	— ^a	0.554
Methods of safe disposal of contaminated articles	197	94.7	101	92.7	0.534	0.465
Importance of using gloves	206	99.0	109	100.0	— ^a	0.547
Importance of changing gloves between patients	203	97.6	109	100.0	— ^a	0.169

*P < 0.05.

^aFisher exact test.

Table 5 Distribution of health care workers with correct knowledge by previous training

Knowledge item	Previous training		χ^2	P-value		
	Yes (n = 237)	No (n = 80)				
	No.	%	No.	%		
<i>HIV/AIDS is a serious problem in Egypt</i>	200	84.4	65	81.3	0.430	0.512
<i>Diseases transmitted by blood</i>						
HIV/AIDS	233	98.3	75	93.8	— ^a	0.048*
Hepatitis B	234	98.7	76	95.0	— ^a	0.071
Hepatitis C	224	94.5	77	96.3	— ^a	0.769
<i>Source of information about HIV/AIDS</i>						
Mass media	182	76.8	71	88.8	6.307	0.021*
Educational curriculum	144	60.8	36	45.0	6.053	0.014*
Scientific meetings	163	68.8	20	25.0	46.970	0.0005*
Colleagues	71	30.0	20	25.0	0.718	0.397
<i>Methods of HIV infection</i>						
Transfusion of contaminated blood/ blood products	232	97.9	78	97.5	— ^a	1.000
Sexual contact	223	94.1	71	88.8	2.537	0.111
Mother to infant	121	51.1	26	32.5	8.280	0.004*
Contaminated sharps	134	56.5	38	47.5	1.969	0.161
Injecting drug addiction	8	3.4	4	5.0	— ^a	0.506
(Incorrect methods stated)	20	8.4	7	8.8	0.007	0.931
<i>Equipment in unit liable to be source of infection</i>	223	94.1	71	88.8	2.537	0.111
<i>Risk of HIV infection in haemodialysis units</i>						
HIV asymptomatic patients	224	94.5	63	78.8	17.349	0.0005*
Few drops of blood contaminating needles	225	94.9	74	92.5	— ^a	0.410
Blood spots on horizontal surfaces	203	85.7	68	85.0	0.021	0.886
<i>Probability of bloodborne infection in haemodialysis units</i>						
Higher	196	82.7	65	81.3	2.291	0.514
Lower	13	5.5	5	6.3		
Not different	21	8.9	5	6.3		
Don't know	7	3.0	5	6.3		
<i>Infection control practices</i>						
Universal blood precautions	232	97.9	69	86.3	— ^a	0.0002*
Disposable items that should be disposed safely	230	97.0	74	92.5	— ^a	1.000
Methods of safe disposal of contaminated articles	228	96.2	70	87.5	— ^a	0.011*
Importance of using gloves	235	99.2	80	100.0	— ^a	1.000
Importance of changing gloves between patients	234	98.7	78	97.5	— ^a	0.603

*P < 0.05.

^aFisher exact test.

Table 6 Distribution of practices observed for health care workers by place of work

Practice item	Place of work				χ^2	P-value
	Government unit (n = 205)		Private unit (n = 74)			
	No.	%	No.	%		
<i>Wash skin of vascular access with antiseptic</i>	184	89.8	74	100.0	8.198	0.004*
<i>Clean blood leakage with bandage</i>	187	91.2	70	94.6	0.853	0.356
<i>Never share needles with other patients</i>	198	96.6	68	91.9	— ^a	0.114
<i>Apply and secure sterile bandage over vascular access point</i>	179	87.3	73	98.6	7.987	0.005*
<i>Adherence to universal blood precautions</i>						
Wash hands thoroughly before work	111	54.1	57	77.0	11.88	0.001*
Wear gowns	148	72.2	29	39.2	25.54	0.0005*
Wear masks and eye goggles during procedures when splash of blood is expected	4	2.0	1	1.4	— ^a	1.000
Wear gloves	179	87.3	39	52.7	38.13	0.0005*
Change gloves between each patient	60	29.3	17	23.0	1.078	0.299
Avoid touching surfaces with gloved hands that may be touched with ungloved hands	101	49.3	26	35.1	4.379	0.036*
Wash hands thoroughly after changing gloves	48	23.4	6	8.1	8.161	0.004*
Wash contaminated hands or body surface immediately and thoroughly	128	62.4	33	44.6	7.094	0.008*
<i>Disposal of soiled materials</i>						
Discard soiled materials in double plastic bag	189	92.2	59	79.7	8.554	0.003*
Empty wastebasket frequently into lined garbage with a tight fitting lid	105	51.2	65	87.8	30.63	0.0005*
Discard dialyser tubing in waterproof container	81	39.5	58	78.4	32.85	0.0005*
Close wastebasket securely when full	164	80.0	61	82.4	0.206	0.650
Label wastebasket in collection place	177	86.3	56	75.7	4.492	0.034*
<i>Sharps disposal</i>						
Dispose in puncture-resistant container	64	31.2	35	47.3	6.140	0.013*
Discard used needles uncapped	63	30.7	13	17.6	4.754	0.029*
Discard used needles unbroken or unbent	132	64.4	70	94.6	24.83	0.0005*
Needle not detached or removed from syringe	131	63.9	66	89.2	16.75	0.0005*
If recapping, done correctly	106	51.7	22	29.7	10.58	0.001*
Never put needles in waste plastic bag	123	60.0	41	55.4	0.474	0.491
Sent for incineration	157	76.6	73	98.6	18.28	0.0005*
<i>Sanitation of dialysis machine</i>						
Cover contaminated surfaces with disinfectant	132	64.4	59	79.7	5.93	0.015*
Disinfect fluid pathway after every dialysis	193	94.1	74	100.0	— ^a	0.040*

