Int. j. adv. multidisc. res. stud. 2025; 5(4):627-634

Received: 02-06-2025
Accepted: 12-07-2025

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Empirical Treatment for Hospital Acquired infection in Sudanese Hospital (O mdurman Teaching Hospital): Cross Sectional Study

Dr. Mazin Mohamed
Department of Pharmacy, KGH Hospital, Dublin, Ireland

DOI: https://doi.org/10.62225/2583049X.2025.5.4.4654
Corresponding Author: **Dr. Mazin Mohamed**

Abstract
This research investigates the implementation of international guidelines in empirical treatment of hospital acquired infection in Sudanese hospitals. The research employs the survey design in order to obtain data concerning the current situation and where possible, to draw valid conclusions from the data analysis. Further, survey design allows identifying whether Sudanese hospitals implement NICE guidelines in the E.T or not. In order to achieve this objective, the study utilizes quantitative and experiment approach. .The target population comprise the, Clinicians in Hospital in Omdurman area, the sample of the research was the hospitals in Omdurman area with the same sterilization techniques and water source, all clinicians that admit/follow up patients in Omdurman area hospitals. Data was collected using a questionnaire by distributed 45 questionnaires to 3 hospitals and laboratory techniques that tests 14 samples. The collected data was analysed using quantitative techniques, such as descriptive statistics.

Keywords: Hospital Acquired Infection, Empirical Treatment, Hospital, Omdurman-Khartoum, Nice Guidelines , Guidelines

1. Introduction

1.1 Background

This chapter aims to view the literature about hospital-acquired infections reflecting its definition and its understanding. Also highlight on the international guidelines in empirical treatment of hospital acquired infection.

1.2 Concept of hospital-acquired infections

Hospital-acquired infections (HAI) are one of the main causes of morbidity and mortality in hospitalized patients at the present time, leading directly or indirectly to an enormous increase in the cost of hospital care and to the emergence of new health hazards for the community. A hospital-acquired infection can be defined as *"any clinically recognizable microbiological disease that affects the patient as a consequence of his being admitted to hospital or attending for treatment, or the hospital staff as a consequence of their work, whether or not the symptoms of the disease appear while the affected person is in the hospital"*.(WHO)

Bradly J. Hensly defined the (HAI) as *"infections that developed after 48 hours of hospitalization or stay at a health care facility that was not present or incubating at the time of admission".*

Hospital acquired infection also called A nosocomial infection that used interchangeably, which defined as "*An infection acquired in hospital by a patient who was admitted for a reason other than that infection. An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility"*. (Ducel G *et al*)

1.3 Nature of (HAI)

Such infections may be caused by micro-organisms acquired from another person in the hospital (cross-infection), acquired from an inanimate object or substance that had not been recently contaminated from a human source (environmental infection), or carried by the patient before the appearance of the hospital-acquired disease (self-infection). It is reasonable to regard theself-infection of a patient, whether the causative organism was carried by the patient before admission to hospital or

acquired subsequently, as hospital-acquired if the development of disease can be attributed to a procedure performed in hospital.

The microbial diseases acquired in hospital are extremely varied, but most of them fall into one of three groups:

1. Septic infection ("sepsis") is usually characterized by local acute inflammation, with or without the presence of pus, and includes infections of wounds and of the respiratory and urinary tracts; the infection may become generalized ("septicaemia") and metastatic septic lesions may appear elsewhere in the body; less often, septicaemia or a metastatic lesion may appear without an initial septic lesion at the point of entry of the microbe.
2. Dia"hoeal disease; and
3. "Conventional" infectious fevers such as measles or influenza. The pattern of hospital-acquired infection depends on a number of factors in the structure, organization, and activities of the hospital. (Benenson 1995)

1.4 Occurrence of HAI

Infections occur worldwide and affect both developed and resource-poor countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. They are a significant burden both for the patient and for public health. A prevalence survey conducted under the auspices of WHO in 55 hospitals of 14 countries representing 4 WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific) showed an average of 8.7% of hospital patients had nosocomial infections. At any time, over 1.4 million people worldwide suffer from infectious complications acquired in hospital. (Tikhomirov E. 2000)

The most frequent occurrence nosocomial infections are infections of surgical wounds, urinary tract infections and lower respiratory tract infections. The WHO study, and others, have also shown that the highest prevalence of nosocomial infections occurs in intensive care units and in acute surgical and orthopaedic wards. Infection rates are higher among patients with increased susceptibility because of old age, underlying disease, or chemotherapy. (Mayon-White RT *et al*. 2003).

