Awareness and safety of healthcare workers in the laboratories of public health facilities in the Kingdom of Saudi Arabia

Tariq Saud Nukhaylan Alshammari[1], Meshari Mutair Haddaj Alrashdi[2], Alaa Bader A Alghanem[3], Mohammed Hadi Ali AL sharyah[4], Shahad Saleh Hassan Alghaty[5], Fawaz Abdulalah Ali Al Khurssan[6], Abdulkarim eida hadi Al-Dogman[7] Zainab Ali Alsaffar[8] Badr Salem Mohammed Al-Hareth[9]

1 Laboratory Technician, Hafr Al , Batin Central
2 Laboratory Technician, Al , Khafji General Hospital
3 Laboratory Specialist, Qatif Central Hospital
4 Laboratory Technician, Khabash General Hospital, Najran Health Cluster
5 Laboratory specialist, najran, New Najran Hospital, Najran Health Cluster salghaty@moh.gov.sa
6 Medical Laboratory Technician, Najran Health Cluster, Najran ,Complex of will and mental health, falkurssan@moh.gov.sa
7 laboratory technician, Najran Health Cluster, Najran Complex of will and mental health, aealhaik@moh.gov.sa
8 Lab technician, Qatif central hospital
9Medical Laboratory Specialist Najran New General Hospital

Abstract

Background: Despite the high prevalence of healthcare-acquired the primary healthcare infection in resource limited settings, healthcare workers' (HCWs') knowledge and practices of infection and control standard are not well-researched especially in primary health care
,healthcare workers have lost their lives in significant numbers in the discharge of their duties as a result of a breach in Infection Prevention and Control (IPC) procedures. The increasing incidence of emerging and re-emerging diseases complicates this burden. Adequate IPC includes knowledge and practices of infection and control standard administrative, environmental and personal protective control measures. Healthcare workers (HCWs) have an increased risk of active and latent infection compared to the general population, despite existing guidelines on the prevention and management of infection, little is known about why HCWs who tested positive for refuse by infection. Aim of study: To determine the level of awareness and practice of Safety Precautions among laboratory workers at tertiary public health facilities in Makah City at Saudi Arabia 2022.Methods: This cross sectional study included (120) health care workers at the primary healthcare in Makah City at Saudi Arabia 2022. (doctors, nurses, lab workers) from primary healthcare (PHC) centers an self- administrated questionnaire was constructed by the researcher and was used for data collection. Results: shows there were 120 participants, and the majority age was(55.67%) in (30-40)years, while the age(<30)were(26.0%), the majority of them were female (68.0%) while male(31.67%), regarding the Nationality most of participants Saudi were(85.83%) while Non- Saudi were (14.17%), regarding Position the majority of participant are Lab technician were(60.0%)followed by Lab worker were(18.33%).Conclusion: This study shows the deficit

in the awareness of Safety Precautions among laboratory personnel and demonstrates that attitude and practice of safety rules are unsatisfactory. Training and re-training on Safety Precautions is therefore desired. Counseling to induce a positive attitudinal change on HBV immunization and post exposure prophylaxis is similarly necessary.

Keywords: Awareness, practices, Laboratory-Acquired, Infections, safety, health care workers, Makah, Saudi Arabia.

Introduction

A giant stride at ensuring safety of healthcare workers was made in 1983, when the Centre for Disease Control (CDC) published a document entitled Guideline for Isolation Precautions in Hospitals [1]. The document contained a section entitled "Blood and Body Fluid Precautions" which is to be applied when a patient is known or suspected to be infected with blood borne pathogens. [2]

However, in August 1987, CDC published another document entitled "Recommendations for Prevention of HIV Transmission in Health-Care Settings" [3-4]with the aim of intensifying effort at ensuring healthcare workers safety. In contrast to the 1983 document, the 1987 document recommended that blood and body fluid precaution be consistently used for all patients regardless of their blood borne infection status. The document is therefore referred to as "Universal Blood and Body Fluid Precautions" or "Universal Precautions." The policy which has widened in scope and has since been renamed standard precautions includes: barrier techniques, hand washing and sharp precautions. [5-6] Standard precautions is often also called safety precaution because it is meant to ensure the safety of healthcare workers. [7]. The standard precautions include hand hygiene, use of gown, cleaning and disinfection of equipment, facial protection (e.g., masks and goggles), disposal of sharp objects, management of medical waste and coughing etiquette [8]. However, Hein and colleagues reported that adherence to hand hygiene recommendations among HCWs is below standard, with a 30% compliance rate. It was found that about 42% of Corona Virus Disease-2019 among HCWs is associated with improper personal protective equipment (PPE) use [9]. Hefty workload, prolonged clinical methods and skin status have been reported as key barriers in maintaining hand hygiene recommendations [10]

Triage, on the other hand, prioritizes care according to the severity of the illness to identify the individuals who need immediate care [11]. IPC and triage substantially contribute to preventing healthcare-acquired infections (HAIs), thereby reducing hospital-acquired morbidity and mortality [12], shortening hospital stay, and trimming healthcare-related expenditures [13]

The burden of HAIs is on the rise globally despite advancements in medical care and technologies [14]. According to the World Health Organization (WHO), the prevalence of HAIs ranges between 5.7% and 19.1% in hospital settings globally [15]. Recent studies estimated the prevalence of HAIs in Europe and the USA at 6.5% and 3.2%, respectively. The burden of HAIs is strikingly higher in low-resourced countries compared with high-income countries [16] Prevalence of HAIs is considerably higher in developing countries than in developed countries .