*P < 0.05.

^aFisher exact test.

Table 7 Distribution of practices observed for health care workers by years of experience

Practice item	Years of experience				χ^2	P-value
	≤ 5 years (n = 194)		> 5 years (n = 85)			
	No.	%	No.	%		
Wash skin of vascular access with antiseptic	184	94.8	74	87.1	5.148	0.023*
Clean blood leakage with bandage	176	90.7	81	95.3	1.701	0.192
Never share needles with other patients	188	96.9	78	91.8	— ^a	0.071
<i>Adherence to universal blood precautions</i>						
Wash hands thoroughly before work	115	59.3	53	62.4	0.233	0.629
Wear gowns	112	57.7	65	76.5	8.948	0.003*
Wear gloves	143	73.7	75	88.2	7.298	0.007*
<i>Disposal of soiled materials</i>						
Discard soiled materials in double plastic bag	171	88.1	77	90.6	0.357	0.550
Discard dialyser tubing in waterproof container	101	52.1	38	44.7	1.279	0.258
Label wastebasket in collection place	166	85.6	67	78.8	1.952	0.162
<i>Sharps disposal</i>						
Dispose in puncture-resistant container	65	33.5	34	40.0	1.089	0.297
Discard used needles uncapped	61	31.4	15	17.6	5.676	0.017*
Discard used needles unbroken or unbent	138	71.1	64	75.3	0.512	0.474
<i>Sanitation of dialysis machine</i>						
Cover contaminated surfaces with disinfectant	135	69.9	56	65.9	0.376	0.540
Disinfect fluid pathway after every dialysis	190	97.9	77	90.6	— ^a	0.009*

*P < 0.05.

^aFisher exact test.

with increased experience included washing skin of vascular access with antiseptic (94.8% versus 87.1%) and disinfection of fluid pathway after every dialysis (97.9% versus 90.6%). Years of experience did not significantly affect other actions and procedures (Table 7).

Previous training was found to have a significant effect only on washing the skin of vascular access and wearing of gloves but had no effect on other actions and procedures (Table 8).

Significant difference in practices was found between the studied groups in relation to the working shift (Table 9). In the morning shift, significantly more nurses immediately cleaned leaked blood with bandages (95.2%) and never shared needles

with other patients (99.3%) compared with workers on afternoon/night shifts (88.8% and 91.0%, respectively). Some items concerning disposal of contaminated wastes were more often done correctly in the morning shift compared with afternoon and night shifts. Other actions showed no significant difference in relation to working shift.

