Antibiotic consumption, structured vulnerabilities, and networks of survival in Southern Pakistan

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Antibiotic Consumption, Structured Vulnerabilities, and Networks of Survival in Southern Pakistan

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Abstract

Pakistan ranks among the top ten countries globally in antibiotic misuse, calling for anthropological attention to explore the underlying contributing factors. We look at antibiotic use as a complex social practice embedded within the critical structures and informal networks of Sindh, Pakistan. Using ethnographic methods, we show that antibiotic misuse is not a 'knowledge gap' but rather a reasonable response to structural neglect. The Pakistan Economic Survey 2024–25 highlights that only 0.9% of GDP is spent on health. With limited healthcare services, people often skip formal clinics to avoid a 'cascade of costs', and pharmacies have become a key part of a makeshift network of care. We show that antibiotic circulation is influenced by gendered social networks and domestic hierarchies, where high maternal and infant mortality rates illustrate the life-threatening impact of restricted female health agency. Addressing antimicrobial resistance (AMR) requires shifting focus from individual 'awareness' to the political economy of health, advocating for structural reforms that target the socioeconomic factors influencing medicine use in resource-limited settings.

Keywords: Misuse, antimicrobial resistance, gendered networks, sociocultural factors, self-medication, healthcare system, critical medical anthropology

Abstract in Sindhi

پاڪستان اينٽي بايوٽڪ دوائن جي غلط استعمال جي حوالي سان عالمي سطح تي پهرين ۱۰ ملڪن ۾ شامل آهي، جيڪا صورتحال انهن عوامل جي کوجنا لاءِ انٿروپالاجيڪل توجه جي تقاضا ڪري ٿي. اسان اينٽي بايوٽڪ جي استعمال کي هڪ پيچيده سماجي مشق طور ڏسون ٿا، جيڪا سندن جي نازڪ ڄانچي ۽ غير رسمي نيٽ ورڪ ۾ جڙيل آهي. ايٿنوگرافڪ طريقن جي ذريعي اسان اهو ثابت ڪريون ٿا ته اينٽي بايوٽڪ جو غلط استعمال رڳو "جاڻ جي کوٽ"جو نتيجو ناهي، بلڪه هي رياستي ۽ ساختي غفلت جو هڪ منطقي ردعمل آهي. پاڪستان اڪنامڪ سروي ۲۰۲۴-۲۵ موجب، ملڪي جي.ڊي.پي جو

رڳو ۰.۹ سيڪڙو صحت جي شعبي تي خرچ ڪيو وڃي ٿو. صحت جي محدود سهولتن سبب، ماڻهو اڪثر سرڪاري اسپتالن ۽ ڪلينڪن ڏانهن وڃڻ کان پاسو ڪن ٿا ته جيئن وڌيڪ اخراجات کان بچي سگهجي، جنهن جي نتيجي ۾ فارميسيون علاج جي هڪ عارضي ۽ هنگامي نيٽ ورڪ طور سامهون آيون آهن.اسان جي تحقيق ظاهر ڪري ٿي ته اينٽي بايوٽڪ جي گردش تي صنفي سماجي لاڳاپن ۽ گهريلو درجي بندين جو گهرو اثر آهي، جتي مائرن ۽ نون ڄاول ٻارن جي فوتگيءَ جي بلند شرح عورتن جي صحت بابت اختيارن جي کوٽ جي موتمار نتيجن کي واضع ڪري ٿي. اينٽي مائڪروبيل ريزسٽنس جي مسئلي کي حل ڪرڻ لاءِ ضروري آهي ته توجه انفرادي 'شعور' تان هٽائي صحت جي سياسي معيشت ڏانهن مبذول ڪئي وڃي، ۽ اهڙين ساختي سڌارن جي حمايت ڪئي وڃي جيڪي وسيلن جي کوٽ وارن علائقن ۾ دوائن جي استعمال تي اثرانداز ٿيندڙ سماجي ۽ اقتصادي عوامل کي نشانو بڻائين.