1.5 Factors influencing the development of nosocomial infections/ HAI

There are several factors that contributed to develop and spread the HAI, these factors are:

1. The microbial agent:

The patient is exposed to a variety of microorganisms during hospitalization. Contact between the patient and a microorganism does not by itself necessarily result in the development of clinical disease, other factors influence the nature and frequency of nosocomial infections. The likelihood of exposure leading to infection depends partly on the characteristics of the microorganisms, including resistance to antimicrobial agents, intrinsic virulence, and amount (inoculum) of infective material.

Many different bacteria, viruses, fungi and parasites may cause nosocomial infections. Infections may be caused by a microorganism acquired from another person in the hospital (cross-infection) or may be caused by the patient's own flora (endogenous infection). Some organisms may be acquired from an inanimate object or substances recently contaminated from another human source (environmental infection).

2. Patient susceptibility:

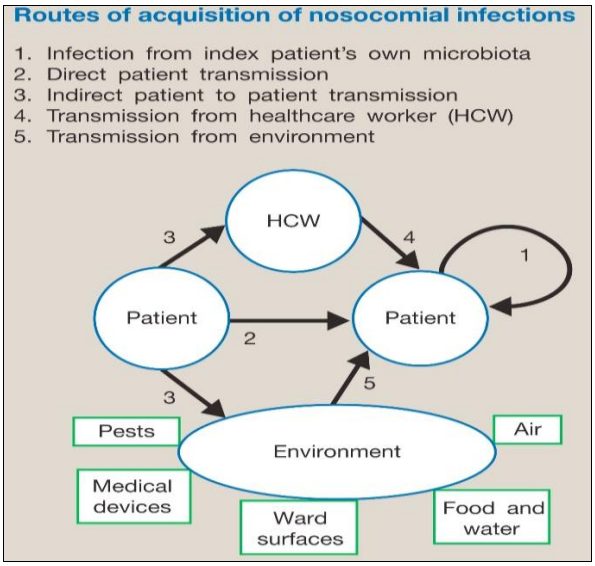
Important patient factors influencing acquisition of infection include age, immune status, underlying disease, and diagnostic and therapeutic interventions. The extremes of life — infancy and old age — are associated with a decreased resistance to infection. Patients with chronic disease such as malignant tumours, leukaemia, diabetes mellitus, renal failure, or the acquired immunodeficiency syndrome (AIDS) have an increased susceptibility to infections with opportunistic pathogens.

3. Environmental factors:

Health care settings are an environment where both infected persons and persons at increased risk of infection congregate. Patients with infections or carriers of pathogenic microorganisms admitted to hospital are potential sources of infection for patients and staff. Patients who become infected in the hospital are a further source of infection. Crowded conditions within the hospital, frequent transfers of patients from one unit to another, and concentration of patients highly susceptible to infection in one area (e.g. new-born infants, burn patients, intensive-care) all contribute to the development of nosocomial infections.

4. Bacterial resistance:

Many patients receive antimicrobial drugs. Through selection and exchange of genetic resistance elements, antibiotics promote the emergence of multidrug resistant strains of bacteria; microorganisms in the normal human flora sensitive to the given drug are suppressed, while resistant strains persist and may become endemic in the hospital. The widespread use of antimicrobials for therapy or prophylaxis (including topical) is the major determinant of resistance. Antimicrobial agents are, in some cases, becoming less effective because of resistance. As an antimicrobial agent becomes widely used, bacteria resistant to this drug eventually emerge and may spread in the health care setting. (Kirkland KB *et al*. 1999)



1.6 Nosocomial infection sites

1. Urinary infections:

This is the most common nosocomial infection; 80% of infections are associated with the use of an indwelling bladder catheter (1,2,3). Urinary infections are associated with less morbidity than other nosocomial infections, but

can occasionally lead to bacteraemia and death. Infections are usually defined by microbiological criteria: positive quantitative urine culture (≥105 microorganisms/ml, with a maximum of 2 isolated microbial species). The bacteria responsible arise from the gut flora, either normal (Escherichia coli) or acquired in hospital (multiresistant Klebsiella).

2. Surgical site infections:

Surgical site infections are also frequent: the incidence varies from 0.5 to 15% depending on the type of operation and underlying patient status (18,19,20). These are a significant problem which limit the potential benefits of surgical interventions. The impact on hospital costs and postoperative length of stay (between 3 and 20 additional days) (21,22,23,24) is considerable.

3. Nosocomial pneumonia:

Nosocomial pneumonia occurs in several different patient groups. The most important are patients on ventilators in intensive care units, where the rate of pneumonia is 3% per day. There is a high casefatality rate associated with ventilator-associated pneumonia, although the attributable risk is difficult to determine because patient comorbidity is so high. Microorganisms colonize the stomach, upper airway and bronchi, and cause infection in the lungs (pneumonia): they are often endogenous (digestive system or nose and throat), but may be exogenous, often from contaminated respiratory equipment.

