



Ethnographic determinants, cultural practices, and habits related to the development of antibiotic resistance in a rural community in South Africa

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ABSTRACT

This qualitative study examined the intersection of traditional cultural practices, healthcare-seeking behaviours, and antibiotic use patterns that may contribute to antimicrobial resistance (AMR) in children within the rural community of Dzimauli, Limpopo, South Africa. Through two focus group discussions comprising 17 participants, this analysis revealed critical gaps in antibiotic knowledge, widespread non-adherence to prescribed treatment courses, and the parallel use of traditional medicine alongside allopathic healthcare. The findings highlight how sociocultural factors, including reliance on traditional healers (Maine), early introduction of complementary foods, and limited health literacy, create conditions that are conducive to AMR development. This study contributes to the understanding of the complex sociological drivers of antibiotic misuse in low-resource African settings.

Keywords: Antimicrobial resistance, cultural practices, habits, health-seeking behaviour.

INTRODUCTION

Antimicrobial resistance represents one of the most pressing global public health challenges of the 21st century, with low- and middle-income countries (LMICs) bearing a disproportionate burden of the crisis.¹ In sub-Saharan Africa, the convergence of weak healthcare infrastructure, limited access to quality medicines, and deeply rooted cultural practices creates a complex environment for AMR

¹ Tsegaye Melaku and Lidia Assegid, "Prescription in Peril: The Sociology of Antibiotics and Antimicrobial Resistance in Low Resource Settings," *Discover Social Science and Health* 5, no. 1 (May 12, 2025): 71, <https://doi.org/10.1007/s44155-025-00225-1>; Hedayatullah Ehsan, "Antibiotic Resistance in Developing Countries: Emerging Threats and Policy Responses," *Public Health Challenges* 4, no. 1 (March 12, 2025), <https://doi.org/10.1002/puh2.70034>.

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proliferation. The sociology of antibiotic use in these settings, though critical to understanding AMR drivers, remains underexplored.²

Rural South African communities present unique challenges, where traditional medicine systems coexist with formal healthcare structures, often without integration or coordination.³ In Limpopo Province, where an estimated 80% of the population relies on traditional medicine for primary healthcare needs, understanding the ethnographic determinants of health behaviours becomes essential for addressing AMR.⁴ Several studies have investigated the impact of antimicrobial resistance (AMR) on various health outcomes, including incidence and mortality rates, hospital stay duration, and healthcare expenditures, with a focus on distinct pathogen-drug combinations across geographic regions.⁵ Additionally, there have been investigations into the ethnographic determinants of drug resistance in countries such as Greece and China. However, there is a notable lack of research examining these phenomena in Limpopo, South Africa. This study fills the gap by investigating practices, attitudes, perceived norms, and values related to health-seeking behaviours and knowledge on antibiotic use to understand the socio-cultural determinants of microbial resistance within a rural community in Limpopo Province, South Africa. Thus, this study examines the cultural practices, beliefs, and healthcare behaviours in Dzimauli that may inadvertently contribute to antibiotic resistance in young children.

LITERATURE REVIEW

The emergence and spread of antibiotic-resistant bacteria (ARB), antimicrobial-resistant genes (ARGs), and antimicrobial-resistant gene determinants (ARGDs) have been identified as one of the leading challenges of the 21st century and a rapidly expanding health issue worldwide.⁶ The increase in antibiotic-resistant bacteria reflects the alluded trend. Alongside the alarmingly low rate of newly approved antibiotics for clinical use, humans are on the verge of not having effective treatments for many common infectious diseases.⁷ Historically, antibiotic discovery has been crucial in outpacing resistance, and success is closely related to systematic procedures and platforms that have catalysed the antibiotic golden age, namely the Waksman platform, followed by the platforms of semi-synthesis and fully synthetic antibiotics.⁸

Infectious diseases have been a persistent challenge throughout history. From 1347 to 1350, approximately one-third of Europe's population perished from the Bubonic plague. Communicable diseases, in general, remained the leading cause of death until the early 1900s, accounting for 25% of England's mortality. However, by the mid-1900s, the mortality of infectious diseases in England had shrunk to under 1% after the commercialization of antibiotics,⁹ which, given their impact on the fate of mankind, was regarded as a 'medical miracle.' Moreover, the non-therapeutic application of antibiotics has also greatly affected humanity; for instance, those used as livestock growth promoters to increase food production after World War II.

The emergence and spread of antibiotic-resistant bacteria (ARB), antimicrobial-resistant genes (ARGs), and antimicrobial-resistant gene determinants (ARGDs)

Will notes that antimicrobial resistance (AMR) has gained prominence as a priority for policymakers and a subject of media debate following advocacy by the Chief Medical Officer.¹⁰ The concept refers to

² Melaku and Assegid, "Prescription in Peril: The Sociology of Antibiotics and Antimicrobial Resistance in Low Resource Settings."

³ Martin Ikhoameh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations," *The Pan African Medical Journal* 47 (2024): 146.

⁴ P. Chidi, "Bridging Tradition and Modern Medicine: A Unified Approach to Healthcare," Rural Health Advocacy Project, August 2024, <https://rhap.org.za/2024/08/bridging-tradition-and-modern-medicine-a-unified-approach-to-healthcare/>.

