

Original Research Article

HIV/AIDS occupational exposure and integrative care; knowledge, attitude, and skills of healthcare workers in Gansu Province, China

Leela S. Mundra¹, Sadaf Aslam^{1*}, Juxia Zhang², Han Lin², Peng Xu³, Jamie Morano¹

¹Division of Infectious Diseases and International Medicine, Morsani College of Medicine, University of South Florida, Tampa, FL

²Nursing Department, Gansu Provincial Hospital, Lanzhou, China

³Division of Policy Research and Social Sciences, National Center for AIDS and STD Control and Prevention China Centers for Disease Control and Prevention, Beijing, China

Received: 28 July 2017

Accepted: 29 August 2017

*Correspondence:

Dr. Sadaf Aslam,

E-mail: saslam@health.usf.edu

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: For HIV infected patients, distinct infectious disease hospitals currently exist in China, therefore, attitudes promoting separation within health care settings persist both in healthcare workers and community. The misinformation and fear of infection negatively affect Health Care Workers, (HCWs) attitudes towards caring for patients with HIV. However, the level of knowledge, attitudes, and skills (KAS) towards occupational exposure to HIV and post-exposure standards of care are unknown in Gansu, China.

Methods: We conducted a cross-sectional study to evaluate the knowledge, attitudes, and skills of health care workers regarding HIV occupational exposure and treatment. We analyzed findings in a total of 324 HCWs through a self-reported questionnaire.

Results: HCWs with a higher than average KAS composite score compared to HCWs with a lower KAS score were more likely to be working clinically ($p=0.0023$), and had completed a university degree or above ($p=0.0370$). The univariate analysis model also showed additional factors that HCWs having a higher KAS composite score were significantly associated with being a physician (OR 9.22; $p=0.045$) and receiving formal infection control training (OR 4.20; $p<0.0001$).

Conclusions: Our study provides considerable information on occupational exposure regarding HIV/AIDS in Gansu Province of China. A continuous education is necessary to increase the level of knowledge, attitude and skills of HCWs about the risk of infection at the workplace. With the adoption of standardized occupational exposure protocols and infection control programs, we should be able to reduce barriers of HIV care into general hospital facilities which in turn can modify their attitudes.

Keywords: HIV, Occupational exposure, China, Healthcare worker, People living with HIV/AIDS (PLWHA), Post-exposure prophylaxis

INTRODUCTION

HIV/AIDS has had a profound impact on China since the first confirmed indigenous case in 1986.¹ East and Southeast Asia in particular have seen a growing HIV infection with an estimated prevalence of 5.2 million

infected in 2011.² The number of infected people has since risen with expanding geographic distribution,³ and for the first time in 2008, HIV/AIDS was the leading cause of death among infectious diseases in China.⁴ This reflects a dramatic increase (133%) in HIV/AIDS-related mortality from 12,287 in 2009 to 28,000 in 2011.⁵ The Chinese Ministry of Health estimates that in 2011,

approximately 780,000 people lived with HIV among the 1.2 billion people in China, with a prevalence of 0.1% among ages of 19-49 yrs.⁶

Multiple attempts have been made in China to reduce HIV morbidity and mortality by providing universal access to HIV care, including free antiretroviral drugs and HIV testing services. Unfortunately, barriers to expansion of HIV care include a high proportion of residents with unknown HIV status, lack of education about HIV transmission, social stigma, unwillingness to be tested for HIV among at-risk individuals, and lack of integration of HIV care into primary care. In China, distinct infectious disease hospitals currently exist for HIV infected patients; therefore, attitudes promoting separation within health care settings persist both among healthcare workers (HCW) and those in the community.⁷ There are also restrictions on obtaining governmental services among migrant workers; these are generally Chinese citizens who have moved from their hometown to a more prosperous, usually urban, area without official government permission.

The majority of HIV transmission from patients to HCW occur through accidental percutaneous exposure or direct contact with broken skin or mucous membrane exposure.⁸ The estimated percentage of HCW exposed through percutaneous exposure or mucous membrane exposure is as high as 0.3%.^{9,10} The risk of exposure is considerably higher with deep sharp injuries, visible blood on the sharp instrument, and procedures that involve arteries, and veins of HIV-positive patients.¹¹ A study in Yunnan, China, concluded that of documented 257 occupational exposures, 68.5% involved HCWs. Among HCW, 54.5% involved sharp injuries, and 22.6% involved mucous membrane exposure.¹² When standard precautions for handling infected blood and body fluid are not routinely followed by all HCW, the risk of exposure increases; this is especially true in developing nations, where approximately 90% of HIV infections among HCW occur at the workplace.^{13,14}