4. Nosocomial bacteraemia:

These infections represent a small proportion of nosocomial infections (approximately 5%) but case fatality rates are high — more than 50% for some microorganisms. The incidence is increasing, particularly for certain organisms such as multi-resistant coagulase-negative Staphylococcus and Candida spp. Infection may occur at the skin entry site of the intravascular device, or in the subcutaneous path of the catheter (tunnel infection). Organisms colonizing the catheter within the vessel may produce bacteraemia without visible external infection. The resident or transient cutaneous flora is the source of infection. The main risk factors are the length of catheterization, level of asepsis at insertion, and continuing catheter care.

5. Other nosocomial infections:

These are the four most frequent and important nosocomial infections, but there are many other potential sites of infection. For example:

- Skin and soft tissue infections: open sores (ulcers, burns and bedsores) encourage bacterial colonization and may lead to systemic infection.
- Gastroenteritis is the most common nosocomial infection in children, where rotavirus is a chief pathogen: Clostridium difficile is the major cause of nosocomial gastroenteritis in adults in developed countries.
- Sinusitis and other enteric infections, infections of the eye and conjunctiva.
- Endometritis and other infections of the reproductive organs following childbirth. (Gastmeier P *et al*. 2003).

1.7 Infection Control Programs:

Prevention of nosocomial infections is the responsibility of all individuals and services providing health care. Everyone must work cooperatively to reduce the risk of infection for patients and staff. This includes personnel providing direct patient care, management, physical plant, provision of materials and products, and training of health workers.(Haley RW *et al*. 2000)

Each hospital needs to develop a programme for the implementation of good infection control practices and to ensure the well-being of both patients and staff by preventing and controlling HAI. The objectives of establishing such program is to help in:

1. Monitoring of hospital-associated infections.
2. Training of staff in prevention and control of HAI.
3. Investigation of outbreaks.
4. Monitoring of staff health to prevent staff to patient and patient to staff spread of infection.
5. Advice on isolation procedures and infection control measures.
6. Monitoring and advice on the safe use of antibiotics. (Schechler WE *et al*.2003)

There are several infection controls programs that are effective provided they are comprehensive and include surveillance and prevention activities, as well as staff training. There must also be effective support at the national and regional levels.

1.7.1 National or regional programs:

The responsible health authority should develop a national (or regional) program to support hospitals in reducing the risk of nosocomial infections. Such programs must:

- Set relevant national objectives consistent with other national health care objectives
- Develop and continually update guidelines for recommended health care surveillance, prevention, and practice
- Develop a national system to monitor selected infections and assess the effectiveness of interventions.
- Harmonize initial and continuing training programs for health care professionals.
- Facilitate access to materials and products essential for hygiene and safety.
- Encourage health care establishments to monitor nosocomial infections, with feedback to the professionals concerned.

1.7.2 Hospital programs:

The major preventive effort should be focused in hospitals and other health care facilities. Risk prevention for patients and staff is a concern of everyone in the facility, and must be supported at the level of senior administration. A yearly work plan to assess and promote good health care, appropriate isolation, sterilization, and other practices, staff training, and epidemiological surveillance should be developed. Hospitals must provide sufficient resources to support these programs.

1.8 Prevention of Hospital Acquired Infections/ Nosocomial infections

1.8.1 Standard/universal precautions:

With the onset of the AIDS pandemic, the concept of universal precautions has been adopted i.e. precautions that should be practised with all patients and laboratory specimens regardless of diagnosis. It is presumed that every patient/specimen could be potentially infected with blood borne pathogens such as HIV, hepatitis B and C. Universal (Standard) precautions are applied to all patients regardless of diagnosis, instead of universal testing. The main objective is to prevent exposure of staff and patients to blood and body fluids.

1.8.2 Additional precautions for prevention of transmission of infection

In addition to standard precautions which are required for all patients in all situations, special precautions need to be taken for patients suffering from certain infections. These are based on the mode of transmission of these infections. The ICC should decide the policy for the individual hospital and procedures which are feasible in its situation.

1.8.3 Surgical site infections:

Infection in the surgical site that occurs within 30 days of the surgical procedure or within one year if there is an implant or foreign body such as prosthetic heart valve or joint prosthesis.

