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Antibacterial profiles of bacterial isolates from maternity ward hospital beds at Bubulo health centre IV, A cross- sectional study.

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Abstract

Background:

Healthcare-associated infections (HAIs) remain a major challenge in maternity wards, particularly in low-resource settings like Uganda. This study investigated the antibacterial profiles of bacterial isolates from maternity ward bed surfaces at Bubulo Health Centre IV, Manafwa District, to address knowledge gaps and inform infection control practices.

Methodology:

A cross-sectional, laboratory-based analytical study was conducted over three months, during which 60 swab samples were collected from high-touch points on maternity beds, including mattress covers, bed rails, and headboards. Samples were cultured on selective media, and bacterial isolates were identified through Gram staining and biochemical tests. Antibacterial susceptibility testing was performed using the Kirby-Bauer disk diffusion method in accordance with CLSI guidelines.

Results:

The study identified five bacterial species: *Staphylococcus aureus* (33.3%), *Escherichia coli* (20%), *Enterococcus* spp. (16.7%), *Klebsiella pneumoniae* (15%), and *Proteus* spp. (15%). Gram-positive and Gram-negative bacteria were equally represented (50% each). Antibacterial susceptibility testing revealed that Gram-positive isolates were highly sensitive to Vancomycin (100%) and Gentamicin (80–90%), with 25% of *S. aureus* isolates resistant to Oxacillin, suggesting possible MRSA strains. Gram-negative isolates showed high sensitivity to Ciprofloxacin (88–83%) and Ceftriaxone (77–75%), but moderate to high resistance to Ampicillin (33–66%) and Co-trimoxazole (33%). These findings indicate the presence of multidrug-resistant organisms on maternity bed surfaces, highlighting the risk of nosocomial infections.

Conclusion:

Maternity bed surfaces at Bubulo Health Centre IV are contaminated with clinically significant bacteria, including multidrug-resistant strains. The study underscores the urgent need for stringent IPC practices, routine environmental surveillance, rational antibiotic use, and targeted cleaning and disinfection strategies to safeguard maternal and neonatal health.

Recommendation:

Strengthen national infection prevention guidelines, ensure strict cleaning and disinfecting practices in health facilities, provide regular staff training and supplies, and promote public awareness on personal and environmental hygiene

Keywords: *Antibacterial profile, Bacterial isolate, Hospital bed surface, Maternity ward, Health Centre IV, Disk diffusion method, Zone of inhibition, Gram-positive bacteria*
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Background of the study

Infection Prevention and Control (IPC) is a critical patient safety element in health facilities, especially in maternity wards, because both mothers and infants are vulnerable to healthcare-associated infection (HAIs). An underestimated and overlooked source of HAIs is dirty non-living hospital surfaces, specifically hospital beds, which act as fomites that facilitate indirect transmission of pathogenic microbes (Otter et al., 2013). Regular cleaning and disinfection of maternity ward beds, which are often

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in proximity to patients, attendants, and health workers, could help reduce cross-contamination. However, in most low-resource health care settings, such as Uganda, this is not routinely performed owing to limitations in facilities, staffing, and training in IPC (WHO, 2020).

A review of patients with skin and soft tissue infections (SSTIs) who were prescribed antimicrobials in the surgical department of a major South African tertiary public hospital was performed from April to June 2021, using an adapted data collection instrument. A total of 67 patient files were reviewed. Blood cultures were undertaken for 40.3% of patients, with 32.7% having Staphylococcus aureus and 21.2% Enterococcus species as pathogens cultured. Cefazolin was the initial empirically used for 46.3% of patients with SSTIs, while gentamicin, ciprofloxacin, and rifampicin were the prescribed antimicrobials in 17.5%, 11.3% and 8.8% of patients, respectively.. Therefore, the most frequently identified pathogen was Staphylococcus aureus as a cause of SSTIs. Culture sensitivity testing would follow to facilitate compliance with STGs as well as provide quality care in the future (Makwela et al., 2023).