We suspect that misinformation and fear of infection negatively affect HCW attitudes towards caring for patients with HIV in China. However, the level of knowledge, attitudes, and skills among HCW towards occupational exposure to HIV as well as post-exposure standards of care in Gansu are unknown. Gansu is a province of the People's Republic of China, located in the northwest of the country. Gansu Province was selected as it represents a resource-limited region of China and has insufficient representation in the medical literature. Due to increased prevalence, occupational risk of HIV/AIDS transmission can be a major concern for healthcare workers. Some healthcare workers are at a greater risk of acquiring HIV infection than others due to their close proximity in treating these patients and lack of information provided to them. As a result of its numerous effects, HIV has significantly altered the delivery of healthcare. The evidence of HCW perception and a

successful integrated HIV care in hospital settings is very limited in literature. This study aimed to examine the perceptions of healthcare workers on work place transmission of HIV and its effects on healthcare. Our objective was two fold: 1) to implement a survey to quantify the knowledge, attitudes, and skills of HCW regarding occupational exposure to HIV in this region and 2) to conduct a comprehensive literature review on HIV occupational exposure in China. Thus, we hoped to inform individual and institutional policy recommendations on how to integrate HIV care into primary hospital care settings and to decrease stigmatization and segregation among HCW towards people living with HIV/AIDS (PLWHA) in China in accordance with United Nations AIDS (UNAIDS) recommendations.¹⁵

METHODS

A cross-sectional study was conducted among 355 HCWs including doctors, nurses, and other support medical staff from the three urban government hospitals in Lanzhou, Tianshui, and Linxia in Gansu Province, China so that they could reflect on their knowledge, perceptions and skills. The selected healthcare workers were asked about the risks related to their work, their experience of HIV related hazards and their general views on the transmission of HIV. The main themes were identified for analysis and the views were summarized under the themes. The study was approved by each hospital's institutional review board prior to initiation.

Sample population

The inclusion criteria for participants were: (1) HCW employed at Lanzhou, Tianshui, or Linxia hospitals (2) at least 18 years of age (3) more than one year of work experience in healthcare (4) able to provide informed consent. Exclusion criteria were: (1) HCW with less than one year of healthcare work experience (2) students performing clinical rotations at the hospitals.

HCW who met the inclusion criteria were randomly selected to participate using a computer-generated number. The individuals selected were approached by the investigators and briefed about the study. A cover letter briefly describing the study, confidentiality agreement, and the contact information of the researcher was provided to each participant. Participation was voluntary and written consent was obtained from all participants.

A self-reported paper questionnaire was used to collect information about the current knowledge, attitudes, and skills of HCW surrounding occupational exposure to HIV from September, 2012 to October, 2012. The participating hospitals were Gansu Provincial People's Hospital (Lanzhou), First People's Hospital (Tianshui), and Lixia's People's Hospital (Lixia). The questionnaires were either hand delivered or mailed to the hospital's coordinating administrator, who then distributed the

surveys directly to the HCWs. All participants were asked to return the questionnaire in a sealed envelope. All responses were confidential.

The questionnaire consisted of 26 questions categorized by baseline demographics, and HIV knowledge, attitudes, or skills.

- Demographics: 8 questions consisting of sex, age, marital status, highest educational degree, title, profession, department affiliation, and years engaged in medical-related work.
- HIV Knowledge: 4 questions assessing occupational risk of infection in a variety of clinical care scenarios.
- HIV Attitudes: 7 questions assessing perceived impression of PLWHA and reaction to clinical case scenarios.
- HIV Skills: 7 questions assessing ability to perform occupational exposure standard precautions, guidelines, and protocols.

The responses to HIV knowledge, attitude and skills questions were thematically grouped to give each participant a Knowledge score (K score), Attitude score (A score), Skills score (S score), and a KAS cumulative score (KAS score). Favorable responses were determined based on WHO care guidelines; favorable responses received a higher numerical value, and unfavorable responses were assigned a lower numerical value with a possible total KAS composite range of 0-41 (K score: 0-7; A score: 0-21; S score: 0-13). Composite KAS scores were then made dichotomous based on above and below mean performance. Further, an optional, informal qualitative section was included for participants to discuss their feelings surrounding integration of PLWHA within the general medical hospital system.

