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Practices Of Infection Prevention And Associated Factors Among Healthcare Professionals At Community Health Clinics In Saudi Arabia, 2024

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Abstract:

Background: Globally, one of the most significant and complicated health issues is healthcare-associated infections (HCAI). HCAIs have been strongly linked to inadequate infection prevention strategies and pose significant obstacles to the safe and high-quality delivery of healthcare.
The study aimed: To assess infection prevention practices and associated factors among healthcare professionals (HCPs) of community health clinics in Saudi Arabia.
Methods: A cross-sectional study was conducted among a convenience sample of 128 HCPs of community health clinics in Saudi Arabia. Data were collected between January and February, 2024 through semi-structured questionnaire.
Results: Of the study participants, only 39.1% had good infection prevention procedures and 37.5% knew enough about infection prevention methods. Higher educated health care professionals were substantially more likely to follow excellent infection prevention practices, which were linked to proper infection prevention knowledge and the availability of soap and hand washing facilities in community clinics.
Conclusion: To improve the currently dropping infection prevention knowledge and practices among community HCPs, an efficient infection prevention training program must be implemented, along with a sufficient supply of basic infection prevention resources, ongoing monitoring, and supervision.

Keywords: Practices, Infection Prevention, Associated Factors, and Healthcare Professionals.

Introduction:

The spread of viruses from environmental surfaces and healthcare workers' hands is a key vector for healthcare-associated infections (HCAI), which can be caused by contaminated surfaces across the hospital environment [(1)]. Environmental pollution is responsible for between 30 and 50 percent of all HCAI [(2)]. A major negative impact on the quality of clinical services for hundreds of millions of hospitalized patients annually, healthcare-associated infections (HAIs) are the most common adverse events in healthcare facilities worldwide, affecting roughly 10% of patients in developed countries and 25% in developing ones [(3-7)].
In fact, developing nations are 2–20 times more likely to experience HAIs than resource rich nations,

which exacerbate the socioeconomic burden in economies with limited resources [8]. HAIs are associated with undue increase in healthcare cost in addition to higher patient morbidity and mortality [9]. Additionally, up to 50 % of HAIs are caused by micro-organisms resistant to one or more antimicrobials [10, 11]. Conducting HAI surveillance and providing timely feedback of infection rates and related process measures to healthcare providers and other stakeholders are critical steps in the improvement process [12]. Additionally, surveillance alone without interventions may induce significant changes in practices and behaviors of healthcare providers that can be translated into reduced infection rates [13, 14].

In 2019, the percentage of healthcare-associated infections (HAIs) in Riyadh, Saudi Arabia, was 0.43% of all patient admissions. In 2019, there were 1.15 bloodstream infections linked to central lines for every 1000 central line days. During 2019, there was one urinary tract infection for every 1000 catheter days. In 2019, there were 0.41% of surgical site infections and 2.11 cases of ventilator-associated pneumonia for every 1000 ventilator days [15]. The absence of adequate infection prevention and control (IPC) and patient safety practices increases the risk of acquiring HAIs in both healthcare providers and patients [6, 16-18]. HAIs are important contributors to increased mortality, morbidity, antimicrobial resistance, healthcare costs for patients and their families, and lead to unnecessary prolonged hospital stays [6, 19, and 20].

The World Health Organization (WHO) showed that effective implementation of IPC practices in healthcare facilities leads to significant reduction (> 30%) in HAIs [21], and to annual medical cost savings of $25.0 - $31.5 billion [6, 22]. Therefore, prevention of HAIs is essential for the provision of safe and high-quality healthcare services. The Centers for Disease Control and Prevention (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) demonstrated a significant shift in healthcare delivery from the acute, inpatient hospital setting to a variety of outpatient and community-based settings over the past several decades [23]. Compared to inpatient acute care settings, outpatient and community-based settings have traditionally lacked infra- structure and resources to support IP activities [23-26].

Consequently, it is important to investigate IP practices among community healthcare providers (CHCPs). Therefore, the study aimed to assess infection prevention practices and associated factors among healthcare professionals (HCPs) of community health clinics in Saudi Arabia.