Many studies from East Africa confirm that the beds in neonatal wards and maternity wards are heavily contaminated with bacteria. For example, Sserwadda et al. (2018) sampled beds in a postnatal ward in Uganda. They found that 75% of surfaces sampled (including hospital beds) were colonized with Staphylococcus aureus, with over 50% of these isolates being MDR. Mayanja et al. (2023) also recovered MDR Klebsiella pneumoniae, Escherichia coli, and Enterobacter spp. from the beds in the maternity ward at Mulago National Referral Hospital (36% were ESBL and 6% were carbapenemase gene-positive).

In Uganda, the Health Centre IVs, such as Bubulo Health Centre IV, function as a rural referral health unit, ideally servicing populations with high maternal delivery rates and using limited laboratory diagnostics and poor adherence to Infection Prevention and Control (IPC). There is, however, a lack of local data on bacterial contamination and antimicrobial resistance patterns of pathogens isolated from maternity bed exposures at these health facilities, constraining evidence-based planning and response to infection risk in maternity services. The Ugandan Ministry of Health National Action Plan on Antimicrobial Resistance 2018- 2021 stresses enhanced surveillance of resistance microorganisms at all levels of care, but it is not uniform at the primary and district levels. Therefore, the objective of this study was to determine antibacterial profiles of bacterial isolates from the hospital bed surface of the maternity ward at Bubulo Health Centre IV.

Methodology

Study Design

The study adopted a cross-sectional, laboratory-based analytical design. This design facilitated the collection and analysis of environmental samples at a single point in time, allowing for the detection of bacterial contaminants and their antibacterial susceptibility patterns.

Study Area

The research was conducted at Bubulo Health Centre IV, located in Manafwa District, Eastern Uganda. As a government-run health centre, Bubulo serves as a referral facility for several lower-level health units in the region and handles a high volume of maternal and neonatal patients.

Study population

The study population comprised hospital bed surfaces in the maternity wing of Bubulo Health Centre IV. High-touch points on the beds, including mattress covers, bed rails, and headboards, were targeted for swab sampling. The research was conducted over three months, from June to July 2025.

Sample Size Determination

Using the Yamane (1967) sample size formula for finite populations, because the total population (**N**) was already small (60 beds),

$$n = \frac{N}{1 + N(e)^2}$$

Where:
N= Number in population
e = Confidence interval
n= Sample size

Calculation:
n=60/ [1+60(0.05)2]
n=60/ [1+60(0.0025)]
n=60/ (1+0.15)
n=60/1.15
n≈52.17

Thus, a total of at least 60 swab samples was collected from the maternity beds.

Exclusion and Inclusion Criteria

Inclusion Criteria

- Hospital surfaces and maternity ward beds that have been used over the previous 24 hours.
- Areas where there has been routine patient care activity recorded (e.g., postnatal beds, delivery beds).
- Surfaces from which facility management permission has been obtained.

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Exclusion Criteria

- Hospital beds that are being disinfected or maintained.
- Surfaces not used for direct patient care.
- Spaces where consent is refused by facility management.

Sampling Method

Purposive sampling was used to select maternity beds and high-touch bed surfaces. Systemic swab sampling will be taken by utilizing sterile moistened swabs, consistent with standard surface sampling practices. Each sample point was considered a unit of analysis.

Data Collection Instruments

Data was collected using:

- A structured observation checklist to check surface cleanliness, disinfectant history, and bed status.
- Sterile swab collection forms to assess sample identification, location, time, and handling.

Laboratory Procedures and Methods

Sample Collection and Transport

- Sterile cotton swabs wetted in sterile normal saline were used to swab 10 cm^2 areas on maternity bed tops.
- Swabs were placed in peptone water, labelled, and stored in a cool box (4–8°C) for transport.
- The samples were taken to the University of Kisubi Microbiology Laboratory within 24 hours for analysis.

Bacterial Isolation and Identification

- The samples were placed on Bile Esculin Azide agar, MacConkey Agar, and Mannitol Salt Agar for overall as well as selective bacterial growth.
- The plates were incubated at 37°C for 18–24 hours.
- Colonies were typed based on morphology, Gram staining, and biochemical tests like catalase, coagulase, oxidase, indole, urease, and Triple Sugar Iron (TSI).