مکيه لفظ: جراثيمن ۾ وڌندڙ مدافعت، صنفي نيٽ ورڪ، سماجي ۽ ثقافتي عنصر، پاڻمرادو علاج، صحت جو نظام، تنقيدي طبي بشريات.

Implications statement

This study shifts the focus from individual 'awareness' to structural failures, demonstrating that antibiotic misuse is a rational response to systemic neglect and a healthcare budget of only 0.9%. It highlights that public health interventions must address gendered hierarchies and the 'cascade of costs' associated with appropriate health-seeking behaviors to effectively reduce the life-threatening impact of restricted female health agency. Given that, in this article we advocate for a political economy approach to health. In policy and program terms, this requires prioritizing socioeconomic reforms over simple educational campaigns in resource-limited settings. Future efforts should go beyond awareness to address socioeconomic factors that influence health, ensuring that the right to healing is structurally guaranteed rather than a commodity. By moving from a localized case study to a comparative political economy model, we offer a scalable framework for culturally grounded health

interventions that target the root structural drivers of medicine misuse, rather than just individual behavior.

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Social media thread

Antibiotic misuse in Sindh is more than a ‘knowledge gap’—it is a rational response to structural neglect, limited healthcare budgets, and restricted female health agency.

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The consumption of antibiotics transcends purely clinical transactions. In Pakistan this manifests as a complex social practice deeply rooted in social structures and informal healing networks (Tompson, Manderson, and Chandler, 2021). Despite the Drug Act 1967, amended in 1976, in Pakistan stating that antibiotics aren't OTC (over-the-counter) medicines and that their sale to the public without a prescription is illegal, there was an overall 65% increase in antibiotic use in 2000–2015 (Mudenda et al., 2023). In the country, according to Saleem and colleagues (2020), 96% of community pharmacies and medical stores dispensed antibiotics without a prescription in 2020. Similarly, in Sindh, southeast Pakistan, antibiotics are entrenched as a 'universal remedy', a transformation facilitated by neoliberal policies that have led to unregulated dispensing and widespread over-the-counter access (Ahmad et al., 2022). This phenomenon must be understood within a broader 'geography of exclusion' whereby persistent 'urban bias' (Zaidi, 1985; Ali, 2024) and chronic underinvestment have rendered formal healthcare a luxury largely out of reach for rural communities. The fragility of this system is evident in the Pakistan Economic Survey 2024–25, which reports that public health expenditure remains stagnant at just 0.9% of GDP (Pakistan, 2024). This has entrenched reliance on the informal sector, with over 70% of health expenses paid out of pocket (Pakistan, 2024).

In this context, pharmacies serve as critical nodes within surrogate care networks, filling gaps of a public health infrastructure that appears to have limited capacity to serve a population of over 200 million. In the absence of accessible healthcare facilities, self-medication is a practical response to institutionalized forms of structural vulnerabilities (Ali, 2024; Farmer, 2004), driven by calculations of 'practicality' aimed at avoiding costs associated with doctor visits, diagnostics, and lost wages. Cultural and gender norms further complicate these practices. In the patriarchal social fabric of rural Sindh, women's health-seeking behaviors are often limited by financial dependence and the need for male intermediaries in public

spaces (Habib et al., 2021). As a result, antibiotics circulate within domestic hierarchies, in which male household heads access open drug markets without professional oversight to get medicines. Reliance on non-professional providers and the inappropriate use of WHO's 'Access,' 'Watch' and 'Reserve' antibiotics categories—per the AWaRe framework[i]—have led Pakistan to be among the largest consumer of antibiotics among low- and middle-income countries (Ahmed, 2024; Mudenda et al., 2023).

In this study, we situate antibiotic consumption within the broader sociocultural fabric of Sindh, and examine how local perceptions, gender norms, and social hierarchies shape health-seeking behaviors and practices related to medication use. Drawing on anthropological fieldwork, we explore how cultural beliefs, economic constraints, and structural vulnerabilities shape self-medication and the informal networks through which antibiotics circulate, with people often bypassing formal healthcare systems. By analyzing these interconnected factors, we aim to deepen understanding of the socio-cultural dynamics that underpin antibiotic misuse, highlighting its embeddedness within local worlds. In this context culturally informed approaches to health interventions are a significant consideration.

