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Antimicrobial Resistance in Diarrhea Treatment: Addressing Future Challenges in Africa

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ABSTRACT

Antimicrobial resistance (AMR) in the treatment of diarrheal diseases represents a significant and escalating public health challenge in sub-Saharan Africa. The region is particularly vulnerable due to factors such as poor sanitation, inadequate diagnostic infrastructure, and the overuse of antibiotics in both healthcare and agriculture. This review explores the impact of AMR on the management of common diarrheal diseases caused by pathogens like *Shigella*, *E. coli*, and *Salmonella*. It highlights the drivers of resistance, including the indiscriminate use of antibiotics, lack of regulatory oversight, and insufficient healthcare resources. The emergence of resistant strains complicates treatment options, resulting in prolonged illness, higher mortality rates, and strained healthcare systems. This review also discusses potential strategies to address AMR, such as strengthening diagnostic capabilities, implementing antibiotic stewardship programs, improving sanitation, and promoting public awareness. The findings underscore the need for a coordinated, multi-sectoral approach to combat AMR and preserve the effectiveness of current antimicrobial treatments in sub-Saharan Africa.

Keywords: Antimicrobial Resistance, Diarrheal Diseases, Sub-Saharan Africa, Antibiotic Stewardship.

INTRODUCTION

Antimicrobial resistance (AMR) is one of the most pressing global health issues of the 21st century. AMR occurs when microorganisms bacteria, fungi, viruses, and parasites develop resistance to drugs that once effectively treated infections they cause. This resistance diminishes the efficacy of existing medications, leading to longer durations of illness, increased healthcare costs, and, most critically, higher mortality rates [1]. While AMR is a global concern, its impact is particularly severe in low- and middle-income countries (LMICs), including those in sub-Saharan Africa. In these regions, infectious diseases, particularly diarrheal diseases, remain a leading cause of morbidity and mortality. The emergence of AMR in the treatment of diarrheal diseases exacerbates the already fragile public health systems in these areas, creating an urgent need to address this issue comprehensively [2].

Diarrheal diseases, which include infections caused by a range of pathogens such as *Escherichia coli*, *Salmonella spp.*, *Shigella spp.*, *Vibrio cholerae*, and various parasites and viruses, represent one of the largest contributors to global health burdens. In sub-Saharan Africa, where access to clean water, sanitation, and adequate healthcare is often limited, the effects of these diseases are particularly devastating [3]. According to the World Health Organization (WHO), diarrheal diseases are responsible for over 200,000 deaths annually in the region, with the majority of these fatalities occurring in children under five years of age. However, the challenge is being compounded by the increasing incidence of AMR in diarrheal pathogens, which makes treatment options less effective and increases the likelihood of adverse health outcomes [4].

The emergence and spread of AMR in Africa have been driven by various factors, including overuse and misuse of antibiotics, poor sanitation and hygiene practices, lack of regulation in healthcare settings, and inadequate diagnostic capabilities. This review seeks to examine the growing threat of AMR in the context of diarrheal disease treatment in Africa [5]. It will highlight the critical factors contributing to AMR, the public health consequences, and explore potential strategies for mitigating this issue to improve health outcomes across the continent.

The burden of infectious diseases in sub-Saharan Africa has historically been high due to a combination of socio-economic, environmental, and healthcare challenges. In many parts of the region, inadequate access to clean drinking water, sanitation, and healthcare services creates a perfect storm for the transmission of infectious agents, including those that cause diarrhea [6]. The problem of diarrheal disease is further exacerbated by high levels of malnutrition,

which weaken the immune system and make individuals more susceptible to infections. Despite efforts to improve sanitation and hygiene, as well as the availability of vaccines for some diarrheal diseases, the situation remains dire, with AMR presenting an additional, significant obstacle [7].

AMR in Africa is not a new phenomenon, but its increasing prevalence is a cause for alarm. Antibiotics are commonly used in the treatment of bacterial diarrheal diseases, yet indiscriminate use—particularly in the absence of proper diagnostic testing has accelerated the development of resistance. The unregulated use of antibiotics in both human and veterinary settings has played a significant role in the rise of resistant strains [8]. Furthermore, the lack of adequate healthcare infrastructure, including diagnostic laboratories capable of detecting resistance patterns, limits the ability to address AMR effectively. As a result, many patients in sub-Saharan Africa are either receiving inappropriate antibiotic treatments or going untreated, leading to prolonged illness, increased transmission of resistant pathogens, and preventable deaths [9].