Literature review

AWHO-led systematic review revealed that the prevalence of HAIs varies between 7.6% and 15.5% in high-income and low- and middle-income countries, respectively [17]. HAIs contribute to increased length of hospital stay, high mortality, higher health-care costs, and economic burden on families, communities, and countries at large. Hence, prevention and control of HAIs appear as a critical public health concern [18].

Online searching for studies exploring the knowledge and practical towards standard infection control precautions among primary healthcare workers yielded relatively few studies as most studies conducted in this field were among healthcare workers in hospitals and future health care workers. In addition, relatively limited studies were carried out in Saudi Arabia . [19]

In Al-Qassim (2018), Al Ra'awji et al evaluated in a multicenter cross-sectional study among 354 HCWs the knowledge, attitudes, and practices regarding guidelines of hand hygiene. The average knowledge score was 63%. Health-care workers aged over 30 years had higher scores than those younger than 30 years. Those at tertiary care hospitals had higher scores than those at secondary hospitals. Almost all had positive attitudes toward hand hygiene as well as adhering to the guidelines regularly. This study concentrated on only hand hygiene as a component of standard precautions .[20]

In Malaysia a country with an recurrent infections, the HCWs are the risk of contracting of infections although with a lower mortality rate compared to the general population [21]. These findings indicate increased workplace exposure to infections despite existing guidelines on the prevention of infections among HCWs [22]. A study conducted in a tertiary hospital in Malaysia using infection control standard showed a prevalence of infection among HCWs, which was comparatively higher than a past study among a similar population [23].

Faith , et al.(2019) study in Nigeria about good and fair knowledge among participants was reported as 50% and 44% respectively.[24] In Ethiopia, Yakob et al. showed that all participants had acceptable knowledge about contaminated needles and sharp materials that transmit disease causative agents, while 70.4% knew that gloves and gowns were required for any contact with patients. In Brazil, Oliveria et al. identified a gap between knowledge of standard precautions and the practical applications among physicians.[25]

A systematic review of records between 1995 and 2008 in developing countries reported an HAI incidence of almost 48 per 1000 patient-days in adult intensive care units three times as high as that of the USA . Insufficient water, sanitation, and waste management systems, insufficient environmental cleaning, inadequate equipment, understaffing, overcrowding, poor knowledge of IPC measures, and the absence of proper IPC guidelines, policies, and programmers contribute to the disproportionate breakout of HAIs in resource-poor settings [26].

In Ethiopia (2019) Beyamo et al assessed the compliance of health care workers with standard precaution practices and identified its determinants in public health institutions. The study included 250 HCWs. Nearly two-thirds (65%) of them had complied with standard precaution practices. Factors significantly associated with compliance to standard precaution practices were experience of ≤5 years, training on standard precaution, having good hand hygiene and availability of (personal protective equipment's)[27]

In Al-Kharj, Alotaibi et al assessed the knowledge of as well as compliance of health care students with standard precautions. Results revealed that among surveyed 353 students, 70% had previously attended an infection control course. The

knowledge and compliance with SPs levels were high. The commonest source of information self-learning while the current

curriculum was the least reported one. Female students were more knowledgeable and compliant with SPs compared to males. Student`s specialty and academic level were significantly associated with knowledge and compliance regarding SPs .[19]

Rationale

Health care workers at the primary healthcare reveal poor knowledge about IPC and triage except for the personal hygiene domain; this may be the result of extensive hand-hygiene campaigns to prevent of infection transmission, the effective knowledge about standard precautions of infection control and having favorable attitude towards them as well as practicing them properly is very critical in controlling the transmission infections among HCWs. Overall, the HCWs of FWCs manifest better knowledge and practices than those of community clinics. Education and designation of HCWs are positively associated with knowledge. The HCWs of FWCs are more experienced and assume higher designations and education than those of community clinics as they have to perform more sophisticated MNCH- related procedures that warrant rigorous IPC management. The difficult challenge faced by the Saudi Ministry of Health is the healthcare services. services that are provided free of charge to all Saudi citizens, increasing awareness of health and disease . Healthcare workers, particularly nurses are at a greater risk of acquiring and transmitting infections during the course of carrying out their daily usual duties in primary healthcare facilities.

Aim of the study

To determine the level of awareness and practice of Safety Precautions among laboratory workers at tertiary public health facilities in Makah City at Saudi Arabia 2022.

Materials and methods .

Study design:

This study is descriptive cross-sectional study

Study sitting:

The study has been carried out in the city of Makah Al-Mokarramah Makah PHC centers in in Makah City at Saudi Arabia Region. There are primary health care centers belonging to Ministry of health (MOH) distributed as North and South

Study population:

MOH PHC health care professionals (n=120) distributed as follows: physicians, nurses and laboratory technicians, Dental assistant, Dentist Study duration: July 20221st September 2022

Sample size:

Sample size was calculated using open Epi online sample size calculator at 95% confidence level with bound on error of 5% regarding standard infection control precautions max sample size required is 120 participants.