Variables were defined as follows: Young age was defined as less than 35 years old. New healthcare worker (HCW) was defined as less than 14 years of work experience. Stable relationship was defined as married; cohabitation was not a survey option. Higher education was defined as a subset of education level and was defined as having a university degree or above. A clinical occupation was defined as a professional who had direct contact with patients, including surgery, medicine, gynecology, and Traditional Chinese Medicine, and excluding radiology, laboratory, or public health work. A surgical occupation was defined as a healthcare worker who was actively involved in procedures in the operating room. An occupation at risk of blood exposure was defined as having direct contact with blood and body fluids. Infection control training was defined as receiving formal infection control training from either the Chinese Centers for Disease Control or affiliated medical institution.

Univariate and multivariate analysis were conducted for the outcome of scoring an above average KAS composite

score ≥ 27 . Variables significant at the $p < 0.05$ level in the univariate analysis were entered into the multivariate analysis. To determine the best multivariate model, the Akaike Information Criterion (AIC) and Pearson's chi-squared tests were used to calculate the relative goodness-of fit of the model. All analyses were carried out using STATA IC 12.1.¹⁶

RESULTS

Out of the 355 surveys distributed, 324 surveys were successfully completed. The demographic information and socioeconomic factors of the participants are reported in Table 1. The average age of participants was 35.7 years old, a majority female ($n=224$; 69.1%), predominately nurses ($n=168$; 49.7%) and physicians ($n=145$; 45.5%) working in a surgical occupation ($n=177$; 54.6%) with a higher education degree ($n=203$; 62.6%). Of the participating HCWs, 29.9% ($n=97/324$) received infection control training, of whom 83.5% ($n=81/97$) had received training at their home institution (Table 1).

Knowledge:

HCWs with a higher than average KAS composite score compared to HCWs with a lower KAS score using two-group comparison statistics were shown to be significantly more likely to be working clinically ($p=0.0023$), and had completed a university degree or above ($p=0.0370$) as shown in Table 1.

Attitude:

In our study, 58.6% ($n=41/70$) respondents advocated separating HIV positive patients into a distinct infectious disease referral hospital. The responses were not significantly correlated to a profession, receipt of infection control training, which are strongly associated with more knowledge about HIV.

Skills (practices and universal precautions):

Our study reported that formal training was significantly correlated with both categorical and composite KAS scores ($p < 0.0001$) as shown in Figure 1. Formal occupational skills training were significantly associated with a higher score in "skills" portion of KAS, but also with significantly higher knowledge and attitude scores (Figure 1).

The univariate analysis model revealed additional significant factors in that HCWs having a higher KAS composite score were significantly associated with being a physician (OR 9.22; $p=0.045$) and receiving formal infection control training (OR 4.20; $p < 0.0001$), in addition to having a clinical occupation (OR 5.08; $p=0.005$), working at the First People's Hospital of Tianshui (OR 2.04; $p=0.01$) or Lixia People's Hospital (OR 3.44; $p < 0.0001$), or completing a university or graduate degree (OR 2.59, OR 2.70; $p=0.034$ and $p=0.047$) as shown in Table 2.

Table 1: Baseline characteristics of healthcare worker (HCW) HIV knowledge, attitude, and skills (KAS) stratified by low and high composite KAS score in Gansu Province, China, 2012 (N=324).

