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ORIGINAL ARTICLE

Knowledge and practices of healthcare workers in prevention and control of hospital-acquired infections in the Maternity Department at Bindura Provincial Hospital, Zimbabwe

Chipfuwa Tirivanhu[1*], Mwanza Estele[2], Tirivavi Elizabeth[3] and Chigonde Chipo[2]

[1]Department of Health Sciences, Zimbabwe Open University, Bindura, Zimbabwe; [2]Department of Health Sciences, Bindura University of Science Education, Bindura, Zimbabwe; [3]Department of Health Sciences, Zimbabwe Open University, Harare, Zimbabwe

Abstract

Infections acquired in hospitals are the most frequent negative consequences of the healthcare delivery system, which affects both developed and developing nations. Among hospitalized patients and healthcare professionals, they are among the top causes of mortality and morbidity. Therefore, healthcare professionals are crucial in preventing and controlling hospital-acquired illnesses and safeguarding patients. The purpose of this study was to determine the knowledge and practices of healthcare workers (HCWs) in the prevention and control of hospital-acquired infections (HAIs) in the Maternity Department at Bindura Provincial Hospital. A cross-sectional study design was used to collect data from 46 participants using a self-administered questionnaire. Of which, 54.3% had 2 to 5 years of experience. With regard to the knowledge of HAIs, 59% of HCWs did not know what HAIs were, 57% did not know that cleaners and mothers should be engaged in infection prevention and control (IPC) activities, whereas 85% did not know that ventilator-associated infections and COVID-19 (57%) are HAIs. Segregation of waste was shown to be poorly practiced with 56% of HCWs, 65% were unaware of the hospital's IPC policy, and 7% had never utilize the manuals of standard operating procedures when performing their jobs. This study recommended that every HCW should receive instruction on IPC methods from the facilities' IPC coordinators, who should also regularly supervise the staff to monitor compliance with IPC. Mothers should receive more education on the prevention of infections when first admitted to the ward.

Keywords: *healthcare workers*; *hospital-acquired infections*; *infection prevention and control*; *knowledge*; *practices*

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The most common unfavorable outcomes in the healthcare delivery system are hospital-acquired infections (HAIs), which impact both developed and developing countries (1). Hospital-acquired illnesses impact 10% of all patients admitted to hospitals around the world (2). The number of HAIs in developing countries is underestimated or perhaps unknown because diagnosis is difficult, and surveillance operations, which require knowledge and resources, are inadequate in most of them (3). Viral, bacterial, and fungal pathogens are the most common causes of nosocomial infections, with bloodstream infections, ventilator-associated pneumonia, urinary tract infections (UTIs), and surgical site infections being the most common types (4). Healthcare workers (HCWs) form the backbone of infection prevention and control (IPC) and, therefore, possibly contribute to infection transmission or prevent and control infection (5). Infections acquired in hospitals increase morbidity, mortality, length of stay, and expenditures and should be avoided if possible (6). Therefore, IPC is critical in reducing the spread of nosocomial infections in hospitals. Infection control comprises hand washing, wearing personal protective equipment (PPE), cleaning, disinfection and sterilization, post-exposure prophylaxis, good waste management, and safe injection techniques, among other things (7).

Background

Globally, over a 1.4 million people are affected by HAIs. Because of an increase of invasive procedures and a growing resistance to antibiotics, HAIs have increased by 36% in the last 20 years and are consuming more healthcare resources each year (8). Nations such as Germany, Romania, and the Netherlands had a low prevalence of HAIs (less than 4%), whereas Greece, Portugal, and Italy had an incidence of 8% in 2018 (9). In 2019, 9.9% of

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patients in Australia developed HAIs, which is a higher incidence than in comparable Western countries (10). In low- and middle-income nations with limited healthcare resources, HAIs constitute the most serious problem. Lack of proper healthcare facilities, such as isolation units, sinks, and bed space, and sufficient waste management, decontamination of equipment, and hand hygiene facilities are all risk factors (11). The overuse and misuse of broad-spectrum antibiotics, particularly in healthcare settings, is increasing nosocomial infection rates (9).