Sample technique:

Sample technique was two stage.

At first stage: simple random sampling method will be used to select primary health care centers. At second stage: all the doctors, nurses and laboratory technicians within the selected PHCCs enrolled in the study. There are total primary health care centers . Expected numbers of HWs per each center are 10. So, we need 20 centers to collect the sample size.

Inclusion criteria:

Primary health care workers (doctors, nurses, laboratory technicians) in PHC center male and female, Saudi and non-Saudi, all ages, those who agreed to participate in the research.

Exclusion criteria:

Pharmacists, dentists, dental assistant . Those who have Vacation, disabled and absent during the data collection period .

Data collection tool and technique:

Data were collected by self-administrated questionnaire.

First part of the questionnaire includes questions about Demographic data of the physicians (gender, age, nationality, job title)

Second part about knowledge and practice of standard precautions which including hand will be assessed covering hand hygiene obtained from WHO injection safety, and protective equipment utilization with barriers of adherence to standard infection control precaution. Score was created for the participants` responses to knowledge questions and statements, Right answers were given a score of 1 whereas wrong answers were given a score of 0. Total score and its percentage were computed. The mean of the score percentage was estimated for each of the subscales and well as the overall knowledge. Participants who scored at or above the mean score percentage for each subscale as well as for the overall were considered having "adequate knowledge" and those who scored below the mean score percentage were considered having inadequate knowledge.

Data analysis:

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) software, version 24. Descriptive analysis was carried out as the mean and standard deviation (SD) were calculated for quantitative variables, frequency and proportion were calculated for categorical variables.

For comparisons, chi-square and t-test was used for categorical and quantitative variables respectively. p –value ≤ 0.05 was considered significant for all inferential analysis.

Ethical approval:

- The ethical approval was taken from the Regional Research Ethics committee. A permission letter was obtained from the regional director of the city of Makah Al-Mokarramah MOH before starting the data collection.
- A written Informed consent was obtained from each participant from commencing the data collection.
- The researcher preserved the confidentiality of the participants at all steps of the study for the data collection, analysis and result.

Budget: Self-funded.

Result

Table 1Socio-demographic characteristics of Personal characteristics of the participants (n=120)

	N	%
Age		
<30 years	32	26.67
30-40 years	67	55.83
40 -50years	14	11.67
>50	7	5.83
Gender		
Female	82	68.33
Male	38	31.67
Nationality		
Non-Saudi	17	14.17
Saudi	103	85.83
Position		
Laboratory doctor	12	10.00
Nurse lab technician	14	11.67
Lab technician	72	60.00
Lab worker	22	18.33
Qualification		
Diploma	8	6.67
Bachelor	78	65.00
Master	34	28.33
Experience in PHC		
<5 years	44	36.67
5-10 years	65	54.17
>10 years	11	9.17
Marital status		
Un married	49	40.83
Married	60	50.00
Divorced	6	5.00
Widowed	5	4.17
Salary satisfaction		

Sufficient	54	45.00
Partly Sufficient	36	30.00
Insufficient	24	20.00
Quite Insufficient	6	5.00

Table 1 shows there were 120 participants, and the majority age was(55.67%) in (30-40)years, while the age(<30)were(26.0%), the majority of them were female (68.0%) while male(31.67%), regarding the Nationality most of participants Saudi were(85.83%) while Non- Saudi were (14.17%), regarding Position the majority of participant are Lab technician were(60.0%)followed by Lab worker were(18.33%) followed by Nurse lab technician were(11.67%), regarding the Qualification most of participants Bachelor were(65.0%) followed by Master were(28.33%), regarding the Experience in PHC the majority of participant 5-10 years were (54.17%) followed by <5 years were(36.67%), regarding Marital status the majority of participant are married were(50.0%) followed by un married were(40.83%), regarding the Salary satisfaction most of participants Sufficient were(45.0%) followed by Partly Sufficient were(30.0%).

Table 2: Knowledge of the healthcare workers regarding infection control element of standard precautions

Statements statements/questions	TRUE		FALSE		Chi-Square	
	N	%	N	%	X2	P-value
Dirty needle and sharp materials can transmit disease causing agents (TRUE)	94	78.33	26	21.67	38.533	<0.001*
Standard precautions should be practiced on all patients and laboratory specimen serology irrespective of diagnosis (TRUE)	79	65.83	41	34.17	12.033	<0.001*
Sharps should never be recapped (TRUE)	80	66.67	40	33.33	13.333	<0.001*
Needles should be bent or broken after use (FALSE)	26	21.67	94	78.33	38.533	<0.001*
When you have a patient who vomited in dressing room or clinic, the first step in infection control procedure is to isolate infected area (TRUE)	85	70.83	35	29.17	20.833	<0.001*
Sharp containers are utilized for used injection needles (TRUE)	83	69.17	37	30.83	17.633	<0.001*
Hepatitis B causing agent can be transmitted with dirty needles and sharps (TRUE)	86	71.67	34	28.33	22.533	<0.001*
Hepatitis C causing agent can be transmitted with dirty needles and sharps (TRUE)	97	80.83	23	19.17	45.633	<0.001*
HIV/AIDS causing agent can be transmitted with dirty needles and sharps (TRUE)	88	73.33	32	26.67	26.133	<0.001*
Tetanus (Clostridium tetani) causing agent can be transmitted with dirty needles and sharps (TRUE)	91	75.83	29	24.17	32.033	<0.001*

