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Full-Length Research Article

Barriers and Facilitators to Infection Prevention and Control Practices Among Healthcare Professionals at Arba Minch General Hospital, South Ethiopia: A Phenomenological Qualitative Study

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ABSTRACT

Hospital-acquired infections pose a significant global safety concern for patients and healthcare professionals. In Ethiopia, the issue is exacerbated by overcrowding, understaffing, and lack of trained professionals. This study investigated barriers and facilitators to infection prevention and control identified by healthcare workers at Arba Minch General Hospital, South Ethiopia, using the Systems Engineering Initiative for Patient Safety framework.

A phenomenological qualitative study was conducted at the 260-bed hospital. Semi-structured interviews were held from July 19 to August 23, 2019, involving eight healthcare professionals (three physicians, one environmental health professional, two midwives, and two nurses) from various clinical departments, selected through purposive sampling. Data were transcribed, translated, and analyzed using Open Code software (version 3.6), with themes coded based on the conceptual framework. Key barriers included poor facility design, overcrowding, inadequate handwashing facilities, limited budget, lack of knowledge and training, insufficient and poor-quality personal protective equipment, inadequate waste management, high workload, and poor sterilization practices. Facilitators highlighted were the formation of an infection prevention and control committee, dedicated staff, and leadership roles for nurses and physicians in ongoing infection prevention and control initiatives. Tailored logistical and administrative actions addressing local conditions are essential. The study underscores the need for comprehensive training programs and infection prevention and control care packages to improve infection prevention and control practices in Ethiopian hospitals.

Keywords: Infection Barriers, Ethiopia, Facilitators, Healthcare Professionals Prevention and Control

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1. INTRODUCTION

The occurrence of serious infections such as severe acute respiratory syndrome and re-occurrence of infectious diseases like tuberculosis have tinted require for well-organized infection control programmes in all health care settings. An infection control programme puts collectively diverse practices which, when used properly, limit the expand of infection (WHO, 2004). Infection prevention and control (IPC) in the sharp care setting is one of the major vital issues in contemporary healthcare (Backman et al., 2012). Hospital acquired infections (HAIs) is a major global safety concern for both patients and health-care professionals. HAIs are infections that patients and health-care professionals get while getting treatment for therapeutic or surgical conditions and are the most common unfavorable event during health care delivery (Bates et al., 2009). HAI is the main problem for patient wellbeing and its impact can result in enlarged hospital stay, durable disability, and increased resistance of microorganisms to antimicrobial agents, immense extra financial trouble for the health system, high expenditure for patients and their families, and high deaths (Burke, 2003).

HAIs, or infections acquired in health-care settings are the major difficult incident in health-care delivery worldwide. It affects millions of patients every year and are the most frequent impediment of healthcare delivery (WHO, 2017). According to WHO (2017), about four types of infection account for more than 80% of all HAIs. These include: urinary tract infection (usually catheter-associated), surgical-site infection, bloodstream infection (usually associated with the use of an intravascular device), and pneumonia (usually ventilator-associated). In many settings, from hospitals to ambulatory and long-standing care, HAI appears to be a concealed, cross-cutting problem that no institution or country can announce to have solved yet (WHO, 2011a). Poor infrastructure, insufficient equipment, understaffing, lack of knowledge, inappropriate use of antibiotics, and scarcity of local and national guidelines and policies were reported as regular barriers to effective implementation of IPC in developing countries (Damani, 2008; Raza et al., 2004).

HAIs rates are lower when there is very good air quality and patients are in single-bed rather than multi-bed rooms. Also, there is some evidence that providing numerous, easily accessible

hand washing sinks along with hand washing gel can increase hand washing compliance and thereby reduce contact contagion (Ulrich, 2004).

There is a model called Systems Engineering Initiative for Patient Safety (SEIPS) (Carayon et al., 2006), which is one of the leading conceptual frameworks in human factors engineering research. The model assesses the problems through the lens of composite relations among people and systems, which includes organizations, equipment and supplies, the environment, responsibilities, and people (Fig. 1). The SEIPS model improves upon former patient safety frameworks by examining both the causes and control of therapeutic errors (Carayon et al., 2006). Thus, it is a normal fit for exploring the behavioral and systematic components of IPC practices. SEIPS has previously been used to identifying barriers and facilitators to IPC at a hospital (Barker et al., 2017) , barriers and facilitators to IPC practices for Clostridium difficile infection (Yanke et al., 2015), ventilator associated pneumonia in intensive care units for assessing barriers and facilitators to guideline adherence (Safdar et al., 2016).