Baseline characteristics	Total (N=324) No. (%)	KAS Score <27 (low performance) (N=134) No. (%)	KAS Score ≥27 (high performance) (N=190) No. (%)	P value
Mean Age, years	35.7	35.8	35.6	0.9506
Gender				
Male	100 (30.9)	44 (32.8)	56 (29.5)	0.5194
Female	224 (69.1)	90 (67.2)	134 (70.5)	
Age				
< 35years	141 (43.5)	58 (43.3)	83 (43.7)	0.9430
≥ 35 years	183 (56.5)	76 (56.7)	107 (56.3)	
Public hospital location in Gansu				
Lanzhou	101 (31.2)	58 (28.3)	43 (22.6)	<.0001
Tianshui	113 (34.9)	45 (22.0)	68 (35.8)	
Linxia	110 (34.0)	31 (15.1)	79 (36.8)	
Work Experience (mean years)	13.9	14.3	13.7	0.7060
Work Experience (categorical)				
< 14 years	162 (50.0)	66 (49.3)	96 (50.5)	0.8218
≥ 14 years	162 (50.0)	68 (50.7)	94 (49.5)	
Hospital department				
Surgery	177 (54.6)	70 (52.2)	107 (56.3)	0.2648
Medicine	87 (26.8)	34 (25.3)	53 (27.9)	
Radiology	2 (0.6)	2 (1.5)	0 (0.0)	
Traditional chinese medicine	5 (1.5)	1 (0.75)	4 (2.1)	
Facilities / maintenance	41 (12.7)	22 (16.4)	19 (10.0)	
Profession				
Physician	145 (44.8)	51 (38.1)	94 (49.5)	0.0996
Nurse	160 (49.4)	68 (50.7)	92 (48.4)	
Public health	6 (1.9)	4 (3.0)	2 (1.1)	
Medical technology	6 (1.9)	5 (3.7)	1 (.5)	
Management	4 (1.2)	4 (3.0)	0 (0.0)	
Other	1 (0.3)	0 (0.0)	1 (.5)	
Clinical occupation				
Yes	305 (94.1)	119 (88.8)	186 (97.9)	0.0023
No	17 (5.3)	13 (9.7)	4 (2.1)	
Surgical occupation				
Yes	177 (54.6)	70 (52.2)	107 (56.3)	0.4609
No	135 (41.7)	59 (44.0)	76 (40.0)	
Blood exposure potential				
Yes	264 (81.5)	104 (77.6)	160 (84.2)	0.1101
No	48 (14.8)	25 (18.7)	23 (12.1)	
Assigned rank				
Very high	25 (7.7)	6 (4.5)	19 (10.0)	0.3194
High	48 (14.8)	19 (14.2)	29 (15.3)	
Intermediate	94 (29.0)	42 (31.3)	52 (27.4)	
Primary	138 (42.6)	58 (43.3)	80 (42.1)	
No Title	14 (4.3)	5 (3.7)	9 (4.7)	
Other	4 (1.2)	3 (2.2)	1 (.5)	
Level of Education				
Graduate Degree	88 (27.2)	33 (24.6)	55 (28.9)	0.0526
College / University Degree	115 (48.7)	42 (31.3)	73 (38.4)	
Vocational / Trade School Degree	97 (29.9)	45 (33.6)	52 (27.4)	
Secondary/High School	23 (7.1)	14 (10.4)	9 (4.7)	
Other	1 (3.1)	0 (0.0)	1 (0.5)	

Higher education (subset)				
Yes	203 (62.6)	75 (55.9)	128 (67.4)	0.0370
No	121 (37.3)	59 (44.0)	62 (32.6)	
Infection control training (total)	96 (29.6)	19 (5.9)	77 (23.8)	<0.0001
CDC	11 (3.4)	3 (2.2)	8 (4.2)	
Home institution	81 (25.0)	15 (11.2)	66 (34.7)	
Other	5 (1.5)	1 (0.7)	4 (2.1)	
None	226 (69.8)	115 (85.8)	111 (58.4)	
Qualitative response (N=70)				
Separate hospitals	29 (41.4)	20 (44.4)	9 (36.0)	0.8210
Same hospital, separate precautions	11 (15.7)	5 (11.1)	6 (24.0)	
Integrate fully, standard precautions	10 (14.3)	7 (15.6)	3 (12.0)	
Enhance HIV Education and precautions in general	20 (28.6)	13 (28.9)	7 (28.0)	
Marital status				
Single / never married	91 (28.1)	39 (29.1)	52 (27.4)	0.7551
Married	226 (69.8)	92 (68.7)	134 (70.5)	
Divorced	5 (1.5)	3 (2.2)	2 (1.1)	
Widowed	1 (0.3)	0 (0.0)	1 (0.5)	
Other	1 (0.3)	0 (0.0)	1 (0.5)	
Stable relationship				
Yes	226 (69.8)	92 (68.7)	134 (70.5)	0.7187
No	98 (30.2)	42 (31.3)	56 (29.5)	

Note: Total may not add up to 100% due to rounding and non-response.

Table 2: Univariate and multivariate models for correlates of high KAS composite score (score $\geq$ 27) among HCW in three hospitals, Gansu Province, China, 2012 (N=324).

	Univariate Analysis			Multivariate Analysis		
	OR	95% CI	P value	AOR	95% CI	P value
Gender						
Female	1.17	.73-1.88	0.519			
Male	Ref					
Age group						
< 35 years	1.02	0.65-1.59	0.070			
$\geq$ 35 years	Ref					
Public hospital location in Gansu						
Lanzhou	Ref			Ref		
Tianshiu	2.04	1.18-3.52	0.010	1.22	0.60-2.48	0.580
Linxia	3.44	1.94-6.10	<0.0001	7.80	3.53-17.22	<0.0001
Work years, years	0.99	0.97-1.02	0.599			
Work experience						
<14 years	Ref					
$\geq$ 14 years	1.05	0.68-1.64	0.822			
Hospital department						
Surgery	1.77	0.89-3.51	0.102			
Medicine	1.81	0.85-3.82	0.123			
Radiology	Ref					
Traditional Chinese medicine	4.63	0.48-45.08	0.187			
Facilities/maintenance	1					
Profession						
Physician	9.22	1.05-81.03	0.045	13.88	1.24-155.08	0.033
Public health	2.50	0.16-38.60	0.660	3.71	0.20-69.82	0.381