Malaria causing agent (Plasmodium spp) can be transmitted with dirty needles and sharps (FALSE)	32	26.67	88	73.33	26.133	<0.001*
Tuberculosis causing agent (M. tuberculosis) can be transmitted with dirty needles and sharps (FALSE)	47	39.17	73	60.83	5.633	0.018*
Type of isolation with pulmonary tuberculosis is airborne precaution (TRUE)	89	74.17	31	25.83	28.033	<0.001*
There is treatment for MERS-CoV (coronavirus) (FALSE)	23	19.17	97	80.83	45.633	<0.001*
The best disinfecting material to clean exposed skin after contamination is soap (TRUE)	95	79.17	25	20.83	40.833	<0.001*
The appropriate immediate action after pricking finger by I.V. line needle is dressing wound and inform infection control supervisor(TRUE)	79	65.83	41	34.17	12.033	<0.001*

Table 2 shows the knowledge of the participants about infection control regarding (the Dirty needle and sharp materials can transmit disease causing agents, Standard precautions should be practiced on all patients and laboratory specimen serology irrespective of diagnosis, Sharps should never be recapped) the majority of participant have true information respectively (78.33%, 65.83%, 66.67%) while is a significant relation were P-value=0.001 X^2 respectively (38.533, 12.033, 13.333).

Regarding the When you have a patient who vomited in dressing room or clinic, the first step in infection control procedure is to isolate infected area, Sharp containers are utilized for used injection needles , Hepatitis B causing agent can be transmitted with dirty needles and sharps. Hepatitis C causing agent can be transmitted with dirty needles and sharps. HIV/AIDS causing agent can be transmitted with dirty needles and sharps. Tetanus (Clostridium tetani) causing agent can be transmitted with dirty needles and sharps the majority of participant have true information respectively (70.83% ,69.17%, 71.67% , 80.83%, 73.33%, 75.83%) while is a significant relation were P-value=0.001 X^2 respectively (20.833,17.633,22.5233,45.633, 26.133, 32.033).
Regarding the Type of isolation with pulmonary tuberculosis is airborne precaution , The best disinfecting material to clean exposed skin after contamination is soap , The appropriate immediate action after pricking finger by I.V. line needle is dressing wound and inform infection control supervisor the majority of participant have true information respectively (74.17%, 19.17%, 79.17, 65.83%) while is a significant relation were P-value=0.001 X^2
respectively (25.033, 45.633,40.833, 12.033).
Regarding the Needles should be bent or broken after use, The best disinfecting material to clean exposed skin after contamination is soap , Malaria causing agent (Plasmodium spp) can be transmitted with dirty needles and sharps, Tuberculosis causing agent (M. tuberculosis) can be transmitted with dirty needles and sharps the majority of participant have false information respectively (78.33%,73.33%, 60.83%, 80.83) while is a significant relation were P- value=0.001 X^2 respectively (38.533,

26.133,5.633, 28.033, 45.633)

Table 3: Practice of the healthcare workers regarding infection control element of standard precautions

practice statements/questions		
	N	%
How often you wash your hands with proper detergent after contact with patient		
Always	103	87
Sometimes	12	10
Never	5	3
Do you use antiseptic hand rub to clean hands?		
Yes	110	92
No	10	8
How often do you use all personal protective equipment's as per standard to prevent infection?		
Always	80	67
Sometimes	40	33
When do you change chlorine solutions that used for instrumental Processing?		
Every 24 h	82	66.7
After 2 days	38	33.3
How often do you use glove when you perform procedures that need wearing glove?		
Always	117	98
Sometimes`	3	2
Have you ever exposed to blood or other body fluids of patients through contact or unprotected skin?		
Yes	55	46
No	65	54
What measure did you take if you are exposed to blood or fluids, needle stick injury?		
Only taking Post exposure prophylaxis	1	1
Only clean by alcohol	12	10
Only washing with water	4	3.5
Taking Post exposure prophylaxis and clean by alcohol	8	6.8
Taking post exposure prophylaxis and washing with water	20	17
Clean by alcohol and washing with water	16	13
All action taken	39	48.7
Did you practice high-level disinfection where sterilization is not applicable?		
Yes	44	37

No	76	63
What is your facility sterilization technique		
Boiling	28	23
Steam sterilization	92	77