To offer imminent for IPC in Ethiopia, it is vital to recognize what factors have limited execution of IPC policies and programmes in Ethiopia. Even if the rate of HAI in Ethiopia is high, no study of the wide-ranging barriers and facilitators to IPC practice has been conducted at an Ethiopian hospital, and there has been few such researches conducted in other developing countries, as far as our knowledge is concerned. Therefore, the objective of this study was investigating the barriers and facilitators to IPC that healthcare professionals identify in visual narratives of their part environment at Arba Minch General Hospital, based on the SEIPS conceptual framework. The findings were interpreted to provide insights of benefit for hospital managers, clinicians and IPC coordinators not only in Arba Minch Hospital but also other hospitals in Ethiopia.

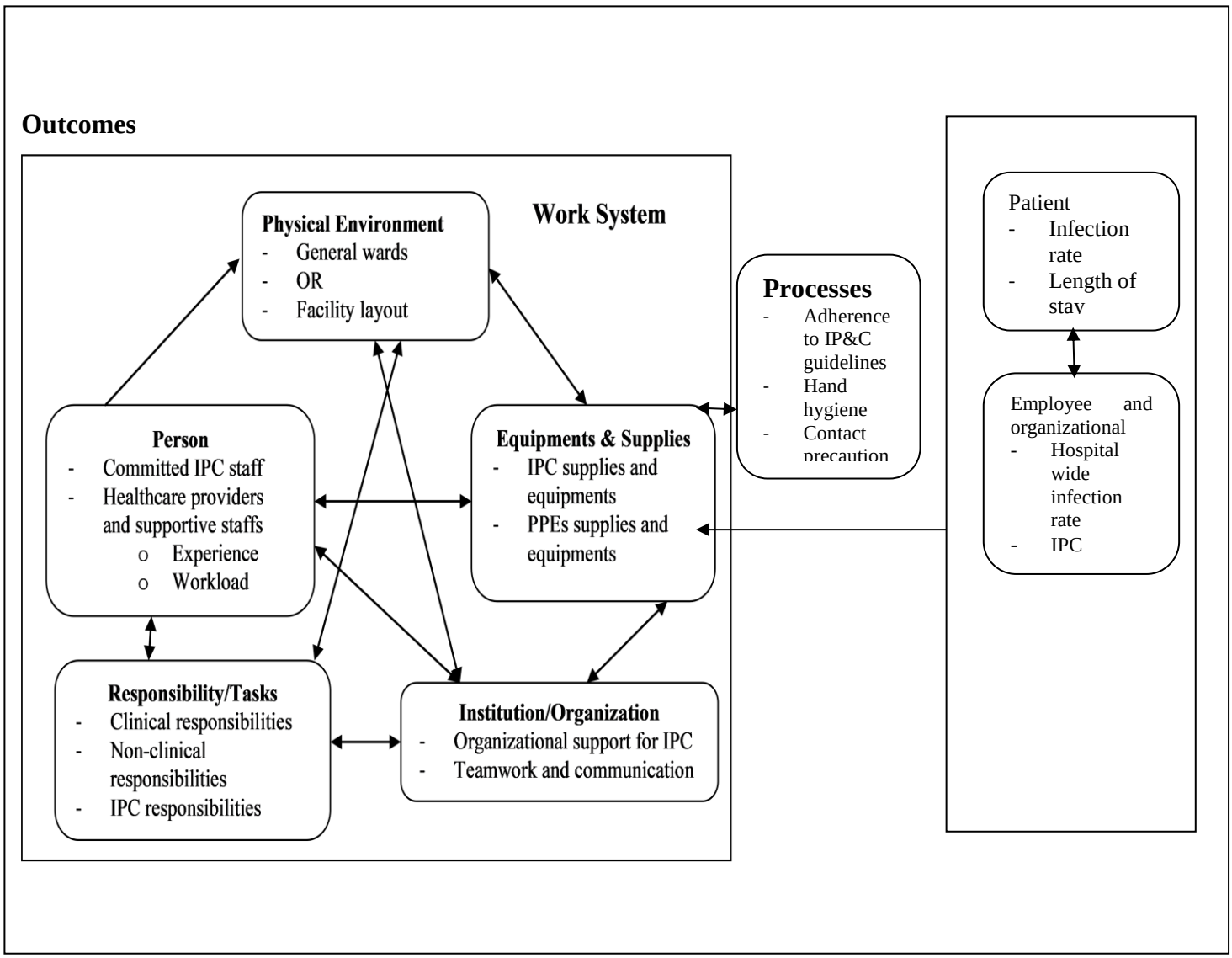

Figure 1: The SEIPS model of IP&C in an Arba Minch general hospital. Adaptation of the SEIPS model by Carayon, et al. work system design for patient safety: the SEIPS model (Carayon et al., 2006) and Barker et al. to identify barriers and facilitators to infection control at a hospital in northern India (Barker et al., 2017).