Antibiotic Susceptibility Testing (AST)

- Kirby-Bauer disk diffusion on Mueller-Hinton agar was used for testing susceptibility.
- The following antibiotics will be used: ampicillin, ceftriaxone, ciprofloxacin, gentamicin, tetracycline, chloramphenicol, meropenem, and co-trimoxazole.
- Interpretation of zones of inhibition was based on Clinical and Laboratory Standards Institute (CLSI, 2021) guidelines.

1. Coli ATCC 25922 and S. aureus ATCC 25923 served as control strains.

Data Management and Analysis

Data was keyed into Excel software. Data analysis was done using Microsoft Excel 2016. Descriptive statistics documented the frequency and proportion of bacterial species and resistance patterns. And results were presented in tables, figures, among others.

Ethical considerations

Ethics clearance from the University of Kisubi Institutional Research and Ethics Committee (IREC) and approval from Bubulo Health Centre IV administration were acquired. Permission was obtained from hospital management both verbally and in writing. Coded identifiers offered confidentiality and anonymity of data.

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RESULTS

Isolation and identification of bacterial species present on maternity ward bed surfaces at Bubulo Health Centre IV.

Figure 1: Showing the primary culture results by different media types

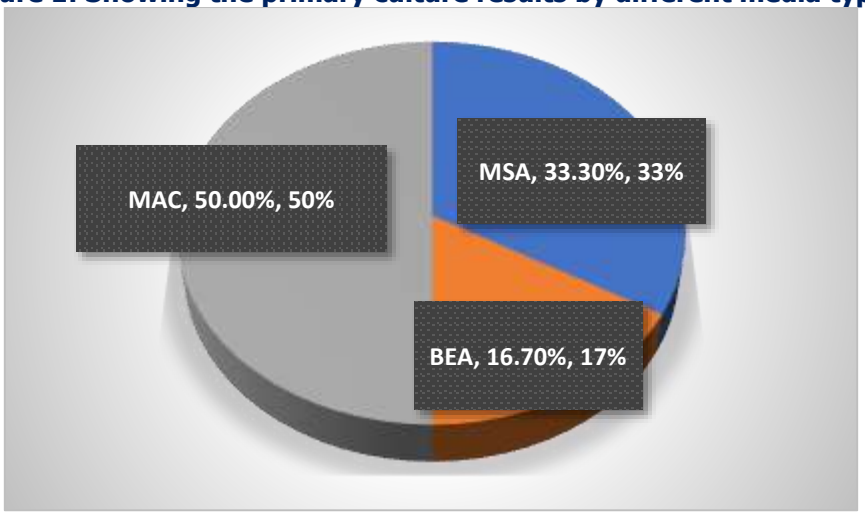

Figure 1 indicates that MacConkey Agar supported 50% of the isolates, which is a considerable number of Gram-negative bacteria. MSA represented 33.3% of the bacteria, suggesting staphylococcal organisms were present, and BEA had 16.7% which is some esculin-hydrolyzing Gram-positive bacterial species, most likely Enterococcus spp. The maternal bed surfaces presented a diverse bacterial population.

Subculturing for Pure Colonies

Representative colonies from each primary culture plate were subcultured onto Nutrient Agar (NA) in an attempt to get pure isolates. Each subculture purified mixed colonies and provided an opportunity to correctly perform downstream Gram staining and biochemical testing on a pure isolate from the original primary culture plate.

Upon 18–24 h incubation and checking each pristine culture at 24 h later out of the 60 isolates, all had uniform colonies and yielded well-isolated colonies. The use of strict aseptic technique ensured that each isolate maintained its original characteristics without contamination.

Gram Staining of the Isolates

The 60 pure isolates were all Gram-stained to determine if they were Gram-negative or Gram-positive and to evaluate cellular morphology.