The Underlying Structural Context

Sindh is shaped by a rich hydro-social history. The Indus River (Sindhu), birthplace of the Indus Valley Civilization, runs through the province. The archaeological remains of Mohenjo-daro, Amri, and Kot Diji reflect a legacy of advanced urban planning and trade that stands in sharp contrast to the province's current duality: Sindh today is divided between the megacity of Karachi—the provincial capital and main economic hub—and rural areas which face distinct socioeconomic challenges.

This inequality is rooted in a national context of 'serious' hunger, with estimated child stunting at 33.2% (Pakistan, 2024). According to the Pakistan Economic Survey 2024-25, Pakistan ranks 109th out of 127 countries on the Global Hunger Index (GHI), with a score of 27.9. In rural Sindh, the lived experience of this index is characterized by structural vulnerabilities. High inflation, fiscal constraints, and the devastating aftermath of the 2022 floods make survival a constant struggle. In these communities, health is not just a biological state; it is a luxury often sacrificed to cover the rising costs of basic nutrition and fuel.

Pakistan experienced a fundamental shift after the 18th Amendment to the Constitution, which transferred authority over health policy to the provinces. Some scholars have argued that this legislative milestone created a significant 'implementation gap' (Nishtar et al., 2013; Zaidi et al., 2019; Zaidi et al., 2013; Habib et al., 2021). While devolution provided a theoretical chance for local responsiveness, provinces struggled to manage the complex regulatory and fiscal responsibilities previously handled by the federal government. Moreover, the system's structural weakness stems from chronic underfunding. Nationwide, public health spending is critically low. In Sindh, although the government allocated Rs 320.147 billion (c US$ 1.148 billion)[ii] for health in the latest fiscal year, nearly 90% of this -- Rs 287.756 billion -- was spent on recurrent expenses such as salaries and overheads, leaving little for development or infrastructure. As a result, the public health hierarchy—made up of dispensaries, Basic Health Units (BHUs), Rural Health Centers (RHCs), *Tehsil* headquarters (THQs) and District Headquarters (DHQs)—functions as what can be called as a 'fragile and overwhelmed' network (see Ali, 2024; Tompson, Manderson and Chandler, 2021).

Further, reflecting an historical urban bias (Zaidi, 1985), in which healthcare infrastructure and staff are heavily concentrated in large urban areas, rural regions are left in a state of medical desertification. Only 5,434 BHUs exist nationwide for a rural population of 147.75

millions (Pakistan 2024), and this lack of facilities creates a gap that is often filled by the private sector. Pharmacies, medical stores, and even grocery stores have become the main, and often the only, point of contact for healthcare.

The reliance on pharmacies is a practical response to economic realities. Since over 70% of health expenses in Pakistan are paid out-of-pocket, pharmacies serve as accessible and cost-effective options. Visiting a formal hospital can be costly due to transportation, long wait times, and the physician's consultation fee. In contrast, pharmacies provide immediate access without requiring an appointment. Pharmacy staff—often local residents with limited formal clinical training—serve as informal medical authorities.

This environment supports the misuse of antibiotics. In rural Sindh's cultural mindset, antibiotics are often seen as ‘cure-alls’ or ‘strong’ medicines that can quickly restore health for a workforce that cannot afford to lose a day’s wages. The Drug Regulatory Authority of Pakistan (DRAP) finds it difficult to enforce prescription-only laws in these remote areas, leading to widespread availability of medications over-the-counter (OTC). For consumers, buying a few ‘loose’ antibiotic tablets is a highly affordable shortcut. This practice is further normalized by the extremely low number of doctors, making formal medical consultation rare for people who are poor, marginalized, or who live in rural or remote areas at significant distance from any clinic (Pakistan, 2024).