2. METHODS AND MATERIALS

2.1 Study design and setting

An interpretative phenomenological qualitative study was conducted at 260 beds general hospital in Arba Minch, Ethiopia from July 19 to August 23, 2019. Arba Minch General Hospital is located in the Gamo Zone of the South Ethiopia Regional State which is about 500 kilometers South of Addis Ababa at an elevation of 1285 meters above sea level. There are multidisciplinary professional's team that includes physicians, nurses, midwifes, public health professionals, laboratory technologists, pharmacists and volunteer adherence supporters.

2.2 Study population and data collection process

Eight health professionals (3 physicians, 1 environmental health, 2 midwifes and 2 nurses), of which three of them were IP persons, were recruited. Participants were selected by purposive sampling and represented a wide range of clinical departments and career levels. These groups of health professionals were chosen to better understand barriers and facilitators of IPC from the healthcare providers' perspective. They were recruited in the hospital surgical wards, obstetric wards, delivery wards and medical wards. All hospital health professionals directly involved in patient care were eligible for enrollment. Student trainees were excluded. Health professionals were identified with the assistance of the hospital manager and out patient department coordinator. Initially, we interviewed the hospital IPC coordinator to have an in-depth understanding of various concepts related to the study objectives.

The data were collected using semi structured in-depth interviews and field notes and picture capturing by the lead author. After giving consent, all interviews were conducted in Amharic language with each informant in a private room at the hospital. Each session lasted between 8 and 22 minutes. Eight health professionals were approached and asked to provide consent to participate; none of them refused to participant. The preliminary interview guide was prepared based on the SEIPS model (Fig. 1) and advanced based on participant responses.

Interviews took place at the hospital, in a room adjacent to the participant's work environment. The principal investigator moderated the interviews using the semi-structured guide. The moderator acted as a guide for the participants helping to maintain the flow of discussion when relevant through

probes. The moderator was formerly involved in healthcare waste management research projects and was known to some policy. However, he had no direct connection with the participants and all roles were disclosed and vacant prior to beginning fieldwork so as to guarantee the discussion and data was not overly compromised or prejudiced. The discussions were recorded digitally.

The data were collected from different participants' point of view (triangulation). One participant had been invited once the data was analyzed to evaluate the findings and ideas, which they think the researcher had presented a true depiction from their perception. In addition, the researcher developed an early familiarity with the customs of the selected hospital in order to gain sufficient understanding of the organization and to create a relationship of trust. Rigor is attained through firm attention to detail, adhering to procedures and through consistency and accuracy throughout the research process, each of which the investigator was considered at all times.

2.3 Data processing and analysis

All audio files were entered into Open Code software (version 3.6). The lead investigator transcribed and translated the data. Groundwork data analyses were done alongside with study procedures to lead iterative revisions of the interview guide and decide theoretical saturation. Adaptation of the interview guide permitted the center of the interview content to change overtime, so that fresh information was captured even among the later participants. After interviewing the eighth participants, the lead investigator decided that the responses to interview questions were becoming decidedly recurring and that no new data were likely to come into view. Thus, an eight participant sample size was finalized based on theoretical saturation. Interview transcripts were consequently analyzed using Open Code software, with responses coded for themes based on the SEIPS framework (Carayon et al., 2006). All interviews were audio recorded and transcribed verbatim. The field notes and the photos taken were also interpreted. Data were coded using a thematic analysis. Data were independently coded in Open Code by two investigators.

3. RESULTS

3.1 Participants' characteristics

A total of eight interviews were conducted and averaged approximately 15 minutes in length. Participants were comprised of two nurses (all female), two female midwifes, one male environmental health, IP coordinator, and three physicians (all males). Five main themes used indicating perceived barriers to successful implementation of IPC practices in Arba Minch general hospital perceived by these health professional (participants): 1) Physical environment and structure; 2) Organization and training; 3) Person; 4) Responsibilities/tasks; and 5) equipment and supplies.

3.2 Physical environment and structure

The hospital's work station design or the physical environmental design, (the layout, air quality, temperature, humidity, overcrowding, hand washing facility etc) was not well structured and maintained to facilitate IPC practices. In each ward of the hospital there was a centrally located hand washing facility (sink) with no running water and washing gel at the patients' bedside. Overcrowding was also a problem and every patient was not given his/her own bed.

The hospital is too old and its housing structures were not constructive to practice IPC. The floors and the walls were cracked and beds were broken and not encouraging to practice infection prevention.

> "If you go to the medical wards, there are many inpatients (including TB patients) and the roof is very short and it is not well ventilated, electric lines and sanitary facilities are not well structured so they impose a significant impact on proper practicing of IP in our hospital."- (IP coordinator, Environmental health).

