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Enhancing Hospital-Acquired Infection Prevention Practices: Strategies for Healthcare Workers in Low- and Middle-Income Settings: Insights from a Study on Healthcare Workers in Western Uganda

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ABSTRACT

In low- and middle-income hospital settings, hospital-acquired infections can occur among patients or arise among hospital staff, posing a significant challenge. This study aimed to assess the knowledge, attitudes, and practices related to preventing hospital-acquired infections (HAIs) and the associated factors among healthcare workers at Fort Portal Regional Referral Hospital in Kabarole district, western Uganda. Conducted between January and March 2011, this hospital-based cross-sectional study employed simple random sampling to select 236 participants, achieving a 100% response rate. Structured self-administered questionnaires were utilized for data collection. Descriptive analysis was employed to present the main findings, revealing that 90% of participants had good knowledge and 57.2% held positive attitudes towards HAI prevention. However, only 36% demonstrated good practices in this regard, indicating suboptimal scores. Significant associations were found between levels of education and work experience and attitudes and practices related to HAI prevention (P value <0.005). Despite respondents exhibiting good knowledge and positive attitudes towards HAI prevention, this did not consistently translate into appropriate practices. Further, education level and work experience emerged as independent risk factors influencing attitudes and practices concerning HAI prevention. To bridge this gap, continuous on-the-job and off-the-job training, coupled with stringent adherence to updated standard operating procedures, are recommended.

Keywords: Healthcare workers, HAI prevention, Hospital staff, Hospital settings, Work experience.

INTRODUCTION

Nosocomial infections are infections acquired in the hospital or other healthcare facilities that were not present or incubating at the time of the client's admission. It is also referred to as hospital-acquired infections and includes those infections that become symptomatic after the client was discharged as well as infections among medical personnel. Most nosocomial infections are transmitted by health care personnel who fail to practice proper hand washing procedures or change gloves between client contacts [1] Nosocomial infection is one of the leading causes of death and increased morbidity for hospitalized Patients [2]. Standard precautions are based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. The term standard precautions were replacing 'universal precautions' as it expands the coverage of universal precautions by recognizing that anybody fluid may contain contagious and harmful microorganisms. Standard precautions include hand hygiene, use of appropriate personal protective equipment (PPE), use of aseptic technique to reduce patient exposure to microorganisms and management of sharps, blood spills, linen, and waste to maintain a safe environment [3]. Globally WHO (World health organization) estimates that every year unsafe injections and needle stick injuries cause at least 8-16 million HBV infections, 2.3-4.7 million HCV infections and 160,000 HIV/AIDS infection. WHO estimated that at least 50% of the 12 billion injections administered each year in developing countries are unsafe posing serious health risk to recipients, health workers, health students and the public Injuries from sharp devices have been associated with the transmission of more than 40 pathogens including hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV [4]. Standard

precautions are practiced in high-income countries to protect HCWs from occupational exposure to blood and the consequent risk of infection with blood-borne pathogens. The situation is different in low-income countries, where standard precautions are partially practiced [5] Hundreds of thousands of healthcare workers remain susceptible to deadly viruses throughout the year, including blood-borne pathogens. Exposure to infectious material could happen through splash incidents, Needle stick injuries (NSI), airborne spread of infections and also physical contact. NSI constitute one of the most common occupational health hazards in healthcare profession. Health Care Workers (HCWs) are at more risk of acquiring NSI due to their working schedule, limited and restricted working area. A thorough understanding of the safe practices while handling needles and sharps is crucial for HCWs to create a risk-free work place environment [5]. In African setting, Sub Saharan Africa harbors the largest population of people living with infectious disease mainly with HIV/ AIDS. Ethiopia, Nigeria and South Africa are the three countries with the largest number of people living with HIV/AIDS. Based on the 2003 nationwide sentinel surveillance of Kenya every year unsafe injections and needle stickle injuries cause around 2 million to become infected by infectious diseases. Urban prevalence of HIV seems stabilizing at a higher magnitude while the spread of HIV among the rural African population is increasing [6]. Problems with infrastructure and infection control plague Ugandan health care services. Only 31 percent of health care facilities in Uganda, including 64 percent of all hospitals, have a regular water supply, and even fewer, 24 percent, have regular electricity or a generator. Other items needed for infection control are also in short supply; more than half of facilities do not have soap or disinfectant, and 42 percent do not have latex gloves. These conditions put both providers and clients at risk [6]. In Uganda, where the healthcare service is largely covered by low and midlevel health professionals, assessing the necessary knowledge, attitude and practice or skill on infection prevention and factors in health care facilities as early as possible can give way to manage the limited resource available in the sector for health providers and customers. Therefore, this study seeks to assess the knowledge, attitude and practice of standard precautions among health care workers of HCWs at Fort Portal Regional Referral Hospital (FPRRH) towards nosocomial infection prevention.