⁵ Christopher J L Murray et al., "Global Burden of Bacterial Antimicrobial Resistance in 2019: A Systematic Analysis," *The Lancet* 399, no. 10325 (February 2022): 629–55, [https://doi.org/10.1016/S0140-6736\(21\)02724-0](https://doi.org/10.1016/S0140-6736(21)02724-0).

⁶ World Health Organization, "Antimicrobial Resistance: 2014 Global Report on Surveillance," *World Health Organization*, 2014.

⁷ Bernardo Ribeiro da Cunha, Luis P. Fonseca, and Cecilia R. C. Calado, "Antibiotic Discovery: Where Have We Come from, Where Do We Go?," *Antibiotics* 8, no. 2 (April 24, 2019): 45, <https://doi.org/10.3390/antibiotics8020045>.

⁸ Ribeiro da Cunha, Fonseca, and Calado, "Antibiotic Discovery: Where Have We Come from, Where Do We Go?"

⁹ Philip W. Smith, Kristin Watkins, and Angela Hewlett, "Infection Control through the Ages," *American Journal of Infection Control* 40, no. 1 (February 2012): 35–42, <https://doi.org/10.1016/j.ajic.2011.02.019>.

¹⁰ Catherine M Will, "Beyond Behavior? Institutions, Interactions and Inequalities in the Response to Antimicrobial Resistance.," *Sociology of Health & Illness* 40, no. 3 (2018).

the emergence and spread of strains of common infections that can no longer be treated with existing antibiotic classes, as bacteria evolve in response to antibiotic exposure. The concept is well known, not least because of Dubos, whose work informed early critical accounts of biomedicine and its claims. Antibiotic resistance is increasingly clinically important due to the lack of new antibiotic classes and the spread of resistant bacteria to older drugs through the transfer of genetic material and inheritance. Recent work in sociology and science and technology studies has examined different framings of this 'social problem'.¹¹

According to Will, AMR can be posed as a tension between an individual with current health problems and collective future needs that demand the preservation of antibiotic efficacy.¹² The meanings of infections and their treatment are negotiated in a web of relationships between people and technologies. As health-seeking behaviour by professionals or laypeople is balanced against priorities and pressures, providing information about the risks of particular actions, such as overprescribing antibiotics, is insufficient, because risks are known yet do not alter embedded routines and ways of thinking, especially when time or money is scarce. For lay people, the unequal distribution of such pressures also helps explain social patterns of harmful practices like smoking and medicine use in ways tackled only briefly in analyses that start from individual behaviour.¹³

A global look at microbial resistance

Exposure to antimicrobials is causing drug resistance. Contributory factors include the suboptimal and non-judicious use of drugs in hospitals, the community, veterinary practice, and agriculture. The leakage of medicines into the environment creates pathways for AMR, although the relative importance and contribution of these pathways have not been established.

Currently, more than 2 million North Americans acquire infections associated with antibiotic resistance every year, resulting in 23,000 deaths.¹⁴ In Europe, nearly 700 thousand cases of antibiotic-resistant infections directly develop into over 33,000 deaths yearly,¹⁵ with an estimated cost over €1.5 billion.¹⁶ Despite a 36% increase in human use of antibiotics from 2000 to 2010,¹⁷ approximately 20% of deaths worldwide are related to infectious diseases today.¹⁸

Worldwide, healthcare is already facing the effects of ABR; the diminishing effectiveness of antibiotics jeopardizes the treatment of infections as well as the prevention of complications to tertiary care associated with surgeries, cancer treatment, and other modern health procedures. It has been estimated that about 1.3 million deaths globally were directly attributable to antibiotic-resistant bacterial infections in 2019.¹⁹ In Europe alone, ABR accounted for approximately 33,000 attributable deaths and 875,000 DALYs (one DALY represents one lost year of "healthy" life) in 2015.²⁰

¹¹ A.C.Tompson, Lenore Manderson, and Clare I R Chandler, "Understanding Antibiotic Use: Practices, Structures and Networks," *JAC-Antimicrobial Resistance* 3, no. 4 (2021): dlab150; Richard Helliwell, Sujatha Raman, and Carol Morris, "Environmental Imaginaries and the Environmental Sciences of Antimicrobial Resistance," *Environment and Planning E:Nature and Space* 4,no.4(2021):1346–68.

¹² Will, "Beyond Behavior? Institutions, Interactions and Inequalities in the Response to Antimicrobial Resistance."

¹³ Will, "Beyond Behavior? Institutions, Interactions and Inequalities in the Response to Antimicrobial Resistance."

¹⁴ Centers for Disease Control and Prevention, *Antibiotic Use in the United States, 2017: Progress and Opportunities* (US Department of Health and Human Services, 2017).

¹⁵ Alessandro Cassini et al., "Attributable Deaths and Disability-Adjusted Life-Years Caused by Infections with Antibiotic-Resistant Bacteria in the EU and the European Economic Area in 2015: A Population-Level Modelling Analysis," *The Lancet Infectious Diseases* 19, no. 1 (January 2019): 56–66, [https://doi.org/10.1016/S1473-3099\(18\)30605-4](https://doi.org/10.1016/S1473-3099(18)30605-4).