Methods:

A cross-sectional study was conducted among a convenience sample of 128 HCPs of community health clinics in Saudi Arabia. Data were collected between January and February, 2024 through face-to-face survey using a pre-tested semi-structured questionnaire. Around 15 minutes spent for each survey. The study was formulated based on the previous studies [6, 8, 20, 27-31] and the questions were developed by a team of three experts who were knowledgeable in the area of IPC. The questionnaire consisted of three parts: The first part encompassed questions relating to socio-demographic variables (age, sex, marital status, level of education, length of service.) and existing information of respondent's community clinics (presence of IP guideline/evidence, and hand washing facility, and availability of soap, gloves and mask).

The second part included questions assessing knowledge of IP concerning IP principles, transmission of infection, hand hygiene, personal protective equipment (PPE), serialization techniques, post-exposure prophylaxis (PEP) and healthcare waste management. The third part included questions assessing self-reported IP practices concerning hand hygiene, use of PPE, exposure incident/needle stick injury, provision of health education about HAIs, covering of wounds, vaccination against common pathogens, and healthcare waste management.

To assure the data quality, data collection instruments were pre-tested on 10 % CHCPs of the intended sample size who were drawn from the study area but not included in the actual study. The results and experiences from the pre-test were evaluated for clarity, reliability, accuracy and relevance and changes were made to the instrument by three experts who were knowledgeable in this field. The reliability coefficient for IP knowledge and practice items had a Cronbach's Alpha value of 0.77 and 0.75 respectively. Data were examined by the principal investigators for completeness and consistency during data collection on a daily basis.

The dependent variables evaluated were CHCP's self-reported IP practices, whereas independent variables included socio-demographic characteristics (age, sex, marital status, level of education, length

of service, and history of IP training) and existing factors regarding respondent's community clinics (IP guideline/evidence, hand washing facility, and availability of soap, gloves and masks), and knowledge of IP. Respondents' knowledge regarding IP and self-reported IP practices, findings were categorized using a scoring system in which, the respondent's correct or incorrect responses to the questions were allocated "1" or "0" points respectively. The total score of knowledge questions was classified into two categories: adequate (> mean) and inadequate (≤ mean). Similarly, healthcare providers' self-reported IP practices were classified into two categories: good (> mean) and poor (≤ mean) [20, 27, 31, and 32].

Statistical analysis relied on the SPSS version 28.0. Descriptive statistics were used to calculate the frequencies, percentages, means and standard deviations of relevant variables. Chi-square tests and Fisher's exact tests were applied to assess associations between the dependent and independent variables. In addition, binary logistic regressions were employed between dependent and independent variables and those variables with a p-value of less than 0.2 in the binary analysis were then entered into a multiple logistic regression to control for the effect of potential confounders. The statistical significance was declared as a p-value < 0.05 with a 95% of confidence interval (CI).

This study was approved by the Ethical Committee of the University and all procedures were performed in accordance with the ethical standards. The aim of the study was explained to the participants prior to participate in the study and written informed consent was obtained from all participants. Strict confidentiality of information and anonymity to the participants were ensured.

Results:

Table (1) shows general characteristics of the study participants. The majority of respondents (57.8%) were male, and half of the participants were between the ages of 31 and 35. The average age of the participants was 32.6 ± 3.7 years [SD]. The percentage of respondents with a bachelor's degree, master's degree, and higher secondary education was 43.8%, 33.6%, and 22.7%, respectively. There were no IP guidelines, suggestions, or supporting documentation in the great majority of the respondents' community clinics. Just 85.9% of respondents said their community clinics always had soap on hand. Just 13.3% and 7% of respondents, respectively, claimed that gloves and masks were always available.