Statement of Problem

World over, nosocomial infections are one of the leading causes of death and increased morbidity for hospitalized Patients with vehicle transmission and vector transmission being the common routes of nosocomial infections. Nosocomial infections could be spread in a wide variety of ways and these include improper bio-medical waste management, unsterile procedure and poor surgical techniques, ineffective vaccination, poor hand hygiene practices, exposure to infectious material through splash incidents, Needle stick injuries (NSI), airborne spread of infections and also physical contact and many other ways. Health care workers themselves can be a major source of vectors for pathogens. Therefore health care work must have awareness of nosocomial infection [7] At Fort Portal Regional Referral hospital, it has been observed that there is a growing number of hospital-acquired infections among patients suffering from different medical conditions ranging from mothers who develop puerperal sepsis, and babies developing septicemia and these patients did not have such conditions at admission though all these observations have not yet studied scientifically to ascertain the extent of the burden and patterns of infection. Therefore, the exact gap that potentially predisposes these patients to such hospital-acquired infections is not yet known. This study seeks to assess the knowledge, attitude and practice of HCWs at FPRRH towards nosocomial infection prevention.

METHODOLOGY

Study Design

This was a cross-sectional study [8] that was conducted at Fort Portal Regional Referral Hospital, Kabarole district involving women of reproductive age attending FRRH. A cross-sectional study research design was used because the method enables data collection from a relatively large number of different categories of respondents at a particular time with the exposure and outcome being measured at the same time and there is no need to follow up with the study participants.

Area of Study

Fortportal Regional Referral Hospital, commonly known as Fort Portal Hospital, sometimes referred to as Buhinga Hospital, is a hospital in the town of Fort Portal, in Kabarole District, Western Uganda. It is the referral hospital for the districts of Bundibugyo, Kabarole, Kamwenge, Kasese, Ntoroko and Kyenjojo. Fort Portal Hospital lies within the city of Fort Portal, approximately 148 kilometres (92 mi), by road, and west of Mubende Regional Referral Hospital. This location is approximately 294 kilometres (183 mi), west of Mulago National Referral Hospital, in Kampala, Uganda's capital and largest city. The coordinates of the hospital are: 0°39'19.0"N, 30°16'53.0"E (Latitude: 0.655278; Longitude: 30.281389). The bed capacity of Fort

Portal Hospital is quoted as 333 and is a government institution.

Target population and sampling technique

The target population was all designated health care workers that physically engaged patients and were involved in clinical practice at FRRH. These included the hospital staff and students on clinical practice.

Inclusion criteria.

All health care workers who consented to take part in the study.

Exclusion criteria

Healthcare workers were not available on the day of data collection since it was a cross-sectional design.

Sample size determination and procedures.

A study sample size will be determined using Fitchers' et al (1990) formula i.e.

$n = Z^2pq/ r^2$

Where;

n = desired sample size

Z = standard normal deviation taken as 1.96 at 95% confidence interval (CI)

p = proportion of the target population estimated to have similar characteristics; according to a study before [6] = 19%.

Thus, p = 0.19.

q = proportion of target population without a desired characteristic (q = 1 – p = 0.81).

r = degree of accuracy (0.05).

$n = (1.96^2 \times 0.19 \times 0.81) / (0.05^2) = 236$

Data collection instruments

In this study, a structured questionnaire with closed-ended questions was used. The compilation of the questionnaire was done through literature review, consultation with experts in the field of infection control, the supervisor and co-supervisor as well as the statistician who supervised the application of statistics.

Validity of data collection instruments

To maximize validity, representative questions for each category (Knowledge, Attitude and Practices) were designed and evaluated against the desired outcome. To establish the validity of the instrument, a pilot study was conducted with help of willing HCWs at Kampala International University teaching Hospital (KIUTH).

Data Processing and analysis

Questionnaire tools were checked for their accuracy and data completeness, then data was coded and entered into Epi info version 7, then exported into SPSS version 22.0 for analysis. Descriptive statistics was used to summarize the variables. For analysis, the outcome variables originally consisting of multiple categories were reduced to two levels. Univariant descriptive analysis was conducted by calculating the frequency and percentage of the main findings. The association between independent variables and KAP scores on HAI prevention was calculated using Pearson's Chi-square. For all statistical tests, the decision was significant if the p-value was <0.05.

Quality control

The questionnaire was pretested amongst selected willing health care staff at Kampala International University Teaching Hospital prior to the actual data collection. The collected data was checked immediately after finalizing the questionnaire for completeness and consistency of information collected.

