

# Knowledge, Practices, and Related Factors of Primary Healthcare Providers towards Infection Prevention in Saudi Arabia 2024

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## Abstract:

**Background:** Standard precautions are intended to prevent patients from possible cross-infection and to safeguard professionals from dangers associated with exposure to bodily fluids, including blood. The collection of knowledge regarding clinical infection control procedures is always expanding and changing. In order to avoid nosocomial infections, healthcare providers must have sufficient knowledge of and adhere to safe infection prevention practices.

**This study aimed:** To assess the level of knowledge and practices of healthcare providers (HCPs) towards infection prevention and its related factors in the health facilities at Saudi Arabia.

**Methods:** A cross-sectional study was conducted among 171 HCPs who were selected by a simple random sampling technique. An interviewer-administered questionnaire was used to collect data. The study utilized multivariable logistic regression to determine the factors associated with knowledge and practice of infection prevention.

**Result:** Approximately 70.8 and 55.0% of HCPs had acceptable knowledge and safe practice of infection prevention respectively. Having infection prevention guideline (AOR = 3.65, 95% CI; 1.26, 10.54), taking infection prevention training (AOR = 2.2, 95% CI; 1.01, 4.75), having five years or more work experience (AOR = 1.52: 95%CI; 1.13, 4.51), and working in maternity unit (AOR = 1.67:95%CI; 1.38-5.23) were positively associated with acceptable knowledge of infection prevention. The odds of safe practice were higher in participants who received infection prevention training (AOR: 2.4; 95% CI; 1.01, 4.75) but lower among HCPs who are working in the facility which has no continuous water supply (AOR = 0.48:95% CI; 0.21, 0.83).

**Conclusion:** A significant proportion of HCPs performed unsafe infection prevention techniques and lacked sufficient understanding. Adequate pre-service and on-the-job training should be provided to healthcare workers in order to enhance their understanding of infection prevention.

**Keywords:** Knowledge, Practice, Infection prevention

## **Introduction:**

Primary health Care is essential health care made universally accessible to individuals and families in the community by means acceptable to them, through their full participation and at a cost that the community and country can afford. It forms an integral part both of the country's health system of which it is the nucleus and of the overall social and economic development of the community <sup>(1)</sup>. Infections have a serious impact on the quality of patient health care outcomes, and increased morbidity, leading to unnecessary deaths and additional cost <sup>(2)</sup>.

Healthcare-acquired infections (HAIs) are a common global challenge mainly in low and middle-income countries <sup>(3)</sup>. An estimated 10% of hospitalized patients in developed countries and 25% in developing countries develop HAIs and subsequently results in adverse healthcare outcomes as increased hospital stay, economic burden, significant morbidity, and mortality. It is an unevenly distributed in developing countries, more than 90% of these infections occurred <sup>(4-6)</sup>. The high burden of HCAIs is due to lack of standardized infection prevention program, which was neglected due to limited resources, poor sanitary conditions and hygiene practices <sup>(7-10)</sup>.

HCAIs are infections that were not present or incubating at the time of admission and are received by the patient during the process of care in a hospital or any other health care facility. Hepatitis B virus, Hepatitis C Virus, and HIV infection are commonest HAIs, mostly transmitted by healthcare workers who fail to practice infection prevention measures. Hence, Healthcare workers are front line of protecting themselves and clients from infection <sup>(11-15)</sup>. Infection prevention is a process of placing barrier between susceptible host and the microorganisms and a major component of safe and high-quality service delivery at the facility level <sup>(16)</sup>. Hence, HAIs associated morbidity and mortality is preventable through infection prevention strategy like, proper hand hygiene <sup>(17-21)</sup>.

Implementing standard precautions like safety injection, isolation precautions (contact, droplet, and airborne precautions), patient bathing, antibiotic stewardship, vaccinations, and environmental cleaning, disinfection, and sterilization, comprehensive unit based safety program and surveillance were the major steps of infection prevention <sup>(22-25)</sup>. Surveillance data in real time allows infection control practitioners to identify and understand important nosocomial infections and to detect epidemics or outbreaks <sup>(26, 27)</sup>.