Table (1): General characteristics of the study participants

Variables	n	(%)
Age (years)		
1–25	4	(3.1)
6–30	33	(25.8)
1–35	64	(50)
35	27	(21.1)
Sex		
Male	74	(57.8)
Female	54	(42.2)
Marital Status		
Married	123	(96.1)
Single	5	(3.9)
Education		
Higher secondary	29	(22.7)
Bachelors	56	(43.8)
Masters	43	(33.5)
Length of service (years)		
<5	11	(8.6)
5–8	76	(59.4)
>8	41	(32)
IP guideline/ evidence in CHC		
Yes	9	(7)
No	119	(93)
Hand washing facility (tube well and/ or basin) with effective water supply in CHC		
Yes	113	(88.3)

Variables	n	(%)
No	15	(11.7)
Availability of soap in CHC		
Always	110	(85.9)
Sometimes	18	(14.1)
Availability of gloves in CHC		
Always	17	(13.3)
Sometimes	94	(73.4)
Never	17	(13.3)
Availability of mask in CHC		
Always	9	(7)
Sometimes	27	(21.1)
Never	92	(71.9)

Table (2) shows study participants' knowledge regarding infection prevention. The percentage of respondents with sufficient IP knowledge was just 37.5%. Knowledge scores ranged from 2 to 9, with an average of 5.17±1.38 [SD]. Additionally, just 47.7% of respondents understood that wearing gloves does not negate the necessity for hand washing, and only 42.2% of respondents were aware that gloves cannot offer total protection against the spread of illnesses. When hands are not obviously unclean, 55.5% of respondents thought that using an alcohol-based antiseptic for hand hygiene was just as effective as using soap and water. Additionally, just 21.9% of respondents knew how to make a 0.5% chlorine solution, but 50% recognized that the safety box should be sealed or closed once three quarters of it was full.

Table (2): Study participants' knowledge regarding infection prevention

Knowledge items	n	(%)
Heard about infection prevention principles		
Yes	45	(35.2)
No	80	(62.5)
Don't know	3	(2.3)
Gloves can provide complete protection against transmission of infections		
Yes	70	(54.7)
No	54	(42.2)
Don't know	3	(2.3)
Washing hands with soap or use of an alcohol-based antiseptic decrease the risk of transmission of healthcare acquired infections		
Yes	119	(93)
No	7	(5.5)
Don't know	2	(1.6)
Use of an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty		
Yes	71	(55.5)
No	57	(45.5)
Don't know	0	(0)
Wearing of gloves replace the need for hand washing		
Yes	61	(47.7)
No	67	(52.3)
Don't know	0	(0)
Chemical sterilization technique used for every equipment		
Yes	27	(21.1)
No	95	(74.2)
Don't know	6	(4.7)
Physical sterilization (heat/radiation) technique used for every equipment		

Knowledge items	n	(%)
Yes	24	(18.8)
No	93	(72.7)
Don't know	11	(8.6)
Post exposure prophylaxis (PEP) for HIV after exposure		
Yes	32	(25)
No	91	(71.1)
Don't know	5	(3.9)
Know how to prepare 0.5% chlorine solution		
Yes	28	(21.9)
No	100	(78.1)
Should safety box be closed/sealed when three quarters filled?		
Yes	64	(50)
No	63	(49.2)
Don't know	1	(0.8)

Table (3) shows that 39.1% reported good IP practices. Moreover, only 57.9% CHCPs wash hands with soap/antiseptic before each patient care, and 86.7% wash hands with soap after patient care or contact with body fluids. The frequency of respondents who always used aprons, gloves and masks when splashes and spills of any body fluids were likely was 57.8%, 25% and 7%, respectively. In addition, 7.8% of CHCPs used IP guidelines/ evidence and 55.5% recapped needles before disposing them or preferably placing then in a safety box.

Further, 28.9% of the respondents had a preceding history of contact with blood, body fluids or needle stick injury, and among them only 24.3% underwent post-exposure prophylaxis (PEP). The majority of the CHCPs (86.7%) provided health education to healthcare recipients concerning HAIs, but only 25.8% were vaccinated against common viral pathogens. Furthermore, the majority of the CHCPs (96.1%) placed needles or sharps in safety/sharp boxes, and 55.5% disposed of the safety/sharp boxes when they were three- quarters full (**Table 3**).