Ethical considerations

Ethical clearance was obtained from Faculty of clinical medicine and dentistry and the hospital administration of FRRH. Privacy was maintained throughout the study and the participants' confidentiality was taken very seriously [8]. Women participants were educated and advised on importance of contraceptive use practise at the end of the interview.

RESULTS

Socio-demographic characteristics of health care workers at FRRH

A total of 236 healthcare workers at FRRH participated in the study with a 100% response rate. Majority were male 143 (60.6%) and aged between 26–30 102 (43.2%). Majority by qualification were still progressing students doing clinical practise at the hospital 131 (55.5%) and by discipline the nurses were the most respondents 78 (33.1%). Majority of health care had a work experience of ≤ 5 years (69.5%) as shown in Figure 1 and Table 1.

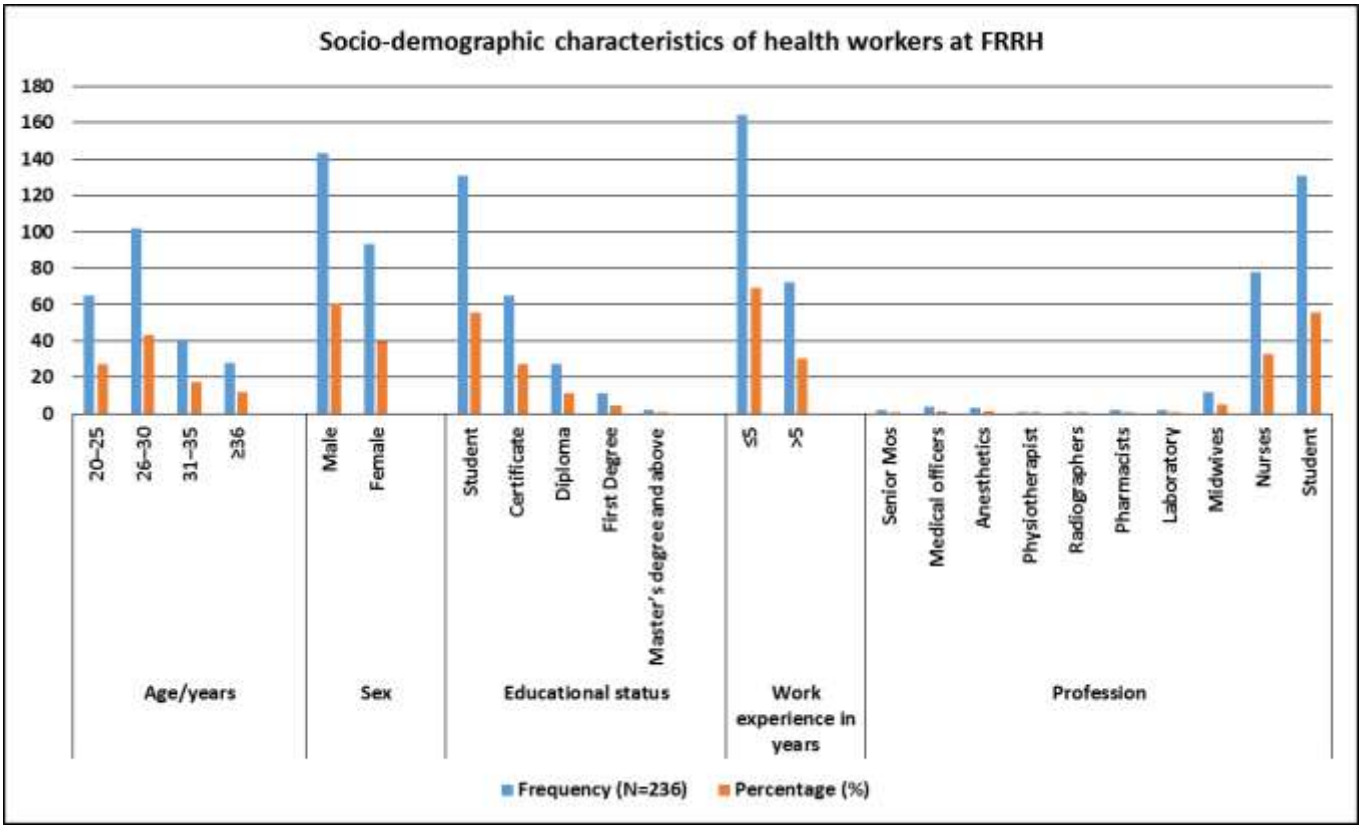

Figure 1: Column bar chart showing socio demographic characteristics of health workers at FRRH