There was no hand washing facilities for majorities of the general wards. Even if some of the wards/rooms had a hand washing facilities (the structure), it was not functional and there was no running water and hand washing gel (Fig. 2). Many participants described their concern about water and hand hygiene/sanitation: "There is scarcity of water and some time we wash our hands only by alcohol. No one in an outpatient department wash his/her hands properly using the recommended

hand washing steps because it is tiresome."- IP coordinator, Environmental health and senior midwife noted.

Figure 2: Sample hand washing facilities station inside of patient rooms in the study hospital

There was overcrowding specially in surgical and medical wards. The rooms were very crammed with more than four beds in one room and even very difficult to clean properly. As a senior nurse, surgical ward coordinator, described:

> "There is overcrowding and it is a challenge. When we are on wound care, many visitors come in and overcrowd the rooms and this facilitates the transmission of infections from one to another. So we are seriously challenged on this."

Another senior midwife from obstetrics and gynecology ward said:

> "We fail to treat the patients properly because many visitors enter the room in one time and make the rooms overcrowded. This is very risky even to the patient and to the providers regard to infection transmission."

Besides overcrowding, the rooms were very hot and were not well ventilated. There were also many visitors entering the rooms and these all are favorable for infection transmission. As one senior physician from medical ward said,

> The rooms are overcrowded and favor the transmission of many air borne communicable diseases like tuberculosis (TB) and Influenza which are risky for all us. On top of that, the patients and I as an internist are exposed to these communicable diseases since we do not have oral masks for protection. The wards are not well ventilated because primarily they were not constructed for this purpose.

3.3 Organization and Training

Lack of knowledge and training were perceived by participants to hinder information delivery and limit the healthcare professional's ability to successfully implement and stick to IPC processes. This was cited as a concern by general and infection control nurses, physicians and also the IP&C coordinator. Almost all of the participants agreed that training was not given to both housekeeping staffs and the healthcare professionals. Some of the participants stated that "there was some form of orientation which was not well organized and ongoing." A participant responsible for IPC noted,

> "There is some orientation but it is not continuous. At the end of any meeting we orient the healthcare providers about proper IPC practices for 10 minutes. For housekeeping staffs or the waste handlers, we orient them about proper IPC practices at the end of the agendas for the day have been addressed at a meeting held every month. For newly hired staffs, we do not have the training and there is no revision/update." One senior physician also coined, "the training is not given in a well-organized manner. Many of the works in our ward is done by medical intern students and they are highly exposed to infection; the training is not given to them and the staffs. But it should be given for both."

When the hospital's IP coordinator were asked to state the reasons why they did fail to give a well-organized and ongoing training to the housekeeping staffs and the healthcare providers, he puts two reasons: high number of staffs and lack of budget. An environmental health from the hospital noted,

> Since we have many number of staffs (around 600), it is very difficult to us to successfully organize and deliver the training; so the training is given as an orientation on Saturday and Sunday, the staffs need to be paid, but we do not have budget to pay, or it is not adequate/sufficient. That is also why we failed to give training on IPC to the staffs.

Particularly, the slight learning requirements of healthcare waste handlers, compared to those of healthcare professionals, were perceived as a barrier to effective implementation of IPC. As one senior midwifes noted,

> Waste handlers are practicing IPC improperly and they are very exposed to hospital acquired infections. Since they do not have awareness/ or knowledge about hospital acquired infections they do not even take care for themselves. So they need trainings.

In other conditions, even if it was supposed that the healthcare professionals were knowledgeable about IP&C implementation; gaps still existed when it came to the healthcare professionals applying what they had oriented to their everyday patient care. An IP coordinator and senior nurse, surgical ward coordinator noted,

> The staffs are sloppy to practice what they have been oriented. There is lack of enthusiasm among healthcare professionals. Unless the coordinator is there, the work/ infection prevention will not be done. So I am there to facilitate IP.

All of the IP persons described as, they did not prepared a guideline or policy by themselves to their hospital instead they accept and implement a policy which is developed by higher level without their feedback. As a senior nurse from surgical ward stated,

> When a new policy is come to our hospital, we enforce just to do/ implement it without giving any feedback. The policy is come from somebody from higher level then to our boss then to us for implementation. So there is no place for feedback.

Notwithstanding these barriers, the organization was devoted to IPC and has organized it through the formation and enrollment of a large IPC committee. As the hospital's IP coordinator stated, the established IP committee included eighteen healthcare professionals, the infection prevention

coordinator was the secretary and the hospital's manager was the chairperson. Some senior physicians and each ward coordinator were the members of the committee. They were dedicated full-time to IPC activities. The hospital has also dedicated staffs and designated several nurses and physicians as leaders in continuing IPC initiatives. These measures have formed an institutional environment that prioritizes and values infection prevention and control. "We have committed healthcare providers and supportive staffs to practice IPC." – An IP coordinator, environmental health said.