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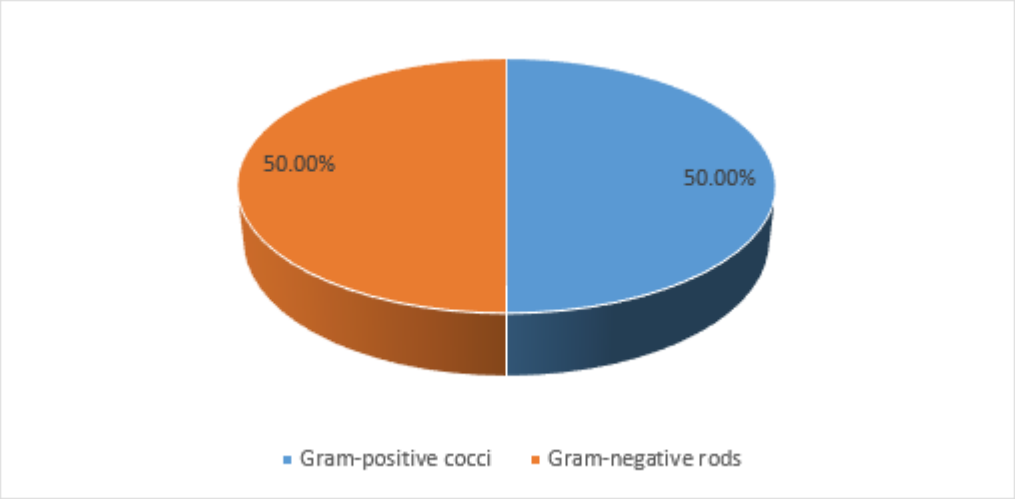
Figure 2: Gram staining results of isolates (N = 60)



In Figure 2, there was an equal proportion of Gram-positive and Gram-negative bacteria, each with 50% of isolates. The Gram-positive isolates were primarily cocci, and the Gram-negative isolates were rods. This indicates that both forms of Gram staining were present on the maternity bed surface organisms that the planning infection prevention must consider.

Biochemical Identification of Bacterial Isolates

Biochemical tests were performed on all Gram-positive and Gram-negative isolates for species identity. The tests included: catalase, coagulase, oxidase, indole, methyl red, Voges-Proskauer, citrate utility, urease, motility, and PYR, where applicable.

Table 1: Biochemical identification of bacterial isolates (N = 60)

Organism	Catalase	Coagulase	Oxidase	Indole	MR	VP	Citrate	Urease	Motility	PYR	Frequency (n)	Percentage (%)
Staphylococcus aureus	+	+	-	-	-	-	-	-	-	-	20	33.3%
Enterococcus spp.	-	-	-	-	-	-	-	-	-	+	10	16.7%
Escherichia coli	-	-	-	+	+	-	-	-	+	-	12	20.0%
Klebsiella pneumoniae	-	-	-	-	-	+	+	+	-	-	9	15.0%
Proteus spp.	-	-	-	-	+	-	+	+	+	-	9	15.0%
Total											60	100%

Staphylococcus aureus is the most common isolate (33.3%) in table 4.3, along with E. coli (20%), with Enterococcus spp. making up 16.7%, which demonstrates the utility of BEA for finding the esculin-positive Gram-positive organisms. The *Klebsiella pneumoniae* and

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Proteus spp. isolates (15% each) indicates high levels of Gram-negative contamination.

Figure 1: Summary of bacterial species identified (N = 60)