Risk factors for surgical site infections	Prevention
Patient	Avoid operating on very old or very
Age	young as they are at higher risk for developing infections
Nutritional status	Build a good nutritional status
Diabetes	Control and maintain blood sugar levels
Smoking	Cessation of smoking at least one month prior to surgery
Obesity	Reduce weight prior to surgery
Co-existent infections in a remote body site	Treat adequately before operation
Colonization with micro-organisms Altered immune response Length of preoperative stay	Screen and treat carriers; avoid preoperative shaving Boost immunity if possible Avoid long stay in hospital
Duration of surgical scrub, operational procedure, Skin antisepsis, Pre-operative shaving, Preoperative skin preparation, Duration of operation	Guidelines 2 minutes as effective as 10 minutes Use povidone-iodine / chlorhexidine gluconate, Avoid if possible or shave immediately prior to operation Allow drying of antiseptic Keep procedures as short as possible

1.9 Use an appropriate empirical treatment for HAI:

One of the consequences of an increase in anti-microbial resistance has been an increased recognition of inappropriate antimicrobial treatment of infections. Inappropriate antimicrobial treatment of serious infections in the hospital setting has been demonstrated to be an important determinant of hospital mortality. Inappropriate antimicrobial treatment represents the use of antimicrobials with poor or no in vitro activity against the identified microorganisms causing infection at the tissue site of infection. Examples of inappropriate treatment include the absence of antimicrobial agents directed at a specific class of microorganisms (e.g. absence of therapy for fungaemia due to Candida species) and the administration of antimicrobial agents to -which the microorganism responsible for the infection are resistant (e.g. empirical treatment with nafcillin for pneumonia subsequently attributed to MRSA).

To optimise antibacterial treatment effectively the following point should be considered:

- Prescribe initial appropriate empirical treatment based on local pathogen prevalence and antibacterial susceptibility.
- Use combination antibacterial treatment to cover the most common bacterial pathogens.
- Provide education and professional detailing to clinicians on appropriate antibacterial therapy.
- Use locally developed antibacterial management guidelines Consult with local infectious disease specialists.
- Use antibacterial cycling and scheduled antibacterial changes according to changing patterns of pathogens and antibacterial susceptibility.
- Consider the use of area-specific empirical antibacterial regimens in larger hospitals because of area-specific variability in pathogens and their susceptibility patterns.

1.10 previous studies on the empirical treatment of HAI:

Trevor D, Indah K *et al*.(2014) stated in their study; Prevention of hospital-acquired infections (HAI) is central to providing safe and high quality healthcare. Transmission of infection between patients by health workers, and the irrational use of antibiotics have been identified as preventable aetiological factors for HAIs. They attempt to implement a multifaceted infection control and antibiotic stewardship programme and evaluate its effectiveness on HAIs and antibiotic use.

The result was that the Multifaceted infection control interventions are effective in reducing HAI rates, improving the rational use of antibiotics, increasing hand hygiene compliance, and may reduce mortality in hospitalised children in developing countries.

Also another study by Genene A, Behailu T *et al*,(2022) try to reflect that there should be an appropriate antimicrobial treatment (AMT) among patients with HAI, and any inappropriate use of antimicrobial my cause a risk on HAI patients. A prospective observational study was conducted involving 300 patients with HAIs in medical, surgical, and gynecology-obstetrics. Inappropriate AMT was identified by researchers that, in about three-fourths of the patients with HAIs. A decrease in the likelihood of inappropriate AMT was identified in patients having culture findings and in those taking metronidazole, whereas taking vancomycin increased the likelihood of inappropriate AMT. Therefore, they recommend scaling up the capacity of definitive therapy through culture and sensitivity tests. Furthermore, training of prescribers in the rational use of antimicrobials is also warranted.

2. Methodology

2.1 Introduction

This chapter describes the research methodology used for this research. According to Kothari (2004) "Research methodology is a way to systematically solve the research problem; it may be understood as a science of studying how research is done scientifically". The purpose of this research is to assess the Implementation of international guidelines in empirical treatment of hospital acquired infection in Sudanese hospitals.

Topics discussed in this chapter include; the research design section which will present the population and the sample, the instruments of data collection, and the procedures used for the research.

2.2 Research Design

Burns and Grove (2003) define the research design as "A blue print for conducting a study with maximum control over factors that may interfere with the validity of the findings". The design describes what the researcher will do from formulating the hypothesis; through operational implications to the final analysis of data. In other words, it is

a complete plan of the research (Kumar, 2005; Creswell, 2013).

A descriptive exploratory research design was chosen to assess the topic of this research. Tegan George (2021) explain that exploratory research is a methodology approach that investigates research questions that have not previously been studied in depth. It is actually a type of research design which focuses on explaining the aspects of our research in a detailed manner. The exploratory research is not used to give us some conclusive evidence but helps us in understanding the problem more efficiently. It also can be qualitative or quantitative in nature depend on the sample.