Diarrheal diseases are caused by a variety of pathogens, which complicates treatment options. While bacterial infections often respond to antibiotics, viral and parasitic infections do not, and their treatment is often symptomatic. This, combined with the emergence of AMR, has led to a situation where healthcare providers may be forced to use more expensive, less effective, or more toxic alternatives in an attempt to combat resistant infections. The lack of effective treatment regimens and the overburdened healthcare systems further exacerbate the problem [10].

AMR in the treatment of diarrheal diseases is a growing concern for public health in sub-Saharan Africa. The increasing resistance of pathogens such as *Shigella*, *E. coli*, and *Salmonella* to common antibiotics, coupled with the limited availability of alternative treatments, has significantly undermined efforts to reduce the mortality and morbidity associated with these diseases. The inappropriate use of antibiotics, compounded by factors such as poor infection control, inadequate healthcare infrastructure, and a lack of public awareness, has accelerated the emergence of resistant strains [11]. This threatens to undo years of progress made in the fight against diarrheal diseases, and poses a serious challenge to achieving the United Nations' Sustainable Development Goal (SDG) 3, which aims to ensure healthy lives and promote well-being for all, particularly by reducing the burden of communicable diseases.

In sub-Saharan Africa, where healthcare systems are already stretched thin by a range of other health challenges such as malaria, HIV/AIDS, and tuberculosis, the emergence of AMR in diarrheal disease pathogens further burdens an already fragile public health infrastructure. The widespread misuse of antibiotics, combined with high rates of untreated and undiagnosed infections, has led to the development of multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains, making it increasingly difficult to manage even common diarrheal diseases effectively [12].

Given these challenges, there is an urgent need to assess the current status of AMR in diarrheal diseases in Africa, explore the underlying drivers of resistance, and propose evidence-based strategies for combatting this growing threat. This study aims to address the significant issue of antimicrobial resistance (AMR) in sub-Saharan Africa, particularly focusing on diarrheal pathogens. One key objective is to assess the prevalence of AMR in common bacterial pathogens like *Shigella*, *Salmonella*, *Vibrio cholerae*, and *Escherichia coli* across different regions of sub-Saharan Africa. By understanding the scope of AMR, the study intends to identify regional patterns and trends that can guide effective interventions. Another specific objective is to examine the factors contributing to AMR, such as the overuse and misuse of antibiotics, lack of sanitation, poor hygiene practices, and unregulated use in both human and veterinary sectors. This comprehensive analysis will explore how these factors vary regionally and their collective impact on the rise of resistance. Furthermore, the study aims to evaluate the public health consequences of AMR, particularly its effect on morbidity and mortality rates in Africa, and the subsequent strain on healthcare systems. Proposed strategies for mitigating AMR include promoting antibiotic stewardship, improving diagnostic capabilities, and enhancing infection control measures. Finally, the study highlights the importance of international collaborations, particularly supporting African governments and healthcare institutions, to combat AMR effectively. Addressing AMR will not only improve health outcomes in sub-Saharan Africa but will also contribute to global efforts to combat resistance.

The Scope of Diarrheal Diseases in Africa

Diarrheal diseases continue to pose a significant health burden in sub-Saharan Africa, particularly among children under five years of age. These diseases, which lead to more than 500,000 deaths annually in the region according to the World Health Organization (WHO), are primarily caused by bacterial pathogens such as Shigella, Escherichia coli (E. coli), and Salmonella. The primary treatment for these infections typically involves antibiotics, which can be highly effective in reducing morbidity and mortality when used appropriately [13]. However, the growing prevalence of antimicrobial resistance (AMR) in the region is making the management of these diseases increasingly difficult. AMR arises from the overuse and misuse of antibiotics in both human medicine and agriculture, where antibiotics are frequently administered to livestock. This practice accelerates the emergence of resistant bacteria, rendering standard treatments less effective and leading to prolonged illness and higher mortality rates. In addition to the direct health impact, AMR also places a substantial strain on healthcare systems, as more expensive and complex treatment regimens may be required. Tackling this issue requires a multifaceted approach that includes

improving infection prevention strategies, promoting rational use of antibiotics, and enhancing surveillance to monitor the spread of resistant pathogens [14].