Studies have shown that different factors such as availability of infection prevention guidelines, training on infection prevention and availability of personal protection equipment can promote safe infection prevention practices at the hospital level <sup>(28-30)</sup>. However, the factors associated with knowledge and practice of infection prevention in the primary health care of Saudi Arabia has not previously been explored. Therefore, this study aimed to assess the level of knowledge and practices of healthcare providers (HCPs) towards infection prevention and its related factors in the health facilities at Saudi Arabia.

## **Methods:**

A cross-sectional study design was conducted from January to April in primary health care at Saudi Arabia. All HCPs (Laboratory, Nurse, Health officer, and Midwifery) have direct participation in patient care were eligible to be included in the study during data collection. The sample size was determined by using single population proportion formula by considering the proportion of practices on infection prevention method 87.5%, from the study conducted by Alemayehu et al., (2016) <sup>(31)</sup> using the assumptions: 95% confidence interval, 5% margin of error. The calculated sample size was 162 but after adding a 5% non-response rate, the final sample size became 171. A simple random sampling technique (table of random number) was used to select the representative subjects from all HCPs.

Knowledge (adequate/inadequate) and practice (safe/unsafe) in relation to infection prevention were the outcomes of interest. Socio-demographic traits, water availability, the existence of an infection prevention committee, the presence of infection prevention guidelines at a medical facility, and infection prevention training are examples of independent variables. Eleven questions were used to calculate knowledge about infection prevention. If an HCW's score was equal to or higher than the mean, their infection prevention knowledge was categorized as adequate. Respondents were categorized as having insufficient knowledge about infection prevention if their scores fell below the mean value of correct responses.

The primary components of infection control measures, such as hand hygiene, the use of personal protective equipment (PPE), post-exposure prophylaxes (PEP), healthcare waste management, and instrument cleaning, were evaluated in the infection prevention practices of healthcare professionals. The frequency of use (practice) of these seven infection prevention strategies was inquired of the respondents. Three or two alternative answers were available for practice evaluation questions: "Always" or "Yes," "Sometimes," and "Never" or "No." Each approved or proper practice was worth one point, while all other answers were worth zero. Each healthcare worker's overall practice score was calculated by adding up their individual practice scores. Therefore, the total score of practice questions ranging from zero (all prevention measures not practiced safely) to seven (all infection prevention measures practiced safely) were classified into two categories of response: safe practice (equal or above the mean) and unsafe practice (below the mean) <sup>(32, 33)</sup>.

The researchers collected the data through face to face interview using a structured and pre-tested questionnaire which was prepared in Arabic language. The tool was developed after reviewing related varieties of literature <sup>(31, 34-37)</sup>. Data collectors were trained and supervised during the data collection period. For each component, a reliability test was done. The reliability coefficient for practice and knowledge items had a Cronbach Alpha value of 0.85 and 0.75 respectively.

The data were examined for completeness and consistency during data collection on a daily base by the supervisor. Data were analyzed by SPSS version 28. Before analysis, data were cleaned and checked for outliers and missing's. Logistic regression was done and variables with a *P*-value of less than 0.2 at bivariable logistic regression model were entered into the multivariable logistic regression model. In all cases, *p*-values of less than 0.05 were considered as statistically significant.

## Result

**Table (1)** shows a total of 171 study contributors were involved and the mean age of the study participants was 27.98 with SD  $\pm$  3.56 years. Of the total participants, (69.6%) of them were males and the majority (64.3%) were married. About (48.5%) study participants were Nurses regardless of their educational level. In terms of educational status, (59.6%) study participants were diploma and nearly one-third of respondents were currently working at the outpatient clinics.