2.3 Nature of Research

This is exploratory qualitative cross-sectional research.

Sources of data

Primary data and secondary data will be used in this study.

2.3.1 Primary Data:

This research use firstly; a questionnaire for research data collection. A questionnaire is a data collection instrument consisting of a series of questions and other prompts for th purpose of gathering information from respondents.

Questionnaire will be used to obtain data from a sample of the clinicians in hospitals. Using questionnaire enables the researcher to collect information from a large sample and save time.

2.3.2 Target population:

Hospital located in Omdurman area. The researcher select three hospitals (Omdurman hospital, Albogaa hospital and tropical disease hospital).

Study inclusion: hospitals in Omdurman area with the same sterilization techniques and water source, all clinicians that admit/follow up patients in Omdurman area hospitals.

Study exclusion: hospitals in Omdurman area with different water source and sterilization techniques

2.3.3 Unit of analysis:

Clinicians in Hospital in Omdurman area

2.3.4 Sampling Frame:

The sampling frame is a (physical) representation of all the elements in the population from which the sample is drawn (Saunders, 2011). The researcher used probability sampling, which uses randomization and takes steps to ensure all members of a population have a chance of being selected.

3. Results and Discussion

3.1 Introduction

This chapter presents the findings of the study using descriptive and experiment method that help to understand the topic.

3.2 Personal Information

In this section the demographic characteristics of the respondents are discussed as follows:

3.2.1 Job Description

Job description	Number of Respondents	Percentage
Consultants	10	22%
Registrar	35	78%
SHO	0	0
Clinical Pharmacist	0	0

The job entitled by respondents was registrar for 35 respondents (about 78%), and the rest of the respondents were a consultant with a percentage of (22%).

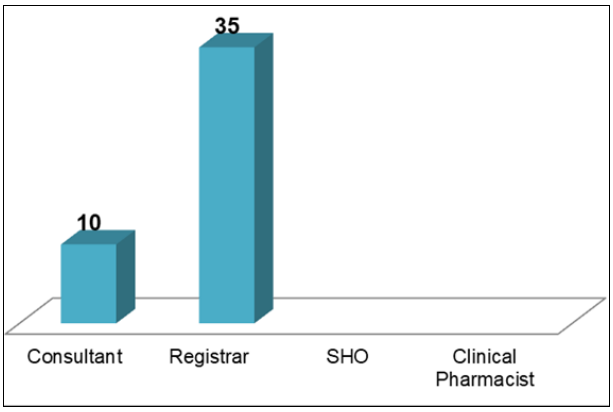


Fig 1: Job Description

3.2.2 Professional experience

Professional Experience	Number of Respondents	Percentage
0-5	15	33%
5-10	10	22%
Above 10 years	20	40%

Most of the respondents have worked in their hospitals between above 10 years (about40%). A considerable percentage of respondents (33%) have an experience in their current hospitals form 5-10 years (see Table 4.2.2). Also (22%) of the respondents have worked in their current hospital for 0-5 years.

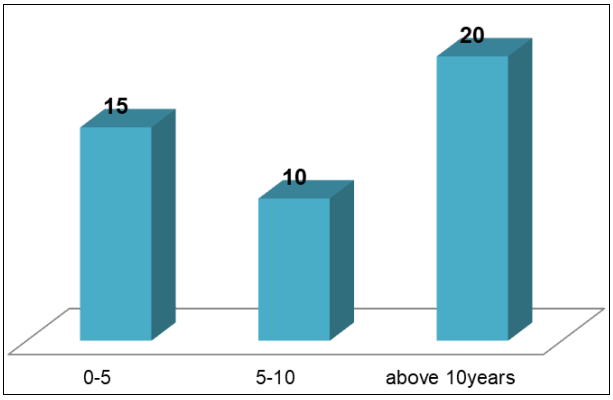


Fig 2: Professional experience

3.3 Section Two

This section considered HAI causes and treatment

3.3.1 How many patients develop HAI in your hospital

Patients develop HAI	Number of patients	Percentage
0-10	24	53%
10-20	15	33%
20-30	6	13%