¹⁶ European Centre for Disease Prevention and Control & European Medicines Agency, *The Bacterial Challenge: Time to React* European Centre for Disease Prevention and Control, vol. 6, 2009.

¹⁷ Ramanan Laxminarayan et al., "Access to Effective Antimicrobials: A Worldwide Challenge," *The Lancet* 387, no. 10014 (January 2016): 168–75, [https://doi.org/10.1016/S0140-6736\(15\)00474-2](https://doi.org/10.1016/S0140-6736(15)00474-2).

¹⁸ Evan Martens and Arnold L Demain, "The Antibiotic Resistance Crisis, with a Focus on the United States," *The Journal of Antibiotics* 70, no. 5 (May 1, 2017): 520–26, <https://doi.org/10.1038/ja.2017.30>.

¹⁹ Dimitrios Papadimou, Erik Malmqvist, and Mirko Ancillotti, "Socio-Cultural Determinants of Antibiotic Resistance: A Qualitative Study of Greeks' Attitudes, Perceptions and Values," *BMC Public Health* 22, no. 1 (2022): 1439.

²⁰ Papadimou, Malmqvist, and Ancillotti, "Socio-Cultural Determinants of Antibiotic Resistance: A Qualitative Study of Greeks' Attitudes, Perceptions and Values."

The latest report on antibiotic consumption by the European Centre for Disease Prevention and Control ranked Greece the second-highest country in EU/EES for total antibiotic use both at the community and healthcare level in 2020.²¹

Determinants of Antibiotic Resistance

Franco et al. suggest that several broad influences on antibiotic decision-making can explain the observed resistance rates.²²

- 1) The person who prescribes the antibiotic is a health care practitioner, as they differ in their choice and how they prescribe antibiotics.
- 2) The demands of patients depend on attitudes.
- 3) Sociocultural, economic, and health care regulatory policies are macro-level influences on prescribing antibiotics, as cultural factors determine which signs and symptoms are perceived as abnormal and which ones require medical care and treatment.
- 4) Lastly, dosing variation and use of poor pharmacodynamic principles.

Antibiotic resistance is a global health challenge involving the transfer of bacteria and resistance genes between humans, animals, and the environment. Although multiple barriers restrict the flow of both bacteria and genes, pathogens recurrently acquire new resistance factors from other species, thereby reducing our ability to prevent and treat bacterial infections. Antimicrobial resistance poses a significant threat to human health worldwide, particularly in middle- and low-income countries, including South Africa.²³

The cost of AMR is immense, both economically and in terms of human lives. It is estimated that deaths attributable to AMR will reach 4.73 million in Asia and 10 million worldwide by 2050, and that global GDP will shrink by 2.5–3% if the current problem of antibiotic resistance is not alleviated.²⁴

The Limpopo province public sector met the global monitoring indicator, with antibiotic use in the Access group exceeding 80% and decreasing at a 4.0% CAGR. However, the 15.8% CAGR increase in the consumption of Watch antibiotics and the 17.0% decrease in AW-I are a warning signal.²⁵

METHODOLOGY

Study Design and Setting

This qualitative study employed focus group discussions (FGDs) with mothers of children to explore cultural practices, infant care traditions, and antibiotic use patterns in Dzimauli, a rural community in Limpopo Province, South Africa. The study was conducted in 2025 within a community characterized by limited access to formal healthcare facilities and high reliance on traditional healing practices. Detailed information from respondents, including demographic information; antibiotic use behaviours and knowledge; use of traditional practices and alternative healthcare; and other beliefs, was collected during face-to-face focus group discussions using semi-structured questions. Demographic information included age, ethnicity, marriage status, level of education, occupation, number of children, and religious affiliation. Antibiotic use included both prescription and nonprescription antibiotics, and the most recent use; respondents were asked whether they had last taken antibiotics in the past month, 2–6 months, 7–12 months, over one year ago, or never. Antibiotic use was defined as ‘yes’ if the last reported use was within the past year.

²¹ Papadimou, Malmqvist, and Ancillotti, “Socio-Cultural Determinants of Antibiotic Resistance: A Qualitative Study of Greeks’ Attitudes, Perceptions and Values.”

²² Beatriz Espinosa Franco et al., “The Determinants of the Antibiotic Resistance Process,” *Infection and Drug Resistance*, 2009, 1–11.

²³ Sunil Pokharel, Shristi Raut, and Bipin Adhikari, “Tackling Antimicrobial Resistance in Low-Income and Middle-Income Countries,” *BMJ Global Health* (BMJ Publishing Group Ltd, 2019).

²⁴ Y Wang et al., “Patterns and Determinants of Antibiotic Use Behaviours among Rural Community Residents in Eastern China,” *Antibiotics* 11, no. 6 (2022): 823.

²⁵ Tiyani C. Mthombeni et al., “Antibiotic Consumption by Access, Watch and Reserve Index in Public Sector of Limpopo Province, South Africa: 2014–2018,” *Southern African Journal of Infectious Diseases* 37, no. 1 (October 27, 2022), <https://doi.org/10.4102/sajid.v37i1.463>.