Table 1: Socio demographic characteristics of health workers at FRRH

Variables	Category	Frequency (N=236)	Percentage (%)
Age/years	20–25	65	27.5
	26–30	102	43.2
	31–35	41	17.4
	≥36	28	11.9
Sex	Male	143	60.6
	Female	93	39.4
Educational status	Student	131	55.5
	Certificate	65	27.5
	Diploma	27	11.4
	First Degree	11	4.7
	Master's degree and above	2	0.9
Work experience in years	≤5	164	69.5
	>5	72	30.5
Profession	Senior Mos	2	0.9
	Medical officers	4	1.7
	Anesthetics	3	1.3
	Physiotherapist	1	0.3
	Radiographers	1	0.3
	Pharmacists	2	0.9
	Laboratory	2	0.9
	Midwives	12	5.1
	Nurses	78	33.1
	Student	131	55.5

Knowledge of healthcare workers about HAI Prevention at FRRH

Majority of FRRH health care staff (90.2%) were found to be knowledgeable about HAI preventions. Most of the health care workers (96.6%) has better knowledge about the need for implementation of SOP in reduction of HAIs. Further still, (95.3%) of the healthcare workers know how NIs development is favored. Majority of the health care staff at FRRH knew the importance of personal protective equipment (PPE) were more than 92% answered that hand washing before and after patient care and wearing of PPEs were vital to prevent HAI as shown in Table 2 and Figure 2.

Table 2: Knowledge of Healthcare Workers about HAI Prevention at FRRH

	Knowledge			
Variables	**True (%)**		**False (%)**	
	n	**%**	**n**	**%**
Nosocomial infection is an infection whose development is favored by a hospital environment.	225	95.3	11	4.7
Nosocomial infections include Ventilator associated pneumonia (VAP), Tuberculosis, Urinary tract infection, Gastroenteritis.	160	67.8	75	31.8
HBV, HCV, Staphylococcus aureus and Pseudomonas aeruginosa are the organisms commonly encountered in nosocomial infections.	207	87.7	29	12.3
Gloves should always be worn in contact precautions.	218	92.4	18	7.6
Standard precautions should include the use of protective equipment and frequent hand washing.	228	96.6	8	3.4
Diagnosis influences my decision to choose PPE.	196	83.1	40	16.9
Patient history will influence my decision in choosing PPE.	168	71.2	67	28.4
Washing hands before and after handling patients helps to prevent infection.	219	92.8	16	6.8
Wearing N95 mask is important when dealing with air born infection.	219	92.8	17	7.2
Wearing surgical masks when doing surgical procedures are vital to prevent infection.	221	93.6	15	6.4