Environmental hygiene and administration

Concerning observations of environmental hygiene and administrative aspects (Table 10), no significant differences were found between government and private units. However, some aspects were found deficient in both types of units. Health care workers may treat infected and non-

Table 8 Distribution of practices observed for health care workers by previous training

Practice item	Previous training				χ^2	P-value
	Yes		No			
	No.	%	No.	%		
<i>Wash skin of vascular access with antiseptic</i>	194	95.1	64	85.3	7.512	0.006*
<i>Clean blood leakage with bandage</i>	187	91.7	70	93.3	0.210	0.647
<i>Never share needles with other patients</i>	195	95.6	71	94.7	— ^a	0.753
<i>Adherence to universal blood precautions</i>						
Wash hands thoroughly before work	120	58.8	48	64.0	0.613	0.434
Wear gowns	135	66.2	42	56.0	2.449	0.118
Wear gloves	168	82.4	50	66.7	7.899	0.005*
Change gloves between each patient	62	30.4	15	20.0	2.964	0.085
<i>Disposal of soiled materials</i>						
Discard soiled materials in double plastic bag	182	89.2	66	88.0	0.082	0.775
Discard dialyser tubing in waterproof container	102	50.0	37	49.3	0.010	0.921
Label wastebasket in collection place	169	82.8	64	85.3	0.247	0.619
<i>Sharps disposal</i>						
Dispose in puncture-resistant container	78	38.2	21	28.0	2.510	0.113
Discard used needles uncapped	61	29.9	15	20.0	2.713	0.100
Discard used needles unbroken or unbent	143	70.1	59	78.7	2.015	0.156
Needle not detached or removed from syringe	138	67.6	59	78.7	3.209	0.073
If recapping, done correctly	93	45.6	35	46.7	0.026	0.876
Never put needles in waste plastic bag	125	61.3	39	52.0	1.947	0.163
Sent for incineration	171	83.8	59	78.7	1.007	0.316
<i>Sanitation of dialysis machine</i>						
Cover contaminated surfaces with disinfectant	140	68.6	51	68.0	0.010	0.920
Disinfect fluid pathway after every dialysis	194	95.1	73	97.3	0.666	0.415

*P < 0.05.

^a Fisher exact test.

infected patients with bloodborne diseases simultaneously (72.2% in government units and 64.3% in private units). Presence of a protocol for prevention of needle-stick injuries was found only in 27.8% of government units and 14.3% of private units. On the other hand, private units were better than government ones as regards segregation of contaminated from uncontaminated wastes (64.3% compared with 50.0%) and dialysing patients with known bloodborne

infections on separate machines (78.6% compared with 55.6%).

Concerning disposal of waste, the following defects were observed: first, in almost all units there was no segregation of sharps from other contaminated articles; secondly, sharps and other contaminated articles were collected from outside the unit in thin plastic bags; thirdly the collected wastes were kept in the unit for some time before being sent for incineration.

Table 9 Distribution of practices observed for health care workers by working shift

Practice item	Working shift				χ^2	P-value
	Morning (n = 145)		Afternoon/night (n = 134)			
	No.	%	No.	%		
Wash skin of vascular access with antiseptic	137	94.5	121	90.3	1.752	0.186
Clean blood leakage with bandage	138	95.2	119	88.8	3.886	0.049*
Never share needles with other patients	144	99.3	122	91.0	10.71	0.001*
Apply and secure sterile bandage over vascular access point	134	92.4	118	88.1	1.510	0.219
<i>Adherence to universal blood precautions</i>						
Wash hands thoroughly before work	101	69.7	67	50.0	11.23	0.001*
Wear gowns	82	56.6	95	70.9	6.178	0.013*
Wear gloves	106	73.1	112	83.6	4.476	0.034*
Change gloves between each patient	47	32.4	30	22.4	3.503	0.061
Wash hands thoroughly after changing gloves	35	24.1	19	14.2	4.425	0.035*
<i>Disposal of soiled materials</i>						
Discard soiled materials in double plastic bag	127	87.6	121	90.3	0.519	0.471
Discard dialyser tubing in waterproof container	90	62.1	49	36.6	18.12	0.0005*
Label wastebasket in collection place	120	82.8	113	84.3	0.125	0.724
<i>Sharps disposal</i>						
Disposal in puncture-resistant container	58	40.0	41	30.6	2.690	0.101
Discard used needles uncapped	39	26.9	37	27.6	0.018	0.893
Discard used needles unbroken or unbent	118	81.4	84	62.7	12.18	0.0005*
Needle not detached or removed from syringe	117	80.7	80	59.7	14.78	0.0005*
If recapping, done correctly	78	53.8	50	37.3	7.617	0.006*
<i>Sanitation of dialysis machine</i>						
Cover contaminated surfaces with disinfectant	103	71.0	88	65.7	0.928	0.335
Disinfect fluid pathway after every dialysis	142	97.9	125	93.3	3.654	0.056

*P < 0.05.

Discussion

Because of the rapidly increasing number of people affected by HIV/AIDS, health care providers will increasingly face issues of risk assessment and infection control. Health workers' knowledge, attitude and practice regarding this and other blood-

borne infection will affect the quality of care given to the patient [4,8].