Participant Selection and Sampling

Two focus groups were conducted with purposively selected participants. Focus Group 1 consisted of eight women, aged 25-42 years (mean age: 34.6 years), with 2-6 children each. Focus Group 2 consisted of nine women, aged 21-41 years (mean age: 33.1 years), each with 1-5 children. All participants were mothers with direct experience in childcare, traditional healing practices, and interaction with local health services.

Data Collection

The semi-structured focus group discussions explored four key thematic areas: (1) childbirth and postnatal cultural practices; (2) infant feeding practices and breastfeeding patterns; (3) use of traditional medicine and healers; and (4) knowledge, access, and use of antibiotics. Discussions were conducted in the local language (Tshivenda), allowing participants to express cultural concepts authentically. Sessions were facilitated by trained researchers with expertise in community health.

Data Analysis

Transcripts were analysed using thematic content analysis, which identified patterns across cultural practices, healthcare-seeking behaviours, and antibiotic use. Emerging themes were coded and categorized, then interpreted through the lens of recent AMR literature from similar resource-limited settings. The analysis focused on identifying behaviours and beliefs that may contribute to antibiotic misuse and the development of AMR.

Ethical Considerations

The study is part of a larger project on the acquisition of antibiotic-resistant gut bacteria and the impact of microbiota on antimicrobial resistance in communities of low socioeconomic status, with protocol approval from the Human and Clinical Trials Research Ethics Committee of the University of Venda (Project registration number: FSEA/22/MBY/04). Participants provided informed consent, and confidentiality was maintained throughout the study. Cultural sensitivity was prioritized in data collection and interpretation, recognizing the legitimacy of traditional practices while identifying potential public health concerns.

PRESENTATION OF FINDINGS AND DISCUSSION

Analysis and Interpretation of Focus Group Data: Mothers' Perspectives on Antibiotic Resistance in Dzimauli Villages

This analysis examines data from two focus group discussions conducted with mothers in Dzimauli villages, focusing on antibiotic resistance, healthcare practices, and child-rearing customs. The findings are interpreted through established frameworks in medical sociology, rural health behaviour, and antimicrobial stewardship research.

Traditional Medicine Integration and Healthcare Pluralism Reliance on Traditional Healers (Maine)

A predominant finding across both focus groups was the universal reliance on traditional healers for preventive child healthcare, specifically through practices termed "*muthuso wa vhana*" (traditional preventive medicine for children). All participants except two church-affiliated families reported consulting 'Maine' for infant protection rituals, with costs ranging from R200 to R800 per consultation.

This dual healthcare system aligns with broader African patterns where traditional medicine serves as a cornerstone of primary healthcare, particularly in rural areas. Research indicates that approximately 80% of Africa's population relies on traditional medicine for basic health needs, a figure driven by accessibility, affordability, and cultural alignment.²⁶ However, this parallel system creates

²⁶ Ikhoiyameh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations"; Chidi, " Bridging Tradition and Modern Medicine: A Unified Approach to Healthcare."

challenges when traditional remedies containing unknown substances are combined with antibiotics, potentially compromising treatment efficacy and contributing to the development of resistance.

As one participant explained, "Traditional medicine works with clinical health. We use it for *ngoma ya vhana* (the process that happens when newborn children have motions in the middle of the head when bones are joining together), to clean intestines for children, prevent stomach-aches, and diarrhoea." This integration, while culturally significant, often lacks coordination with formal healthcare providers, a gap that has been identified as problematic across sub-Saharan Africa.²⁷

Specific Traditional Practices and Health Implications

Participants described elaborate traditional protection rituals involving multiple natural substances, including tree extracts (*muvhuyu*), animal products (such as python and baboon faeces), and other traditional medicines, which were applied through steaming, topical application, and ingestion. One participant noted these practices target "*ngoma, magoni, and misho*", culturally specific illness concepts not recognized in Western medicine.

The practice of administering herbal preparations like "*tshiunza*" (porridge made from roots) to infants as young as one month contradicts WHO recommendations for exclusive breastfeeding until six months. Early introduction of complementary foods may expose infants to gastrointestinal pathogens, potentially leading to infections requiring subsequent antibiotic treatment. Research from similar African contexts has demonstrated that early prelacteal feeding is associated with an increased risk of infant morbidity and mortality.²⁸

Antibiotic Knowledge Deficits and Health Literacy Gaps

Limited Antibiotic Awareness

A striking finding from Focus Group 2 was that none of the participants could initially identify antibiotics by name or understand their purpose. Only after the researcher provided visual descriptions of antibiotic formulations (specifically powder forms mixed with water by nurses) did participants recognize the medications they had been using. This fundamental knowledge gap represents a critical vulnerability in the appropriate use of antibiotics.

When asked about antibiotic indications, responses revealed significant misconceptions:

"It is used to treat flu" (Participant 2, FG2)

"It is used to treat germs" (Participant 3, FG2)

"We think it is used to treat pain" (Participants 5 & 6, FG2)

These responses reflect the widespread misconception identified in LMIC literature that antibiotics are universal cure-alls effective against any illness, including viral infections. This cultural tendency to view antibiotics as a first-line treatment for diverse ailments drives inappropriate use and accelerates the development of resistance.²⁹

Low health literacy in rural communities leaves populations vulnerable to myths and cultural beliefs about medicines.³⁰ In settings where formal education levels are limited, and healthcare professional interaction is minimal, such knowledge gaps perpetuate undesirable medication practices.

