

Effect of Antimicrobial Stewardship Interventions on Clinical Outcomes and Antimicrobial Resistance among Neonates with Sepsis in Selected Health Facilities in Kiambu County, Kenya

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ABSTRACT

Background: Neonatal sepsis remains an important cause of neonatal morbidity and mortality, while inappropriate and prolonged antimicrobial use contributes to antimicrobial resistance and adverse drug events. Antimicrobial stewardship (AMS) interventions provide a strategy for optimizing antimicrobial selection, dosing, duration, and review while maintaining effective treatment of infection.

Methods: A quasi-experimental interrupted time-series design with a non-equivalent comparison group was used. The study involved neonates aged 0–28 days diagnosed with neonatal sepsis in selected Level 4 and Level 5 hospitals in Kiambu County. Intervention facilities implemented antimicrobial stewardship interventions comprising prescribing guidelines, audit and feedback, diagnostic stewardship, antimicrobial review, de-escalation, and healthcare-provider training, while comparison facilities continued routine care. Quantitative data were obtained through medical record review and healthcare-provider questionnaires, while qualitative information was collected through key informant interviews. Data were analyzed using SPSS version 30.0. Descriptive statistics, chi-square/Fisher's exact tests, Mann–Whitney U tests, segmented regression, and multivariable regression were used.

Results: Recovery was higher among neonates in the intervention group than the control group, 100 (93.5%) versus 82 (76.6%), while mortality was lower, 2 (1.9%) versus 9 (8.4%). Adverse drug reactions occurred in 3.7% of intervention neonates compared with 15.9% of controls, while 28-day readmission was 3.7% versus 13.1%, respectively. Hospitalization was shorter among intervention neonates, with 32.7% discharged within seven days compared with 3.7% of controls, while stays exceeding 14 days occurred in 11.2% and 42.1%, respectively. Stewardship processes also improved substantially. Guideline-concordant prescribing increased to 86.0%, blood cultures before therapy to 93.5%, appropriate dosing to 99.1%, therapy review at 48–72 hours to 81.3%, culture-guided therapy to 85.0%, and de-escalation to 84.1%. MDR organisms occurred in 16.8% of intervention cases compared with 40.2% of controls, while ESBL-producing organisms occurred in 7.5% versus 19.6%, respectively.

Conclusions: Antimicrobial stewardship interventions were associated with improved antimicrobial prescribing practices, reduced antimicrobial resistance indicators, and better neonatal clinical outcomes. Structured stewardship programs should therefore be strengthened and institutionalized within neonatal units in Kenya.

Keywords: Antimicrobial stewardship, neonatal sepsis, antimicrobial resistance, neonatal outcomes, antibiotic prescribing

INTRODUCTION

Antimicrobial resistance (AMR) occurs when microorganisms evolve mechanisms to withstand drugs designed to eliminate them, rendering standard treatments ineffective and posing significant threats to global health (World Health Organization, 2023). Neonatal sepsis is a major cause of neonatal morbidity and mortality and

requires timely initiation of effective antimicrobial therapy. However, the extensive use of antibiotics in neonatal units creates an important clinical dilemma because delayed or inadequate treatment may result in treatment failure and death, whereas unnecessary, inappropriate, or prolonged antimicrobial exposure contributes to adverse drug events, increased healthcare costs, and antimicrobial resistance (Villanueva et al., 2021). The World Health Organization recommends appropriate empirical antimicrobial therapy for hospitalized young infants with suspected sepsis and emphasizes obtaining blood cultures before treatment where possible and reviewing therapy according to clinical and microbiological findings (Poggi & Dani, 2023).

