

Research Article

An Evaluation of Factors Impeding Adherence to Established Hand Hygiene Protocols Among Medical Students at Three University Teaching Hospitals in Zambia

Christopher Nyirenda^{1*}, Toshiki M Kuchebe¹, Sebastian Chinkoyo¹, Mabvuto Zulu², Kennedy Gondwe²

¹Copperbelt University School of Medicine & Ndola Teaching Hospital, Department of Clinical Sciences, Ndola, Zambia.

²Copperbelt University School of Medicine & Kitwe teaching Hospital, Department of Clinical Sciences Kitwe, Zambia.

Received: 10 January, 2024 **Accepted: 14 February, 2024** **Published: 18 February 2024**

Abstract:

Objective: To assess the obstacles affecting compliance with established hand hygiene protocols among medical students at university teaching hospitals

Design and Methods: The study was conducted at Ndola Teaching Hospital, Kitwe Teaching Hospital, Copperbelt University Dental Clinic, and Arthur Davidson Children's Hospital, serving as training sites for medical students at Copperbelt University School of Medicine in Zambia. The target population were Bachelor of Medicine and Bachelor of Surgery (MBChB) and Bachelor of Dental Surgery (BDS) students in their clinical years. The research employed a cross-sectional descriptive questionnaire-based study to evaluate the factors hindering compliance to hand hygiene protocols. A non-probability quota sampling technique was applied, stratifying participants by clinical year for a comprehensive representation.

Results: The sample was derived from a population of 497 students, using EpiInfo Build Number 1.4.3 at a confidence level of 95%, an expected value of 50% and a confidence limit of 5%. A required sample of 217 was needed and factoring in an assumed response rate of 70%, at least 300 questionnaires were distributed in which there was a response rate of 81% resulting in a sample size of 244. Lack of facilities was the major self-reported factor limiting compliance at 50.4%, lack of knowledge and facilities at 17.2%, lack of knowledge at 10.2% and a personal failure to adherence at 9.8% while 12.3% reported no factors.

Conclusion: A multi-faceted approach that combines improvements in facilities, educational initiatives, and addressing individual attitudes is essential for enhancing hand hygiene practices. By addressing the identified barriers comprehensively, healthcare settings and individuals can collectively contribute to effective infection prevention.

Key words: Hand hygiene, Impeding factors, Adherence, Medical students.

1.0 Introduction

1.1 Background to the problem

The Copperbelt University School of Medicine is a public university providing medical and paramedical training based in the Copperbelt Province of Zambia. It offers undergraduate and postgraduate academic clinical programs in 4 main disciplines namely, Internal Medicine, Surgery, Obstetrics and Gynecology and Pediatrics & Child Health. Students in their clinical years of study conduct their rotations at the 3 teaching hospitals in the province namely Ndola Teaching Hospital, Kitwe Teaching Hospital and Arthur Davidson Children's Hospital. The undergraduate students spend three years conducting their clinical rotations where they work in the hospital and attend to patients under the tutelage of qualified health personnel.

Hospital acquired infections and Infection prevention

Hospital acquired infections (HAIs), also called nosocomial

infections are defined as infections that occur within forty-eight hours of admission or within three days of discharge or within thirty days of an operation [1]. Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections [2]. Disparities exist in the burden of nosocomial infections but the prevalence exists in both developed and developing hospitals, however healthcare associated infections have a higher incidence in developing countries with far more damaging effects on patients and healthcare systems [3].

Infection prevention and control affects all aspects of health care, including hand hygiene, surgical site infections, injection safety, antimicrobial resistance and how hospitals operate during and outside of emergencies [2]. The major factors that lead to the development of such infections depend on the infectious agent e.g., virulence, resistance etc., the host e.g., geriatric, malnourished, debilitated, immunosuppressed etc. as well as the environment e.g., prolonged hospitalization,

invasive procedures, ventilation etc. [4]. The most common of the nosocomial infections in low-income countries are Surgical Site Infections (SSI), Urinary Tract Infections (UTI) and Lower Respiratory Tract Infections (LRTI).