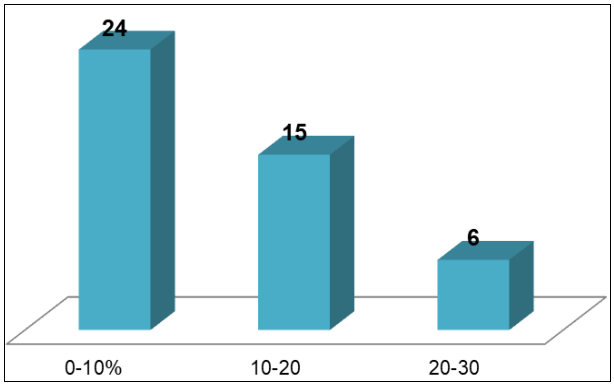


Fig 3: How many patients develop HAI in your hospital

3.3.2 What is your management for HAI?

Management for HAI	Number	Percentage
Use empirical treatment	37	82%
Use hospital guidelines	8	18%
Others	0	0%

Regard to the question about how the hospital can manage the HAI, most of the respondent's answer that by using empirical treatment with percent of (82%), and the other respondent's answer that using hospital guidelines with percent of (18%)

.

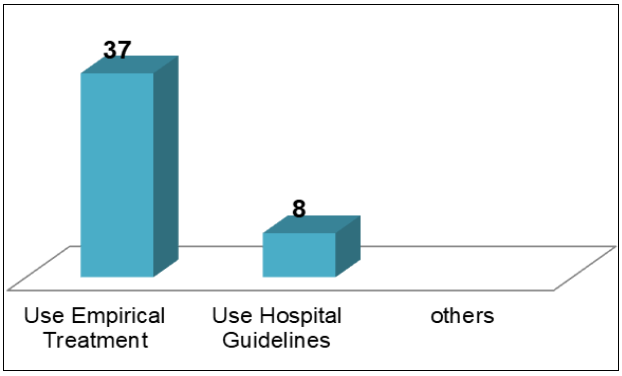


Fig 4: What is your management for HAI

3.3.3 Regarding empirical treatment, what is your criteria for antimicrobial?

Criteria for Antimicrobial	Number	Percentage
Nice guidelines	17	38%
WHO guidelines	5	11%
Experience	23	51%
Hospital guidelines	0	0%

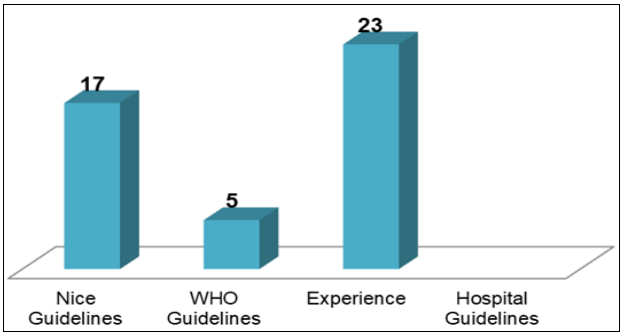


Fig 5: Regarding empirical treatment, what is your criteria for antimicrobial

Experience is the criteria adopted by most of the hospitals as the respondents answer with percentage of (51%), other respondents their answer were by adopting Nice guidelines with (38%), and the rest were adopting WHO guidelines with (11%).

3.3.4 What is the most common pathogen that causes HAI in your hospital?

Type of Pathogen	Number	Percentage
E.coli	18	40%
Serratia	0	0%
Pseudo.ar	7	16%
Staph.aur	20	44%
Others	0	0%

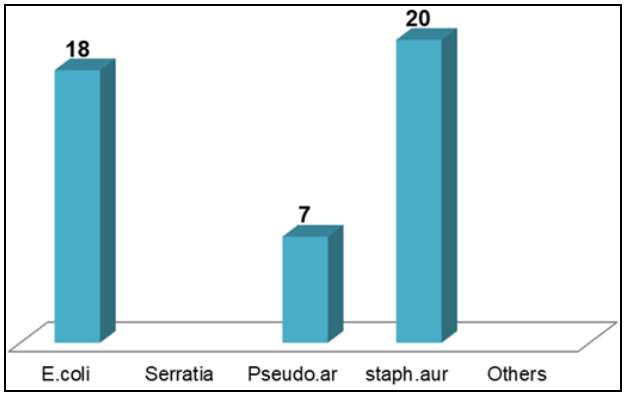


Fig 6: What is the most common pathogen that causes HAI in your hospital

The respondents answered that Staph.aur and E.coli are the most reason behind HAI affect with (44% and 40%) respectively. Also, Pseudo.ar is one of the HAI reason with (16%).

3.3.5 How many patients respond positively to E.T?

patients respond	Number	Percentage
10%	8	18%
20-30%	10	22%
30-50%	15	33%
50-70%	12	27%

30- 50% were the number of patients that respond positively to the E.T with (33%), and (27%) was the percent of the number of patients respond positively to E.T about 50-70%. While 20-30% and 10% have the lowest percentage of the number of patients with (22% and 18%) respectively.