Antimicrobial stewardship is increasingly recognized as an important approach for balancing these competing risks (Zhang et al., 2021). Neonatal AMS programs may include evidence-based prescribing guidelines, prospective audit and feedback, antimicrobial review, diagnostic stewardship, microbiological surveillance, de-escalation, provider education, and monitoring of antibiotic duration (Ackers et al., 2020). These interventions seek to ensure that neonates receive the right antimicrobial at the right dose, through the appropriate route, for the shortest effective duration. Evidence from the international literature supports the effectiveness of neonatal AMS. Mascarenhas et al., (2024), in a meta-analysis involving more than 350,000 neonates across 70 studies, found moderate-certainty evidence that AMS programs reduced antimicrobial initiation by 19% in neonatal intensive care units, reduced antimicrobial duration, and shortened length of therapy by approximately 1.82 days. Importantly, the interventions were not associated with increased sepsis-related mortality or reinitiation of antimicrobial therapy.

Evidence from Africa similarly demonstrates the potential benefits of neonatal stewardship. The South African NeoAMS study implemented multidisciplinary prospective audit and feedback across 14 neonatal units. Among 565 neonates enrolled during the intervention period, pharmacists reviewed 700 antibiotic prescription episodes and recommended 437 stewardship interventions (Ahmed et al., 2024). Clinicians accepted 77% of the recommendations, while mean antibiotic length of therapy decreased by 24%, from 9.1 to 6.9 days. The largest reduction occurred among neonates treated for culture-negative sepsis. In Kenya, evidence demonstrates substantial neonatal antibiotic exposure and therefore an important opportunity for stewardship. Aluvaala et al., (2025) analyzed data from 22 Kenyan neonatal units involving 82,834 neonates and found that 62.6% received at least one antibiotic prescription at admission. First-line antibiotics constituted 86% of prescriptions, although substantial variation existed between facilities and switching after admission frequently involved third-generation cephalosporins. Antibiotic consumption was estimated at 418 days of therapy per 1,000 patient-days by length of therapy and 744 per 1,000 patient-days by days of therapy.

METHODS

Study design

A quasi-experimental interrupted time-series design with a non-equivalent comparison group was used. The study was conducted in selected Level 4 and Level 5 health facilities in Kiambu County, Kenya. The design involved repeated observations before and after implementation of AMS interventions in intervention facilities and corresponding observations in comparison facilities. The intervention consisted of evidence-based antimicrobial prescribing guidelines, prescription audit and feedback, diagnostic stewardship, provider training, antimicrobial review at 48–72 hours, culture-guided treatment, de-escalation, and documentation of antimicrobial indication, duration, and stop/review dates. The comparison facilities continued routine neonatal sepsis management without the structured AMS package. The study was conducted over a six-month period in selected public health facilities in Kiambu County, Kenya between January 2026 and June 2026.

Study setting and population

The study population comprised neonates aged 0–28 days diagnosed with clinical or laboratory-confirmed sepsis and receiving antimicrobial therapy in selected neonatal units. Healthcare providers directly involved in neonatal care and antimicrobial prescribing, including pediatricians, neonatal nurses, clinical officers, and pharmacists, were also included for assessment of provider and health-system factors.

Sampling

The study planned to recruit 214 neonates, comprising 107 in the intervention arm and 107 in the comparison arm. Neonates meeting the eligibility criteria were recruited consecutively during the study period. Six facilities were purposively selected based on neonatal service availability and neonatal sepsis burden. Intervention and comparison facilities were selected to allow assessment of changes associated with AMS implementation while minimizing contamination between study arms.

Research instruments

Three principal sources of data were used:

1. **Medical record review:** demographic characteristics, diagnosis, antimicrobial regimen, dosage, duration, culture results, susceptibility profiles, length of stay, treatment outcome, adverse drug reactions, and readmission.
2. **Healthcare-provider questionnaire:** provider knowledge, attitudes, prescribing practices, AMS exposure, and perceived health-system barriers.
3. **Key informant interviews:** perspectives of pediatricians, neonatal nursing leaders, pharmacists, laboratory managers, and facility managers concerning AMS implementation.