²⁷ Ikhoayameh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations."

²⁸ K M Edmond et al., "Impact of Early Infant Feeding Practices on Mortality in Low Birth Weight Infants from Rural Ghana," *Journal of Perinatology* 28, no. 6 (June 6, 2008): 438–44, <https://doi.org/10.1038/jp.2008.19>; Melina Mgongo et al., "Early Infant Feeding Practices among Women Engaged in Paid Work in Africa: A Systematic Scoping Review," *Advances in Nutrition* 15, no. 3 (March 2024): 100179, <https://doi.org/10.1016/j.advnut.2024.100179>.

²⁹ Ehsan, "Antibiotic Resistance in Developing Countries: Emerging Threats and Policy Responses."

³⁰ Idemudia Imonikhe Otaigbe and Charles John Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries," *JAC-Antimicrobial Resistance* 5, no. 3 (May 3, 2023), <https://doi.org/10.1093/jacamr/dlad062>.

Non-Adherence to Antibiotic Treatment Courses

Premature Discontinuation Patterns

The most concerning finding regarding direct AMR risk emerged from Focus Group 2's adherence data: of nine participants, only one completed the prescribed antibiotic course. Eight participants (89%) discontinued treatment prematurely, primarily because they "felt well" or observed symptom improvement.

Representative quotes include:

"Even with the children, if the child stops coughing, we stop giving medication" (Participant 1, FG2)

"The reason is that we feel well, then stop using antibiotics" (Participant 6, FG2)

This behavioural pattern directly parallels findings from other LMICs. A 2022 Jordanian study found that 32.1% of patients did not adhere to short-term antibiotic regimens, with symptom relief as the primary reason for discontinuation.³¹ Research across LMICs consistently identifies premature treatment cessation as a major AMR driver, linked to financial constraints, inadequate patient education at dispensing, and a lack of understanding about resistance mechanisms.³²

Incomplete antibiotic courses allow bacterial populations to survive sub-therapeutic drug exposure, thereby selecting for resistant strains. This practice of storing leftover medications also facilitates future self-medication, compounding the potential for resistance development.³³

Awareness-Practice Gap

Paradoxically, some participants demonstrated awareness of treatment completion requirements: "They say antibiotics are used for 7 days. Some say a child finishes the course" (Participant 5, FG2). Yet this knowledge failed to translate into adherence behavior, highlighting a critical implementation gap between health information and practice.

This awareness-behavior disconnect has been documented across sub-Saharan Africa, where knowledge about optimal health practices often fails to overcome cultural norms, financial barriers, and competing priorities.³⁴ The multidimensional poverty framework suggests that financial constraints, limited access to healthcare, and socioeconomic pressures interact to undermine adherence, even when awareness exists.³⁵

Traditional Medicine as an Alternative to Antibiotics

One participant explicitly described abandoning antibiotics in favour of traditional remedies: "I used an antibiotic, and it is not working, making the sickness worse. I used medication from the bush, and it worked. I use *"Tshiumbeumbe"* (Participant 2, FG2).

This narrative reveals how perceived antibiotic failure drives patients toward unregulated traditional alternatives. Such switching behaviour may result from: (1) actual treatment failure due to resistance; (2) misdiagnosis where antibiotics were inappropriate; (3) premature discontinuation leading to incomplete treatment; or (4) poor-quality medications.

The participant further described using multiple herbal preparations, including *"Tshikavhavhe"*, guava leaves, *Mufensi*, *Musudzungwane*, *mudzi wa Mututulwa*," and *"Munambala"* for various conditions. While some traditional medicines possess legitimate antimicrobial properties, their unregulated use, either alongside or instead of prescribed antibiotics, creates significant risks.

³¹ Basima A. Almomani et al., "Prevalence and Predictors of Non-Adherence to Short-Term Antibiotics: A Population-Based Survey," *PLOS ONE* 17, no. 5 (May 19, 2022): e0268285, <https://doi.org/10.1371/journal.pone.0268285>.

³² Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries"; Dominique L Green et al., "The Role of Multidimensional Poverty in Antibiotic Misuse: A Mixed-Methods Study of Self-Medication and Non-Adherence in Kenya, Tanzania, and Uganda," *The Lancet Global Health* 11, no. 1 (2023): e59–68.

³³ Almomani et al., "Prevalence and Predictors of Non-Adherence to Short-Term Antibiotics: A Population-Based Survey."

³⁴ Smith, Watkins, and Hewlett, "Infection Control through the Ages"; Green et al., "The Role of Multidimensional Poverty in Antibiotic Misuse: A Mixed-Methods Study of Self-Medication and Non-Adherence in Kenya, Tanzania, and Uganda."

³⁵ Green et al., "The Role of Multidimensional Poverty in Antibiotic Misuse: A Mixed-Methods Study of Self-Medication and Non-Adherence in Kenya, Tanzania, and Uganda."