In Africa, the frequency of HAIs is believed to be between 3 and 15% of all hospitalized patients. However, outbreaks are rarely documented (12). In Ethiopia, the frequency of acquired illnesses was 16.96% in 2020 (13). According to a study conducted in three Nigerian hospitals, the frequency of HAIs was 14.3%. In Nigeria, the frequency of HAIs is high in neonatal units, with an alarming rate of 53.6% and a cause for concern (14). In Egypt, the percentage of HAIs was 3.7%, making it one of the few African countries with a low rate of acquired infections (15). HAIs are still a major problem in Zambia as shown by the study results of surgical site infections of 30%, which is a greater percentage compared to the World Health Organization statistics of 5% (16). Despite the lack of evidence on the economic impact of HAIs in Zimbabwe, annual direct medical expenses in developed countries are more than US$35 billion due to prolonged hospital stays that necessitate more laboratory tests, therapies, and nursing care (17, 18). In neighboring countries like Zambia, patients can stay in the hospital for up to 10 days after surgery (19).

According to a news release from Zimbabwe's Ministry of Health and Child Care, the frequency of health sector-linked illnesses ranged from 5.7 to 19.1% (18). In a study done at Parirenyatwa Hospital in Zimbabwe, hospital-acquired newborn sepsis increased with 94% of neonates having hospital-acquired sepsis due to a lack of standard disinfection of resuscitation equipment (20). In the Postnatal Department at Bindura Provincial Hospital, 60% of admitted patients had surgical site infections after a caesarean section (unpublished statistics/admission book) (21). The majority of mothers who had a caesarean section are affected. According to unpublished figures from Bindura Provincial Hospital/discharge book, mothers are remaining in the hospital for longer than 3 days, and those from home are staying for up to 7 days. Mothers developed HAIs as a result of their long hospital stay, necessitating the administration of costly broad-spectrum antibiotics such as meropenem, which costs $339.50 per one gram of vial (21). The medicine is prohibitively expensive for mothers, with many of them unable to afford it. The prolonged hospital stays increased bed occupancy, resulting in the ward being overcrowded. The Bindura maternity unit has a bed capacity of 25 patients, although the ward may accommodate 35 patients due to overcrowding of mothers. The greater the number of people admitted in a given ward, the more likely they are to contract or spread diseases (22). However, in Zimbabwe, there is limited research and reports of HCWs on IPC, indicating that this is an issue to be concerned about. Therefore, the aim of this study was to determine the knowledge and practices of HCWs in the prevention and control of HAIs in the maternity ward at Bindura Provincial Hospital.

Materials and methods

Study design

A quantitative cross-sectional research design was adopted in this study. The participants in this study were HCWs in the maternity department at Bindura Provincial Hospital, which comprises of the postnatal ward, caesarean section ward, and labor ward. During the time of the study, the maternity section had a staff establishment of 52 HCWs.

Sample size determination and sampling technique

Convenience sampling approach was used to select 46 participants from the Maternity Department at Bindura Provincial Hospital. For calculating the sample size, the Yamane formula (1967) was used. Doctors, nurses-in-charge, midwives, nurse aides, general hands, and students were all included as they all play an important role in contributing to or preventing infection in the ward.

Research instrument

Self-administered questionnaires were used because they are a cost-effective approach to collect huge volumes of data from a large number of people in a short period of time (23). The research instrument was divided into three portions: demographic data, knowledge, and practices of HCWs on the prevention of HAIs. In this study, a pilot study was conducted on five participants who had the same characteristics as those in the main trial. The pilot trial took place in a female surgical ward. This was done to ensure the research instrument's reliability and validity. Furthermore, the questionnaire was reviewed by experts to ensure validity of the questions.

Data collection procedure

A data collection procedure is the precise, systematic gathering of information relevant to the research purpose or to the specific objectives, questions, or hypothesis of a study (24). The nurses-in-charge introduced the researchers to the HCWs. Questionnaires were distributed during tea break and lunch to meet those who came with afternoon shifts and to avoid disturbing the participants'

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routine duties. The researchers gave the questionnaires to those who were conveniently available. Data were collected over a period of 4 days to allow for coverage of the HCWs who would be on shift. The HCWs were given the questionnaires in their respective wards. Forty-six questionnaires were distributed to doctors, nurses-in-charge, nurse aides, general hands, and student midwives. The response rate was 100%.