Data analysis

Quantitative data were coded and analyzed using SPSS version 30.0. Descriptive statistics Quantitative data were analyzed using SPSS version 30.0. Frequencies and percentages were used to summarize categorical variables. Associations between categorical variables were assessed using Pearson's chi-square test or Fisher's exact test where appropriate. The Mann–Whitney U test was used for non-normally distributed continuous or ordinal outcomes. For the interrupted time-series component, segmented regression was planned to evaluate immediate level changes and changes in post-intervention trends. Multivariable regression was used to assess factors associated with neonatal clinical outcomes and antimicrobial resistance. Qualitative interviews were transcribed, coded, and analyzed thematically. Deductive codes were derived from the study objectives and conceptual framework, while inductive coding allowed new themes to emerge. Qualitative findings were triangulated with quantitative results.

Ethical considerations

Ethical approval was obtained from the Great Lakes University of Kisumu-Ethical Review Committee (GLUSERC /021/2026), with additional authorization from NACOSTI (NACOSTI/P/26/4192095), Kiambu County authorities, and participating facilities. Written informed consent was obtained from all participants. Confidentiality and anonymity were maintained through coded identifiers and secure data storage. Participation was voluntary, and respondents were informed of their right to withdraw at any time without penalty. No incentives were provided, and no invasive procedures were involved.

RESULTS

Antimicrobial Resistance Surveillance

At postintervention, antimicrobial resistance surveillance showed marked improvement in the intervention arm compared with control. Empirical therapy dominated controls 83 (77.6%) but fell sharply in intervention 40 (37.4%), while targeted treatment rose to 67 (62.6%). Short courses ≤ 7 days were far more common in intervention 77 (72.0%) than control 27 (25.2%), and de-escalation increased from 31 (29.0%) to 90 (84.1%). Stewardship intervention use rose from 4 (3.7%) to 104 (97.2%). Resistance burdens were also lower in intervention: ESBL 8 (7.5%) versus 21 (19.6%), carbapenem resistance 3 (2.8%) versus 12 (11.2%), and MDR organisms 18 (16.8%) versus 43 (40.2%). Turnaround time under 60 hours improved dramatically.



Table 1: Antimicrobial Resistance Surveillance

Characteristics		Control		Intervention	
		Freq	Percent	Freq	Percent
Therapy type	Empirical	83	77.6%	40	37.4%
	Targeted	24	22.4%	67	62.6%
Duration of antibiotic therapy	≤ 7 days	27	25.2%	77	72.0%
	8-11 days	61	57.0%	28	26.2%
	≥ 12 days	19	17.8%	2	1.9%
De-escalation performed	Yes	31	29.0%	90	84.1%
	No	76	71.0%	17	15.9%
Stewardship intervention applied	Yes	4	3.7%	104	97.2%
	No	103	96.3%	3	2.8%
ESBL producer	Yes	21	19.6%	8	7.5%
	No	34	31.8%	38	35.5%
	Not applicable	52	48.6%	61	57.0%
Carbapenem-resistant organism	Yes	12	11.2%	3	2.8%
	No	43	40.2%	43	40.2%
	Not applicable	52	48.6%	61	57.0%
Methicillin resistance	Yes	5	4.7%	4	3.7%
	No	8	7.5%	10	9.3%
	Not applicable	94	87.9%	93	86.9%
Presence of MDR organism	Yes	43	40.2%	18	16.8%
	No	64	59.8%	89	83.2%
Contamination noted	Yes	9	8.4%	10	9.3%
	No	98	91.6%	97	90.7%
Culture turnaround time	< 60 hours	21	19.6%	102	95.3%
	60-84 hours	75	70.1%	5	4.7%
	> 84 hours	11	10.3%	0	0.0%

Key informants consistently reported that antimicrobial resistance (AMR) remains a significant concern in neonatal sepsis management, although noticeable improvements have occurred following antimicrobial stewardship implementation. Participants observed reductions in multidrug-resistant infections, improved culture-guided therapy, shorter hospital stays, and better neonatal recovery. However, resistant organisms and occasional treatment failures continue to challenge optimal management, particularly among critically ill neonates.

"Before introducing stewardship interventions, we frequently managed neonates empirically because laboratory results took too long. We experienced increasing multidrug-resistant infections, prolonged admissions, and occasional treatment failures. Since strengthening culture-guided treatment and antimicrobial review, we have seen fewer resistant infections, improved recovery rates, and shorter hospital stays, although resistant organisms remain an ongoing challenge." (KII 1).