Table (3): Infection prevention practice of community healthcare providers

Practice items		n	(%)
Wash hands with soap/antiseptic hand rub before patient care			
Yes		74	(57.9)
No		54	(42.1)
Wash hands with soap after patient care/contact with fluid			
Yes		111	(86.7)
No		17	(13.3)
Always used PPE if splashes and spills of any body fluids were likely			
Apron	Yes	74	(57.8)
	No	54	(42.2)
Gloves	Yes	32	(25)
	No	96	(75)
Mask	Yes	9	(7)
	No	119	(93)
Used infection prevention guideline/evidence			
Yes		10	(7.8)
No		118	(92.2)
Recap needle before disposing/placing it in safety box			
Yes		71	(55.5)
No		57	(44.5)
History of contact for blood, fluid or stick injury			
Yes		37	(28.9)
No		91	(71.1)

Practice items		n	(%)
Measures were used after exposed for blood, fluid or stick injury (n = 37)			
Taking PEP	Yes	9	(24.32)
	No	28	(75.68)
Clean by alcohol	Yes	10	(27.02)
	No	27	(72.98)
Washing with water	Yes	31	(83.79)
	No	6	(16.21)
Provided health education to patients about HAIs			
Yes		111	(86.7)
No		17	(13.3)
Covered wounds on the skin before starting work			
Yes		109	(85.2)
No		19	(14.8)
Vaccinated against common pathogens			
Yes		33	(25.8)
No		95	(74.2)
Used needles or sharps put on safety/sharp boxes			
Yes		123	(96.1)
No		5	(3.9)
Safety/ sharp boxes disposed of when they were three-quarters full			
Yes		71	(55.5)
No		57	(44.5)

Table (4) shows that the IP practices were significantly associated with respondents' education (χ^2 = 8.541, df = 2, p = 0.014), presence of a hand washing facility (χ^2 = 4.725, df = 1, p = 0.030), availability of soap in clinic setting (χ^2 = 4.413, df = 1, p = 0.036) and IP knowledge (χ^2 = 9.531, df = 1, p = 0.002).

Table (4): Factors associated with CHCPs infection prevention practice

Variables	Good IP practice n (%)	Poor IP practice n (%)	χ2 (df)	p-value
Age (years)				
21–25	1 (0.8)	3 (2.3)	1.924 (3)	0.620
26–30	15 (11.7)	18 (14.1)		
31–35	26 (20.3)	38 (29.7)		
>35	8 (6.3)	19 (14.8)		
Sex				
Male	25 (19.5)	49 (38.3)	2.053 (1)	0.152
Female	25 (19.5)	29 (22.7)		
Marital status				
Married	48 (37.5)	75 (58.6)	0.002 (1)	1.000
Single	2 (1.6)	3 (2.3)		
Education				
Masters	22 (17.2)	21 (16.4)	8.541 (2)	0.014*
Bachelor	23 (18.0)	33 (25.8)		
Higher Secondary	5 (3.9)	24 (18.8)		
Length of service				
<5	3 (2.3)	8 (6.3)	0.738 (2)	0.692
5–8	31 (24.2)	45 (35.2)		
>8	16 (12.5)	25 (19.5)		
IP guideline/evidence				
Yes	4 (3.1)	5 (3.9)	0.118 (1)	0.736
No	46 (35.9)	73 (57.0)		
Hand washing facility (tube well and/or basin)				

Variables	Good IP practice n (%)	Poor IP practice n (%)	χ2 (df)	p-value
Yes	48 (37.5)	65 (50.8)	4.725 (1)	0.030*
No	2 (1.6)	13 (10.2)		
Availability soap				
Always	47 (36.7)	63 (49.2)	4.413 (1)	0.036*
Sometimes	3 (2.3)	15 (11.7)		
Availability of gloves				
Always	9 (7.0)	8 (6.3)	3.102 (2)	0.212
Sometimes	37 (28.9)	57 (44.5)		
Never	4 (3.1)	13 (10.2)		
Availability of mask				
Always	5 (3.9)	4 (3.1)	1.115 (2)	0.573
Sometimes	10 (7.8)	17 (13.3)		
Never	35 (27.3)	57 (44.5)		
IP Knowledge				
Adequate	27 (21.1)	21 (16.4)	9.531 (1)	0.002*
Inadequate	23 (18.0)	57 (44.5)		

* Significant p-value less than 0.05.