Table 3 show practice of the healthcare workers regarding infection control element of standard precautions regarding the How often you wash your hands with proper detergent after contact with patient the majority of the participants answer always were(87.0%), while sometimes were (10.0%) but never were (3.0%) ,regarding the you use antiseptic hand rub to clean hands the majority of the participants answer Yes were(92.0%). While No were (8.0%) , regarding the How often you wash your hands with proper detergent after contact with patient the majority of the participants answer always were(67.0%), while sometimes were (33.0%), regarding the you change chlorine solutions that used for instrumental Processing the majority of the participants answer every 24 h were(66.7%). while after 2 days were (33.3%), regarding the How often do you use glove when you perform procedures that need wearing glove the majority of the participants answer always were(98.0%), while sometimes were (2.0%), regarding the you ever exposed to blood or other body fluids of patients through contact or unprotected skin the majority of the participants answer No were(54.0%). While Yes were (46.0%) , regarding the measure did you take if you are exposed to blood or fluids, needle stick injury the majority of the participants answer all action taken were(48.7%), while taking post exposure prophylaxis and washing with water were (17.0%), but clean by alcohol and washing with water were (13.%), regarding you practice high-level disinfection where sterilization is not applicable the majority of the participants answer No were(63.0%). while Yes were (37.0%)
, regarding What is your facility sterilization technique the majority of the participants answer Steam sterilization were(77.0%). while boiling were (37.0%)

Table 4: Distribution of knowledge of the healthcare workers about standard precautions of infection control

Knowledge			Chi-square	
	N	%	X2	P-value
Weak	2	1.67	82.95	<0.001*
Average	35	29.17		
High	83	69.17		
Total	120	100.00		
Range	6-16.			
Mean±SD	12.983+2.421			

This table 4 shows the majority of participant (69.17%) have high of the Knowledge about standard precautions of infection control, followed by (29.17%) of participant average while weak were (1.67%) while Range(6-16) and Mean ±SD(12.983+2.421), while a significant relation were P-value=0.001 $X^2$82.95

Figure (1): Distribution of knowledge the healthcare workers about standard precautions of infection control

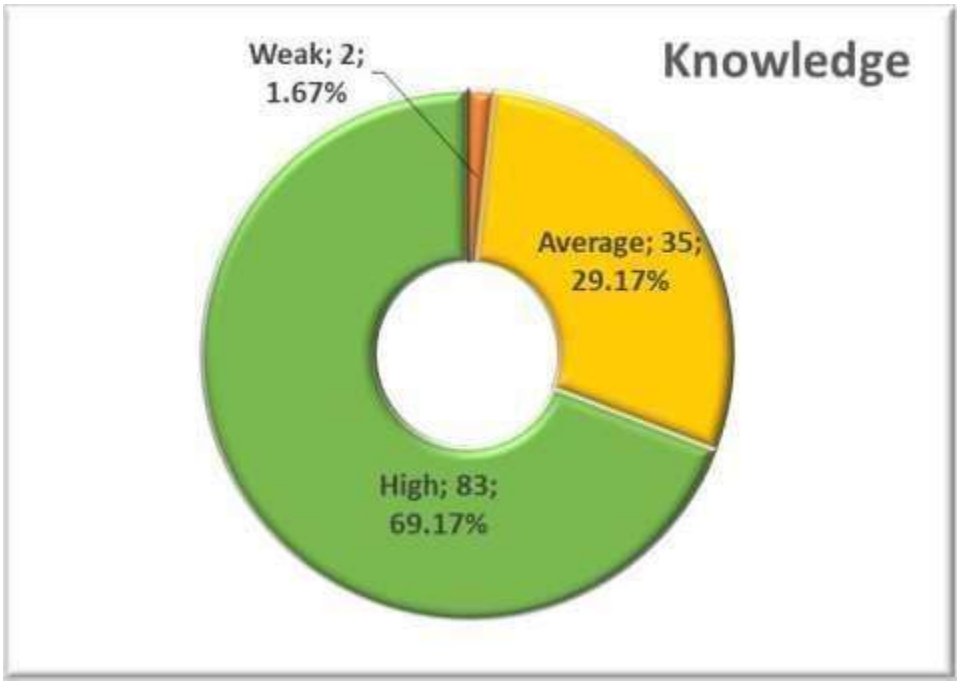


Table 5: Distribution of practice of the healthcare workers about standard precautions of infection control

Practices			Chi-square	
	N	%	X2	P-value
Weak	30	25.00	15	0.0006*
Average	60	50.00		
High	30	25.00		
Total	120	100.00		
Range	2-14.			
Mean±SD	8.342+3.014			

Table 5 shows the practice of the healthcare workers about standard precautions of infection control regarding the practice the majority of participant (50.0%) have average of the practice about standard precautions of infection control, followed by (25.0%) of participant high and weak were(25.5)while Range(2-14) and Mean ±SD(8.342+3.014), while a significant relation were P-value=0.0006 X^2 15.00

Figure (2): Distribution of practice of the healthcare workers about standard precautions of infection control