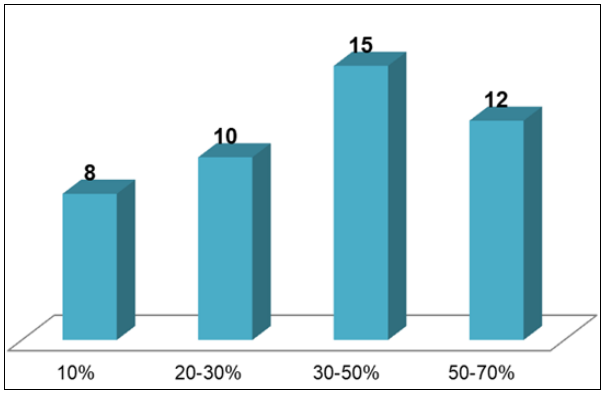


Fig 7: How many patients respond positively to E.T

3.3.6 How much time needed by patients to respond positively to E.T?

Time needed for respond	Number	Percentage
2 days	6	13%
3 days	15	33%
4 days	0	0%
1 days	24	53%

The needed by patients to respond positively to E.T is 1 day with (53%) as the respondent's answer, 3days with (33%) time needed to respond positively to E.T. the lowest percent is (13%) is for 2days as the respondent's answered.

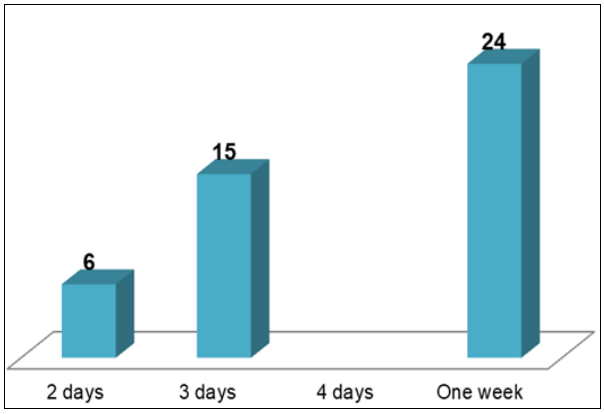


Fig 8: How much time needed by patients to respond positively to E.T

3.4 Discussion and Results

The study included responses from 45 clinicians working in three hospitals in Omdurman, Sudan (Omdurman Teaching Hospital, Tropical Disease Hospital, and Ombada Teaching Hospital). The majority of the respondents were registrars (78%), and the remaining individuals were consultants (22%). 40% of respondents had more than 10 years of clinical practice, indicating a strong support of seasoned practitioners. There was also another 33% of participants having 0-5 years, and 22% having 5-10 years of experience. This reflects a diverse range of clinical maturity. Majority of clinicians (82%) reported using empirical treatment rather than following standardised hospital guidelines, and 18% used the institutional protocols. This highlights a substantial reliance on ad hoc or experience-based decision-making in clinical practice (Lerch *et al*., 2025) [4]. Regarding the use of empirical antimicrobial agents, 51% of respondents relied on personal experience, 38% adhered to NICE guidelines, while 11% used WHO guidelines. No one used hospital-specific guidelines, suggesting a lack of localised protocols or poor adherence. The findings highlight a critical gap in the integration of international or national evidence-based protocols into clinical practice in Sudanese hospitals. It shows that most clinicians continue to use subjective experience in clinical practice. This reliance increases variability in care and the risk of inappropriate treatment (Muhlebach *et al*., 2021) [6].

The burden of HAI in the surveyed hospital appeared moderate, with 53% of respondents reporting 0-10% of admitted patients develop HAIs, 33% estimated 10-20%, and 13%, reported 20-30%. The values shows that HAI is a routine clinical challenge that needs to be addressed to improve patient safety (Alamer *et al*., 2022) [1]. In the assessment, the most frequently identified pathogens were the *Staphylococcus aureus* (44%), *Escherichia coli* (40%), and *Pseudomonas aeruginosa* (16%). None of the respondents reported the existence of *Serratia marcescens* or other organisms that are often reported in other healthcare facilities. The reported organisms are consistent with global patterns of HAI, where *Staphylococcus aureus* and *Escherichia coli* are commonly reported in surgical site infections. This is because of their presence in the body's natural flora and their ability to cause infection to a surgical wound (Monk *et al*., 2024) [5]. The report emphasises the need for accurate diagnosis and appropriate antimicrobial coverage to avoid adverse outcomes such as prolonged hospital stays and even mortality.