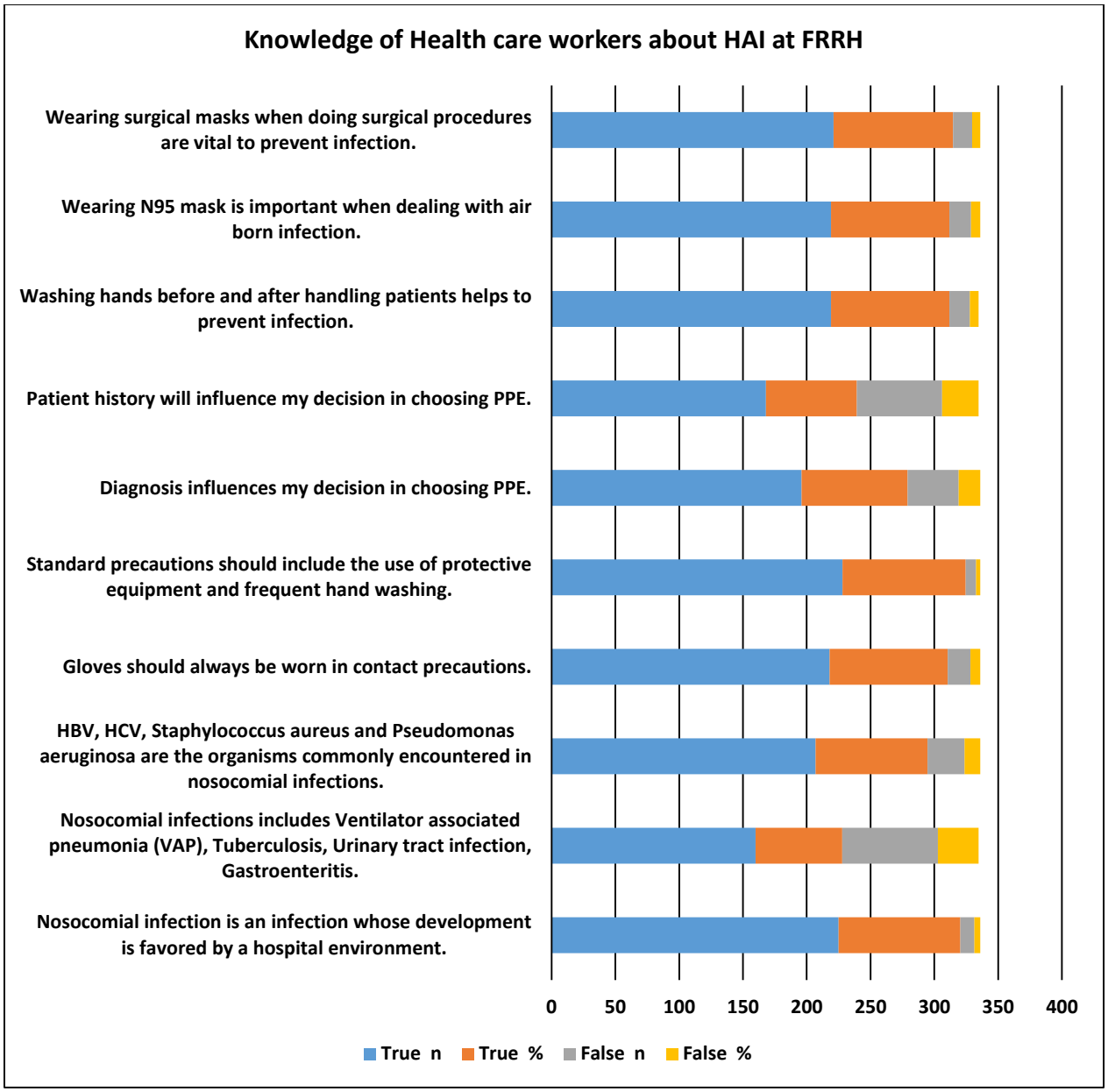

Figure 2: Clustered bar chart showing level of knowledge of health care workers about HAI at FRRH

Attitude of healthcare workers about HAI Prevention at FRRH

Majority of the health care staff at FRRH who was more than a half 135 (57.2%) had a favorable attitude rating in regard of HAI prevention. The bigger majority of the staff (91.1%) strongly agreed that use of antiseptic is necessary to prevent HAIs. A significant number of the FRRH health care staff did not agree on the importance of changing mask as a measure of HAIs control (disagree plus not sure=46.2%) as shown in Table 3 and Figure 4.

Table 3: Attitude of Healthcare Workers about HAI Prevention at FRRH

Variables	Attitude					
	Agree N (%)		Disagree N (%)		Not sure N (%)	
	n	%	n	%	n	%
It is necessary to categorize hospital waste before disposal.	144	61.0	61	25.9	31	13.1
Hand hygiene after removing gloves is a healthcare-associated infection control measure.	207	87.7	20	8.5	9	3.8
The use of antiseptic is necessary to prevent nosocomial infection	217	91.9	10	4.2	9	3.8
Invasive procedures are risk factor for multi-drug resistant organisms.	117	49.6	60	25.4	59	25
Health workers hands are vehicle for transmission of nosocomial pathogen.	177	75.0	43	18.2	15	6.4
Changing mask before going to another patient is a nosocomial infection control measure.	125	53.8	63	26.7	46	19.5