Patriarchal norms shape the social fabric and govern public life and access to healthcare. These norms interact with economic barriers, creating complex challenges for women. National indicators reflect this systemic neglect: Pakistan’s Maternal Mortality Ratio (MMR) was 186 per 100,000 live births in 2019, and the Infant Mortality Rate was 50.1 per 1,000 live births, both significantly surpassing South Asian regional averages of 120 and 30.2, respectively. In rural Sindh, women’s health-seeking behavior is rarely a matter of personal

choice; it is constrained by a lack of financial autonomy and by social expectations requiring male accompaniment (*mahram*) when women travel outside the household. This spatial exclusion renders the pharmacy and marketplace—the primary venues for medication negotiation—male-dominated 'third spaces'. Drawing on Homi Bhabha's (1994) conceptualization, these spaces act as hybrid zones of negotiation where medical authority is filtered through social and patriarchal hierarchies rather than clinical protocols. As João Biehl (2007) observed in his work on pharmaceutical governance, such sites function as critical junctures where social identity and biological survival are contested, often prioritizing the 'will to live' over biomedical precision. This normative behavior influenced participants' representation in this study. Only five of the 24 interlocutors were women: the absence of female voices is not a methodological deficiency but rather a critical ethnographic finding. Reflecting what Veena Das (2015) describes as 'spaces of silence' -- the normatively restricted context of rural Sindh -- cultural norms governing gender interactions often inhibit female residents from engaging with unfamiliar male researchers. Similar methodological challenges have been identified in ethnographic studies conducted within other patriarchal settings (see Nayiga, 2022).

Due to restrictions on public medical engagement, healthcare decisions for women and children are often made and implemented by male household heads. This creates a framework of 'mediated agency', in which women's and children's clinical needs are negotiated via the subjective interpretations of male relatives. When a child falls ill, it is typically the father or the eldest son who consults at pharmacies and interacts with healthcare providers, consequently silencing or filtering women's perspectives on symptoms and treatment. Women often resort to using leftover antibiotics or medicines obtained by male relatives. This practice 're-socializes' the antibiotic as a household resource rather than a targeted prescription, thus perpetuating a cycle of unregulated self-medication within households.

Methods and Materials

In the following, we provide an overview of the methodology used for data collection, analysis, and interpretation. The data presented in this article comply with the Standards for Reporting Qualitative Research (SRQR) guidelines and employ the Consolidated Criteria for Reporting Qualitative Studies (COREQ), a 32-item checklist (Tong et al., 2007).

Locale and Participants

The research setting was a district area within Sindh Province, Pakistan, where data collection methods involved participant observation combined with in-depth interviews, followed by *kachaharī* sessions (Ali, 2024). While in-depth interviews followed a semi-structured guide for individual perspectives, these kachaharī sessions were unstructured group discussions that captured community norms and collective viewpoints. A kachaharī is a voluntary, participant-driven gathering—often held in an *Otaq* (a male guest room) or *Baithak* (a male guest room)—that serves as a vital space for communal storytelling and social negotiation. Traditionally male-dominated and multi-generational, these gatherings are anchored by village elders and influential men who provide social weight to the discourse. They function as inclusive spaces where the community voluntarily assembles to welcome guests or researchers, facilitating the exchange of *hawal* (discussion) and the intergenerational transfer of oral history and social codes. By utilizing this culturally grounded method, we were able to move beyond formal interviews to build deep rapport and observe how 'local logic' and health decisions are authentically constructed in real time.

The research sample consisted of 24 respondents, of whom 20 were male and four female, and comprised 10 healthcare professionals (including two women doctors), two unlicensed healthcare providers, three pharmacy employees, one laboratory employee, two pharmacy customers, and six residents (two women). The inclusion criteria for participation were that

individuals had direct or indirect experience with antibiotic use, either through their professional roles or as consumers. Exclusion criteria were applied to individuals with limited understanding or involvement with the subject matter. Purposive sampling enabled researchers to include key stakeholders and ensured that participants were informed and could provide relevant insights into the research questions. This research included information from healthcare professionals regarding antibiotic treatment prescriptions, as well as collecting sales and purchase data from pharmacy staff and clients, and self-treatment practices from patients and residents. The research design, which involves diverse participant groups, provides detailed knowledge about antibiotic utilization, as well as resistance factors. Throughout this writing, pseudonyms have been used as substitutes for actual names to ensure participant anonymity.