Table (5) shows that the unadjusted model, CHCPs who had bachelors and masters level education were three times and five times more likely to have good IP practices (COR = 3.35, 95% CI = 1.11–10.06, p = 0.032 and COR = 5.03, 95% CI 1.62–15.63, p = 0.005, respectively). The unadjusted model also revealed that CHCPs who had one/more hand washing facilities in CCs were 4.8 times more likely to have more frequent practices towards prevention of HAIs (COR = 4.80, 95% CI = 1.03–22.27, p = 0.045). Moreover, permanent availability of soap in CCs was 3.7 times more likely to result in more frequent IP practices (COR = 3.73, 95% CI = 1.02–13.63, p = 0.046).
Furthermore, CHCPs who had more adequate knowledge about IP, were three times more likely to have more frequent IP practices (COR = 3.19, 95% CI = 1.51–6.73). In the adjusted model, having a master's degree (AOR = 4.92, 95% CI = 1.41–17.23, p = 0.013) and adequate IP knowledge (AOR = 2.89, 95% CI = 1.26–6.63, p = 0.012) emerged as significant independent factors associated with more frequent IP practices (**Table 5**).

Table (5): Binary and multiple regression analysis of factors associated with infection prevention practices.

Variables	IP Practice		Unadjusted model		Adjusted model [a]	
	Good	Poor	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age						
21–25	1 (0.8)	3 (2.3)	Reference		—	—
26–30	15 (11.7)	18 (14.1)	2.50 (0.24–26.60)	0.448	—	—
31–35	26 (20.3)	38 (29.7)	2.05 (0.20–20.84)	0.543	—	—
>35	8 (6.3)	19 (14.8)	1.26 (0.11–14.05)	0.849	—	—
Sex						
Male	25 (19.5)	49 (38.3)	0.59 (0.29–1.22)	0.153	0.48 (0.20–1.14)	0.095
Female	25 (19.5)	29 (22.7)	Reference		Reference	
Marital status						
Married	48 (37.5)	75 (58.6)	0.96 (0.16–5.96)	0.965	—	—
Single	2 (1.6)	3 (2.3)	Reference		—	—
Education						
Masters	22 (17.2)	21 (16.4)	5.03 (1.62–15.63)	0.005	4.92 (1.41–17.23)	0.013
Bachelor	23 (18.0)	33 (25.8)	3.35 (1.11–10.06)	0.032	2.66 (0.80–8.86)	0.110

Variables	IP Practice		Unadjusted model		Adjusted model [a]	
	Good	Poor	COR (95% CI)	p-value	AOR (95% CI)	p-value
Higher Secondary	5 (3.9)	24 (18.8)	Reference		Reference	
Length of service						
<5	3 (2.3)	8 (6.3)	Reference		— —	—
5–8	31 (24.2)	45 (35.2)	1.84 (0.45–7.48)	0.396		
>8	16 (12.5)	25 (19.5)	1.71 (0.39–7.41)	0.475		
IP guideline/evidence						
Yes	4 (3.1)	5 (3.9)	1.27 (0.32–4.97)	0.732	— —	—
No	46 (35.9)	73 (57.0)	Reference			
Hand washing facility (tube well and/or basin)						
Yes	48 (37.5)	65 (50.8)	4.80 (1.03–22.27)	0.045	1.92 (0.37–10.06)	0.443
No	2 (1.6)	13 (10.2)	Reference		Reference	
Availability soap						
Always	47 (36.7)	63 (49.2)	3.73 (1.02–13.63)	0.046	1.93 (0.47–7.86)	0.361
Sometimes	3 (2.3)	15 (11.7)	Reference		Reference	
Availability of gloves						
Always	9 (7.0)	8 (6.3)	3.66 (0.84–15.93)	0.084	2.84 (0.55–14.60)	0.212
Sometimes	37 (28.9)	57 (44.5)	2.11 (0.64–6.97)	0.221	1.73 (0.45–6.59)	0.422
Never	4 (3.1)	13 (10.2)	Reference		Reference	
Availability of mask						
Always	5 (3.9)	4 (3.1)	2.04 (0.51–8.10)	0.313	— —	—
Sometimes	10 (7.8)	17 (13.3)	0.96 (0.39–2.33)	0.924		
Never	35 (27.3)	57 (44.5)	Reference			
IP knowledge						
Adequate	27 (21.1)	21 (16.4)	3.19 (1.51–6.73)	0.002	2.89 (1.26–6.63)	0.012
Inadequate	23 (18.0)	57 (44.5)	Reference		Reference	