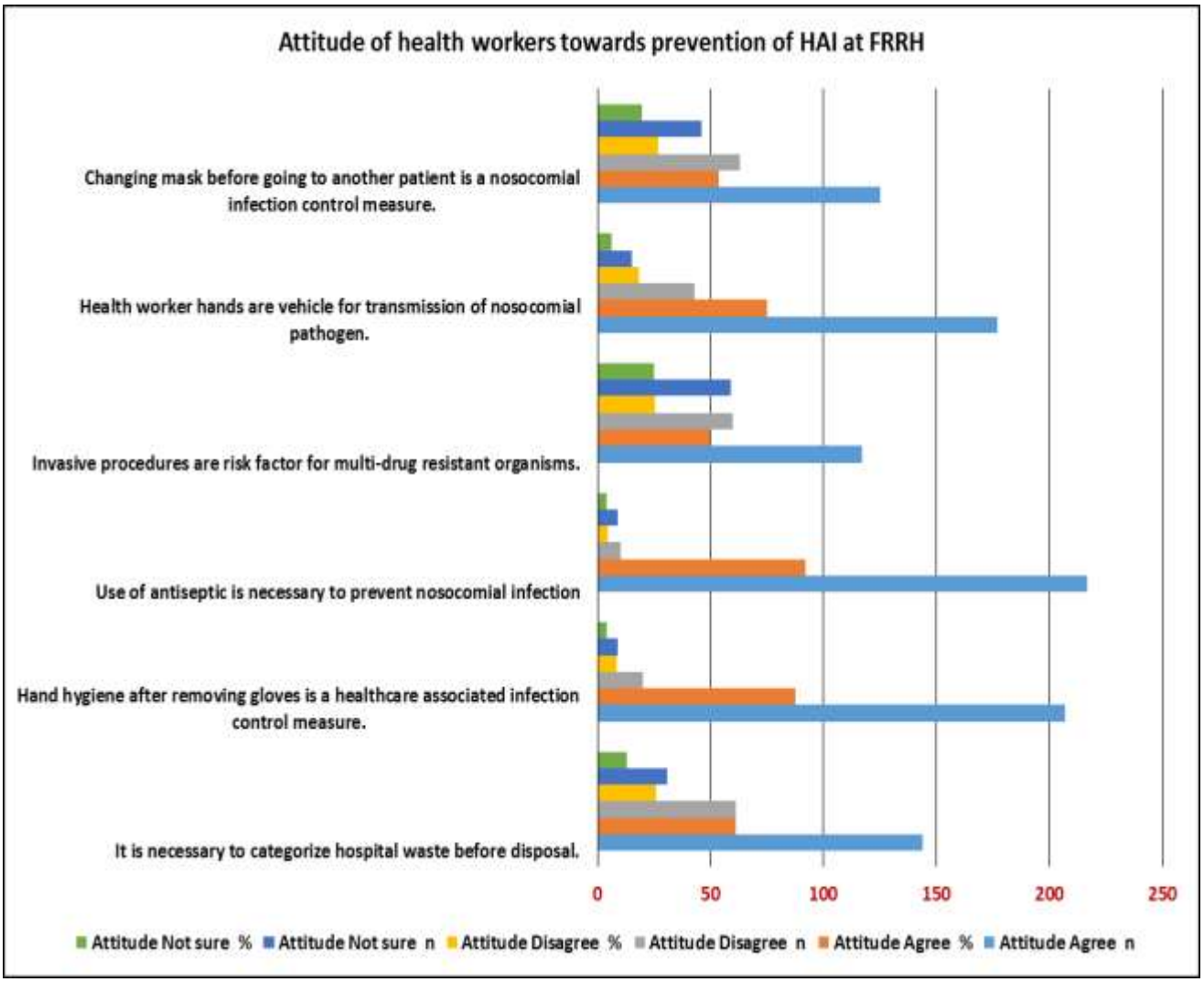

Figure 3: Bar chart showing attitude of healthcare workers about HAI Prevention at FRRH

Practice of Healthcare workers about HAI Prevention at FRRH

By practice ratings, the majority of FRRH healthcare staff had poor returns on practice indicators with 151 (64%) showing poor practice towards HAI prevention. Half of the HCWs (50.4%) always change gloves before handling new patients, whereas 39.4% of respondents never use safety cabinets in the laboratory as shown in Table 4 and Figure 5.

Table 4: Healthcare workers practice towards HAI Prevention at FRRH

Variables	Practice							
	Always		Often		Sometimes		Not at All	
	n	%	n	%	n	%	n	%
Hand washing before starting work	80	33.9	63	26.7	74	31.4	18	(7.6)
Hand washing before handling new patients	68	28.8	61	25.8	86	36.4	20	8.5
Changing gloves before starting handling new patient	119	50.4	63	26.7	48	20.3	6	2.6
Wearing mask during handling TB suspected patients	93	39.4)	62	26.3	58	24.6	22	9.3
Using safety cabinets in the laboratory	67	28.4	36	15.3	33	14.0	93	39.4
Discarding infectious materials and left-over samples according to the guide line	43	18.2	28	8.5	135	57.2	33	14.0