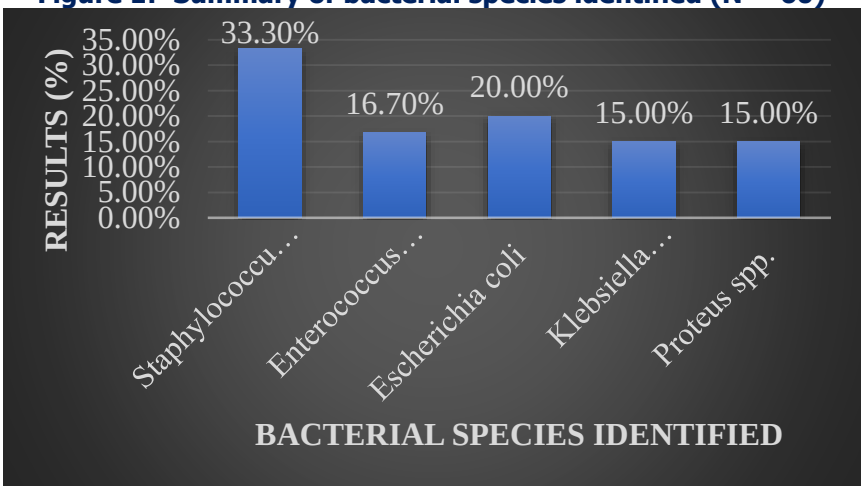

Figure 3 showed that the most frequently isolated organism was *Staphylococcus aureus*, accounting for one-third of our isolates (33.3%), which demonstrates the predominance of *Staphylococcus aureus* on maternal bed surfaces. Gram-negative bacteria were also notable among our isolates, including *Escherichia coli* at 20% of the isolates, *Klebsiella pneumoniae* at 15% of the isolates, and *Proteus spp*. At 15% of the isolates. The study also isolated *Enterococcus spp.* Identified by BEA, demonstrating esculin-hydrolizing Gram-positive cocci, which represented 16.7% of our isolates.

Antimicrobial susceptibility patterns of the bacterial isolates from maternity ward hospital beds at Bubulo Health Centre IV

Antimicrobial susceptibility testing (AST) was conducted by the Kirby-Bauer disk diffusion method on Mueller-Hinton agar. The isolates were standardized to the 0.5 McFarland turbidity standard and streaked on the agar plate in one direction. E. coli ATCC 25922 and S. aureus ATCC 25923 were also tested as control strains. The antibiotics tested were as follows:

Gram-positive isolates (Staphylococcus aureus, Enterococcus spp)

Oxacillin (OX), Vancomycin (VA), Clindamycin (DA), Ciprofloxacin (CIP), Gentamicin (GEN).

Gram-negative isolates (E. coli, Klebsiella pneumoniae, Proteus spp)

Ampicillin (AMP), Ceftriaxone (CRO), Ciprofloxacin (CIP), Gentamicin (GEN), and Co-trimoxazole (SXT).
Note: Zones of inhibition were measured and interpreted per CLSI (2021) guidelines as Sensitive (S), Intermediate (I), and Resistant (R).

Table 2: Antimicrobial susceptibility patterns of bacterial isolates

Organism	Antibiotic	S (n, %)	I (n, %)	R (n, %)
***Staphylococcus aureus* (n=20)**	Oxacillin (OX)	15 (75.0%)	0 (0%)	5 (25.0%)
	Vancomycin (VA)	20 (100.0%)	0 (0%)	0 (0%)
	Clindamycin (DA)	16 (80.0%)	2 (10.0%)	2 (10.0%)
	Ciprofloxacin (CIP)	17 (85.0%)	1 (5.0%)	2 (10.0%)
	Gentamicin (GEN)	18 (90.0%)	0 (0%)	2 (10.0%)
***Enterococcus spp*. (n=10)**	Vancomycin (VA)	10 (100.0%)	0 (0%)	0 (0%)
	Gentamicin (GEN)	8 (80.0%)	1 (10.0%)	1 (10.0%)
	Ciprofloxacin (CIP)	7 (70.0%)	2 (20.0%)	1 (10.0%)
	Oxacillin (OX)	5 (50.0%)	2 (20.0%)	3 (30.0%)