COR = Unadjusted/ Crude odds ratio; CI = Confidence interval; AOR = Adjusted odds ratio. [a] Adjusted for CHCP's sex, education, hand washing facility (tube well and/or basin), availability soap, availability of gloves, and IP knowledge.

Discussion:

This study evaluated CHCPs' IP practices and expertise as well as the elements that are related to them. According to the current study's findings, only 37.5% of CHCPs had sufficient knowledge of IP, and the bulk of them scored poorly on the IP knowledge questions (62.5%). The frequency of adequate knowledge is comparatively lower than several previous studies conducted among healthcare professionals (81.6%) [33], healthcare workers (53.7%) [6] and nursing staff (57.1%) [34]. There are several potential reasons behind these findings including: differences in education: most of the healthcare providers in the aforementioned studies had Diploma/Bachelor/Masters level education in Medicine or Nursing; the type of healthcare staff (CHCPs vs. others [Doctor or Nurse]); difference in the availability and implementation of IP training; difference in the instrument to categorize IP knowledge. However, lower knowledge rates have also been reported among primary health workers (22%) [35].

The current study found that 39.1% of CHCPs had good IP practices, a finding that is matching with the findings of a study conducted by Geberemariyam et al., (2018) [6]. Comparatively higher frequencies of good IP practices were however also reported by several previous studies conducted in Ethiopia in different settings including 57.3% [20], 54.2% [27], and 66.1% [31]. The proportion of good IP practices among male CHCPs was higher than among female CHCPs, although there were no significant sex differences regarding overall IP practices. Particularly, other studies found a higher prevalence of less

frequent IP practice among male health workers [6, 20].

Unsurprisingly, the degree of education of CHCPs, the accessibility of soap and hand washing stations, and IP understanding were all strongly correlated with IP practices. An analysis of IP practices among healthcare workers, on the other hand, revealed a strong correlation with age, sex, marital status, educational attainment, job experience, the availability of personal protective equipment, and IP method training [20]. Similarly, another study conducted among healthcare workers found that IP practices were significantly associated with sex, profession, years of experience, avail- ability of water for hand washing, the presence of an IP committee, availability of IP guidelines, and training on IP [6]. These differences may be due to differences in education status, supply of IP basic resources, sample size, socio-demographic differences, lack of in-service training and non-adherence to IP, and monitoring and evaluation system.

Although some previous studies assessed healthcare provider IP knowledge and practice, and showed associations with different factors including socio-demographic factors and IP basic resources and facilities [6, 18, 20, 26, 36], only a few studies assessed the association between healthcare provider's IP knowledge and IP practice [37]. The present study was one of the few studies that examined the association between healthcare provider's IP knowledge and IP practice, and found that CHCPs, who had adequate IP knowledge, were three times more likely to have good IP practices than those who had no adequate IP knowledge. This finding is similar with a recent study which reported that healthcare workers who had good knowledge of infection prevention were two times more likely to have good infection prevention practices than those who had poor knowledge [37].

Conclusions:

Most of the respondents used IP techniques less frequently and had little understanding of IP. Good IP practices were present in just 39.1% of CHCPs. In fact, higher levels of engagement in IP practices were linked to understanding of IP, education levels, access to hand washing stations, and soap availability in community clinics (CCs). In order to improve the quality of healthcare services, our findings imply that healthcare authorities must closely monitor IP measures in CCs. In order to improve IP practices among CHCPs and the resulting results, it is extremely desirable and reasonably easy to implement an effective IP training program and fulfill the required IP resources in CCs. In addition, government and non-government stakeholders will need to ensure continuous training, monitoring and supervision to improve IP practices among CHCPs.

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