"Resistance patterns have become easier to monitor because stewardship activities now encourage routine surveillance and documentation. We have observed fewer inappropriate prescriptions and reduced carbapenem use. These improvements have translated into better treatment success and fewer cases requiring escalation to last-resort antibiotics." (KII 5).

"From the nursing perspective, babies recover faster than before because antibiotics are reviewed earlier. We now experience fewer prolonged admissions and fewer complications related to ineffective antibiotic treatment. Families also express greater confidence when treatment decisions are supported by laboratory findings." (KII 9).

"Our biggest concern has been ESBL-producing organisms and other multidrug-resistant bacteria among critically ill neonates. Fortunately, regular susceptibility testing has enabled us to prescribe more targeted antibiotics. Mortality has reduced, readmissions have declined, and fewer babies require prolonged antibiotic therapy compared with previous years." (KII 11).

Antimicrobial Prescribing Audit

At postintervention, antimicrobial prescribing improved substantially in the intervention arm across all stewardship indicators. Indication documentation increased from 67 (62.6%) in controls to 100 (93.5%) in intervention, and guideline-concordant prescribing rose from 65 (60.7%) to 92 (86.0%). Blood culture before therapy improved from 74 (69.2%) to 100 (93.5%), while dose appropriateness reached 106 (99.1%) in intervention. De-escalation where indicated increased from 39 (36.4%) to 76 (71.0%), culture-guided therapy from 59 (55.1%) to 91 (85.0%), and stop/review documentation from 49 (45.8%) to 82 (76.6%) (Table 2).

Table 2: Antimicrobial Prescribing Audit

Characteristics		Control		Intervention	
		Freq	Percent	Freq	Percent
Indication documented	Yes	67	62.6%	100	93.5%
	No	40	37.4%	7	6.5%
Antibiotic prescribed according to guideline	Yes	65	60.7%	92	86.0%
	No	42	39.3%	15	14.0%
Blood culture obtained before therapy	Yes	74	69.2%	100	93.5%
	No	33	30.8%	7	6.5%
Dose appropriate for weight/age	Yes	75	70.1%	106	99.1%



	No	32	29.9%	1	0.9%
Route appropriate	Yes	89	83.2%	103	96.3%
	No	18	16.8%	4	3.7%
Duration documented	Yes	63	58.9%	80	74.8%
	No	44	41.1%	27	25.2%
Review after 48–72 hours	Yes	56	52.3%	87	81.3%
	No	51	47.7%	20	18.7%
De-escalation done where indicated	Yes	39	36.4%	76	71.0%
	No	68	63.6%	31	29.0%
Broad-spectrum antibiotic justified	Yes	67	62.6%	85	79.4%
	No	40	37.4%	22	20.6%
Culture results used to guide therapy	Yes	59	55.1%	91	85.0%
	No	48	44.9%	16	15.0%
Duplicate antimicrobial coverage avoided	Yes	70	65.4%	96	89.7%
	No	37	34.6%	11	10.3%
Stop/review date documented	Yes	49	45.8%	82	76.6%
	No	58	54.2%	25	23.4%

Antimicrobial Stewardship Interventions and Clinical Outcomes

The intervention group demonstrated superior clinical outcomes compared with the control group. Recovery occurred in 100 (93.5%) intervention neonates compared with 82 (76.6%) controls. Referral was lower among intervention neonates, 5 (4.7%), compared with 16 (15.0%) controls. Mortality was also lower, with 2 (1.9%) deaths in the intervention group compared with 9 (8.4%) in controls. Adverse drug reactions occurred in 4 (3.7%) intervention neonates compared with 17 (15.9%) controls, with a statistically significant association (FET = 0.003). Similarly, 28-day readmission occurred in 4 (3.7%) intervention cases compared with 14 (13.1%) controls (FET = 0.012). Hospitalization was shorter among intervention neonates. Thirty-five (32.7%) intervention neonates stayed for less than seven days compared with only 4 (3.7%) controls. A stay exceeding 14 days occurred in 12 (11.2%) intervention cases compared with 45 (42.1%) controls. The difference was statistically significant (Mann–Whitney U = 0.0001). These findings demonstrate that AMS implementation was associated with improved recovery and reductions in mortality, referral, adverse drug reactions, readmission, and prolonged hospitalization.