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Original Article

	Clindamycin (DA)	6 (60.0%)	2 (20.0%)	2 (20.0%)
***Escherichia coli* (n=12)**	Ampicillin (AMP)	4 (33.3%)	1 (8.3%)	7 (58.4%)
	Ceftriaxone (CRO)	9 (75.0%)	1 (8.3%)	2 (16.7%)
	Ciprofloxacin (CIP)	10 (83.3%)	0 (0%)	2 (16.7%)
	Gentamicin (GEN)	8 (66.7%)	2 (16.7%)	2 (16.6%)
	Co-trimoxazole (SXT)	7 (58.3%)	1 (8.4%)	4 (33.3%)
***Klebsiella pneumoniae* (n=9)**	Ampicillin (AMP)	2 (22.2%)	1 (11.1%)	6 (66.7%)
	Ceftriaxone (CRO)	7 (77.8%)	1 (11.1%)	1 (11.1%)
	Ciprofloxacin (CIP)	8 (88.9%)	0 (0%)	1 (11.1%)
	Gentamicin (GEN)	6 (66.7%)	2 (22.2%)	1 (11.1%)
	Co-trimoxazole (SXT)	5 (55.6%)	1 (11.1%)	3 (33.3%)
***Proteus spp.* (n=9)**	Ampicillin (AMP)	3 (33.3%)	1 (11.1%)	5 (55.6%)
	Ceftriaxone (CRO)	7 (77.8%)	0 (0%)	2 (22.2%)
	Ciprofloxacin (CIP)	8 (88.9%)	0 (0%)	1 (11.1%)
	Gentamicin (GEN)	6 (66.7%)	2 (22.2%)	1 (11.1%)
	Co-trimoxazole (SXT)	5 (55.6%)	1 (11.1%)	3 (33.3%)

Staphylococcus aureus demonstrated complete sensitivity to Vancomycin (100%) and 90% sensitivity to Gentamicin, while 25% were resistant to Oxacillin (possibly indicating MRSA strains). There was also 10-20% resistance to Clindamycin and Ciprofloxacin.

Enterococcus spp. Provided 100% sensitivity to Vancomycin, while showing 10-30% resistance to Oxacillin, Gentamicin, and Ciprofloxacin, indicating moderate multiple-drug resistance patterns.

Escherichia coli showed high sensitivity to Ceftriaxone (75%) and Ciprofloxacin (83.3%), while 58.4% were resistant to Ampicillin and 33.3% were resistant to Co-trimoxazole.

Klebsiella pneumoniae had 88.9% sensitivity to Ciprofloxacin and 77.8% to Ceftriaxone, while 66.7% were resistant to Ampicillin and 33.3% were resistant to Co-trimoxazole.

Proteus spp. Exhibited 88.9% sensitivity to Ciprofloxacin, 77.8% to Ceftriaxone, but 55.6% were resistant to Ampicillin and 33.3% to Co-trimoxazole.

DISCUSSION

Isolation and identification of bacterial species present on maternity ward bed surfaces at Bubulo Health Centre IV.

This study isolated and identified five bacterial species from 60 swabs collected from maternity ward bed surfaces at Bubulo Health Centre IV. These included Staphylococcus aureus (33.3% of isolates), Escherichia coli (20.0%), and Enterococcus spp. (16.7%), Klebsiella pneumoniae (15.0%), and Proteus spp. (15.0%). The high percentage of S. aureus indicates that these bed surfaces are laden with Gram-positive cocci, largely staphylococcal contamination. Overall, Gram-negative organisms also totaled 50% of the isolates. E. coli, K. pneumoniae, and Proteus spp. have established the existence of pathogenic Gram-negative bacilli that are mechanistically not limited to a few surfaces in maternity bed spaces. The isolation of Enterococcus spp. Reflects an environment laden with esculin-positive Gram-positive bacteria that are particularly hardy in poor survival conditions and potentially involved in infections (Kyamulabi et al., 2025). The fact that S. aureus was the predominant isolate is consistent with a number of recent studies in Uganda and other sub-Saharan African countries. Twinamasiko et al. (2023) point out that staphylococcal species are constantly being isolated from hospital surfaces (eg, patient beds, medical equipment) and that the level of contamination is often at rates of between 30% to 40%. More recently, Mayito et al. (2024) reported that Gram-positive cocci, and S. aureus specifically, were the most common bacteria isolated from the surfaces of hospital tertiary care. Both reports represent the continuing burden of environmental staphylococcal contamination in a healthcare setting. The Gram-negative bacteria, E. coli, K. pneumoniae, and the prevalence of Proteus spp. are consistent with the findings and reports of Obakiro et al. (2021) and Kyamulabi et al. (2025), and these authors suggested that Enterobacteriaceae typically were isolated from the surfaces of hospitals that might harbor multidrug-resistant determinants, thereby increasing the threat of healthcare-associated infections. The recovery of Enterococcus spp. is consistent with the findings of the other two studies, which astutely suggest that resilient Gram-positive cocci that can survive inside a hospital have a significant role in the nosocomial spread.