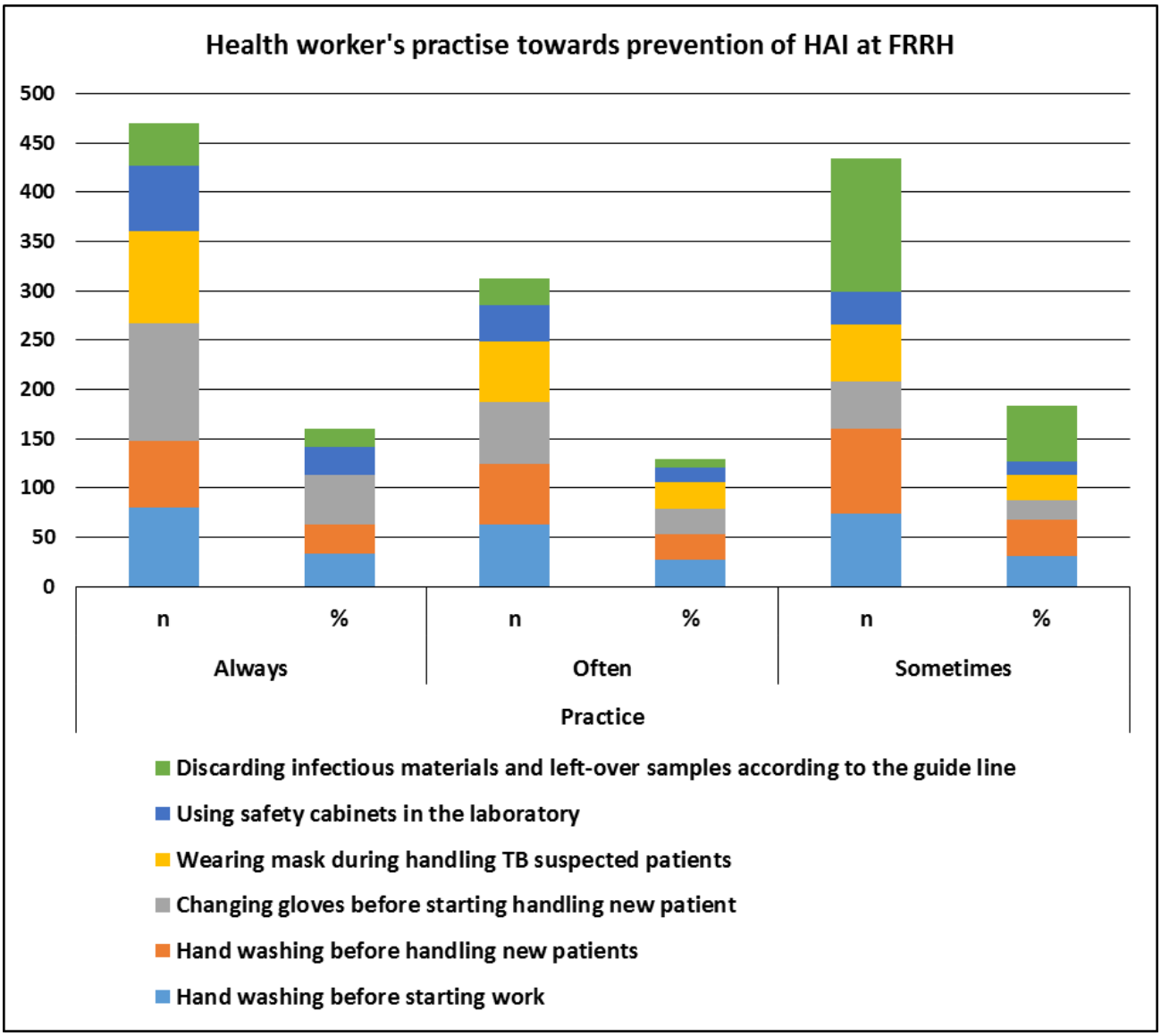

Figure 4: Clustered bar chart showing health workers' practice towards prevention of HAI at FRRH

Factors associated with the attitude and practice of HCWs towards HAI prevention

Pearson's Chi-square was used to determine the association between independent variables with practice and attitude states of HCWs on HAI prevention. In this study, the working experience and educational level of HCWs (P value 0.021 and 0.037 respectively) had a statistically significant association with attitude towards HAI prevention. Similarly, there was a significant association between practices towards HAI prevention versus educational status and level of experience of HCWs (P value=0.027 and 0.044, respectively). The finding also showed that the trend of good infection prevention practice was getting better and better as the educational level increased from the students in clinical practice to senior practitioners' master's levels as shown in Table 5. In this study, we did not find any associated factors which were significantly associated with knowledge about infection prevention.

Table 5: Association of socio-demographic variables with attitude and practice of healthcare workers towards HAI Prevention at FRRH.

		Attitude					
Variable	**Category**	**Favorable**		**Unfavorable**		**X^2**	**P-value**
		n	%	n	%		
Age/years	20–25	36	55.4	29	44.6	0.431	0.210
	26–30	53	52	49	48.0		
	31–35	30	73.1	11	26.9		
	≥36	16	57.1	12	42.9		
	Total	135	57.2	101	42.8		
Sex	Male	99	69.2	44	30.8	0.342	0.559
	Female	61	65.6	32	34.4		
	Total	160	67.8	76	32.2		
Educational status	Student	25	32.0	53	68.0	**0.001**	**0.037**
	Certificate	56	42.8	75	57.2		
	Diploma	20	74.0	7	26.0		
	Degree						
	≥Master's						
	Total	101	42.8	135	57.2		
Level of experience	≤ 5	86	52.4	78	47.6	**0.016**	**0.021**
	>5	48	66.7	24	33.3		
	Total	134	56.7	102	43.3		
		Practice					
Variables	**Category**	**Good**		**Poor**		**X^2**	**P-value**
		n	%	n	%		
Age	20–25	27	41.5	38	58.5	0.926	0.428
	26–30	33	32.3	69	67.7		
	31–35	13	31.7	28	68.3		
	≥36	12	42.9	16	57.1		
	Total	85	36.0	151	64.0		
Sex	Male	53	37.1	90	62.9	0.342	0.559
	Female	31	33.3	62	66.7		
	Total	84	35.6	152	64.4		
Educational status	Student	24	30.8	54	69.2	**0.26**	**0.027**
	Certificate	47	35.9	84	64.1		
	Diploma	10	37.1	17	62.9		
	Degree						
	≥Master's						
	Total	81	34.3	155	65.7		
Level of Experience	≤5	58	35.4	106	64.6	**0.014**	**0.044**
	>5	27	37.5	45	62.5		
	Total	85	36.0	151	64.0		