**Table (1):** Socio-demographic characteristic of HCPs

| Variables                          | Category                           | Frequency | Percentage (%) |
|------------------------------------|------------------------------------|-----------|----------------|
| Age                                | 18–27                              | 84        | 49.1           |
|                                    | 28–37                              | 82        | 48.0           |
|                                    | 38–47                              | 5         | 2.9            |
| Sex                                | Male                               | 119       | 69.6           |
|                                    | Female                             | 52        | 30.4           |
| Marital status                     | Married                            | 110       | 64.3           |
|                                    | Single                             | 61        | 35.7           |
| Profession                         | Nurse                              | 68        | 39.8           |
|                                    | Midwifery                          | 33        | 19.3           |
|                                    | Health Officer                     | 26        | 15.1           |
|                                    | Laboratory technologist/technician | 29        | 17.0           |
|                                    | Pharmacist/pharmacy-technician     | 15        | 8.8            |
| Educational status                 | Degree and above                   | 69        | 40.3           |
|                                    | Diploma                            | 102       | 59.7           |
| Work experience in health facility | Less than 5 years                  | 114       | 66.7           |
|                                    | > = 5 years                        | 57        | 33.3           |
| Currently working unit             | Outpatient department              | 51        | 29.8           |
|                                    | Emergency and Triage               | 22        | 12.9           |
|                                    | Maternity unit                     | 33        | 19.3           |
|                                    | Inpatient clinic                   | 13        | 7.5            |
|                                    | Laboratory                         | 29        | 17.0           |
|                                    | Pharmacy                           | 15        | 8.8            |
|                                    | Under-five clinic                  | 8         | 4.7            |

**Table (2)** shows more than two-thirds of health facilities had infection prevention committee and around 73% of health facilities had infection prevention guidelines. About (19.3%) study participants didn't take any training on infection prevention and universal precaution.

**Table 2** Characteristic of HCPs

| Characteristics                           | Category            | Frequency | Percentage (%) |
|-------------------------------------------|---------------------|-----------|----------------|
| Type of health facility                   | Rural Health center | 98        | 57.3           |
|                                           | Urban health center | 73        | 42.7           |
| Members of infection prevention committee | Yes                 | 119       | 69.5           |
|                                           | No                  | 52        | 30.5           |
| Access infection prevention guideline     | Yes                 | 124       | 72.5           |
|                                           | No                  | 47        | 27.5           |
| Infection prevention training             | Yes                 | 58        | 33.9           |
|                                           | No                  | 113       | 66.1           |
| Availability of continuous water supply   | Yes                 | 88        | 51.5           |
|                                           | No                  | 83        | 48.5           |

**Table (3)** shows 70.8% of participants had adequate knowledge about infection prevention. (9.4%) were believed that gloves cannot provide complete protection against acquiring infection. (95.3%) of the study participants responded that washing hands with soap or an alcohol-based antiseptic decreases the risk of transmission of hospital acquired pathogens.