The study found varied levels of success within empirical therapy. Approximately 33%of clinicians observed that 30-50% of patients responded positively to empirical treatment, 27* reported a 50-70% response, while 22% and 18% of responses showed lower response rates of 20-30% and 10% respectively. Regarding response to empirical treatment, 53% noted clinical improvement in one day, and 33% within three days. Only 13% reported improvements by the second day, and none reported response to treatment beyond three days. The relatively rapid response to empirical therapy in many cases suggests that clinicians are selecting reasonably effective treatments. These treatments are likely chosen because they are expected to improve patient outcomes. The challenge is the wide variation in response rates that can be attributed to inconsistent antimicrobial choices, possible pathogen resistance, or misdiagnosis. These findings are in line with the study conducted by Debela *et al*. (2022) [2] showing the risk of inappropriate empirical therapy to reduce HAIs. Kaasgaard *et al*. (2024) [3] advocates for the use of culture-based guidance to improve patient outcomes. This is crucial because organisational culture fosters safety, accountability, and continuous improvement in the healthcare setting. Creating the culture involves educating staff on the significance of using standardised protocols to prevent HAIs in the hospital setting. This is shown to promote understanding and adoption of the intervention to improve patient safety and quality of care.

4. Conclusion and limitation

4.1 Introduction

This chapter presents the summary of the study as guided by the specific research objectives and questions, the conclusions reached based on the findings and recommendations.

4.2 Conclusion

This research investigates the implementation of international guidelines in empirical treatment of hospital acquired infection in Sudanese hospitals. The research employs the survey design in order to obtain data concerning the current situation and where possible, to draw valid conclusions from the data analysis. Further, survey design allows identifying whether Sudanese hospitals implement NICE guidelines in the E.T or not. In order to achieve this objective, the study utilizes quantitative and experiment approach. The target population comprise the, Clinicians in Hospital in Omdurman area, the sample of the research was the hospitals in Omdurman area with the same sterilization techniques and water source, all clinicians that admit/follow up patients in Omdurman area hospitals. Data was collected using a questionnaire by distributed 45

questionnaires to 3 hospitals and laboratory techniques that tests 14 samples. The collected data was analysed using quantitative techniques, such as descriptive statistics.

The research comes to the conclusion that, most of the Sudanese hospitals adopted an empirical treatment with patients that have HAI, also they depending on their experience rather than any other guidelines (their hospital or NICE guidelines).

4.3 Limitations

Having outlined that we have reached the initial purpose of this research, some limitations were inevitable. In the analysis section, we have analyzed only the hospitals located in Omdurman due to the time and resources limitation. Also, the researcher depends on specific criteria for selection which is not available for all hospitals.

5. References

1. Alamer A, Alharbi F, Aldhilan A, Almushayti Z, Alghofaily K, Elbehiry A, *et al*. Healthcare-Associated Infections (HAIS): Challenges and measures taken by the Radiology Department to control infection transmission. Vaccines. 2022; 10(12):2060. Doi: https://doi.org/10.3390/vaccines10122060
2. Debela GA, Tesfaye BT, Yizengaw MA. Risk Factors for Inappropriate Antimicrobial Therapy Among Patients with Hospital-Acquired Infection at Jimma Medical Center: A Prospective Observational Study. Infection and Drug Resistance. 2022; 15:837-850. Doi: https://doi.org/10.2147/idr.s349358
3. Kaasgaard M, Grebosz-Haring K, Davies C, Musgrave G, Shriraam J, McCrary JM, *et al*. Is it premature to formulate recommendations for policy and practice based on culture and health research? A robust critique of the CultureForHealth (2022) report. Frontiers in Public Health. 2024; 12. Doi: https://doi.org/10.3389/fpubh.2024.1414070
4. Lerch SP, Huwendiek S, Nendaz M, Klöppel S, Pinilla S. Perceptions of ad hoc entrustment, the need for supervision and coping strategies in clinical residents: A Qualitative study. Academic Medicine, 2025. Doi: https://doi.org/10.1097/acm.0000000000006019
5. Monk EJM, Jones TPW, Bongomin F, Kibone W, Nsubuga Y, Ssewante N, *et al*. Antimicrobial resistance in bacterial wound, skin, soft tissue and surgical site infections in Central, Eastern, Southern and Western Africa: A systematic review and meta-analysis. PLOS Global Public Health. 2024; 4(4):e0003077. Doi: https://doi.org/10.1371/journal.pgph.0003077
6. Muhlebach MS, Jiang X, Kosorok MR, Klein EY, Saiman L. Longitudinal changes and regional variation of incident infection rates at cystic fibrosis centers, United States 2010-2016. Journal of Cystic Fibrosis. 2021; 21(1):34-39. Doi: https://doi.org/10.1016/j.jcf.2021.08.009