3.4 Equipment and supplies

3.4.1 Inadequate availability of personal protective equipment (PPEs) and supplies

Almost all of the participants were devastatingly reported that the supply of safety measures equipment or PPEs (like gloves, masks and goggles) were not readily available for use. As an Emergency case team coordinator, a physician noted, "As an emergency room, PPEs should be available adequately, but in our hospital there is shortage of many of the PPEs. As we are working in emergency room, we should wear goggle and mask, but we do not have these."

One senior general nurse also noted, *"*The hospital provide us only one mask at a time and expected to use it for longer period of time and if you loss it, there is no any to replace it." –

As all of the participants stated, housekeeping staffs were face a problem regarding to personal protective equipment; they lack many of the PPEs like heavy duty gloves, aprons and closed toed shoes. Many of the PPEs get old and wear out. Most of the time, they exposed to infection. This was one of the challenges to practice IPC. Even if there were few PPEs for use by waste handlers, they wear out in a short period of time. As one of the IP person stated,

> Ah, sometimes we face shortage of the PPEs. As I have said previously, because of the unconstructive structure of the house, many of our PPEs (e.g. heavy duty gloves) are damage within a short period of time and it takes some times to buy another so we face shortage in this case. Generally, there is supply shortage for PPEs in our hospital.

Hospital IP explained that because of low quality and shortage of many of the personal protective equipment, the cleaning and housekeeping staffs had not functioned well and not cooperative. As the IP coordinator noted, "Because of lack of supplies of PPEs (e.g. heavy duty gloves), commitments of

housekeeping staffs to practice IP become reduced. Another reason for lack/or reduction of commitment is low standard quality of PPEs."

Although they were available, participants reported that the healthcare workers struggled with goggle and mask compliance for patients under airborne diseases protection, in large fraction because of issues close to comfort. "Goggle is not comfortable because it induces heat" - Emergency surgeon.

3.4.2 Availability of un-standardized waste storage containers

Most of the participants in this study reported that there were shortages or lacks of temporary healthcare waste storage containers. Despite their availability, participants reported that containers were not the recommended quality/standard of the WHO; they were locally made plastic containers and were not color labeled (confirmed in walkthrough survey of the hospital) (Fig. 3) "Even if we have color coded plastic containers in some wards, wastes are mixed together." – An Emergency case team coordinator, physician noted.

As an IP coordinator and most of the participants noted,

> Currently, there is a shortage of safety boxes nationally. But to solve this problem in our hospital, we prepared a plastic container (modified one) instead of safety box (Fig 3). Since we do not have the recommended safety boxes, many healthcare providers in our hospital were exposed to needle stick and sharp injuries. It is also a challenge to us to practice IPC properly.

"Usually there is shortage of safety boxes. When we lack safety boxes we dump the sharp wastes in anywhere in a ward for a short period of time until we get a safety box."- A *midwife noted.*

Figure 3: Un-standerdized (locally made) temporary healthcare waste storage plastic containers used in the study hospital.

3.5 Person

Even though there were eighteen IP persons who were dedicated to front-line implementation of hospital infection prevention control guidelines and policies, "majority of the healthcare professionals lack enthusiasm. Unless the coordinator is there, the work/IP is not done." – Surgical ward coordinator, senior IP nurse. When the participants asked why the staffs are reluctant to practice IP properly, a similar senior IP nurse noted, "I think it is not due to lack of knowledge but it is due to slackness and high workload."

> It is not only the lack of knowledge but also the culture/behavior of the surrounding environment that makes things to do/go in routine ways. There is no infection prevention culture/behavior among staffs (for example you may not wash your hands, may not use alcohol, may not use glove for each and every procedure (minor procedures), and you may be selective). – One senior physician stated.

New clinical staff's hires often lack clinical experience. As senior nurse from medical ward noted, "Most of the times, our newly hired staffs are come from rural health centers by transfer. The number

of patients and the types of cases came to our hospital is high, the new staff face lack of experiences and somehow they are confused. They have difficulties in practicing IP."

3.6 Responsibilities/Tasks

3.6.1 Workload and Poor disinfection and sterilization

There is a perceived workload among healthcare providers and housekeeping staffs. As the IPC physician reported both the healthcare providers and housekeeping staffs were less likely to practice IPC properly when they were full of activity. "When we have high patient flow and work over load, we may ignore disinfection of medical equipment (we may not keep the medical instruments for 10 minutes under chlorine solution to disinfect)." – Emergency case team coordinator, physician noted.