Ethical considerations

Permission to conduct the research was obtained from the ethics review board at Bindura University of Science Education (BUSE). The researchers sought permission from the hospital's Medical Superintendent and the Matron. Each participant was given a written informed consent form to sign, following an explanation of the purpose of the study. Anonymity and confidentiality of the information were assured by making sure that there were no names used on the questionnaires. To ensure confidentiality, the completed questionnaires were kept in a lockable room until the time when they were used for analysis of data. Participants were allowed to leave the study at any time if they felt they were no longer able to continue. The participants were assured that all information was kept private and confidential and would only be shared with the researchers. Completed questionnaires were destroyed after the research study.

Data processing and analysis

The processing began by checking the gathered data for accuracy and completeness. Each completed questionnaire was assigned a unique code. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 20. To display and visualize data, the researcher utilized frequency tables and pie charts.

Results

Demographic data

Table 1 shows the participant details, which were 37 (80%) females and 9 (20%) males, of which 11 participants (24%) were aged between 21 and 29 years, 24 (52%) between 30 and 39, 10 (22%) between 40 and 49, while 1 (2%) was over the age of 50. Midwives made up the majority of the HCWs (18, 39%), followed by nurse aides (10, 22%), student midwives (8, 17%), general hands (5, 11%), doctors (3, 7%), and nurses-in-charge (2, 4%). The majority of participants (25, 54.3%) were employed for 2 to 5 years, 13 (29%) were employed for more than 5 years, while 8 (17%) were employed for 1 year. None of the participants had less than 1 year of service. Twenty-four (52%) participants reported that they had tertiary education, while 19 (41%) had ordinary level and 3 (7%) had advanced level of education (Table 1).

Table 1. Demographic data (n = 46)

Demographic variable	Frequency, n	%
Gender		
Male	9	20
Female	37	80
Age (years)		
20–29	11	24
30–39	24	52
40–49	10	22
≥50	1	2
Job title		
Doctor	3	7
Nurse-in-charge	2	4
Midwives	18	39
Student midwives	8	17
Nurse aides	10	22
General hands	5	11
Duration of employment (years)		
≤1	8	17
2–5	25	54
≥5	13	29
Level of education		
Ordinary level	19	41
Advanced level	3	7
Tertiary education	24	52
Total	46	100

Knowledge of HCWs on HAIs

Table 2 shows that 19 (41%) of the HCWs correctly knew what HAIs are, while 27 (59%) had incorrect knowledge. The majority of the HCWs (36, 78%) correctly knew the organism that causes most HAIs (bacteria), while 10 (22%) gave incorrect responses. All the HCWs correctly reported that nurses should also be engaged in IPC, while 43 (93%) reported students, 20 (43%) reported cleaners, and 4 (9%) reported mothers. Quite a large number of HCWs (38, 83%) correctly mentioned UTIs as common example of HAIs, while 32 (70%) correctly mentioned surgical site infections, 20 (43%) correctly mentioned COVID-19, and only 7 (15%) correctly mentioned pneumonia brought on by using a ventilator (Table 2).

The majority of the HCWs (40, 87%) correctly cited hand washing properly with soap and water as the best method to prevent HAIs, while 6 (13%) correctly cited PPE, such as wearing of caps, masks, and shoe covers, and none (0%) cited prudent use of antibiotics and vaccination of HCWs (0%). Quite a small number (13, 28%) of the participants correctly cited the time to be taken to wash hands (40 to 60 s), while the majority (33, 72%) incorrectly cited the time (Table 2).