Table 3: Antimicrobial Stewardship Interventions and Clinical Outcomes

Characteristics		Control		Intervention		Statistics
		Freq	Percent	Freq	Percent	
Clinical outcome	Recovered	82	76.6%	100	93.5%	



	Referred	16	15.0%	5	4.7%	Mann–Whitney U=0.002
	Died	9	8.4%	2	1.9%	
Adverse drug reactions	Yes	17	15.9%	4	3.7%	FET=0.003
	No	90	84.1%	103	96.3%	
Readmission within 28 days	Yes	14	13.1%	4	3.7%	FET=0.012
	No	93	86.9%	103	96.3%	
Length of hospital stay	< 7 days	4	3.7%	35	32.7%	Mann–Whitney U=0.0001
	7-14 days	58	54.2%	60	56.1%	
	> 14 days	45	42.1%	12	11.2%	

Stewardship Process Indicators

There were significant differences between intervention and control facilities across most stewardship indicators. De-escalation where indicated increased from 36.4% in controls to 71.0% in the intervention group ($\chi^2 = 25.733$; $df = 1$; $p = 0.001$). Guideline-concordant prescribing increased from 60.7% to 86.0% ($\chi^2 = 17.433$; $df = 1$; $p < 0.001$), while blood culture collection before antimicrobial therapy increased from 69.2% to 93.5% ($\chi^2 = 20.785$; $df = 1$; $p < 0.001$). Appropriate dosing increased from 70.1% to 99.1% ($FET < 0.001$), while appropriate route increased from 83.2% to 96.3% ($FET = 0.003$). Review of therapy after 48–72 hours increased from 52.3% to 81.3% ($\chi^2 = 20.255$; $df = 1$; $p < 0.001$), and de-escalation increased from 29.0% to 84.1% ($\chi^2 = 66.199$; $df = 1$; $p < 0.001$). Culture-guided therapy increased from 55.1% to 85.0% ($\chi^2 = 22.827$; $df = 1$; $p < 0.001$), while avoidance of duplicate antimicrobial coverage increased from 65.4% to 89.7% ($\chi^2 = 18.156$; $df = 1$; $p < 0.001$). Documentation of stop/review dates increased from 45.8% to 76.6% ($\chi^2 = 21.433$; $df = 1$; $p < 0.001$).

Table 4: Stewardship Process Indicators

Variables		Control		Intervention		Statistics
		Freq	Percent	Freq	Percent	
De-escalation done where indicated	Yes	39	36.4%	76	71.0%	$\chi^2=25.733$; $df = 1$; $p=0.001$
	No	68	63.6%	31	29.0%	
Stewardship intervention applied	Yes	4	3.7%	104	97.2%	FET=0.0001
	No	103	96.3%	3	2.8%	
Indication documented	Yes	67	62.6%	100	93.5%	$\chi^2=29.691$; $df = 1$; $p=0.001$
	No	40	37.4%	7	6.5%	
Antibiotic prescribed according to guideline	Yes	65	60.7%	92	86.0%	$\chi^2=17.433$; $df = 1$; $p=0.0001$
	No	42	39.3%	15	14.0%	
	Yes	74	69.2%	100	93.5%	