Medical technology	Ref			Ref		
Nurse	6.76	0.77-59.23	0.084	4.45	0.46-43.33	0.199
Management	1					
Other	1					
Clinical occupation						
No	Ref			Ref		
Yes	5.08	1.62-15.95	0.005	1		
Surgical occupation						
No	Ref					
Yes	1.87	0.75-1.87	0.460			
Blood exposure potential						
No	Ref					
Yes	1.67	0.90-3.10	0.103			
Assigned rank						
Very High	Ref					
High	0.48	0.16-1.43	0.187			
Intermediate	0.39	0.14-1.07	0.067			
Primary	0.44	0.16-1.16	0.096			
No Title	0.57	0.14-2.37	0.438			
Other	0.11	0.99-1.12	0.071			
High ranking occupation						
No	Ref					
Yes	1.09	0.73-1.71	0.400			
Level of education						
Graduate Degree	2.59	1.01-6.67	0.047	2.72	0.70-10.63	0.151
Undergraduate Degree	2.70	1.08-6.78	0.034	2.24	0.69-7.29	0.181
Junior College	1.80	0.71-4.55	0.215	1.73	0.57-5.23	0.334
Secondary/High School	Ref			Ref		
Other	1		1			
Infection control training						
CDC	0.67	0.05-8.64	0.756			
Affiliated institution	1.1	0.11-10.56	0.934			
Other	Ref					
Formal infection control training						
No	Ref			Ref		
Yes	4.20	2.38-7.39	<0.0001	4.21	2.25-7.88	<0.0001
HIV triage response (N=70)						
Separate hospitals	2.67	0.64-11.08	0.177			
Same hospital, separate precautions	0.95	0.20-4.55	0.951			
Integrate fully, standard precautions	Ref					
Enhance HIV Education and Precautions	1.20	0.36-4.01	0.771			
Marital status						
Unmarried/single	Ref					
Married	1.09	0.67-1.79	0.725			
Divorced	0.5	0.08-3.14	0.46			
Widowed	1					
Other	1					
Stable relationship						
No	Ref					
Yes	1.09	.68-1.77	0.718			
AIC: 379.09; Pearson Chi Square p= 0.696						

Note: OR: Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval; CDC: China Center for Disease Control; AIC: Aikake Information Criterion

Table 3: Multivariate best-fit model for correlates of high KAS composite score (score >27) among HSW in three hospitals in Gansu Province, China, 2011 (N=324).

	AOR	CI	P value
Public hospital location in Gansu			
Lanzhou	Ref		
Tianshiu	1.70	0.91-3.16	0.0910
Linxia	5.64	2.74-11.60	<0.0001
Clinical occupation			
No	Ref		
Yes	3.70	1.09-12.51	0.0350
Level of education			
Graduate degree	5.83	1.82-18.65	0.0030
Undergraduate degree	3.40	1.13-10.23	0.0290
Junior college	1.85	0.63-5.43	0.2600
Secondary/high school	Ref		
Other	1		
Formal infection control training			
No	Ref		
Yes	4.62	2.47-8.62	<0.0001

AIC: 383.00; Pearson's Chi Square $p=0.5964$; Note: AOR: Adjusted Odds Ratio; CI: Confidence Interval; CDC: China Center for Disease Control; AIC: Aikake Information Criterion

The multivariate model revealed that those having a high KAS composite score were physicians (AOR=13.88; $p=0.033$), from Lixia People's Hospital (AOR= 7.80; $p<0.0001$), and received formal infection control training (AOR=4.21; $p<0.0001$) (Table 2). As profession and education level were thought to be collinear, multivariate modeling revealed the best fit model excluding profession and thus included formal infection control training (AOR=4.62; $p<0.0001$), being from Lixia People's Hospital (AOR=5.64; $p<0.0001$), being in a clinical occupation (AOR 3.70; $p<0.035$), and having either a university or graduate degree (AOR 3.40 and AOR 5.83, $p<0.03$) as shown in Table 3.

formal occupational exposure training, it was found that formal training was significantly correlated ($p<0.0001$) with both categorical KAS and composite KAS scores (Figure 1).