Knowledge on where infectious waste should be disposed

Figure 1 shows that 20 (44%) of the HCWs indicated that infectious waste from patients should be disposed in

Table 2. Knowledge of healthcare workers on HAIs (n = 46)

Variable	Response			
	Correct		Incorrect	
	n	%	*n*	%
What are hospital-acquired infections?	19	41	27	59
The organism that causes most HAIs	36	78	10	22
Groups to be engaged in IPC				
Nurses	46	100	0	0
Students	43	93	3	7
Cleaners	20	43	26	57
Admitted mothers	4	9	42	91
Common examples of HAIs				
UTI	38	83	8	17
Ventilator-associated pneumonia	7	15	39	85
Surgical site infections	32	70	14	30
COVID-19	20	43	26	57
Best method to prevent HAIs				
Hand washing properly with soap and water	40	87	6	13
Wearing of caps, masks, and shoe cover (PPE)	6	13	40	87
Prudent use of antibiotics	0	0	46	100
Vaccination of healthcare workers	0	0	46	100
Time required to wash hands (40 to 60 s)	13	28	33	72

HAI, hospital-acquired infections; IPC, infection prevention and control; UTI, urinary tract infections.

yellow bags, while 24 (52%) indicated black bags, 2 (4%) green bags, and none (0%) blue bags.

Knowledge on route of transmission of microorganisms

Furthermore, the majority of the HCWs (31, 67%) reported that the most common route of transmission of microorganisms is contact (direct/indirect), while 15 (33%) reported airborne transmission, and none (0%) reported droplet transmission (Fig. 2).

Practices on IPC

Table 3 shows that all the HCWs (46, 100%) indicated that after using sharps, they dispose them in a sharps box, while none (0%) indicated that they recap and discard or recap and throw in the bin. All the HCWs (46, 100%) reported that they change gloves in the ward before handling a new patient. Thirteen (28%) HCWs reported that they can correctly formulate chlorine solution for disinfection by giving the correct formula, while 33 (72%) gave an incorrect formula (Table 3).

The majority of the HCWs (22, 48%) indicated that they always followed standard operational procedures (SOPs) when carrying out their work, while 21 (46%)

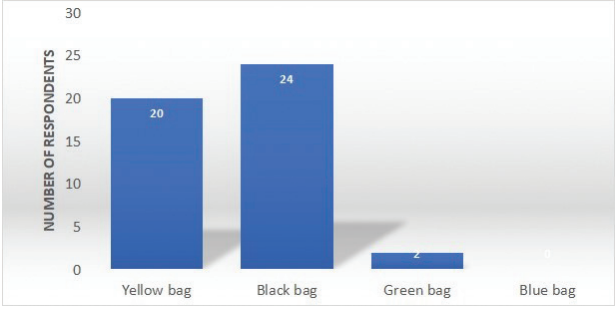

Fig. 1. Knowledge on where infectious waste should be disposed (n = 46).

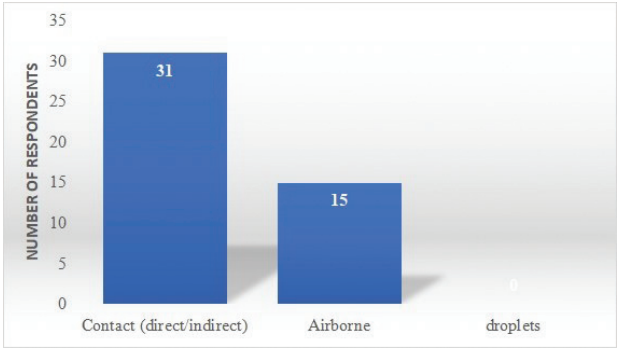

Fig 2. Knowledge on route of transmission of microorganisms (n = 46).

indicated that they sometimes follow SOPs and 3 (7%) indicated that they never follow SOPs at all. Furthermore, 44 (96%) midwives, student midwives, and nurses-in-charge reported that there is no HAIs monitoring tool in their departments, while 2 (4%) reported that it is there. Nineteen (41%) HCWs reported that they always give health education to mothers on IPC, while 17 (37%) indicated sometimes and 10 (22%) indicated never (Table 3).

Figure 3 shows that the majority of the HCWs (30, 65%) reported that there is no IPC policy in their hospital wards, while 6 (35%) indicated that it exists.