Data Collection

Data collection was conducted during a three-month fieldwork period, from November 2022 to January 2023. A total of 24 interviews were conducted, comprising 11 in-depth interviews, lasting between 30 and 90 minutes) and 13 informal conversations or kachaharī sessions of one-two hours with participants. The interviews were conducted with participants' prior consent and were translated and transcribed for analysis by SA. The interview guide was structured for consistency and cultural relevance, and the interviews were conducted in the Sindhi language, allowing locals to feel confident and comfortable to share their perspectives freely. Data saturation was considered achieved when no new themes, categories, or patterns emerged during the analysis of the interviews. This point was reached after reviewing the 24 interviews, when recurring insights aligned with the study's objectives and scope.

Participant observation was conducted in a pharmacy in the selected district during fieldwork, where SA observed the local population's antibiotic-purchasing habits and

interactions with pharmacists. The researcher adopted a passive observer role, spending approximately 40 hours over 12 visits in the pharmacy. Detailed field notes were recorded in a structured journal immediately following each observation period, focusing on interactions, medications requested and purchased without prescription, and conversations between customers and pharmacists. Observation notes were used in the analysis.

To ensure rigor, methodological triangulation was employed by integrating multiple data collection methods, including participant observation, in-depth interviews, and informal conversations (kachahri).

Data Analysis

The interviews, conducted in Sindhi, were translated and transcribed into English by SA, then verified and in some cases modified by IA to ensure consistency and reliability; both authors are native speakers of the local language and proficient in English. The thematic analysis approach was employed to analyze the data; this involves organizing and categorizing data through the assignment of labels based on patterns identified from the divergence of ideas or information collected during the fieldwork (Braun and Clarke, 2006, 2021). The data obtained were subjected to the following analytical steps: familiarization with the data, coding, development of themes, review of themes, categorization and labeling of themes, and documentation. SA read and re-read the transcribed interview and observation notes to become thoroughly familiar with the data. The first author manually coded the data, with inductive coding used to categorize significant data. This process was not driven by pre-existing theories, but emerged from the data. Initial codes were grouped into themes relevant to the research objectives, focusing on key factors such as cultural beliefs, economic barriers, and gender norms that influence antibiotic use; co-authors reviewed and resolved discrepancies to ensure consistency in theme development. The identified themes were

refined through ongoing discussion to ensure consistency and relevance. After reviewing the themes, final labels were assigned to each category, and illustrative quotes from participants were selected to highlight the key findings. Data from Kachaharī sessions contextualized and triangulated findings from individual interviews, and co-authors IA, IL and SB helped triangulate the data and guide the paper's writing process.

Reflexivity was maintained throughout the process to minimize bias and uphold a critical perspective. Reflexivity was also an integral part of analysis; the researchers engaged in ongoing reflexive practices such as memo writing and peer debriefing to acknowledge and examine their own assumptions, influences, and potential biases throughout the analysis. These reflexive activities helped to promote transparency and credibility, ensuring that the researchers remained aware of how their perspectives might shape the interpretation of the data.

Antibiotics in Everyday Life: Social Practices and Community Knowledge

Antibiotic use in Sindh is embedded in everyday practices of illness management and not as a result of biomedical prescriptions. Across interviews, pharmacy observations, and *kachaharī*, participants described antibiotics as familiar and accessible medicines used to treat a wide range of ailments. These practices reflect broader social processes through which communities interpret illness, evaluate treatments, and circulate medical knowledge. In rural Sindh, *kachaharī* gatherings—informal meetings where residents collectively discuss social matters and find ‘local logic’—also function as spaces for exchanging health-related advice. During these discussions, people share experiences of illness, compare medicines, and discuss which treatments worked best. Such interactions illustrate how health knowledge often circulates socially rather than through formal education. This internalization of social structures and past

experiences into durable, everyday dispositions is best understood through the concept of habitus (Bourdieu, 2008), whereby the community's shared history and social environment dictate a naturalized approach to medicine.