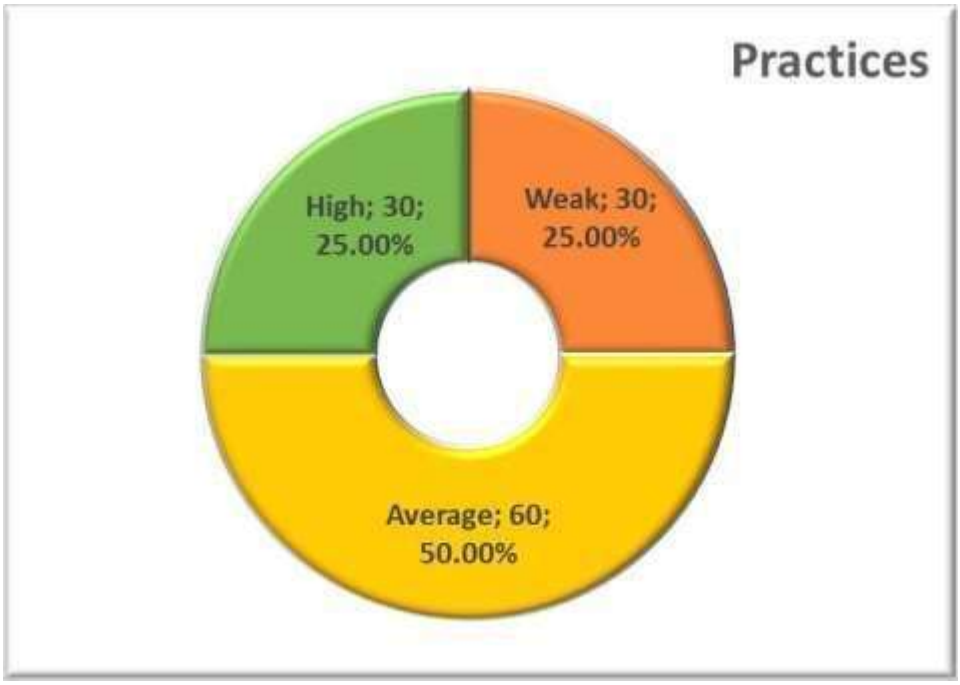
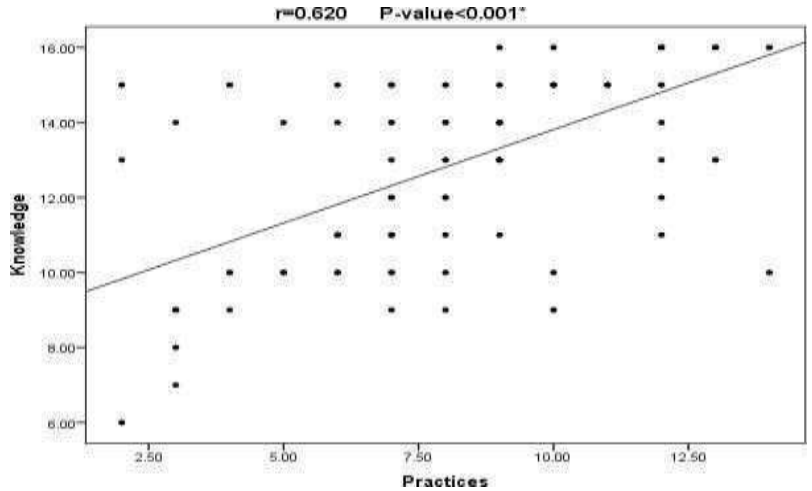


Table (5) Distribution of the Correlation between Knowledge and Practices

Correlation between Knowledge and Practices	
r	0.62
P-value	0.001*

Table 5 show the correlation between Knowledge and Practices while r were 0.62 but a significant relation were P-value=0.001

Figure (3): Distribution of the Correlation between Knowledge and Practices



DISCUSSION

We conducted this study in 120 health care workers the in Makah City at Saudi Arabia 2022, to Assessment of the knowledge and practices of infection control standard among health care workers at the primary health are level in Makah City at Saudi Arabia, we surveyed 120 HCWs in the primary health care, the knowledge of standard precautions by healthcare workers is an essential step in starting and implementing a successful infection control program in any healthcare facility.[28] regard in the Socio-demographic characteristics shows there were 120 participants, and the majority age was(55.67%) in (30-40)years, majority of them were female (68.0%), nationality most of participants Saudi were(85.83%) , regarding Position the majority of participant are Lab technician were(60.0%), regarding the Qualification most of participants Bachelor were(65.0%), marital status the majority of participant are married were(50.0%) , the Salary satisfaction most of participants Sufficient were(45.0%) (See Table1). Worldwide, many studies have shown that healthcare workers expressed variable levels of knowledge regarding standard precautions of infection control, with relatively limited studies have been carried out in the Kingdom of Saudi Arabia.[29]