In developing countries, the prevalence of HAIs is generally higher despite difficulty in acquiring surveillance data owing to poor health systems in developing nations. However, the prevalence was reported to average 10.1% and, in some countries, reaching as high as 18.7% as is the case for Mali. The incidence in developing countries was at least 3 times higher compared to developed countries [3].

An overview of hand hygiene

Hand hygiene is an important aspect of infection prevention and control in healthcare settings and daily life. It involves the removal or destruction of microorganisms from the hands to prevent the transmission of infections. Proper hand hygiene helps reduce the risk of spreading pathogens between individuals, particularly in healthcare settings where patients may be more susceptible to infections. Key components of hand hygiene include handwashing with soap and water or using alcohol-based hand sanitizers. The World Health Organization (WHO) and various health agencies worldwide provide guidelines and protocols for effective hand hygiene practices [4, 5, 6].

The frequently isolated organisms from hands and gloves of health care workers are gram-negative bacilli, *Staphylococcus Aureus*, *Enterococci* and *Clostridium Difficile*. These organisms are further found on infected and draining wounds, on patient skin, linen, furniture, and objects near patients. In the absence of proper hand hygiene as well as defective hand cleansing, evidence suggests that hands become the primary driver of nosocomial infections, however compliance with hand hygiene is inadequate among health care workers [4].

The World Health Organization in the module of Patient Safety has emphasized the need to equip health students with knowledge and skills that will prepare them for safer practice. Our study outcomes can be used as a basis to inform medical students and health workers in general on the recommended hand hygiene measures designed to reduce the incidence of HAIs and to make necessary amendments to the curriculum. Particularly, to evaluate the possibility of initiating education on infection prevention prior to clinical rotations, as suggested by Ali Ibrahim [7].

1.2 Literature Review

The WHO considers failure to adhere to hand hygiene as one of the leading causes of Hospital Acquired Infections; a meta-analysis by the organization into at least 20 hospitals showed a reduction in infection rates as well as transmission rates upon implementation of interventions [4].

There is significant evidence to suggest that hospital acquired infection can be drastically reduced with proper infection prevention practice. This in turn helps alleviate the cost in both time and resources needed to treat them and more importantly it reduces mortality and morbidity [7]. It has also been documented and highlighted by the World Health Organization

the importance in preparing students for infection prevention practice as it sets a good foundation for future practice.

Literature on infection prevention among medical students is limited in the local and developing setting, perhaps a reflection of the attention paid to this critical area ignoring the fact that it affects undeveloped countries the most, with systems most frequently already under stress.

In a study conducted among final year medical and nursing students in Sri Lanka, it was found that while students possessed moderate knowledge about hand hygiene, there was a significant deficiency in understanding the sources of infection and modes of transmission. Specifically, only 35% of medical students were aware that effective antiseptic hand rubbing requires a minimum of 20 seconds. Overall, the study revealed poor and unsatisfactory responses regarding infection prevention, indicating serious knowledge gaps among the students. The conclusion emphasized the imperative to enhance existing training programs to address these knowledge gaps, improve attitudes and practices, and ultimately enhance compliance among students and future healthcare workers [8]. In another study it was demonstrated that regular seminars underscoring the significance of handwashing proved to be an effective method for enhancing compliance [9]. Similarly, a study conducted on final year students in India showed that less than 50% of the medical students received any formal instruction in infection prevention suggesting a need to have training programs or workshops on aspects of infection prevention [10].

A research investigation carried out among health students from the University of Ghana, situated at a teaching hospital in Accra, revealed that students primarily acquired influential knowledge about nosocomial infections through formal classroom training rather than rotations. The study indicated that the level of understanding regarding nosocomial infections and isolation precautions was moderate, prompting a recommendation for a curriculum review that prioritizes practical attention to infection control throughout the course of study [11].