Many participants described antibiotics as powerful medicines capable of addressing multiple health problems, as Abdul Hadi, a 37-year-old biomedical doctor practicing in a private clinic in Khairpur, reflected: "One of the biggest misconceptions is that antibiotics can cure every disease; people use them for treating even the simplest conditions, such as a cough or a headache."

Although healthcare providers recognized this belief was not medically accurate, many community members described antibiotic use as a practical approach to managing illness before it becomes severe. Hussain Ahmed, a 54-year-old patient waiting at a clinic in Khairpur, explained: "In our households, we often use antibiotics even for minor issues such as stomach ache or headache to prevent them from worsening."

These narratives illustrate how antibiotics have become incorporated into household strategies for managing health. Rather than being perceived as specialized medicines requiring medical supervision, antibiotics are often treated as reliable remedies to prevent illness escalation. This reliance is not merely a choice but a manifestation of the habitus, whereby the practical logic of survival in the context of a neglected healthcare system makes the prophylactic use of antibiotics common-sense behavior. Similar observations have been reported in ethnographic studies of antibiotic use in other low- and middle-income countries, where medicines become integrated into everyday therapeutic practices (Nayiga, 2022).

Anthropological research emphasizes that antibiotic use should be seen as a socially organized practice rather than just a biomedical issue. Tompson, Manderson and

Chandler (2021) argue that antibiotic use develops through networks connecting patients, pharmacists, doctors, and family members. In these networks, past illness experiences and treatments often influence future decisions about medicine use. In Sindh, these networks are especially visible in household and neighborhood interactions, where advice on medicines is exchanged informally. Participants often reported depending on family members and elders for guidance on treatment. These exchanges are governed by a 'moral economy' of care (Fassin, 2007; Kleinman, 2006), with the obligation to provide relief to a suffering loved one outweighing the abstract risks of long-term resistance. Noor Bibi, a 48-year-old resident of Khairpur, explained that people often use antibiotics based on their own understanding, because formal instructions are rarely provided: “No one has ever shown us or explained how to use these medicines properly; therefore, we use them according to our own understanding.” Similarly, Hussain Ahmed described how treatment practices are transmitted across generations: “We listen to our elders and take antibiotics for illnesses the way they did. If these medicines worked for them, we believe they will also work for us.”

By following these intergenerational patterns, the community reproduces a habitus that prioritizes inherited collective wisdom over formal biomedical advice. These findings demonstrate how knowledge of antibiotics is embedded in collective memory and social relationships. As Blaser and colleagues (2021) note, variations in antibiotic use across societies are often shaped by historical experiences with medicines and the ways communities interpret therapeutic success. Likewise, this reliance on the intergenerational transmission and embeddedness of health practices becomes part of what Ali (2024) terms ‘societal memory’ that acts as a culturally grounded authority,

often carrying more weight than modern biomedical protocols and rendering medicine use a deeply social and historical act.

The Practicality of Self-Medication

Much anthropological literature has been produced on how economic conditions influence the risk for and outcomes of diverse health conditions (see Farmer, 2004; Singer and Claire, 2003; Fassin, 2007; Pfeiffer and Chapman, 2010; Singer & Baer, 2018; Ali, 2024). In rural areas of Sindh, economic conditions not only influence healthcare choices but also define the limits of survival. Antibiotic use patterns here offer an ethnographic glimpse into a world where bodily health is often dictated more by market volatility than by official prescriptions. For households in rural Sindh, the out-of-pocket nature of Pakistan's health system—where a staggering 70% of all health expenses are paid directly by low-income workers (Ali and Ali, 2022)—makes seeking formal medical care an expensive, almost unaffordable luxury. Within this framework of structured vulnerability (Ali, 2024; Farmer, 2004), bypassing a physician is not an act of ignorance but a calculated risk. Seeking professional care involves a cascade of costs—consultation fees, diagnostic tests, and the hidden toll of lost wages. In contrast, the pharmacy provides a local, immediate, and predictable financial transaction. Noor Bibi, whose life is shaped by these daily negotiations, expressed this economic pragmatism while standing in front of the glass counters of a local drug store: "We cannot go to the doctor for every small illness we have. It is much cheaper to buy antibiotics from a nearby shop and use them whenever we feel the need."