Those seventy participants responding on the qualitative sub-study were from the Lanzhou and Tianshui hospitals only with no responses from the Linxia study site.

DISCUSSION

Based on our comprehensive literature search, overall, the attitudes of healthcare workers towards HIV and people living with HIV/AIDS in China were found to be mixed. Some studies suggest that healthcare workers have a mostly positive attitude towards people living with HIV/AIDS, which is directly related to HIV-related knowledge.¹⁷ Men, younger people, people with reported contact with people living with HIV/AIDS, healthcare workers with medical degrees and more urban facilities are associated with a more positive attitude towards people living with HIV, and are more willing to care for HIV infected people.^{7,17} Despite many positive views towards people living with HIV/AIDS, there's a perceived stigma and shame associated with caring for people living with HIV/AIDS that is more prevalent among younger doctors, providers under stress, and providers with little institutional support.^{17,18}

To our knowledge, there is no existing published literature that sought to investigate HIV knowledge, attitudes, and skills of healthcare workers in an occupational exposure context in Gansu Province, China. Some studies have examined discrimination among HCW towards PLWHA in China such as Li et al, who showed that a majority of HCW matched attitudes towards

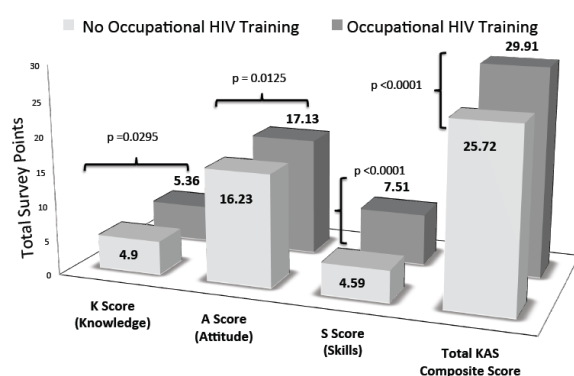


Figure 1: Graphical representation of total K Score (knowledge), A score (attitude), and S score (skills) for health care workers (HCWs) receiving and not receiving formal HIV occupational infection control training in Gansu Province, 2012 (N=324).

When categorical KAS and composite KAS scores were compared among groups that did and did not receive

PLWHA with their personally perceived social norms, with increasingly open views related to younger age or presorted personal contact with PLWHA.⁷

An interesting finding was that having a home institution of Lixia People's Hospital was significantly correlated to higher KAS composite scores. Upon further analysis as compared to the other HCW respondents, this group was significantly more likely to be younger than age 35 ($p=0.0187$), have an increased number of years as a healthcare worker ($p=0.0356$), have daily occupational risk to blood and bodily fluids ($p=0.0028$), and have had received formal infection control training ($p=0.0009$).

Pursuant to our literature search, Wen et al. concluded that formal HIV training is significantly associated with more knowledge ($r=0.222$, $p=0.0016$).¹⁹

In a study of reproductive-health related medical workers, of the respondents, 93.17% (450/483) and 94.41% (456/483) thought that washing hands properly and wearing protective glasses were effective methods of prevention occupational exposure, however; only 15.94% (89/483) and 3.93% (19/493) adhered to proper hand washing and wearing protective glasses in the past year.²⁰ This remarkable finding indicates that despite the skills and training associated with universal precautions of occupational exposure, healthcare workers are not adhering for reasons unknown that must be understood. Similarly, Li et al reports that most occupational exposures occurred during emergencies, when the health care providers did not feel that they had time to consider self-protection.⁷ Adherence to post exposure prophylaxis is poor and a majority of respondents were unaware of local laws and rules regarding post exposure prophylaxis.

Interestingly, Chen et al demonstrated a lack of knowledge and training in infectious disease among nurses. Upon further evaluation, the center was not considered a "concentrated area" for infectious disease transmission, and therefore the need for training was not perceived to be urgent.²¹

In our study, among the variables correlating with improved KAS score, formal skills training in infection control is by far the most easily modified. We noted the consistently high correlation between receiving formal infection control training on higher composite KAS scores despite only a minority of HCW's completing such formal training (29.9%). Formal occupational skill training was significantly associated not only with higher scores on the "skills" portion of the KAS, but also with significantly higher knowledge and attitude scores (Figure 1).

Though this is a cross-sectional survey in which only correlation can be inferred, our data support further study into occupational skills training as a tool to improve Chinese HCW knowledge, attitude and skills around caring for patients with HIV.