Also showed that most of participants had high knowledge regarding infection control but the most of participant average practices, In Makah, the level of satisfactory knowledge and average practice of studied HCWs toward infection had improved after an interventional education program . So, we believe that adequate and well prepared training programs are essential in improving knowledge regarding standard precautions of infection control[29] (see Table 4) shows shows the majority of participant (69.17%) have high of the Knowledge about standard precautions of infection control, followed by (29.17%) of participant average while weak were (1.67%) while Range(6-16) and Mean ±SD(12.983+2.421), while a significant relation were P-value=0.001 X282.95. while regarding practice of the healthcare workers about standard precautions of infection control shows the practice of the healthcare workers about standard precautions of infection control regarding the practice the majority of participant (50.0%) have average of the practice about standard precautions of infection control, followed by (25.0%) of participant high and weak were(25.5)while Range(2-14) and Mean ±SD (8.342+3.014), while a significant relation were P-value=0.0006 X2 15.00(see Table 5 and figure 2) Compared to previous study that was conducted among Nigerian Health care providers, s, the current knowledge status of participants was lower than that (92–97%).[30] In another study from Nigeria good and fair knowledge among participants was reported as 50% and 44% respectively.[27] In Ethiopia, Yakob et al. showed that all participants had acceptable knowledge about contaminated needles and sharp materials that transmit disease causative agents, while 70.4% knew that gloves and gowns were required for any contact with patients.[23] In Brazil, Oliveria et al. identified a gap between knowledge of standard precautions and the practical applications among physicians.[25] regarding the Correlation between Knowledge and Practices show the correlation between Knowledge and Practices while r were 0.62 but a significant relation were P-value=0.001(see Table 5 and figure 3)

In Al-Qassim, health-care workers aged over 30 years and those at tertiary care hospitals were more knowledgeable than younger physicians and those working in secondary care hospitals.[20] In Makkah, older age, previous training, and experience were positively correlated with higher scores of knowledge among HCWs.[19] In Ethiopia (2018), factors significantly associated with compliance to standard precaution practices among HCWs were experience of ≤5 years, training on standard

precaution, having good hand hygiene and availability of (personal protective equipment. In another study carried out also in Nigeria, non-availability of the materials was the main factor reported for non-adherence to SPs.[31]

Conclusion

A health care worker has a good attitude to standard precautions but in depth knowledge and compliance is very poor. Hand hygiene, use of personal protective equipment and needle safety need to be re-emphasized. The post exposure prophylaxis policy of the health facility needs to be widely of the infection control standard disseminated to the HCWs of the trauma triage centre for better reporting about the infection control standard. There is also the need to effectively put in place in a primary healthcare process that ensures ready availability of infection control standard, the trauma triage centre. Besides, enhancement of the existing training on standard precautions for the trauma triage staff could reinforce the need to comply with standard guidelines however hard-pressed for time. Additionally, establishment of an effective occupational health cell incorporating all these elements including periodic surveillance could be the way forward. Future research could evaluate the efficacy of such an initiative in dealing with standard precautions and compliance.

References

1. Garner, J. S., & Simmons, B. P. (1984). Guideline for isolation precautions in hospitals. American Journal of Infection Control, 12(2), 103.Cuhadaroglu, C., Erelel, M., Tabak, L., & Kilicaslan, Z. (2002). Increased risk of tuberculosis in health care workers: a retrospective survey at a teaching hospital in Istanbul, Turkey. BMC infectious diseases, 2, 1-4.
2. Centers for Disease Control (US). (1987). Recommendations for prevention of HIV transmission in health-care settings (Vol. 37). US Department of Health and Human Services, Public Health Service, Centers for Disease Control.
3. Roenigk, R. K., Ratz, J. L., & Roenigk, H. H. (2016). Standard Precautions/Clifford S. Perlis and Raymond G. Dufresne, Jr. In Roenigk's Dermatologic Surgery (pp. 65-68). CRC Press.
4. for Nursing, O. R., Ernstmeyer, K., & Christman, E. (2021). Aseptic Technique. In Nursing Skills [Internet]. Chippewa Valley Technical College.
5. Chu, U. (2018). Barriers to the Use of Standard Precautions for Infection Control in Long Term Care Facilities: An Integrative Literature Review.
6. Nnaji, C. E., Ime, A. U., Nwatu, J. C., Okolo, P. U., Ochiagha, C. S., Nwachukwu, J. O., & Onyeabor, H. C. (2021). Infection control in dentistry. Orapuh Literature Reviews, 1(1), OR001-OR001.
7. Juma, A. A. (2022). Nurses' role in the prevention of nosocomial infections: A systematic literature review.
8. Fram, D. S., da Silva Escudero, D. V., de Oliveira Matias, L., de Souza Coelho, W. E. G., Antonelli, T. S., Ferreira, D. B., & Medeiros, E. A. (2021). Personal protective equipment: Shortage or waste?. Infection Control & Hospital Epidemiology, 42(6), 786-787.
9. Alabbood, M. (2020). Adherence of health care workers to personal protective equipment during coronavirus disease 2019 pandemic. Infectious Diseases in Clinical Practice, 28(6), 357- 360.
10. Lauridsen, S. (2020). Emergency care, triage, and fairness. Bioethics, 34(5), 450-458.
11. Sánchez-Salmerón, R., Gómez-Urquiza, J. L., Albendín-García, L., Correa-

Rodríguez, M., Martos-Cabrera, M. B., Velando-Soriano, A., & Suleiman-Martos, N. (2022). Machine learning methods applied to triage in emergency services: A systematic review. International Emergency Nursing, 60, 101109.