Factors impeding proper infection control practice

Table 4 shows that 10 (22%) HCWs indicated lack of knowledge as a factor that impeded them from proper infection control practice, 8 (17%) indicated lack of time, 10 (22%) indicated lack of equipment, 1 (2%) indicated forgetfulness, 9 (20%) indicated lack of resources, and 8 (17%) indicated shortage of staff.

Discussion

HAIs are defined as infections occurring in healthcare settings that were not present before a patient entered hospital (25). HCWs play a pivotal role in the prevention and control of HAIs, and therefore, the aim of this study was

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Table 3. Practices on IPC (n = 46)

Variable	Frequency, n	%
Discarding of sharps after use		
Recap and discard	0	0
Discard in sharps box	46	100
Recap and put in the bin	0	0
When do you change gloves in the ward?		
Before handling a new patient	46	100
When taking observations	0	0
When writing patient's notes	0	0
Formulation of chlorine solution for disinfection		
Correct	13	28
Incorrect	33	72
Use of the standard operational procedures		
Always	22	48
Sometimes	21	46
Never	3	7
Presence of a HAIs monitoring tool		
Yes	2	4
No	44	96
Health education to mothers on IPC		
Always	19	41
Sometimes	17	37
Never	10	22

HAI, hospital-acquired infections; IPC, infection prevention and control.

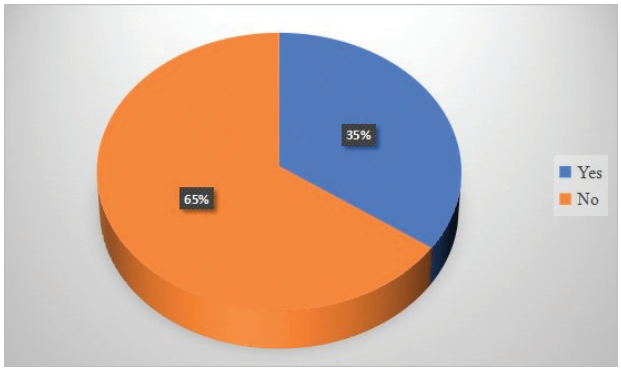

Fig. 3. Availability of infection prevention and control (IPC) policy (n = 46).

to ascertain the knowledge and practices of healthcare professionals in the maternity unit of Bindura Provincial Hospital toward the prevention and control of HAIs. The results indicated that midwives made up the majority (39%). Since this is a specialized field, midwives must have a larger presence. They are also helped by students midwives (17%) who are pursuing certification as midwives.

Since the majority (54.3%) of them had worked for 2 to 5 years, the researcher assumes that they are familiar with all of the IPC department's activities. In this study, just

Table 4. Factors impeding proper infection control practice (n = 46)

Factors impeding infection control practice	Frequency, n	%
Lack of knowledge	10	22
Lack of time	8	17
Lack of equipment	10	22
Forgetfulness	1	2
Lack of resources	9	20
Shortage of staff	8	17
Total	46	100

29% of HCWs held jobs for more than 5 years. Healthcare personnel with more than 5 years of experience were 1.5 times more likely than their peers to possess the necessary expertise (5). The majority (52%) have higher education because the midwives, sisters in charge, and doctors may have finished their post-basic training. This improves their expertise (5).

Quite a number (59%) of HCWs incorrectly stated what HAIs are, which contradicts with a study done in a regional hospital in Ghana, which found out that 88.7% of HCWs knew what HAIs were (26). A large number of HCWs (78%) were aware that bacteria are the main cause of HAIs. This is consistent with a study done in Zaria, Nigeria, where the majority (75.9%) of healthcare professionals identified bacteria as the main cause of HAIs (27).

All HCWs were knowledgeable that both nurses and students midwives need to be involved in IPC; however, only 40% of HCWs correctly identified cleaners and 9% correctly identified mothers; this shows that HCWs have poor knowledge that cleaners and mothers also play a major role in the prevention and control of HAIs. A study done by Chipfuwa et al., at Bindura Provincial Hospital, Zimbabwe, also revealed that there was low engagement of mothers and cleaners in IPC (28).