The Role of Antimicrobial Agents in Diarrhea Treatment

Antimicrobial agents have played a central role in treating diarrheal diseases, which are primarily caused by bacterial infections. Historically, antibiotics like tetracyclines, ciprofloxacin, and amoxicillin have been critical in managing these infections, providing effective relief and reducing mortality. However, the widespread and sometimes indiscriminate use of these drugs has led to the rise of antimicrobial resistance (AMR). As bacteria evolve and develop mechanisms to evade the effects of these medications, the effectiveness of these antibiotics diminishes, posing a significant challenge to public health [15]. Broad-spectrum antibiotics, often prescribed without proper diagnostic tests, have exacerbated this problem by targeting both harmful and beneficial bacteria, disrupting the natural microbiome and facilitating the emergence of resistant strains. Furthermore, the global trade in substandard and counterfeit antibiotics, particularly in low-resource settings, has contributed to the spread of resistance. In Africa, the availability of antibiotics over the counter, often without a prescription, encourages self-medication, which increases the likelihood of incorrect usage, such as incomplete courses or improper dosing. This is especially common in rural areas with limited access to healthcare, where individuals frequently turn to non-prescribed treatments due to accessibility and affordability concerns. As a result, antibiotic misuse remains a significant driver of AMR, complicating the treatment of bacterial diarrhea and other infections [16].

Contributing Factors to AMR in Africa

Several factors contribute to the escalating issue of antimicrobial resistance (AMR) in Africa, particularly in the context of treating diarrheal diseases. One of the key challenges is the inadequate diagnostic infrastructure. Many African countries lack the necessary facilities and resources to accurately diagnose the pathogens responsible for diarrhea. This deficiency leads to empirical treatment with broad-spectrum antibiotics, which may not be effective and can contribute to the development of resistant strains. Additionally, poor infection control practices in healthcare settings exacerbate the situation [17]. Overcrowded hospitals and clinics, with limited staff and resources, often fail to implement proper infection control protocols, allowing multidrug-resistant organisms (MDROs) to spread rapidly within healthcare facilities. Limited access to clean water and sanitation further compounds the problem, as unsafe drinking water and poor sanitation increase the frequency of diarrheal diseases, which in turn leads to a higher demand for antibiotics. In regions where clean water and sanitation infrastructure is lacking, the overuse of antibiotics becomes even more pronounced. Finally, the agricultural use of antibiotics, especially in livestock farming, is a significant contributor to AMR. Antibiotics used in animals can lead to the emergence of resistant bacteria, which can be transmitted to humans through direct contact, consumption of contaminated food, or environmental exposure. These factors collectively contribute to the rise of AMR in Africa, making it a complex and multifaceted issue [18].

Consequences of AMR in Diarrhea Treatment

The consequences of antimicrobial resistance (AMR) in the treatment of diarrhea in Africa are profound and alarming. The failure of first-line antibiotics, which were once effective in treating common bacterial diarrhea, has led to significant challenges in managing infections. What was previously a manageable condition has now evolved into a serious health crisis, with prolonged illness, escalating healthcare costs, and a rise in mortality rates. This shift means that individuals, particularly children and vulnerable populations, suffer longer durations of sickness, increasing their risk of dehydration, malnutrition, and systemic infections, all of which exacerbate the burden of disease. Beyond the direct health impacts, AMR strains pose far-reaching consequences for public health infrastructure [19]. With limited alternative treatment options available, healthcare systems, especially in low-resource settings, struggle to manage the rising tide of resistant infections. This places a disproportionate strain on healthcare facilities that are already underfunded and overwhelmed, particularly in rural and remote areas where medical resources are scarce. As healthcare providers face challenges in treating resistant infections, the long-term consequences could include weakened public health systems, reduced access to effective treatment, and a growing health crisis that threatens to undermine years of progress in improving health outcomes in Africa.