**Table (3):** Knowledge questions for HCPs in health facilities

| Knowledge Variables                                                                                                                           | Category | Frequency | Percentage (%) |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|----------------|
| Have you heard about infection prevention principle?                                                                                          | Yes      | 171       | 100            |
|                                                                                                                                               | No       | 0         | 0              |
| Do you think that gloves cannot provide complete protection against acquiring/transmitting infection?                                         | Yes      | 155       | 90.6           |
|                                                                                                                                               | No       | 16        | 9.4            |
| Do you think that healthcare-associated pathogens can be found on normal and intact patient skin?                                             | Yes      | 163       | 95.3           |
|                                                                                                                                               | No       | 18        | 4.7            |
| Do you think that washing your hands with soap or alcohol-based antiseptic decreases the risk of transmission of hospital acquired infection? | Yes      | 163       | 95.3           |
|                                                                                                                                               | No       | 8         | 4.7            |
| Do you think that use of an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty?       | Yes      | 168       | 98.2           |
|                                                                                                                                               | No       | 3         | 1.8            |
| Do you think that gloves reduce the contamination of the hand but do not prevent it completely?                                               | Yes      | 137       | 80.1           |
|                                                                                                                                               | No       | 34        | 19.9           |
| Do you think that no need to wash hands before doing procedures that do not involve bodily fluids?                                            | Yes      | 33        | 19.3           |
|                                                                                                                                               | No       | 138       | 80.7           |
| Do you think that no need to wear the same pair of gloves for multiple patients as long as there is no visible contamination?                 | Yes      | 130       | 76.0           |
|                                                                                                                                               | No       | 41        | 24             |
| Do you think TB is carried in airborne particles that are generated from patients with active pulmonary TB?                                   | Yes      | 169       | 98.8           |
|                                                                                                                                               | No       | 2         | 1.2            |
| Do you know to what level safety boxes should be filled before closing and sealing?                                                           | Full     | 16        | 9.4            |
|                                                                                                                                               | ¾ full   | 155       | 90.6           |
| Do you know specific waste disposal buckets according to the level of their contamination?                                                    | Yes      | 167       | 97.7           |
|                                                                                                                                               | No       | 4         | 2.3            |

**Table (4)** shows practice of HCPs on infection prevention, 55% of HCPs had safe infection prevention practice. From all participants, 68.4% wash their hands before patient care and 77.2% used soap to wash their hands. Around 50.3% of healthcare providers have used all personal protective equipment's and 90.6% participant changes chlorine solution every 24 h.

**Table (4):** Infection prevention practice questions for HCPs in health facilities

| Variables                                                                                            | Category                                                | Frequency(N) | Percentage(%) |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------|---------------|
| How often you wash your hands with proper detergent after contact with patient?                      | Always                                                  | 68           | 39.8          |
|                                                                                                      | Sometimes                                               | 87           | 50.9          |
|                                                                                                      | Never                                                   | 16           | 9.3           |
| Do you use antiseptic hand rub to clean hands?                                                       | Yes                                                     | 160          | 93.6          |
|                                                                                                      | No                                                      | 11           | 6.4           |
| How often do you use all personal protective equipment's as per standard to prevent infection?       | Always                                                  | 86           | 50.3          |
|                                                                                                      | Some times                                              | 85           | 49.7          |
| When do you change chlorine solutions that used for instrumental processing?                         | Every 24 h                                              | 155          | 90.6          |
|                                                                                                      | After 2 days                                            | 16           | 9.4           |
| How often do you use glove when you perform procedures that need wearing glove?                      | Always                                                  | 142          | 83.0          |
|                                                                                                      | Some times                                              | 29           | 17.0          |
| Have you ever exposed to blood or other body fluids of patients through contact or unprotected skin? | Yes                                                     | 122          | 71.3          |
|                                                                                                      | No                                                      | 49           | 28.7          |
| What measure did you take if you are exposed to blood or fluids, needle stick injury?                | Only taking Post exposure prophylaxis                   | 19           | 11.1          |
|                                                                                                      | Only clean by alcohol                                   | 68           | 39.8          |
|                                                                                                      | Only washing with water                                 | 2            | 1.2           |
|                                                                                                      | Taking Post exposure prophylaxis and clean by alcohol   | 32           | 18.7          |
|                                                                                                      | Taking post exposure prophylaxis and washing with water | 7            | 4.1           |
|                                                                                                      | Clean by alcohol and washing with water                 | 14           | 8.2           |
|                                                                                                      | All action taken                                        | 29           | 17.0          |
| Did you practice high-level disinfection where sterilization is not applicable?                      | Yes                                                     | 124          | 72.5          |
|                                                                                                      | No                                                      | 47           | 27.5          |
| What is your facility sterilization technique?                                                       | Boiling                                                 | 19           | 11.1          |
|                                                                                                      | steam sterilization                                     | 152          | 88.9          |

**Table (5)** shows all variables with a *P*-value of less than 0.2 at bivariate logistic regression model were included in the multivariable analysis. Thus age, sex, educational status, profession, work experience, presence of infection prevention guideline, getting of infection prevention training, availability of continuous water supply, type of health center and currently working unit were evaluated as possible factors associated with knowledge of infection prevention. But, we removed two variables; type of health center and member of infection prevention committee to avoid multicollinearity (detected through chi-square test).