In the present study knowledge about bloodborne infections was significantly better for workers in government haemodialysis units compared to private units for many aspects, including: HIV/AIDS, methods of transmission of infection, knowledge

Table 10 Environmental and administrative aspects observed in haemodialysis units by type of unit

Observation item	Government unit (n = 18)		Private unit (n = 14)		χ^2	P-value
	No.	%	No.	%		
Adequate space between patients	12	66.7	8	57.1	0.305	0.581
Horizontal surfaces and floors clean	17	94.4	11	78.6	— ^a	0.295
Spills of blood cleaned up immediately	15	83.3	10	71.4	— ^a	0.669
Contaminated materials segregated	9	50.0	9	64.3	0.653	0.419
No eating or smoking inside the unit	13	72.2	7	50.0	1.659	0.198
Presence of running water in tap and sink	15	83.3	14	100.0	— ^a	0.238
Patients with known bloodborne infections dialysed on separate machines	10	55.6	11	78.6	— ^a	0.266
Infected patients treated separately from non-infected ones	5	27.8	5	35.7	— ^a	0.712
Presence of protocol for infection control	13	72.2	10	71.4	— ^a	1.000
Presence of protocol for prevention of needle-stick injuries	5	27.8	2	14.3	— ^a	0.426
Visitors to dialysis units restricted	10	55.6	11	78.6	— ^a	0.266

*P < 0.05.

^aFisher exact test.

about universal blood precautions and safe disposal of contaminated items. This result could be attributed to generally higher level of education of government workers: 37.8% of workers in private units had no medical-related qualifications compared with 0.4% in government units. Mbanya et al. found that knowledge, but not attitude, was significantly influenced by the grade of the staff [9].

HIV infection has been reported after occupational exposure to HIV-infected blood through needle-sticks or cuts, or through splashes in the eyes, nose or mouth and skin [10]. The present study showed that almost half of working nurses had a history of previous exposure to needle puncture during the last year. This result highlights the risk of occupational exposure to bloodborne infection in dialysis units and the importance of screening for early detection of infected personnel and the strict need for follow-

ing prophylactic measures. In Morocco, Hossini et al. found that health care workers knew a great deal about the usual means of transmission of HIV, but much less about possible occupational contamination. They emphasized that great efforts should be made to educate and inform health care workers [11].

In the present study, the mass media was the main source for information about HIV/AIDS among the studied health care workers. Knowledge was defective in certain points; a great majority of health care workers believed that HIV/AIDS is a serious problem in Egypt even though it is classified by WHO as a country of low HIV/AIDS prevalence [8,12]. Asymptomatic HIV patients were recognized as a risk of HIV infection in dialysis units by 95.3% of government nurses, which was significantly higher than the 76.8% among nurses working in private units. Similar observations

have made researchers stress a universal need for increased education of health care professionals about HIV/AIDS [13].

In the present study, years of experience did not have an influence on the knowledge of studied nurses. This could be attributed to lack of regular systemic in-service orientation courses about recent scientific information. Previous training, however, was found to significantly affect knowledge concerning identification of asymptomatic HIV patients as risk of transmission of infection in the unit, universal blood precautions and methods of safe disposal of wastes in the unit. In agreement, Santana et al. suggested that AIDS training for hospital health workers in the Philippines is necessary and can be effective in improving knowledge and preventing occupational infection [14].

In spite of good knowledge, as observed by the results of the present study, the performance of nurses was defective in many areas, for example: adherence to universal blood precautions, washing hands before and after work and wearing a gown. Changing gloves between patients was practised by less than one third of workers in both government and private units. Generally speaking, adherence to universal precautions was worse in private units compared with government ones.

In the present study, safe disposal of used needles in puncture-resistant containers was only done by 31.2% and 47.3% of government and private units respectively. Used needles were disposed uncapped by only 30.7% and 17.6% of nurses in government and private units and recapping was correctly done by only 51.7% and 29.7% of government and private nurses. This finding needs to be considered in relation to the high percentage of health workers who reported suffering from needle puncture in the last year.

Years of experience and previous training were found to have a limited effect on the practice of nurses concerning the deficiencies in adherence to universal blood precautions and safe disposal of soiled material and used needles. These findings raise questions about the present training programmes and highlight the importance of designing comprehensive and effective in-service training programmes capable of changing the misconceptions and malpractices of nurses in haemodialysis units.