Traditional medicines may contain unknown chemical agents mixed with sub-therapeutic antimicrobial doses, which can foster resistance while delaying appropriate treatment.³⁶

Infant Feeding Practices and Infection Risk

Early Complementary Feeding

Across both focus groups, mothers reported introducing solid foods and traditional preparations significantly earlier than the WHO-recommended six months of exclusive breastfeeding. Introduction times ranged from one month to six months, with most occurring before three months:

Focus Group 1:

"After 6 months, a child is given food" (Participant 2)

"2 months is too much. I give meals from shops or cream of maize" (Participant 3)

Focus Group 2: Most mothers introduced food at 1 or 3 months, with only 2 adhering to the 6-month recommendation.

These practices contradict well-established evidence that exclusive breastfeeding for six months provides optimal nutrition and immune protection for infants. The early introduction of complementary foods, particularly in settings with limited water quality and sanitation, significantly increases the risk of diarrheal disease.³⁷ In African contexts, areas with low exclusive breastfeeding prevalence show elevated rates of diarrheal incidence and infant mortality.³⁸

Cultural Beliefs About Infant Nutrition

The practice of giving "tshiunza" (traditional root porridge) reflects deep-seated cultural beliefs about infant nutrition that supersede the advice of health workers. Research across sub-Saharan Africa reveals that cultural perceptions, including beliefs about insufficient breast milk, infant thirst, and traditional nutritional requirements, influence early complementary feeding despite health education efforts.³⁹ These culturally-driven feeding practices create a vicious cycle: early solid food introduction → increased infection risk → greater antibiotic exposure → heightened AMR selection pressure. For vulnerable infants with immature immune systems, this cycle poses particular danger.

Prolonged Breastfeeding Patterns

Interestingly, although early complementary feeding occurred, most participants breastfed for extended periods (1-3 years), exceeding the WHO minimum recommendations. This mixed pattern of early food introduction, combined with prolonged breastfeeding, represents a compromise between cultural practices and aspects of optimal infant feeding.

Access Patterns and Healthcare-Seeking Behaviour

Clinic as Primary Antibiotic Source

Both focus groups reported obtaining antibiotics exclusively from local clinics, specifically "for flu only." This finding contrasts sharply with patterns documented in other African settings where over-the-counter antibiotic purchases from pharmacies and informal vendors are common.⁴⁰ The restricted access in Dzimauli may reflect geographic isolation, limited pharmacy availability, or effective regulatory enforcement in this specific area. However, this clinic-dependent access creates vulnerability. When clinics experience stock-outs, a common problem in rural African healthcare facilities, patients may

³⁶ Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries."

³⁷ Edmond et al., "Impact of Early Infant Feeding Practices on Mortality in Low Birth Weight Infants from Rural Ghana."

³⁸ Natalia V. Bhattacharjee et al., "Mapping Exclusive Breastfeeding in Africa between 2000 and 2017," *Nature Medicine* 25, no. 8 (August 22, 2019): 1205–12, <https://doi.org/10.1038/s41591-019-0525-0>.

³⁹ Mgongo et al., "Early Infant Feeding Practices among Women Engaged in Paid Work in Africa: A Systematic Scoping Review"; Jimoh Amzat et al., "Sociocultural Context of Exclusive Breastfeeding in Africa: A Narrative Review," *Health Science Reports* 7, no. 5 (2024): e2115.

⁴⁰ Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries"; Moyukh Chowdhury et al., "Rural Community Perceptions of Antibiotic Access and Understanding of Antimicrobial Resistance: Qualitative Evidence from the Health and Demographic Surveillance System Site in Matlab, Bangladesh," *Global Health Action* 12, no. suppl (2019): 1824383.

resort to borrowing medications from neighbours, incomplete courses from previous prescriptions, or traditional alternatives.⁴¹

Limited Healthcare Contact

Participants reported minimal attendance at antenatal care, with most having only a few clinic visits during pregnancy. The preference for traditional birth attendants and home delivery limits health education opportunities. Studies have shown that increased antenatal care contacts are correlated with improved breastfeeding practices and health literacy.⁴² The limited engagement in the healthcare system in Dzimauli restricts opportunities for antibiotic stewardship education and counseling.

Cultural Postpartum Practices and Isolation

Several participants described postpartum isolation practices lasting 1-3 months, where newborns are kept indoors and contact with outsiders is restricted, believed to protect against "ngoma" and other culturally-specific illnesses. While such practices may reduce pathogen exposure in some contexts, they also delay access to healthcare and immunizations.

One participant explained: "3 months, except when going to the clinic. We avoid sickness. The child cannot be held by anyone outside the home... for the child will *inga*, faeces will be foamy" (Participant 5, FG1).

These beliefs about contagion and supernatural harm reflect traditional disease causation models that may conflict with biomedical explanations, complicating health communication efforts.

DISCUSSION

The Sociocultural Matrix of AMR in Rural Africa

This study reveals that antimicrobial resistance in Dzimauli could emerge not from individual behaviours in isolation, but from a complex sociocultural matrix where traditional beliefs, economic constraints, limited health literacy, and gaps in the healthcare system interact. The findings align with the growing recognition that AMR in LMICs is fundamentally a sociological phenomenon shaped by cultural norms, power structures, and resource limitations.⁴³ The parallel operation of traditional and allopathic healthcare systems without integration creates particular challenges. WHO and African Union initiatives increasingly recognize traditional medicine's role in achieving universal health coverage.⁴⁴ The lack of collaboration between traditional healers and biomedical providers in Dzimauli means opportunities for coordinated care and education are missed.