In Malawi, a nation with a high burden of infectious diseases, there is acknowledgment of the imperative to prevent infections within healthcare settings, with an emphasis on hand hygiene as a highly effective preventive measure. A study conducted at a teaching hospital in Malawi, involving both qualified clinicians and medical students, revealed that compliance with hand hygiene was notably low in both groups. This deficiency was attributed to a lack of knowledge, further exacerbated by the challenges of a busy and understaffed healthcare system [12].

The Infection Prevention Unit at Ndola Teaching Hospital conducts audits covering various aspects of infection prevention, including hand hygiene. The latest available audit reports, from the year 2016, focused on healthcare personnel, including doctors, nurses, student doctors, student nurses, and clinical officers. The findings concluded that compliance with hygiene protocols was below the standard, with particular emphasis on indications for hand hygiene [13].

2.0 Research design and Methods

The study was conducted on students rotating at Ndola Teaching Hospital, Kitwe Teaching Hospital, Copperbelt University Dental Clinic and Arthur Davidson Children’s Hospital. The institutions serve as training sites for medical students at the Copperbelt University School of Medicine. The Copperbelt University is the second highest institution of learning in Zambia. At the time of study, the university had medical students training at the aforementioned 3 training sites. The target population of the study were students pursuing a Bachelor of Medicine and Bachelor of Surgery (MBChB) as well as Bachelor of Dental Surgery (BDS) and in their clinical years where most of their training is conducted within the hospital setting. This is the population of students that is exposed to clinical work and thus require the knowledge and skills of infection prevention.

The study was a cross-sectional descriptive questionnaire-based study primarily designed to assess the knowledge, attitude and practice pertaining to hand hygiene. However, the focus and aim in this research article is to evaluate the impeding factors affecting compliance with established hand hygiene protocols among medical students at three university teaching hospitals. The sample size was calculated based on the population of students in each intake.

The study employed a non-probability quota sampling technique. The participants were stratified according to clinical year of study and then a suitable quota based on the size of students per year was sampled. The applied sampling technique allowed for a comprehensive representation of the study population. The data collected was analyzed using IBM’s Statistical Product and Service Solutions (SPSS) Software Version 26. Ethical approval was sought from the Tropical Diseases Research Centre Ethics Review Committee. Every participant in the study was informed of their anonymity and the tenets of ethics including confidentiality and informed consent were upheld.

3.0 Results

The study utilized a sample obtained from a pool of 497 students, employing EpiInfo Build Number 1.4.3, with a confidence level of 95%, an expected value of 50%, and a confidence limit of 5%. A minimum sample size of 217 was determined, considering an assumed response rate of 70%. Consequently, 300 questionnaires were distributed, anticipating a 70% response rate. However, the actual response rate was 81%, yielding a final sample size of 244.

For the baseline characteristics of the study population, refer to table 1.

Table 1. Baseline characteristics

Characteristic	Attribute	Frequency	Percentage of Total
Year of Study	4 th	49	20.1
	5 th	162	66.4
	6 th	33	13.5
Age	18-24	133	54.5
	25-29	96	39.3
	30-34	15	6.1
Rotations completed	1	46	18.9
	2	6	2.5
	3	48	19.7
	4	78	32
	5	27	11.1
	6	33	13.5
	7	3	1.2
	9	3	1.2
	Gender	Males	157
Females		87	35.7
Previous Clinical Studies	None	211	86.5
	Clinical Experience	33	13.5

The predominant self-reported factor hindering compliance was a lack of facilities (50.4%), followed by a combination of lack of knowledge and facilities (17.2%), lack of knowledge alone (10.2%), and personal failure to adhere (9.8%). A notable portion (12.3%) reported no specific factors influencing their compliance. The outcomes are as depicted in table 2 and figure 1.