Blood culture obtained before therapy	No	33	30.8%	7	6.5%	$\chi^2=20.785$; df 1; p=0.0001
Dose appropriate for weight/age	Yes	75	70.1%	106	99.1%	FET=0.0001
	No	32	29.9%	1	0.9%	
Route appropriate	Yes	89	83.2%	103	96.3%	FET=0.003
	No	18	16.8%	4	3.7%	
Duration documented	Yes	63	58.9%	80	74.8%	$\chi^2=6.091$; df 1; p=0.014
	No	44	41.1%	27	25.2%	
Review after 48–72 hrs	Yes	56	52.3%	87	81.3%	$\chi^2=20.255$; df 1; p=0.0001
	No	51	47.7%	20	18.7%	
De-escalation performed	Yes	31	29.0%	90	84.1%	$\chi^2=66.199$; df 1; p=0.0001
	No	76	71.0%	17	15.9%	
Broad-spectrum antibiotic justified	Yes	67	62.6%	85	79.4%	$\chi^2=7.357$; df 1; p=0.007
	No	40	37.4%	22	20.6%	
Culture results used to guide therapy	Yes	59	55.1%	91	85.0%	$\chi^2=22.827$; df 1; p=0.0001
	No	48	44.9%	16	15.0%	
Duplicate antimicrobial coverage avoided	Yes	70	65.4%	96	89.7%	$\chi^2=18.156$; df 1; p=0.0001
	No	37	34.6%	11	10.3%	
Stop/review date documented	Yes	49	45.8%	82	76.6%	$\chi^2=21.433$; df 1; p=0.0001
	No	58	54.2%	25	23.4%	

Participants described several antimicrobial stewardship interventions implemented within neonatal units, including antibiotic prescribing guidelines, blood culture collection before treatment, antimicrobial audits, multidisciplinary stewardship rounds, antibiotic de-escalation, and culture-guided prescribing. Informants agreed that these interventions substantially improved prescribing practices, reduced inappropriate antibiotic use, strengthened documentation, and contributed to improved neonatal outcomes with fewer antimicrobial-resistant infections.

"We have standardized neonatal sepsis treatment guidelines that every clinician is expected to follow. Blood cultures are obtained before initiating antibiotics whenever possible, and therapy is reviewed within 48 to 72 hours. These practices have significantly reduced unnecessary antibiotic exposure." (KII 2).

"Culture reports are now available much faster than before, allowing clinicians to practice de-escalation once susceptibility results become available. Targeted therapy has become increasingly common, reducing dependence on prolonged empirical antibiotic treatment." (KII 7).

"Documentation has improved remarkably. Clinicians now clearly indicate antibiotic indications, review dates, and treatment duration. This has improved accountability and continuity of care while minimizing unnecessary antibiotic administration." (KII 9)

DISCUSSION

The present study demonstrated that implementation of antimicrobial stewardship interventions was associated with improved neonatal clinical outcomes. Recovery increased from 76.6% in the control group to 93.5% in the intervention group, while mortality declined from 8.4% to 1.9%. Adverse drug reactions and 28-day readmissions were also substantially lower among intervention neonates. In addition, the intervention group experienced considerably shorter hospitalization. The findings are consistent with the international evidence synthesized by Mascarenhas et al., (2024). Their meta-analysis of 70 studies involving more than 350,000 neonates found that AMS interventions reduced antimicrobial initiation and duration without increasing sepsis-related mortality or antimicrobial reinitiation. The pooled evidence therefore supports the safety of reducing unnecessary antimicrobial exposure while maintaining effective treatment. The current findings also align closely with the South African NeoAMS study, Ahmed et al., (2024) implemented prospective multidisciplinary stewardship interventions across 14 neonatal units and observed a 24% reduction in mean antibiotic length of therapy, from 9.1 to 6.9 days. The intervention was particularly effective in reducing treatment duration for culture-negative sepsis, while clinicians accepted 77% of pharmacist recommendations.

The improved outcomes observed in the present study may be explained by improvements in the antimicrobial prescribing process. The intervention increased documentation of indications, guideline adherence, blood culture collection, appropriate dosing, review of therapy, de-escalation, and culture-guided treatment. These interventions reduce unnecessary antibiotic exposure while increasing the likelihood that neonates receive effective therapy when bacterial infection is present. The findings are particularly relevant in Kenya, where recent evidence demonstrates substantial antibiotic exposure among neonates. Aluvaala et al., (2025) found that 62.6% of more than 82,000 neonates in 22 Kenyan neonatal units received antibiotics at admission. Although first-line prescribing was generally consistent with national recommendations, antibiotic consumption remained substantial and post-admission switching to third-generation cephalosporins was common. The current study therefore provides an important extension of the Kenyan evidence by demonstrating that stewardship interventions can improve prescribing processes and are accompanied by better clinical outcomes and lower resistance indicators.