As most of the participants receiving formal training worked at Lixia People's Hospital, we suggest that Lixia's training program might serve as a starting point for an interventional study. Further research might work toward developing an evidence-based training program to empower Chinese HCWs to safely and confidently care for patients with HIV. New interventional approaches for HCW beyond the traditional didactic model such as behavioral interventions that incorporate role-playing and open group discussions have been shown to result both in decreased levels of negative feelings towards PLWHA and more accurate understanding of HIV and practice of universal precautions.²²

Factors such as higher educational level, home institution, receiving formal infection control training, and sustained clinical contact positively affect HCW's knowledge, attitudes, and skills surrounding HIV occupational exposure in Gansu, China. However, a majority of HCWs responded qualitatively that they did not feel comfortable caring for patients with HIV in a general hospital setting.

First, prior research has suggested that segregation of HIV patients reduces the quality of HIV care; conversely, integrating PLWHA into mainstream hospital care improves outcomes. In South Africa, PLWHA integrated into general medical health systems with access to comprehensive social and mental health services were three times more likely to achieve HIV viral load suppression on ART and to show improved overall survival (South African STRETCH study protocol).^{23,24}

Chinese HCW are justifiably concerned for their safety due to inadequate local infection control protocols and post exposure prophylaxis practices; for example, nearly 75% of HCW across several studies from China reported occupational exposure to blood and bodily fluids.^{21,25,26} A nationally funded cross-sectional study of a 900-bed academic teaching hospital in Beijing in 2003-2004 reports an incidence rate of 66.3 per 100 for blood and body fluid exposure, averaging out to 7.5 occupational exposures per HCW per year, mostly among surgical staff - a concerning revelation that requires urgent attention.²⁵

Qualitative responses in this study advocating for separation of HIV patients either into a distinctly designated ward or hospital suggests that perhaps measures to prevent occupational HIV transmission are not being applied universally. It is known that basic precautions such as single and double gloving still need to be implemented universally due to limited resources and poor understanding of transmission risk.²⁵

As all Chinese HCWs have potential occupational exposure to HIV, continuing effective, evidence-based occupational infection control programs are shown in this study to improve KAS among HCW's. As more HCWs in China become equipped with the proper knowledge,

attitudes, and skills surrounding integrative care for PLWHA, then it is hoped that this decreased stigma will further accelerate efforts in China to promote screening, treatment, and status disclosure for HIV/AIDS.¹⁵

There were a few limitations to our study. The study was conducted via a cross sectional survey and due to this design we could not establish a causal relationship among various study variables. Some of the study findings were also prone to respondent's bias arising from the use of semi-structured and self-reported questionnaire.

CONCLUSION

Our study has provided considerable knowledge on occupational exposure in the context of HIV/AIDS in Gansu province of China. We are hopeful that expansion of formal infection control training and adoption of standardized occupational exposure protocols may (1) reduce barriers to integration of HIV care into general hospital facilities, thus improving the quality of care for patients with HIV/AIDS and (2) improve occupational safety and confidence in occupational settings among HCWs in China.

ACKNOWLEDGEMENTS

The authors would like to thank Dr. John Sinnott, Chair of Internal Medicine at the University of South Florida, Morsani College of Medicine, for his assistance with manuscript preparation. We acknowledge the staff at the three participating hospitals for making this study possible..

Funding: This study was funded by the Science and Technology Plan of Gansu Province, China, Number #1210RJDA012

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee by the Gansu People's Institutional Review Board