Table 2. Factors limiting compliance

Characteristic	Frequency	Percent	Cumulative Percent
Failure of Adherence	24	9.8	9.8
Lack of Facilities	123	50.4	60.2
Lack of Knowledge	25	10.2	70.5
Lack of Knowledge and Facilities	42	17.2	87.7
None	30	12.3	100

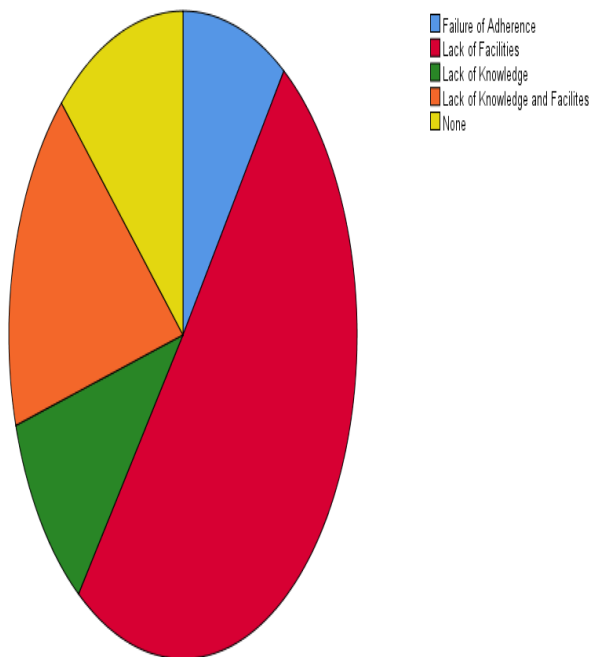


Figure 1: Factors limiting compliance

4.0 Discussion

The finding that a deficiency in facilities serves as the primary driver for non-compliance with hand hygiene protocols aligns with outcomes of a study conducted in Malawi among clinicians and medical students. In that study, personal failure due to forgetfulness emerged as a significant reason contributing to a substantial proportion, whereas failure of adherence accounted for only 9% of the reasons [12]. This observation also finds support in a study involving Polish medical students, where the absence of facilities and empty dispensers was cited as a major hindrance [14].

Similarly, the finding that there is no correlation between knowledge and actual practices corresponds with a study involving medical students in the USA. This study revealed that factors other than knowledge deficiency influenced compliance, with issues like personal failure due to forgetfulness, lack of role models, and insufficient time playing significant roles. Interestingly, the availability of facilities was not prominently mentioned as a reason for non-compliance [15]. This stands in contrast to a study conducted among medical students in India, which concluded that knowledge had a direct association with practices. The study emphasized the frequency of handwashing as a crucial parameter in evaluating practice [16].

The environment in which medical students undergo clinical clerkship significantly influences the development of their behaviors and attitudes. This underscores the crucial role of role models in shaping behavioral adjustments, as medical students tend to mold their practices based on the actions of the senior doctors they observe.

Having a staff with good knowledge and attitudes toward hand hygiene is insufficient; it is also imperative to provide adequate facilities that enable students and clinical staff to implement infection prevention measures. Prolonged institutional inadequacies have the potential to negatively impact people's behaviors and attitudes, leading to a persistent disregard for

infection prevention protocols even when these inadequacies are addressed. Despite financial challenges faced by the institution, ensuring the availability of hand hygiene facilities must remain a priority, as the overt consequences of poor hand hygiene ultimately cost the hospital more than the investment needed for prevention.

Further, studies are necessary to assess the behavioral patterns of both medical students and qualified clinicians concerning infection prevention. This research will contribute to a better understanding of areas that require attention, ultimately enhancing patient safety and improving efficiency within the health system.

5.0 Conclusion

The primary self-reported factor hindering compliance with hand hygiene protocols among the surveyed participants was the absence of adequate facilities, followed by a combination of insufficient knowledge and facilities. The least factor was the acknowledgement of personal lapses in adherence. Therefore, a multi-faceted approach that combines improvements in facilities, educational initiatives, and addressing individual attitudes is essential for enhancing hand hygiene practices. By addressing the identified barriers comprehensively, healthcare settings and individuals can collectively contribute to effective infection prevention.