In multivariable analysis presence of IP guidelines, IP training, work experience and currently working unit were significantly associated with knowledge of infection prevention ( $P < 0.05$ ). The odds of having adequate knowledge of infection prevention among health care providers who have IP guidelines in their health institutions were 3.7 times higher (AOR: 3.65, 95% CI; 1.26, 10.54) than those who have not IP guideline. The odds of having adequate knowledge towards infection prevention were higher in health worker who has trained about infection prevention (AOR = 2.19: 95% CI; 1.01, 4.75) than those who were not trained. (**Table 5**)

Similarly, participants who had more than 5 years' work experience had higher odds of having adequate infection prevention knowledge (AOR = 1.52: 95%CI; 1.13–4.51). Healthcare providers who were currently working in maternity and laboratory unit had higher odds of having adequate knowledge about IP ((AOR = 1.67:95%CI; 1.38– 5.23), (AOR = 2.56:95%CI; 1.26–4.13)) respectively. (**Table 5**)

**Table (5):** Bivariate and multivariate logistic regression of factors associated with knowledge of health care providers towards infection prevention

| Characteristics        |                       | Knowledge status |            | COR (95%CI)       | AOR (95%CI)       |
|------------------------|-----------------------|------------------|------------|-------------------|-------------------|
|                        |                       | Adequate         | Inadequate |                   |                   |
| Sex                    | Male                  | 80(67.2)         | 39(32.8)   | 0.55(0.25–1.18)   | 1.03(0.34–3.09)   |
|                        | Female                | 41(78.8)         | 11(21.2)   | 1                 | 1                 |
| Educational status     | Diploma               | 65(63.7)         | 37(37.3)   | 1                 | 1                 |
|                        | Degree                | 53(80.3)         | 13(19.7)   | 2.47(1.17–5.20)   | 1.05(0.32–3.44)   |
| Work experience        | < 5 Years             | 75(65.7)         | 39(34.3)   | 1                 | 1                 |
|                        | > = 5 years           | 46(80.7)         | 11(19.3)   | 0.46(0.21–0.98)   | 1.52(1.13–4.51)*  |
| IP Guideline           | Yes                   | 100(80.6)        | 24(19.4)   | 5.16(2.49–10.68)  | 3.65(1.26–10.54)* |
|                        | No                    | 21(44.7)         | 26(55.3)   | 1                 | 1                 |
| IP Training            | Yes                   | 32(42.1)         | 26(24.8)   | 17.64(6.87–45.33) | 2.19(1.01–4.75)*  |
|                        | No                    | 44(57.9)         | 79(75.2)   | 1                 | 1                 |
| Currently working unit | Outpatient department | 30(32.2)         | 21(26.9)   | 1                 |                   |
|                        | Emergency and Triage  | 6(6.5)           | 16(20.5)   | 1.25(0.53–2.04)   | 0.25(0.13–1.54)   |
|                        | Maternity unit        | 23(24.7)         | 10(12.8)   | 1.31(1.08–3.38)   | 1.67(1.38–5.23)*  |
|                        | Inpatient clinic      | 8(8.6)           | 5(6.4)     | 0.78(0.25–2.81)   | 1.38(0.48–2.51)   |
|                        | Laboratory            | 15(16.1)         | 14(17.9)   | 1.46(1.13–3.43)   | 2.56(1.26–4.13)*  |
|                        | Pharmacy              | 6(6.5)           | 9(11.5)    | 0.84(0.39–3.03)   | 0.54(0.17–1.57)   |
|                        | Under-five clinic     | 5(5.4)           | 3(3.8)     | 0.91(0.32–1.84)   | 0.87(0.57–3.47)   |