Addressing AMR: Strategies and Recommendations

Addressing Antimicrobial Resistance (AMR) in the context of diarrhea treatment in Africa requires a comprehensive, multi-pronged strategy. Key to mitigating the impact of AMR is strengthening diagnostic capabilities. Expanding access to rapid diagnostic tests in healthcare settings ensures that antibiotics are prescribed only when necessary and that the right antibiotic is selected based on the specific pathogen involved [20]. Furthermore, the implementation of antimicrobial stewardship programs in both the healthcare and agricultural sectors is essential. These programs would promote the rational use of antibiotics by restricting over-the-counter sales and ensuring antibiotics are prescribed based on accurate diagnostic results. Strengthening infection prevention and control measures in healthcare settings is also a priority. This includes adhering to strict hand hygiene protocols and sterilization practices to prevent the transmission of resistant bacteria. Public education and awareness campaigns play a crucial role in combating AMR by educating the public on the dangers of self-

medication, the importance of completing prescribed antibiotic courses, and the proper use of antibiotics. Moreover, improving access to clean water and sanitation is a foundational measure to reduce the incidence of diarrheal diseases, thus reducing the demand for antibiotics [21]. Finally, fostering international collaboration and policy development is vital. Governments, non-governmental organizations, and global health bodies must work together to enforce policies that limit antibiotic misuse and support the development of new antibiotics and vaccines.

CONCLUSION

Antimicrobial resistance (AMR) in the treatment of diarrhea in Africa presents a growing public health threat that demands urgent attention. The rising prevalence of antibiotic-resistant bacterial strains, coupled with factors such as inadequate diagnostic tools, the overuse and misuse of antibiotics, and poor sanitation conditions, highlights the complexity of addressing AMR in the region. To combat this crisis, Africa needs to implement a comprehensive approach that involves improving diagnostic capacity, enforcing stringent antibiotic stewardship policies, and enhancing public health infrastructure. Key interventions should include bolstering preventative measures, such as better sanitation and hygiene practices, alongside widespread educational campaigns aimed at both healthcare providers and the public. In addition, the integration of sustainable practices in healthcare and agriculture will play a critical role in reducing AMR. Ultimately, the fight against AMR in Africa requires coordinated efforts at the local, national, and international levels to safeguard effective treatment options and protect the health of future generations.

REFERENCES

1. Ahmed, S.K., Hussein, S., Qurbani, K., Ibrahim, R.H., Fareeq, A., Mahmood, K.A., Mohamed, M.G.: Antimicrobial resistance: Impacts, challenges, and future prospects. Journal of Medicine, Surgery, and Public Health. 2, 100081 (2024). https://doi.org/10.1016/j.glmedi.2024.100081
2. Moyo, P., Moyo, E., Mangoya, D., Mhango, M., Mashe, T., Imran, M., Dzinamarira, T.: Prevention of antimicrobial resistance in sub-Saharan Africa: What has worked? What still needs to be done? Journal of Infection and Public Health. 16, 632–639 (2023). https://doi.org/10.1016/j.jiph.2023.02.020
3. Alum, E. U., Obeagu, E. I.,Ugwu, O. P. C. Curbing Diarrhea in Children below five years old: The sub-Saharan African Standpoint.*J. New Medical Innovations and Research.* 2024;5(1); DOI:10.31579/2767-7370/083
4. Diarrhoeal disease, https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease
5. Ugwu, O. P. C., Alum, E. U. and Uhama, K. C. (2024). Role of Phytochemical-Rich Foods in Mitigating Diarrhea among Diabetic Patients. Research Invention Journal of Scientific and Experimental Sciences. 3(1):45-55.
6. Moyo, E., Mhango, M., Moyo, P., Dzinamarira, T., Chitungo, I., Murewanhema, G.: Emerging infectious disease outbreaks in Sub-Saharan Africa: Learning from the past and present to be better prepared for future outbreaks. Front Public Health. 11, 1049986 (2023). https://doi.org/10.3389/fpubh.2023.1049986
7. Gulumbe, B. H., Izah, S.C., Uti, D.E., Aja, P.M., Igwenyi, I.O., Offor, C.E. (2025). Natural product-based inhibitors of quorum sensing: A novel approach to combat antibiotic resistance. Biochemistry and Biophysics Reports, 43(2025):102111. doi: 10.1016/j.bbrep.2025.102111. PMID: 40641742; PMCID: PMC12242448
8. Ugwu, O. P. C., Alum, E. U. and Uhama, K. C. (2024). Phytochemicals and Vitamins as Adjunct Therapies for Diarrhea in Diabetic Patients. Research Invention Journal of Research in Medical Sciences. 3(2):27-37.
9. Kariuki, S., Kering, K., Wairimu, C., Onsare, R., Mbae, C.: Antimicrobial Resistance Rates and Surveillance in Sub-Saharan Africa: Where Are We Now? Infect Drug Resist. 15, 3589–3609 (2022). https://doi.org/10.2147/IDR.S342753
10. Agah, V. M., Orji, O. U., Ezeani, N. N., Ugwu, O. P., Bawa, I., Omang, W. A. and Itodo, M. O. (2023). Physico-chemical and Bacteriological Analysis of Water used for Drinking and other Domestic Purposes in Amaozara Ozizza, Afikpo North, Ebonyi State, Nigeria. *Nigerian Journal of Biochemistry and Molecular Biology*, 38(1), 1-8. https://doi.org/10.2659/njbmb.2023.151
11. Okumu, N.O., Muloi, D.M., Moodley, A., Watson, J., Kiarie, A., Ochieng, L., et al.: Antimicrobial resistance in community-acquired enteric pathogens among children aged ≤ 10-years in low-and middle-income countries: a systematic review and meta-analysis. Front Microbiol. 16, 1539160 (2025). https://doi.org/10.3389/fmicb.2025.1539160
12. Alum EU, Obeagu EI, Ugwu OP. Enhancing quality water, good sanitation, and proper hygiene is the panacea to diarrhea control and the attainment of some related sustainable development goals: A review. Medicine (Baltimore). 2024 Sep 20;103(38):e39578. doi: 10.1097/MD.0000000000039578. PMID: 39312342; PMCID: PMC11419503.
13. Ikuta, K.S., Swetschinski, L.R., Robles Aguilar, G., Sharara, F., Mestrovic, T., Gray, A.P., et al.: Global mortality associated with 33 bacterial pathogens in 2019: a systematic analysis for the Global Burden of