One senior physician also added, "Sterilization by itself takes time and we may not wait or we may not do the procedure timely. This is also a problem to practice IP properly."

As one of the senior nurse from medical ward noted, "There are also times to reuse medical equipment without any disinfection. I think this may happen because of workload and lack of giving proper attention."

The housekeeping staffs reported dissatisfaction (especially those who were working in OR, OB-GYN and emergency rooms, there is high workload). "Every four to five hours housekeeping will come; the salary we pay and the work they do is not match." – Similar physician

3.6.2 Poor healthcare waste segregation practices

The hospital IPs and other participants reported the generated healthcare wastes were not segregated according to their types as per the WHO guidelines. As a senior IP physician described,

> Healthcare providers did not segregate hazardous waste from general waste stream; they just store all together (the hazardous and the non-hazardous) in one primary containment vessel without any segregation. This is one of the challenges to practice IPC properly.

The midwife from delivery ward and both the general and IP nurses explained why staffs did not segregate the healthcare wastes according to their types. According to them, staff tiredness/weakened, workload, high number of delivery, forgetting, students practicing in the hospital and lack of behavior

change and non-existence of the culture of medical waste segregation were the reasons of not practicing of waste segregation.

4. DISCUSSION

In this study the majority of the barriers and facilitators were mapped to the environment, organization and responsibility components of SEIPS. To date, as to our knowledge, there has been no published research on barriers for IPC program implementation failure in Ethiopia, and there has been few such researches conducted in other developing countries. So this work explored IPC barriers qualitatively, allowing participants to give an account of the barriers they encountered. To better interpret these findings, the major reported barriers are discussed into the following categories under the components.

4.1 Barriers related to lack of knowledge and training for health professionals

The hindrance of HAIs involves a structured educational and training program in all healthcare facilities. Ongoing education in the area of infection control is necessary. Healthcare workers need to be aware of new scientific innovations in the area of IPC. Lack of expertise, knowledge and training on contemporary IPC are a widespread challenge in developing countries, especially in Africa (Pilsczek, 2009). In Ethiopia, IPC is not well educated under medical education. Hospitals have limited access to internet and healthcare professionals lack updated clinical guidelines and books in the national and local languages. Materials, manpower, trainings, policies and guidelines are needed to promote IPC practices. Tutoring and training of leading edge personnel is a key to ensuring achievement and winning implementation of IPC practices (Smith et al., 2008). As explored by the participants in this study, lack of knowledge and training were perceived by participants to hinder information delivery and limit their ability to successfully implement and stick to IPC processes. Training was not given to both housekeeping staffs and the health professionals regarding to IPC in the hospital. This showed that a low priority has been given to IPC practices among hospital managers, IPC departments and healthcare professionals.

As comprehensible policies and guidelines and active prop up for training appear to be vital determinants of effective practice and successful adjust for IPC (Sarma & Ahmed, 2010), Arba Minch Hospital, (Ethiopia) needs to build up IPC training and education policy together with

institutional mechanisms for sustaining incessant professional advance. Even though there are national infection prevention guidelines for healthcare facilities in Ethiopia (FMoH & CDC, 2016), weak leadership at the policy level, weak managers at hospital level and limited resources has resulted in breakdown to implement the national infection prevention guidelines effectively. The hospital level IPC committee does not function well; the IPC regulations and guidelines lack clear metaphors of the roles and responsibilities of each involved individual/stakeholders in IPC at hospital level.

4.2 Barriers associated with poor budget and lack of resources

A lack of resources for IPC is a major challenge for resource limited developing countries (Pittet et al., 2008). Developing a program to prevent HAI in a country like Ethiopia is extremely difficult because of the intricate infrastructure of the health system and limited resources available for primary prevention. Although the IPC program happening focus largely on the MoH hospitals, it formed demand and pressure in Ethiopia from all other types of hospitals such as private hospitals. The overall budget allocated for healthcare in Ethiopia is inadequate. While developed countries spend 8 to 16% of Gross Domestic Product (GDP) for healthcare in 2010 (WHO, 2011b), in 2014, health expenditure as a share of GDP for Ethiopia was 4.9%. Though Ethiopia health expenditure as a share of GDP fluctuated substantially (Knoema, accessed on January 01/2018.).

Scantiness or lack of IPC products, hand disinfectants, PPE, and normal availability of clean water supply are significant barriers for the implementation of valuable IPC programs in developing countries (Alp & Damani, 2015), were also the barriers in this study too. The major barriers in implementing IPC in this study were: the IPC team and program in the hospital were not effective due to shortage of resources and availability of properly trained IPC personnel, lack of financial support to set up IPC programs, not having IPC infrastructure and even if the IPC infrastructure was established to some extent, the guidelines adopted were those published by high-income countries, and were not applicable.