IP infection prevention, COR crude odds ratio, AOR adjusted odds ratio; \* = significantly associated at  $P < 0.05$

**Table (6)** shows age, sex, educational status, profession, work experience, presence of infection prevention guideline, getting of infection prevention training, availability of continuous water supply, type of health center and currently working unit were evaluated as possible factors associated with safe infection prevention practices. But, getting infection prevention training and the availability of continuous water supply in the health facility were significantly associated ( $P < 0.05$ ) with safe infection prevention practices in the multivariable analysis.

Healthcare providers who have trained on infection prevention were 2.2 times (AOR: 2.19, 95% CI; 1.01–4.75) more likely to have good practice than those who were not trained. The odds of safe

infection prevention practices were 52% lower among healthcare providers who work in health facility which have not continuous water supply (AOR = 0.48;95% CI;0.214–0.832)) than their counterparts (Table 6).

**Table (6):** Bivariable and multivariable logistic regression of factors associated with infection prevention practice of HCPs

| Characteristics                         |                       | Infection prevention practice status |          | COR 95% CI        | AOR 95% CI        |
|-----------------------------------------|-----------------------|--------------------------------------|----------|-------------------|-------------------|
|                                         |                       | Safe                                 | Unsafe   |                   |                   |
| Sex                                     | Male                  | 80(67.2)                             | 39(32.8) | 0.55(0.26–1.19)   | 1.21(0.52–2.80)   |
|                                         | Female                | 41(78.8)                             | 11(21.2) | 1                 | 1                 |
| Educational status                      | Degree                | 53(80.3)                             | 13(19.7) | 2.47(1.17–5.20)   | 0.78(0.32–1.91)   |
|                                         | Diploma               | 65(63.7)                             | 37(37.3) | 1                 | 1                 |
| Work experience                         | < 5 Years             | 75(65.7)                             | 39(34.3) | 0.46(0.21–0.99)   | 0.89(0.42–1.913)  |
|                                         | > = 5 years           | 46(80.7)                             | 11(19.3) | 1                 | 1                 |
| Presence IP guideline                   | Yes                   | 100(80.6)                            | 24(19.4) | 5.16(2.49–10.68)  | 0.95(0.83–4.55)   |
|                                         | No                    | 21(44.7)                             | 26(55.3) | 1                 | 1                 |
| Infection prevention training           | Yes                   | 114(82.6)                            | 24(17.4) | 17.64(6.87–45.33) | 2.19(1.13–4.75) * |
|                                         | No                    | 7(21.2)                              | 26(78.8) | 1                 | 1                 |
| Availability of continuous water supply | Yes                   | 74(52.1)                             | 14(48.3) | 1                 | 1                 |
|                                         | No                    | 68(47.9)                             | 15(51.7) | 0.86(0.34–0.95)   | 0.48(0.21–0.83) * |
| Currently working unit                  | Outpatient department | 39(36.1)                             | 12(22.6) | 1                 | 1                 |
|                                         | Emergency and Triage  | 9(8.3)                               | 13(24.5) | 0.21(0.13–1.24)   | 0.25(0.13–1.54)   |
|                                         | Maternity unit        | 18(16.7)                             | 5(9.4)   | 1.11(0.79–1.21)   | 1.67(0.89–3.61)   |
|                                         | Inpatient clinic      | 7(6.5)                               | 6(11.3)  | 0.28(0.15–1.63)   | 0.68(0.34–1.97)   |
|                                         | Laboratory            | 22(20.4)                             | 7(13.2)  | 0.97(0.53–2.76)   | 3.24(1.68–6.27) * |
|                                         | Pharmacy              | 7(6.5)                               | 8(15.1)  | 0.84(0.39–3.03)   | 0.54(0.17–1.57)   |
|                                         | Under-five clinic     | 6(5.6)                               | 2(3.8)   | 0.47(0.21–1.35)   | 0.79(0.36–2.17)   |