Disease Study 2019. The Lancet. 400, 2221–2248 (2022). https://doi.org/10.1016/S0140-6736(22)02185-7

14. Ogban G. I, Ndueso E. M, Iwuafor A. A, Emanghe U. E, Ushie S. N, Ejemot-Nwadiaro R. I (2021). Availability and Affordability of Sanitation and Health Promoting Amenities: Driving the Impact of Knowledge of Childhood Diarrhea on Health-Seeking Practices of Under-five … *Highlights on Medicine and Medical Research, 3. B P International, 140-155. https://doi.org/10.9734/bpi/hmmr/v3/2344E*.
15. Iwu, C.D., Korsten, L., Okoh, A.I.: The incidence of antibiotic resistance within and beyond the agricultural ecosystem: A concern for public health. Microbiologyopen. 9, e1035 (2020). https://doi.org/10.1002/mbo3.1035
16. Awor P, Wamani H, Bwire G, Jagoe G, Peterson S (2012). Private sector drug shops in integrated community case management of malaria, pneumonia, and diarrhea in children in Uganda. *The American journal of tropical medicine and hygiene, 87, (5), 92, doi: 10.4269/ajtmh.2012.11-0791*.
17. Critchley J. A, Ejemot-Nwadiaro R. I, Ehiri J. E, Arikpo D, Meremikwu M. M (2015). Hand washing promotion for preventing diarrhea. *Cochrane Database of Systematic Reviews, 9, 9. Art. No.: CD004265. DOI: 10.100.*
18. Enshaie, E., Nigam, S., Patel, S., Rai, V.: Livestock Antibiotics Use and Antimicrobial Resistance. Antibiotics (Basel). 14, 621 (2025). https://doi.org/10.3390/antibiotics14060621
19. Hacker, K.: The Burden of Chronic Disease. Mayo Clin Proc Innov Qual Outcomes. 8, 112–119 (2024). https://doi.org/10.1016/j.mayocpiqo.2023.08.005
20. Agwu E, Oming S, Moazzam M. L. (2015). Prevalence of Cryptosporidiosis among diarrhea patients attending clinics in Bushenyi district of Uganda. Spec parasite pathogens J, 1, (1), 01-08.
21. Parveen, S., Garzon-Orjuela, N., Amin, D., McHugh, P., Vellinga, A.: Public Health Interventions to Improve Antimicrobial Resistance Awareness and Behavioural Change Associated with Antimicrobial Use: A Systematic Review Exploring the Use of Social Media. Antibiotics (Basel). 11, 669 (2022). https://doi.org/10.3390/antibiotics11050669

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