6.0 Acknowledgements

Appreciation goes to all the study participants and hospital managements at the respective training sites.

7.0 Conflict of Interest

The authors declare that there was no conflict of interest regarding the publication of the manuscript.

8.0 Financial Support

The authors declare that there was no financial support or benefits from commercial sources for the work reported in the manuscript.

9.0 Author contributions

The concept, design, analyses and interpretation of study findings were conducted by Nyirenda C and Kuchebe T. All coauthors contributed towards the content, review and ultimate write-up of the manuscript

References:

1. Inweregbu, K., Dave, J. & Pittard, A., 2005. Nosocomial Infections. *Continuing Education in Anesthesia Critical Care & Pain*, 5(1), pp. 14-17.
2. World Health Organization (2024). *Infection Prevention and Control* infection prevention and control GLOBAL (who.int)
3. Allegranzi, B. et al., 2011. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *The Lancet*, 337(9761), pp. 228-241.
4. WHO, 2009. *WHO Guidelines on Hand Hygiene in Health Care*. Geneva: World Health Organization.

5. Centers for Disease Control and Prevention (CDC). (2019). Hand Hygiene in Healthcare Settings.
6. Pittet, D., Allegranzi, B., Sax, H., Bertinato, L., Concia, E., & Cookson, B. (2006). Considerations for a WHO European strategy on health-care-associated infection, surveillance, and control. *The Lancet Infectious Diseases*, 6(10), 652-657.
7. Ibrahim, A. A. & Elshafie, S. S., 2016. Knowledge, awareness, and attitude regarding infection prevention and control among medical students: a call for educational intervention. *Advances in Medical Education and Practice*, 7(5), pp. 505-510.
8. Ariyaratne, M. et al., 2013. Knowledge, attitudes and practices of hand hygiene among final year medical and nursing students at the University of Sri Jayewardenepura. *Sri Lankan Journal of Infectious Diseases*, 3(1), pp. 15-25.
9. Clark, R. J. & Storr, J., 2016. Hand Hygiene and Compliance in Health Workers. *Journal of Hospital Infection Prevention*, Volume 64, pp. 205-209.
10. Chauhan, K., 2017. Knowledge Attitude and Practice towards Infection Control Measures amongst Medical Students in a Medical Teaching Tertiary Care Hospital. *International Journal of Clinical Medicine*, 8(9).
11. Bello, A. et al., 2011. Nosocomial Infections: Knowledge and Source of Information among Clinical Health Care Students in Ghana. *International Journal of Medicine*, 2147(10), pp. 571-574.
12. [12] Kalata, N., Kamange, L. & Muula, A., 2013. Adherence to hand hygiene protocol by clinicians and medical students at Queen Elizabeth Central Hospital, Blantyre-Malawi. *Malawi Medical Journal*, 25(2), pp. 50-52.
13. Ndola Teaching Hospital, Infection Prevention Unit, 2016. An audit on compliance with hygiene protocols
14. Kawalec, A., Kawalec, A. & Pawlas, K., 2014. Compliance with Hygiene Procedures among Medical Faculty Students. *International Journal of Environmental and Public Health*, 65(5), pp. 593-599.
15. Birnbach, D. J., Rosen, L. F., Fitzpatrick, M. & Arheart, K. L., 2019. Current Hand Hygiene Education is Suboptimal. *The Clinical Teacher*, 16(6), pp. 589-592.
16. Dutta, G., Singh, G. & Kumar, T., 2020. Knowledge and practice of hand hygiene among undergraduate students and junior doctors in the regional institute of medical sciences, Imhal. *Journal of Family Medicine and Primary Care*, 9(9), pp. 4741-4746.

Copyright (c) 2024 The copyright to the submitted manuscript is held by the Author, who grants the Clinical Medicine and Health Research Journal a nonexclusive license to use, reproduce, and distribute the work, including for commercial purposes.



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)