\*= significantly associated at *P*-value < 0.05

### Discussion:

Decreasing healthcare-associated infections requires adequate knowledge of infection prevention. According to the study's findings, around one-third of the medical professionals employed by basic healthcare units had sufficient understanding of infection prevention. This finding is supported by

preceding studies<sup>(28-30)</sup> done in Saudi Arabia. The current study showed that only 55% of HCPs had safe infection prevention practices. This finding was in line with a study done by Woldegioris et al., (2019)<sup>(38)</sup> but lower when compared with studies done by Alemayehu et al., (2016)<sup>(31)</sup> and Sahiledengle et al., (2018)<sup>(39)</sup>. The discrepancy might be due to a difference in the study setting and composition of HCPs<sup>(31)</sup>.

Remarkably, in the current study, about 90% of health care providers believed that gloves can't provide complete protection against acquiring infection. This finding is higher than previous studies done Desta et al., (2018)<sup>(35)</sup> Geberemariam et al., (2018)<sup>(36)</sup> This study revealed that HCPs who had more than five years of work experience were 1.5 times more likely to have adequate knowledge than their counterparts. This is in line with findings from Desta et al., (2018)<sup>(35)</sup>. This might be due to the fact that as the number of years of practice increases, HCPs are exposed to infection prevention information and became more experienced through working with senior staff.

According to WHO recommendation, all primary healthcare facilities should develop their own standard operating procedures based on national infection prevention and control guidelines<sup>(40, 41)</sup>. Developing and implementation of infection prevention guidelines is one of the core components of infection prevention and control programs at all healthcare facilities<sup>(40, 41)</sup>. In this study, similar to previous studies<sup>(36, 42)</sup> revealed that the presence of infection prevention guidelines in health institutions also increases the odds of having adequate knowledge about infection prevention. This might be attributed to the fact that HCPs who have infection prevention guidelines were more likely to get updated information, which improves their knowledge of infection prevention.

Healthcare providers who are currently working in maternity and laboratory unit had higher odds of having adequate knowledge about IP. This might be due to the availability of infection prevention standard operating procedures in the laboratory unit which might improve their knowledge. Besides, this could be due to the difference in infection prevention training among units. HCPs who had ever attended any form of training program on infection prevention were more likely to practice than those who didn't take training on infection prevention. This is supported by a study done by Geberemariam et al., (2018)<sup>(36)</sup>.

According to different international guidelines, infection prevention education & training is the core components of infection prevention and control programs<sup>(40, 41)</sup>. Infection prevention and control guidelines in combination with health care workers' education and training are effective to reduce hospital acquired infection<sup>(41)</sup>. Previous studies have verified that training of health care workers on infection control has a valuable effect on healthcare staff by improving their compliance with the standard precaution<sup>(43, 44)</sup>. But the current study showed that only 33.9% of the health workers had ever attended any form of training program on infection prevention.

This implies more than two- third of healthcare providers need training for infection prevention. Similarly, healthcare providers who had infection prevention guidelines were more likely to have safe infection prevention practice than those who had no infection prevention guidelines. The finding highlights the necessity of infection prevention guideline in the improvement of healthcare providers' practice.

## **Conclusion**

According to the study's findings, 45% of healthcare providers engaged in dangerous infection prevention practices, and a sizable percentage of HCPs lacked sufficient knowledge of infection prevention. Work experience, obtaining infection prevention training, and the existence of infection prevention guidelines have all been strongly linked to knowledge of infection prevention. As a result, HCPs should receive sufficient pre-service and on-the-job training to enhance their understanding of

infection prevention. Additionally, infection prevention guidelines should be used to enhance infection prevention practice and knowledge.

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