Among previous studies in Uganda, the present study indicates that contamination of hospital surfaces with bacteria remains a problem in hospitals. In addition, the

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Original Article

similar distribution of bacterial isolates from the previous studies indicates that environmental pathogenic contamination remains a concern in health care facilities. This suggests the need for the routine surveillance of hospital surfaces, adherence to cleaning protocols, and the implementation of evidence-based hygiene practices to limit the burden of hospital-acquired infections (HAIs) and to improve outcomes for mothers and newborns (Mayito et al., 2024; Twinamasiko et al., 2023; Kyamulabi et al., 2025).

Antimicrobial susceptibility patterns of the bacterial isolates from maternity ward hospital beds at Bubulo Health Centre IV

The antimicrobial susceptibility testing conducted in this study showed various patterns of resistance and sensitivity among Gram-positive and Gram-negative bacterial isolates in maternity ward bed surfaces at Bubulo Health Centre IV. Staphylococcus aureus isolates, for example, showed to be 100% sensitive to Vancomycin, while 90% of isolates were sensitive to Gentamicin. However, 25% of S. aureus isolates were resistant to Oxacillin, which indicates a potential as methicillin-resistant S. aureus (MRSA). There was moderate resistance (10-20%) to Clindamycin and Ciprofloxacin, which is clinically important since MRSA organisms are recognized as significant contributors to hospital-acquired infections, and the partial resistance to commonly used antibiotics in the maternity context limits treatment possibilities. Overall, the very high levels of sensitivity to Vancomycin and Gentamicin show their continued effectiveness against Gram-positive pathogens as documented by Ugandan and East African studies reporting Vancomycin was still an effective agent for MRSA and multi-drug resistant staphylococcal infections (Namanya, Piven, double, and Opar, 2022; Tumwesigye et al., 2021).

All Enterococcus spp. were 100% susceptible to Vancomycin, and vancomycin resistance was not demonstrated in any Enterococcus spp. Enterococcus spp. Demonstrated moderate patterns of multi-drug resistance to 30% resistance to Oxacillin, 10% resistance to Gentamicin, 10% resistance to Ciprofloxacin, and 20% resistance to Clindamycin. This is particularly concerning in the hospital setting in general and with various patient populations in maternity wards in particular, because postpartum women and neonates may be immunocompromised or have abnormal microbiota. Enterococcus spp. Demonstrating multi-drug resistance should not be unexpected, given recent environmental studies published in Sub-Saharan Africa that showed environmental enterococcal isolates frequently demonstrated resistance to antimicrobials. Environmental Enterococcus spp. are typically resistant to both beta-lactam and aminoglycoside antimicrobials, and the continued potential spread of multidrug-resistant Enterococcus spp. Emphasizes the need for improved antibiotic stewardship (Kasozi et al., 2020).