Quite a large number of HCWs (83%) knew that UTI is a HAI, and 70% knew that surgical site infections are HAIs. These findings coincide with Gezie (2020) who found out that 86.4% of HCWs had good knowledge on knowing that urinary tract and ventilator-associated pneumonia are HAIs (29). However, HCWs had poor knowledge on knowing that ventilator-associated pneumonia (15%) and COVID-19 (43%) are HAIs.

The majority of HCWs (87%) were aware that appropriate hand washing with soap and water is one of the best methods of preventing HAIs. This is in contrast with Asfaw, who discovered that 56% of HCWs did know that washing their hands with soap and water is a good infection preventive practice (30). However, all the HCWs had lack of knowledge that the prudent use of antibiotics and vaccination of HCWs are also some of the best methods of preventing and controlling HAIs. Despite the fact that the current recommendation is to wash hands for 40 to 60

s, this study found that the majority of HCWs (72%) did not know the recommended time for hand washing. This was almost the same as discovered by Asfaw, who discovered that 61% of nurses did not adequately follow infection prevention standards (30).

Knowledge on proper disposal of infectious waste from patients was poor as quite a number of HCWs (56%) wrongly identified black bags, while only 44% correctly identified yellow bags, which show a lack of understanding of the segregation of waste. This was supported by Sarani (31) and Okwii, who discovered that healthcare professionals improperly separate contagious and non-infectious waste based on their research observations (32). The majority of HCWs (67%) were aware that contact (direct or indirect) is the most typical method of microorganism transmission. These findings are consistent with studies done in Kosovo hospitals, which reported that 69% of healthcare professionals were aware that contact was the most prevalent way for acquired illnesses to spread (33).

All the HCWs had good practice on disposal of sharps as they all indicated that they disposed sharps in sharps boxes. This is in contrast to Wasswa's study, which found that 34.4% of needles were recapped after use (34). Furthermore, all the HCWs indicated that they always changed gloves before handling new patients, which is a good practice. This is in contrast to a study done at Northwest Ethiopia, which revealed that 64% of healthcare personnel had bad practice in changing gloves before treating new patients. The act of changing gloves enables HCWs to avoid transmitting an infection from one patient to another (35).

Practice on disinfecting equipment has been proven to be inadequate since the majority of the HCWs did not understand how to dilute the chlorine solution for disinfecting. This is in line with findings from Desta et al., who found that 52% of HCWs had the knowledge of giving the wrong formula (5). The use of incorrect chlorine solution will increase HAIs and bacterial resistance.

A significant number of HCWs (65%) were unaware of the hospital's IPC policy. In addition, this study found that 48% of HCWs indicated that they always use SOPs, while 46% indicated sometime and 7% indicated never. Furthermore, a large number (96%) of HCWs reported there is no monitoring tool for HAIs. This demonstrates that the majority of HCWs are not adhering to the operational standards for the prevention of infection. These results show poor practices on IPC. This is consistent with a study done among nurses in Aksum Saint Mary hospital, Northern Ethiopia, which revealed that 61% of nurses do not adhere to IPC manuals and recommendations (30). Therefore, the nurses should be inducted on the use and importance of the IPC manual. However, this study revealed that only 41% of HCWs reported on educating mothers, 37% reported that they provide education to patients sometimes, and 22% said that they never educate patients on IPC. It is crucial to involve mothers in IPC (26). Other factors impeding IPC practices reported are lack of resources (20), lack of equipment (22%), lack of knowledge (22%), and shortage of staff (17%), which is consistent with what was reported in previous studies (28, 36, 37).

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Conflict of interest and funding

The authors report no conflict of interest. No funding was received for this study.

Ethical approval

This research project was reviewed and assessed by the ethical review committee, Bindura University of Science Education (BUSE), Zimbabwe. The committee had no objection to carrying out this research, and the ethical approval was certified.

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***Chipfuwa Tirivanhu**
Department of Health Sciences,
Zimbabwe Open University,
Bindura, Zimbabwe
Email: chipfuwat@yahoo.co.uk