4.3 Low priority is given to infection prevention and control

In Ethiopia, there is no inclusive research that presents the entire picture about HAIs in hospitals. Majorities of the studies available on HAIs are originated from hospitals in the industrial and

developed nations. Somewhat few data on HAI epidemic situation are available from Ethiopia, and most studies focused on only surgical site infections. Yet, other statistics on hand hygiene facilities and hand-hygiene compliance, disinfection and sterilization practices, occupational exposure and infection levels, financial allocation for HAIs are not available for decision makers (Yallew, Kumie, & Yehuala, 2016). Hence, an absence of inclusive and valid statistics may cause obscurity for decision makers when mitigating resources for infection prevention activities and it leads masking of IPC problems from decision makers. Therefore, it is significant for IPC personnel to produce evidence for decision makers, so that IPC practice receives more attention and resources.

Similar to this findings, poor infrastructure (including poor hand hygiene facilities), insufficient equipment including PPEs, scarcity of knowledge and training, poor healthcare waste management practices, poor funding and overcrowding were reported as common barriers to effective implementation of IPC in Mongolia and in many developing countries (Ider et al., 2012; Raza et al., 2004). In reply, "straightforward, low-cost, high-impact IPC strategies, such as hand-hygiene improvement programmes and simplified process surveillance have been suggested by several authors" (Damani, 2008, 2007). Nonetheless, without essential training of front-line personnel, administrative prop up and provision of essential resources, it is impracticable to apply these recommendations (Borg, 2010; Scheckle et al., 1998). As a result, actions with logistical, didactic and administration components that are precise to local conditions need to be considered and implemented in Ethiopia in general and in Arba Minch General Hospital specifically. A training program is also required, but it alone is not sufficient. Completion of comprehensive IPC programs and HAI care package are required for victory. This study has the following main limitations. Due to resource constraints, the data translation, transcription, coding and quotation selection processes were performed by a single researcher.

The finding of this study is based on interviews with eight participants, and is limited to one geographical area. The results of this study reveal variety in views and experiences; we also triangulated data sources and subject in order to strengthen the validity of the results, although we are unable to determine to what extent different factors are significant barriers or facilitators in other contexts. The study examined issues mainly from the participants' perceptions and there is an obvious need to complement and extend the work presented with large scale mixed-method

investigations that can provide data and findings on a national scale and with statistical significance. But we tried to study the entire organization to obtain a more comprehensive picture of some aspects of the complex phenomena of IPC. More detailed research will be needed in each area of infection prevention and control, including hand hygiene, disinfection and sterilization, occupational health, healthcare waste management, infection control training and education and IPC workload to fully understand all of the issues related to IPC implementation.

5. CONCLUSIONS

This qualitative analysis of barriers and facilitators to infection prevention and control (IPC) revealed that healthcare professionals face numerous challenges in successfully implementing IPC practices. The key barriers identified included poor environmental and structural design of healthcare facilities, overcrowding, insufficient handwashing facilities, budget constraints, inadequate knowledge and training, limited availability of personal protective equipment (PPE), poor-quality PPE, lack of safety boxes and appropriate waste storage containers, inexperienced new clinical staff, high workload, inadequate disinfection and sterilization practices, and suboptimal healthcare waste segregation.

On the other hand, key facilitators for effective IPC included the establishment of IPC committees and the assignment of designated nurses, physicians, and sanitarians to oversee and promote IPC practices.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

MKD participated in the coordination of the study, performed the data analyses and drafted the manuscript. MT and BM were conceived of the study, participated in its design and coordination, and helped to draft the manuscript. All authors read and approved the final manuscript.

Competing interest

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethical approval and consent to participate

Ethical clearance for the proposed study was granted by the Institutional Review Board of the College of Medicine and Health Sciences, Arba Minch University (Reference number: CMHS/4215/111). Permissions were also secured from the hospital manager and medical director. Written informed consent was obtained from all participants prior to their involvement in the study. To ensure confidentiality, participant names were excluded from the data collection process, and all gathered information was coded for anonymity. The collected data were accessible only to the investigators, and strict measures were taken to maintain confidentiality throughout the study.

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REFERENCES

Alp, E., & Damani, N. (2015). Healthcare-associated infections in Intensive Care Units: epidemiology and infection control in low-to-middle income countries. *J Infect Dev Ctries, 9*(10), 1040-1045.

Backman, C., Marck, P., Krogman, N., Taylor, G., Sales, A., Bonten, M., & Gigengack-Baars, A. C. M. (2012). Barriers and bridges to infection prevention and control: results of a qualitative case study of a Netherlands' surgical unit. *BMJ Open*.