The Non-Adherence Crisis

The 89% non-adherence rate documented in Focus Group 2 represents a critical finding with direct AMR implications. This rate exceeds many reported figures from other developing countries, though methodological differences in adherence measurement complicate comparisons. The pattern of symptom-based discontinuation, stopping antibiotics when feeling better, is remarkably consistent across LMIC settings.⁴⁵

Addressing this requires multifaceted interventions beyond simple education. Research suggests that improving adherence necessitates: (1) enhanced pharmaceutical counseling at medication dispensing; (2) simplified dosing regimens; (3) addressing financial barriers that prevent course completion; (4) engaging family decision-makers; and (5) strengthening follow-up systems.⁴⁶

⁴¹ Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries."

⁴² Bolanle Olapeju et al., "Antenatal Care and Breastfeeding Practices in Sub-Saharan Africa: An Analysis of Demographic and Health Surveys," *BMC Pregnancy and Childbirth* 25, no. 1 (January 27, 2025): 77, <https://doi.org/10.1186/s12884-025-07188-w>.

⁴³ Melaku and Assegid, "Prescription in Peril: The Sociology of Antibiotics and Antimicrobial Resistance in Low Resource Settings."

⁴⁴ South African Government, "African Traditional Medicine Day 2024," 2024; Ikhoymeh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations."

⁴⁵ Almomani et al., "Prevalence and Predictors of Non-Adherence to Short-Term Antibiotics: A Population-Based Survey"; Green et al., "The Role of Multidimensional Poverty in Antibiotic Misuse: A Mixed-Methods Study of Self-Medication and Non-Adherence in Kenya, Tanzania, and Uganda."

⁴⁶ Almomani et al., "Prevalence and Predictors of Non-Adherence to Short-Term Antibiotics: A Population-Based Survey"; Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries."

The Knowledge-Practice Nexus

The profound knowledge deficit regarding antibiotics, as documented here, where participants initially struggled to identify the antibiotics they had used, represents a critical intervention point. This gap reflects broader health literacy challenges in rural African communities where formal education may be limited, and health information dissemination is inadequate. Effective interventions must employ culturally appropriate communication strategies, engaging trusted community figures like traditional healers, religious leaders, and grandmothers who wield significant influence over health decisions.⁴⁷ Community health workers operating at the interface between formal and traditional health systems can serve as crucial bridges for improving health literacy.

Infant Feeding and the Infection-Antibiotic Cycle

The early complementary feeding practices documented here perpetuate an infection-antibiotic exposure cycle that disproportionately affects infants. With immature immune systems and high metabolic demands, infants are particularly vulnerable to both infections and antibiotic side effects. The introduction of potentially contaminated foods and traditional preparations in settings with limited access to clean water creates preventable infection burdens.

Interventions to improve exclusive breastfeeding in sub-Saharan Africa have demonstrated success when they engage influential family members, particularly grandmothers and husbands, who often make decisions about infant feeding.⁴⁸ In Dzimauli, the prominent role of grandmothers in dictating childcare practices suggests that they should be the primary targets for breastfeeding promotion efforts.

Structural and Systemic Drivers

While individual behaviours are important, this analysis reveals how structural factors shape antibiotic misuse. Limited healthcare access, poverty necessitating prioritization between healthcare and other needs, stock-outs of essential medicines, inadequate health worker training, and the absence of antimicrobial stewardship programs all contribute to the AMR problem in Dzimauli.⁴⁹ The participant who switched from "failing" antibiotics to bush medicine may have experienced genuine treatment failure due to resistance, misdiagnosis, or poor-quality medications. Each scenario highlights systemic failures, including resistance to prior misuse, diagnostic limitations in resource-poor settings, or weaknesses in the pharmaceutical supply chain. These structural determinants necessitate policy-level interventions that extend beyond community education.

Traditional Medicine: Risk and Opportunity

Traditional medicine's pervasive role in Dzimauli represents both challenge and opportunity. While unregulated use of unknown preparations alongside antibiotics poses risks, the deep trust in traditional healers offers a platform for health promotion. Evidence from successful integration efforts across Africa demonstrates that trained traditional healers can promote health literacy, appropriate medication use, and early referral for serious conditions.⁵⁰

South Africa's recognition of traditional health practitioners through regulatory frameworks provides a foundation for such integration.⁵¹ Extending this approach to rural communities like Dzimauli could harness the cultural legitimacy of traditional medicine while mitigating AMR risks.

⁴⁷ Ikhoymeh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations"; Amzat et al., "Sociocultural Context of Exclusive Breastfeeding in Africa: A Narrative Review."

⁴⁸ Mgongo et al., "Early Infant Feeding Practices among Women Engaged in Paid Work in Africa: A Systematic Scoping Review"; Amzat et al., "Sociocultural Context of Exclusive Breastfeeding in Africa: A Narrative Review."