REFERENCES

1. Settle E. AIDS In China: An Annotated Chronology (1985-2003). China AIDS Survey. 2003;157.
2. World Health Organization. Global Report: UNAIDS Report on the Global AIDS Epidemic. 2013.
3. Qin L, Yoda T, Suzuki C, Yamamoto T, Cai G, Rakue Y, et al. Combating HIV/AIDS in Mainland China: an epidemiological review of prevention and control measures. Southeast Asian J Trop Med Public Health. 2005;36(6):1479-86.
4. McGivering J. Aids takes deadly toll in China. BBC News. 2009. Available at: <http://news.bbc.co.uk/2/hi/asia-pacific/7896133.stm>. Accessed on 3 June 2017.
5. Global Report: UNAIDS report on the global AIDS epidemic 2010. In: UNAIDS, ed. Geneva: UNAIDS; 2010.
6. Bank TW. Prevalence of HIV, total (% of population ages 15-49). The World Bank. 2013. Available at: <http://data.worldbank.org/indicator/SH.DYN.AIDS.ZS>. Accessed on 3 June 2017.
7. Li L, Liang LJ, Lin C, Wu Z, Wen Y. Individual attitudes and perceived social norms: Reports on HIV/AIDS-related stigma among service providers in China. Int J Psychol. 2009;44(6):443-50.
8. Frederich MN, Maritta SJ. Needle sticks injuries among nurses in sub-Saharan Africa. Tropical Medicine and International Health. 2005;10(8):773-81.
9. Henderson DK, Fahey BJ, Willy M, Schmitt JM, Carey K, Koziol DE, et al. Risk for occupational transmission of human immunodeficiency virus type 1 (HIV-1) associated with clinical exposures. A prospective evaluation. Ann Intern Med. 1990;113(10):740-6.
10. Gerberding JL. Incidence and prevalence of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, and cytomegalovirus among health care personnel at risk for blood exposure: final report from a longitudinal study. J Infect Dis. 1994;170(6):1410-7.
11. Cardo DM, Culver DH, Ciesielski CA, Srivastava PU, Marcus R, Abiteboul D, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. N Engl J Med. 1997;337(21):1485-90.
12. Chen LW. Medical professional's cognition on occupational exposure to HIV in community health service center. Chinese J Human Sexuality. 2010;19(6).
13. Kermode M, Jolley D, Langkham B, Thomas MS, Crofts N. Occupational exposure to blood and risk of blood borne virus infection among health care workers in rural north Indian health care settings. Am J Infect Control. 2005;33(1):34-41.
14. World Health Report. Reducing risks, promoting healthy life. In: WHO, ed. Geneva: WHO; 2002.
15. UNAIDS. Key Programmes to reduce stigma and discrimination and increase access to justice in national HIV responses. UNAIDS Guidance Notes. 2012.
16. Stata Statistical Software [computer program]. College Station, TX: StataCorp LP; 2011.
17. Li L, Wu Z, Wu S, Lee SJ, Rotheram-Borus MJ, Detels R, et al. Mandatory HIV testing in China: the perception of health-care providers. Int J STD AIDS. 2007;18(7):476-81.
18. Famoroti TO, Fernandes L, Chima SC. Stigmatization of people living with HIV/AIDS by healthcare workers at a tertiary hospital in KwaZulu-Natal, South Africa: a cross-sectional descriptive study. BMC Med Ethics. 2013;14(Suppl 1):S6-6.

19. Wen Y, Guan J, Wu Z, Li L, Rotheram-Borus MJ, Lin C, et al. Pharmacy workers' sexually transmitted diseases/human immunodeficiency virus knowledge in Fuzhou, China: implications for human immunodeficiency virus testing, treatment, and prevention strategies. *Sexually transmitted diseases*. 2009;36(4):221-6.
20. Zhang Y, Wang J, Li P, Huo Y, Yang J, Wang H. Knowledge, attitudes, and practices regarding blood-borne occupational exposure among reproductive health staff in Tianjin. *Chinese J Industrial Hygiene Occupational Diseases*. 2014;32(3):207-10.
21. Chen WT, Han M, Holzemer WL. Nurses' knowledge, attitudes, and practice related to HIV transmission in northeastern China. *AIDS Patient Care and STDs*. 2004;18(7):417-22.
22. Wu S, Li L, Wu Z, Liang L, Cao H, Yan Z, et al. A brief HIV stigma reduction intervention for service providers in China. *AIDS patient care and STDs*. 2008;22(6):513-20.
23. Hoang T, Goetz MB, Yano EM, Rossman B, Anaya HD, Knapp H, et al. The impact of integrated HIV care on patient health outcomes. *Med Care*. 2009;47(5):560-567.
24. Uebel KE, Lombard C, Joubert G, Fairall LR, Bachmann MO, Mollentze WF, et al. Integration of HIV care into primary care in South Africa: effect on survival of patients needing antiretroviral treatment. *J Acquir Immune Defic Syndr*. 2013;63(3):e94-100.
25. Zhang M, Wang H, Miao J, Du X, Li T, Wu Z. Occupational exposure to blood and body fluids among health care workers in a general hospital, China. *Am J Ind Med*. 2009;52(2):89-98.
26. Chen WT, Han M. Knowledge, attitudes, perceived vulnerability of Chinese nurses and their preferences for caring for HIV-positive individuals: a cross-sectional survey. *J Clin Nurs*. 2010;19(21-22):3227-34.

Cite this article as: Mundra LS, Aslam S, Zhang J, Lin H, Xu P, Morano J. HIV/AIDS occupational exposure and integrative care; knowledge, attitude, and skills of healthcare workers in Gansu Province, China. *Int J Community Med Public Health* 2017;4:3501-10.