The Gram-negative isolates such as Escherichia coli (E. coli), Klebsiella pneumoniae, and Proteus spp. Displayed varying resistance contours. E. coli demonstrated high sensitivity to Ceftriaxone (75%) and Ciprofloxacin (83.3%), and high resistance to Ampicillin (58.4%) and Co-trimoxazole (33.3%). K. pneumoniae isolates were also sensitive to Ciprofloxacin (88.9%) and Ceftriaxone (77.8%), but showed resistance to Ampicillin (66.7%) and Co-trimoxazole (33.3%). Proteus spp. was sensitive to Ciprofloxacin (88.9%) and Ceftriaxone (77.8%), with moderate resistance to Ampicillin (55.6%) and Co-trimoxazole (33.3%). Collectively, it appears that the Gram-negative isolates in our study had general susceptibility to Fluoroquinolones and 3rd generation cephalosporin antibiotics, whereas less so to the first-line antibiotics like Ampicillin and Co-trimoxazole. This tendency is similar to findings by Okoboi et al. (2021) and Nakibuuka et al. (2023), who looked at Gram-negative isolates derived from hospital environmental samples in Uganda, showed primarily resistance susceptibility patterns to Ampicillin and moderate susceptibility for 3rd generation cephalosporins. The data presented in the study, and findings by other authors, provide a needed rationale for continued surveillance for antibiotic susceptibilities for both susceptibility patterns by health care institutions, so that those administering empirical therapy could monitor and avoid resistant pathogens in the HC environment.

Conclusion

Maternity ward bed surfaces at Bubulo Health Centre IV were found to be colonized by both Gram-positive cocci and Gram-negative rods, with Staphylococcus aureus as the most common isolate, followed by Escherichia coli, Enterococcus species, Klebsiella pneumoniae, and Proteus species. The equal distribution between Gram-positive and Gram-negative organisms suggests contamination from both patients and environmental sources, pointing to gaps in infection prevention and control practices. These contaminated bed surfaces serve as potential reservoirs for hospital-acquired infections.

Antimicrobial susceptibility testing revealed high resistance to commonly used older β-lactams such as ampicillin, while last-line agents like vancomycin and ciprofloxacin retained activity, though resistance was emerging. The detection of MRSA and multidrug-resistant Enterobacteriaceae underscores a serious threat to patient safety. These findings highlight the urgent need

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to strengthen infection control, antimicrobial stewardship, and routine surveillance in order to reduce the risks of treatment failure and preventable hospital-acquired infections.

Recommendations

The Ministry of Health should make national infection prevention and control guidelines stronger and ensure that all health facilities, including Bubulo Health Centre IV, adhere to environmental cleanliness.

The Ministry of Health should provide regular funding and supplies for effective disinfectants and management practices associated with laboratory microbiological surveillance programs for the rural healthcare facilities to promote long-lasting infection control.

Bubulo Health Centre IV should introduce a strict cleaning and disinfecting practice for maternity ward beds, and any other surfaces or items with high contact, using agents known to kill harmful microorganisms.

Bubulo Health Centre IV should spend more time and resources on staff training to appropriately clean, disinfect, and use hospital items effectively to lessen the chances of acquiring infections in the hospital.

Maternity mothers should better understand personal cleanliness and the importance of a clean birth environment to protect themselves and their babies from preventable infections.

The general public should learn about how environmental cleanliness impacts infections/diseases and support community health programs.

Acknowledgement

I am profoundly grateful to my dear wife and children, whose unwavering love, prayers, and spiritual support have been a constant source of strength throughout my academic journey. My heartfelt appreciation also goes to my beloved parents, brothers, and sisters, whose encouragement and presence have continually inspired me to persevere in the pursuit of my studies.

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Above all, I thank the Almighty God for His abundant grace, wisdom, and provision that made this work possible. May His blessings richly abound upon you all

List of abbreviations and acronyms

AMP – Ampicillin
AMX – Amoxicillin
ATB – Antibiotic
CLSI – Clinical and Laboratory Standards Institute
E. coli – Escherichia coli
HCIV – Health Centre Level IV
K. pneumoniae – Klebsiella pneumoniae
MHA – Mueller-Hinton Agar
MSSA – Methicillin-Sensitive Staphylococcus aureus
MRSA – Methicillin-Resistant Staphylococcus aureus
S. aureus – Staphylococcus aureus
UTI – Urinary Tract Infection
WHO – World Health Organization
ZDI – Zone of Diameter of Inhibition

Source of funding

The study had no funding.

Conflict of interest

The authors declare no conflict of interest

Data availability

data is available upon request from the author

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