⁴⁹ Otaigbe and Elikwu, "Drivers of Inappropriate Antibiotic Use in Low- and Middle-Income Countries"; Ehsan, "Antibiotic Resistance in Developing Countries: Emerging Threats and Policy Responses."

⁵⁰ Ikhoymeh et al., "Integrating Traditional Medicine into the African Healthcare System Post-Traditional Medicine Global Summit: Challenges and Recommendations"; Ossy Muganga Julius Kasilo et al., "Towards Universal Health Coverage: Advancing the Development and Use of Traditional Medicines in Africa," *BMJ Global Health* 4, no. Suppl 9 (October 11, 2019): e001517, <https://doi.org/10.1136/bmjgh-2019-001517>.

⁵¹ South African Government, "African Traditional Medicine Day 2024."

RECOMMENDATIONS

Integrated Healthcare Delivery

Dzimauli urgently requires an integrated healthcare model that bridges traditional and allopathic systems. This should include: (1) training programs for traditional healers on basic health principles, danger signs requiring referral, and antimicrobial stewardship; (2) regular dialogue forums between traditional healers and clinic staff; (3) referral pathways enabling collaboration rather than competition; and (4) documentation systems capturing traditional medicine use in patient histories.

Targeted Health Literacy Interventions

Community-based education must employ culturally resonant communication strategies. Key components include: (1) visual aids showing antibiotic mechanisms and resistance development using locally relevant examples; (2) simple messaging about treatment completion framed around child protection rather than abstract resistance concepts; (3) engagement of trusted community figures including traditional healers, religious leaders, and grandmother groups; and (4) media campaigns using local languages and culturally appropriate imagery.

Antimicrobial Stewardship at Primary Care Level

Even in resource-limited settings, basic stewardship principles can be implemented: (1) improved diagnostic capacity to distinguish bacterial from viral infections; (2) treatment protocols guiding appropriate antibiotic selection and duration; (3) dispensing practices ensuring adequate counseling and understanding; (4) packaging innovations like blister packs that visually reinforce completion; and (5) follow-up systems to verify adherence and treatment success.

Infant Feeding Promotion

Exclusive breastfeeding promotion requires multi-level interventions: (1) peer counselor programs employing successful mothers to support new mothers; (2) engagement of grandmothers and husbands in feeding decision-making; (3) integration of feeding counseling into antenatal care, delivery, and postnatal visits; (4) creation of mother support groups facilitating shared learning; and (5) community education addressing myths about breastmilk insufficiency and complementary feeding benefits.

Strengthening Health Systems

Sustainable AMR control requires health system strengthening: (1) ensuring consistent medicine availability to prevent stockouts driving inappropriate alternatives; (2) increasing healthcare workforce in rural areas to improve access; (3) implementing surveillance systems tracking resistance patterns and antibiotic consumption; (4) establishing quality assurance for antibiotics to prevent substandard medications; and (5) developing community health worker programs expanding healthcare reach.

CONCLUSION

This analysis reveals that antimicrobial resistance in rural Dzimauli emerges from a complex interplay of cultural practices, health literacy gaps, healthcare system limitations, and socioeconomic constraints. The near-universal premature discontinuation of antibiotics, profound knowledge deficits about antimicrobial medicines, parallel use of traditional remedies, and early infant feeding practices that increase infection risk all contribute to an environment conducive to AMR development.

Addressing this requires moving beyond individualistic behavior change approaches toward comprehensive interventions that respect cultural contexts while promoting evidence-based practices. The integration of traditional and allopathic healthcare systems, targeted health literacy initiatives involving trusted community figures, primary care-level antimicrobial stewardship, and health system strengthening are all essential components of an effective AMR response in settings like Dzimauli.

The findings underscore that AMR in rural African communities is not simply a medical or biological challenge but a profoundly sociological one, embedded in the fabric of daily life, cultural beliefs, family structures, and healthcare systems. Solutions must be similarly multidimensional, culturally grounded, and systemically oriented. Only through such comprehensive approaches can

vulnerable communities like Dzimauli navigate the dual imperatives of preserving beneficial cultural practices while adopting evidence-based health behaviors that protect against the growing threat of antimicrobial resistance.

Future research should employ mixed-methods approaches, combining qualitative exploration with microbiological surveillance, interventional studies testing culturally adapted stewardship programs, and longitudinal designs examining behaviour change processes. The integration of traditional medicine research with AMR studies represents a particularly promising frontier for African public health scholarship.

Study Limitations

This study's qualitative design and small sample size limit the generalizability of its findings beyond Dzimauli. Focus group discussions may be influenced by social desirability bias, where participants may underreport stigmatized behaviours or overreport compliance with health recommendations. The absence of male perspectives represents a significant gap, given men's documented influence on infant feeding and healthcare decisions.

Reliance on self-reported antibiotic use without prescription verification or microbiological testing prevents quantification of actual resistance patterns in the community. Future research should incorporate mixed-methods approaches with antimicrobial susceptibility testing to establish definitive links between AMR behaviour and antimicrobial resistance.

The study's cross-sectional nature captures practices at a single time point without examining behaviour change over time or across different health scenarios. Longitudinal research would better illuminate how healthcare-seeking patterns evolve in relation to illness severity or experiences of treatment failure.

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