12. Salinas, R. C., & Madison, S. D. (2016). Home health care. Post-Acute and Long-Term Medicine: A Pocket Guide, 1-11.

13. Tran, B. X., Vu, G. T., Ha, G. H., Vuong, Q. H., Ho, M. T., Vuong, T. T., ... & Ho, R. C. (2019). Global evolution of research in artificial intelligence in health and medicine: a bibliometric study. Journal of clinical medicine, 8(3), 360.

14. National Academies of Sciences, Engineering, and Medicine. (2018). Crossing the global quality chasm: improving health care worldwide.

15. Kaplan, G. G., & Windsor, J. W. (2021). The four epidemiological stages in the global evolution of inflammatory bowel disease. Nature reviews Gastroenterology & hepatology, 18(1), 56-66.

16. Moses, H., Matheson, D. H., Cairns-Smith, S., George, B. P., Palisch, C., & Dorsey, E. R. (2015). The anatomy of medical research: US and international comparisons. Jama, 313(2), 174-189.

17. Abalkhail, A., Al Imam, M. H., Elmosaad, Y. M., Jaber, M. F., Hosis, K. A., Alhumaydhi, F. A., ... & Mahmud, I. (2021). Knowledge, attitude and practice of standard infection control precautions among health-care workers in a University Hospital in Qassim, Saudi Arabia: a cross-sectional survey. International Journal of Environmental Research and Public Health, 18(22), 11831.

18. Alotaibi, M. M., Almasari, S. M., Alkadam, A. N., Alanazi, Y. A., & Al Gahtani, K. A. (2017). Knowledge and compliance with standard isolation precautions among healthcare students in Al-Kharj Governorate, Saudi Arabia. J Health Spec, 5(3), 162-70.

19. Al Ra'awji, B. A., Almogbel, E. S., Alharbi, L. A., Alotaibi, A. K., Al-Qazlan, F. A., & Saquib, J. (2018). Knowledge, attitudes, and practices of health-care workers regarding hand hygiene guidelines in Al-Qassim, Saudi Arabia: A multicenter study. International journal of health sciences, 12(2), 3

20. Stasi, C., Silvestri, C., & Voller, F. (2020). Update on hepatitis C epidemiology: unaware and untreated infected population could be the key to elimination. SN comprehensive clinical medicine, 2, 2808-2815.

21. Harith, A. A., Ab Gani, M. H., Griffiths, R., Abdul Hadi, A., Abu Bakar, N. A., Myers, J., ... & Zubir, M. Z. (2022). Incidence, prevalence, and sources of COVID-19 infection among healthcare workers in hospitals in Malaysia. International journal of environmental research and public health, 19(19), 12485.

22. . Desta, M., Ayenew, T., Sitotaw, N., Tegegne, N., Dires, M., & Getie, M. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. BMC health services research, 18(1), 1-10.

23. Faria, L. B. G. D., Santos, C. T. B. D., Faustino, A. M., Oliveira, L. M. D. A. C., & Cruz, K. C. T. D. (2019). Knowledge and adherence of the nurse to standard precautions in critical units. Texto & Contexto-Enfermagem, 28.

24. Oliveira, A. C., Marziale, M. H. P., Paiva, M. H. R. S., & Lopes, A. C. S. (2009). Knowledge and attitude regarding standard precautions in a Brazilian public emergency service: a cross- sectional study. Revista da Escola de Enfermagem da USP, 43, 313-319

25. Konlan, K. D., Aarah-Bapuah, M., Kombat, J. M., & Wuffele, G. M. (2017). The level of nurses' knowledge on occupational post exposure to hepatitis B infection in the Tamale metropolis, Ghana. BMC health services research, 17(1), 1-7.

26. Beyamo, A., Dodicho, T., & Facha, W. (2019). Compliance with standard precaution practices and associated factors among health care workers in Dawuro Zone, South West Ethiopia, cross sectional study. BMC health services research, 19(1), 1-6.
27. Tan, C., Kallon, I. I., Colvin, C. J., & Grant, A. D. (2020). Barriers and facilitators of tuberculosis infection prevention and control in low-and middle-income countries from the perspective of healthcare workers: A systematic review. PloS one, 15(10), e0241039.

Migration Letters

28. ALjohani, H. S., & Sulaiman, A. A. (2021). Assessment of Health Care Workers' Knowledge and Practice Toward Infection Standard Precautions in Primary Health Care setting, Buraidah, Saudi Arabia. Middle East Journal of Family Medicine, 7(10), 81
29. Alkot, M., Albouq, M. A., Shakuri, M. A., & Subahi, M. S. (2016). Knowledge, attitude, and practice toward MERS-CoV among primary health-care workers in Makkah Al-Mukarramah: an intervention study. Int J Med Sci Public Health, 5(5), 952-60.
30. Alzahrani, A. A. A., Rumbo, T. A., Alzahrany, N. A. A., & Tumayhi, Y. M. ASSESSMENT OF THE KNOWLEDGE AND PRACTICES OF INFECTION CONTROL STANDARD AMONG HEALTH CARE WORKERS AT THE PRIMARY HEALTHCARE LEVEL IN
MAKKAH CITY AT SAUDI ARABIA. European Journal of Molecular & Clinical Medicine (EJMCM), 6(01), 2019.