Barker, A. K., Brown, K., Siraj, D., Ahsan, M., Sengupta, S., & Safdar, N. (2017). Barriers and facilitators to infection control at a hospital in northern India: a qualitative study. *Antimicrobial Resistance & Infection Control, 6*, 1-7.

Bates, D. W., Larizgoitia, I., Prasopa-Plaizier, N., & Ashish K Jha. (2009). Global priorities for patient safety research. *British Medical Journal, 338*(b1775).

Borg, M. A. (2010). Prevention and control of healthcare associated infections within developing countries. *Int J Infect Control, 6*.

Burke, J. P. (2003). Infection control - a problem for patient safety *New England Journal of Medicine, 348*, 651-656

Carayon, P., Hundt, A. S., Karsh, B., Gurses, A. P., Alvarado, C., Smith, M., & Brennan, P. F. (2006). Work system design for patient safety: the SEIPS model. *BMJ Quality & Safety, 15*(suppl 1), i50-i58.

Damani, N. (2008). Surveillance in countries with limited resources. *Int J Infect Contr, 4*, 1-4.

Damani, N. (2007). Simple measures save lives: An approach to infection control in countries with limited resources. *J Hosp Infect, 65*, 151-154.

FMoH, & CDC. (2016). Infection prevention guidelines for healthcare facilities in Ethiopia. *Federal Ministry of Health of Ethiopia, Addis Ababa, Ethiopia*.

Ider, B.-E., Adams, J., Morton, A., Whitby, M., & Clements, A. (2012). Perceptions of healthcare professionals regarding the main challenges and barriers to effective hospital infection control in Mongolia: a qualitative study. *BMC Infectious Diseases, 12*(170).

Knoema. (accessed on January 01/2018.). Ethiopia - Total health expenditure as a share of GDP. *World Data Atlas, https://knoema.com/atlas/Ethiopia/Health-expenditure-as-a-share-of-GDP*.

Pilsczek, F. H. (2009). Infection control in developing countries: Phnom Penh and Kabul. *Am J Infect Control, 37*, 81-82.

Pittet, D., Allegranzi, B., Storr, J., Nejad, S., Dziekan, G., Leotsakos, A., & Donaldson, L. (2008). Infection control as a major World Health Organization priority for developing countries. *J Hosp Infect, 68*, 285-292.

Raza, M. W., Kazi, B. M., Mustafa, M., & Gould, F. K. (2004). Developing countries have their own characteristic problems with infection control. . *J Hosp Infect, 57*, 294-299.

Safdar, N., Musuuza, J. S., Xie, A., Hundt, A. S., Hall, M., Wood, K., & Carayon, P. (2016). Management of ventilator-associated pneumonia in intensive care units: a mixed methods study assessing barriers and facilitators to guideline adherence. *BMC Infectious Diseases, 16*(349).

Sarma, J. B., & Ahmed, G. U. (2010). Infection control with limited resources: why and how to make it possible? . *Indian J Med Microbiol, 28*, 11-16.

Scheckle, W. E., Brimhall, D., Buck, A. S., Farr, B. M., Friedma, C., Garibaldi, R. A., . . . Hierholze, W. J. (1998). Requirements for Infrastructure and Essential Activities of Infection Control and Epidemiology in Hospitals: A Consensus Panel Report *Am J Infect Control, 26*, 47-60.

Smith, P. W., Bennett, G., Bradley, S., Drinka, P., Lautenbach, E., Marx, J., . . . Stevenson, K. (2008). SHEA/APIC Guideline: infection prevention and control in the long-term care facility. *Am J Infect Control, 36*(7), 504.510.1086/593114 [PubMed: 18786461]

Ulrich, R. (2004). The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity. *The Center for Health Design*.

WHO. (2004). Practical Guidelines for Infection Control in Health Care Facilities. *WHO. SEARO Regional Publication, 41*.

WHO. (2011a). Report on the burden of endemic health care-associated infection worldwide. . *Geneva; WHO Press*.

WHO. (2011b). World Health Organization: World health statistics. *Geneva: WHO Press*.

WHO. (accessed on december 23/2017). Patient Safety: Health care-associated infections fact sheet. *(Internet) available on http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf*.

Yallew, W. W., Kumie, A., & Yehuala, F. M. (2016). Point prevalence of hospital-acquired infections in two teaching hospitals of Amhara region in Ethiopia. *Drug, Healthcare and Patient Safety, 8*, 71-76.

Yanke, E., Zellmer, C., Hoof, S. V., Moriarty, H., Carayon, P., & Safdar, N. (2015). Understanding the current state of infection prevention to preven clostridium difficile infection: a human factors and systems engineering approach. *Am J Infect Control, 43*(3), 241-247.