The reduction in antimicrobial resistance indicators is particularly important. MDR organisms were detected in 16.8% of intervention cases compared with 40.2% of controls, while ESBL-producing organisms occurred in 7.5% versus 19.6%, respectively. Carbapenem resistance was also lower in the intervention group. These findings support the biological plausibility that reducing unnecessary broad-spectrum antimicrobial exposure and increasing targeted treatment may reduce selection pressure for resistant organisms. Nevertheless, the interpretation of these findings should recognize that antimicrobial resistance is multifactorial. Resistance may be affected by infection-prevention and control practices, environmental contamination, patient transfer patterns, laboratory capacity, antimicrobial availability, and local pathogen epidemiology. Consequently, stewardship interventions should be integrated with microbiological surveillance and infection-prevention measures rather than implemented independently.

The importance of microbiological capacity is also evident from the Kenyan literature. Aluvaala et al., (2025) emphasized the importance of monitoring antibiotic prescription patterns over time and across facilities as a means of evaluating stewardship effectiveness. The current study similarly found that culture turnaround time improved substantially following intervention, facilitating more targeted antimicrobial treatment and de-escalation. The findings further support WHO recommendations emphasizing appropriate empirical therapy, microbiological investigation where possible, and rational antibiotic use in young infants with suspected sepsis. WHO currently recommends ampicillin plus gentamicin as first-choice hospital treatment for suspected sepsis in hospitalized young infants aged 0–59 days, while recognizing the importance of antimicrobial resistance and local resistance patterns in treatment decisions. The improvement in antibiotic review and de-escalation is also important because prolonged antimicrobial exposure is common in neonatal care. The present study found that therapy lasting at least 12 days decreased from 17.8% in controls to 1.9% in the intervention group. This is

consistent with the wider neonatal AMS literature showing reductions in antimicrobial duration without evidence of increased mortality.

CONCLUSION

The study demonstrated that implementation of structured antimicrobial stewardship interventions was associated with substantial improvements in neonatal sepsis management. The intervention increased guideline-concordant prescribing, microbiological investigation, appropriate dosing, antimicrobial review, culture-guided treatment, and de-escalation. These improvements were accompanied by higher recovery, lower mortality, fewer adverse drug reactions and readmissions, shorter hospitalization, and lower indicators of antimicrobial resistance. The findings support antimicrobial stewardship as an important strategy for improving the quality and safety of neonatal sepsis management in Kenyan health facilities.

Suggestions

The Ministry of Health, in collaboration with county governments and hospital management teams, should strengthen antimicrobial stewardship (AMS) programmes in neonatal units to improve clinical outcomes and reduce antimicrobial resistance. National and county-level guidelines should be reinforced to standardize antibiotic selection, dosing, duration, review, and de-escalation. Health facilities should strengthen microbiology laboratory capacity to facilitate timely blood culture and antimicrobial susceptibility testing, enabling clinicians to provide targeted rather than prolonged empirical therapy. Regular antimicrobial prescribing audits, multidisciplinary stewardship rounds, and audit-and-feedback mechanisms should be institutionalized to promote adherence to evidence-based treatment protocols. Healthcare providers should receive continuous professional development on neonatal sepsis management, antimicrobial resistance, diagnostic stewardship, and appropriate antibiotic use. Hospital management should ensure consistent availability of essential antibiotics, laboratory supplies, and adequate staffing to support stewardship activities. Routine monitoring of mortality, treatment success, adverse drug reactions, readmissions, length of hospital stay, and antimicrobial resistance patterns should be established. Finally, county health departments should strengthen surveillance systems and use stewardship data to guide resource allocation, quality improvement, and sustainable implementation of AMS interventions in neonatal care.

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Declarations

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