DISCUSSION

This study has been able to establish that majority of the HCWs at FRRH to tune of 90.2% had good knowledge regarding infection prevention in the hospital premises. This finding is consistent with other studies in China, Nigeria, India and Egypt [9 – 12]. This consistency in high knowledge indicators in all these previous studies and the supposed corroboration of the findings in this study can be attributed to expected outcome as health care professionals are expected to have this information on their figure tips in case of immediate attention in time of exposure as expounded in a study in Srilanka [13]. In the study, almost all study subjects, 225 (95.3%), were aware that HAIs are contracted in hospital environment. This finding is higher than a similar study conducted in Nigeria, which was reported as 80.3% [14]. This variation in the studies can be attributed to the level of education in the Nigerian study as the majority of the respondents were certificate nurses which is not the case in this study [14]. The knowledge on the use of PPEs and the importance of hand washing among staff at FRRH was very high at 96.6%. This finding is consistent with studies in India and Ethiopia where respondents were reported to have a good appreciation of PPEs and hand washing at 90% and 95% respectively [15, 16]. This satisfactory level of knowledge by the respondents may be due to the frequent provision of training and refreshment seminars regarding infection prevention as well as HCWs knowing the basics of infection prevention and control measures as it is the foremost portion of their profession [17]. Slightly above half (57.2%) of the healthcare workers at FRRH had a favourable attitude towards HAI prevention. Even though this is the majority of the staff with a favourable attitude, it's still very low. This finding implies that 42.8% of the staff have a passive attitude towards HAI prevention which puts the FRRH as an institution in a precarious situation. This finding is consistent with one study in Ethiopia [18]. However, a study in Morocco showed a better higher attitude [19]. This difference might be attributed to the variation in the academic background of the study respondents, sample size variation as well as implementation and availability of HAI prevention protocols. As well in many settings, hand washing may be seen as a trivial issue that is not routinely taken seriously, especially in non-surgical and non-invasive procedures. Our study also revealed that statistically significant association between attitude towards HAIs prevention and working experience as well as the educational level of HCWs (P value 0.016 and 0.037, respectively), thus good level of knowledge is not accompanied with a positive attitude. In spite of good knowledge, safe infection prevention practice was low (36%). Educational level and work experience of HCWs are significantly associated with the practice (0.027 and 0.044 respectively) towards HAI prevention. This finding was much lower than similar studies conducted in Ethiopia (60.2%) and Italy (52.9%) [20, 21, 22, 23, 24, 25, 26, 27]. This lower result might be due to differences in the availability of sanitary facilities and logistics required for HAI prevention activities at the study sites. The other possible explanation might be experienced HCWs transferred to other hospitals to take advantage of living in the capital city of the country. Similarly, 28.8% of the study subjects wash their hands before handling new patients, which is lower than the study conducted in South Africa [22]. The likely reason might be the differences in logistics and facilities. Other parameters attributed to good practice were also not implemented positively by HCWs which indicates that facilities and materials are poorly accessible. Day-to-day practice of safe infection prevention is mandatory for both the patients and HCWs consequently reducing HAIs but in our study, we found the level of good practice is unsatisfactory.

Recommendations

We recommend the provision of continual on-job and off-job training together with strict implementation of updated SOP in clinical specimen handling and disposal at FRRH. We also recommend the hospital should provide infection prevention facilities and supplies, continuous water supply, hand washing sinks and all necessary PPE to improve infection prevention practices of healthcare workers at FRRH.

CONCLUSION

Generally, healthcare workers at FRRH Healthcare who participated in the study had sufficient knowledge towards infection prevention. However, their attitude and application of safe practices were substandard. The healthcare workers' practice was unsatisfactory for the basic elements of the components like hand washing, wearing PPE, and discarding infectious materials and leftover samples, which will at some point increase the chance of HAIs. Moreover, risk factors like educational level and work experience of HCWs are significantly associated with practice and attitude towards HAI prevention.

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