Defects in adherence to universal blood precautions and safe disposal of contaminated wastes were found in workers on afternoon/night shifts. These defects may be due to lack of supervision, which is present mainly in morning shifts, and the fact that most junior nurses are usually assigned at the afternoon and night shifts and, beside lack of supervision, were lacking knowledge and experience at work.

The environmental and administrative aspects studied were below acceptable standards but showed no significant differences between government and private units. Protocols for prevention of needle puncture and postexposure prophylaxis were mostly not available or not accessible in the studied units. The disposal of waste materials outside the units carried many dangers of transmitting infection to workers handling them and to the members of the community who take advantage of these wastes in recycling.

Conclusion and recommendations

The results of this study revealed a high level of knowledge regarding bloodborne infections, especially HIV/AIDS. However, the practices of health care workers during

care of haemodialysis patients were insufficient to prevent occupational infections including HIV/AIDS. The defects in practice were attributed to: defective qualifications in a high percentage of staff, especially those in private haemodialysis units; defective observation during work; absence of a written policy for precautions regarding infection control; and lack of continuous and efficient in-service training.

These findings indicate the following recommendations:

- Employing only qualified and trained personnel in health care settings, especially when handling of blood and sharp objects is required.
- Training health care workers (pre- and in-service) about bloodborne infections and universal blood precautions through regular scientific meetings and training courses.

- Strict observation of nurses during work and continuous evaluation of their practice and correction of poor practices.
- A protocol for universal blood precautions, needle-stick injuries and infection control should be used in both government and private units, e.g. as wall charts and handouts.

Acknowledgements

This investigation received technical and financial support from the joint WHO Eastern Mediterranean Region (EMRO), Division of Communicable Diseases (DCD) and the WHO Special Program for Research and Training in Tropical Diseases (TDR): The EMRO/TDR Small Grants Scheme for Operational Research in Tropical Medicine and other Communicable Diseases

References

1. *Interim report on HIV/AIDS in the Eastern Mediterranean Region*. Alexandria, Regional Office for the Eastern Mediterranean, World Health Organization, 1999 (EMRO/C46/INF.DOC.5).
2. UNAIDS. *AIDS epidemic update. December 2004*. Geneva, Joint United Nations Programme on HIV/AIDS and World Health Organization, 2005 (UNAIDS/04.45E).
3. *Annual AIDS hot line report*. Cairo, Ministry of Health and Population (Egypt) and National AIDS Control Programme, 2000.
4. Fan H, Conner RF, Villarreal LP. *AIDS: science and society*. Boston, Massachusetts, Jones and Bartlett, 1996.
5. *Safer needle devices: protecting health care workers*. Washington DC, US Occupational Safety and Health Administration, 1997.
6. Wahdan MH. *Epidemiology of acquired immunodeficiency syndrome (AIDS)*, 6th ed. Geneva, World Health Organization, 1995.
7. El-Sayed NM et al. Epidemic transmission of human immunodeficiency virus in renal dialysis centers in Egypt. *Journal of infectious diseases*, 2000, 181(1):91–7.
8. Latman NS et al. Acquired immune deficiency syndrome: knowledge, experiences and attitudes of hospital-based registered nurses. *Sexually transmitted diseases*, 1996, 23(3):219–5.
9. Mbanya DN et al. Knowledge, attitudes and practices of nursing staff in a rural hospital of Cameroon: how much does the health care provider know about the human immunodeficiency virus/acquired immune deficiency syndrome? *International nursing review*, 2001, 48(4):241.

10. Centers for Disease Control and Prevention. Recommendations for preventing transmission of human immunodeficiency virus and hepatitis B virus to patients during exposure-prone invasive procedures. *Morbidity and mortality weekly report*, 1991, 40:1–9.
11. Hossini CH et al. Knowledge and attitudes of health care professionals with respect to AIDS and the risk of occupational transmission of HIV in 2 Moroccan hospitals. *Santé*, 2000, 10(5):315–21.
12. Centers for Disease Control and Prevention. Recommendations for prevention of transmission in health care settings. *Morbidity and mortality weekly report*, 1987, 35(2S):1–18S.
13. Brachman PJr et al. Knowledge and attitudes of hospital-based physicians and trainees about HIV infection in the United States, Canada, India and Thailand. *Archives of internal medicine*, 1996, 156(7):761–6.
14. Santana RT et al. AIDS education for hospital workers in Manila: effects on knowledge, attitudes and infection control practices. *AIDS*, 1992, 6(11):1359–63.