Noor Bibi's testimony serves as a powerful indictment of the deep-rooted inequalities built into the country's structure. While the government displays an image of a layered public

health system, public health spending is, as above, extremely low (Pakistan, 2024). This shows up in rural Sindh as a form of state withdrawal, whereby long-standing urban bias (Zaidi, 1985; Ali, 2024) has kept vital infrastructure focused in big cities like Karachi and Hyderabad, leaving the countryside in a state of medical neglect.

Statistics from the Economic Survey illustrate the extent of this abandonment. Although the country has 319,572 registered doctors, their geographic distribution reveals a clear inequity: most are concentrated in urban settings, where they can access better educational opportunities for their children and have opportunities to run private clinics. With a population over 240 million, there are only 1,696 hospitals and 5,434 Basic Health Units (BHUs), creating a geography of exclusion. In districts such Khairpur in the north of the province, the physical distance to a functioning clinic can turn a common infection into a life-threatening one, requiring costly, unpredictable travel over broken infrastructure. For an agricultural laborer, the time spent on such a journey is a cost that matches the price of the medicine itself. The practicality of the pharmacy thus arises from government absence. Abdul Qayom, a pharmacist whose shop functions as a crucial, though informal, part of this landscape, observed: "Local people prefer buying antibiotics from nearby shops instead of visiting a doctor because it saves time and money. They think it is more practical."

Practicality equates to resilience. The pharmacy worker transitions from merely selling medications to acting as a surrogate healthcare provider, bridging the gap between an overstretched public sector and a community in need. From a critical perspective, these practices illustrate how agency is constrained by the unequal distribution of resources (Singer and Baer, 2018). The findings are consistent with the 'neoliberalized' health landscapes described by Cabral and colleagues (2024), in which self-medication emerges as the only rational response within a system that has commodified the right to health. Ultimately, the

misuse of antibiotics in Sindh underscores a situation in which impoverished individuals are forced to act as their own physicians, navigating the structural limitations of a state that allocates less than one percent of its wealth to their health and well-being.

Pharmacies, Pharmaceutical Markets, and Regulatory Gaps

Participant observation in pharmacies revealed that antibiotics are widely available without a prescription in Sindh, functioning as 'over-the-counter' staples rather than strictly regulated medical products. Customers frequently requested specific medicines by name, and pharmacists or shop assistants often dispensed them without asking detailed questions about symptoms. Razaq, a pharmacist and medical store owner, candidly described this normative culture: "Most customers come in asking for antibiotics by name. If we do not sell to them, they will go to another store. No one asks for a prescription; it is not the norm here." Dr. Muhammad Ghazi, a physician in Khairpur, explained that this accessibility creates a preliminary layer of self-care: "Patients take antibiotics before visiting a doctor because they think it saves time and money. They usually come to us only when their condition becomes serious."

This reliance on antibiotics is what Clare Chandler (2019) describes as a 'social patch'—a quick pharmaceutical fix for deeper structural problems, such as poverty and the lack of accessible primary healthcare. For community members, the pharmacy is a pragmatic alternative to the formal health system, as another pharmacist noted: "We simply cannot go to the doctor for every illness and have to rely on things that worked before. We end up buying the same antibiotics we used the last time." These statements highlight how pharmacies function as informal clinical hubs, reflecting a 'pharmaceuticalization' (Bell & Figert, 2012) of daily life in which pills are expected to resolve social vulnerabilities.

Melaku and Assegid (2025) argue that antibiotic misuse in low-resource settings is driven by the intense commercialization of medicines. In Sindh, this is fueled by a 'corporate-professional assemblage' in which pharmaceutical companies promote antibiotics through incentives directed at vendors. This illustrates the 'biographical' journey of the antibiotic (Van der Geest, Whyte and Hardon 1996), in which its meaning shifts from a scientific tool in the factory to a profit-driven commodity in the shop. A retired medical doctor explained that the economic survival of local practices is closely linked to industry influence: "There are many pharmaceutical companies visiting, offering free samples, products, and commissions. When these support the clinic's sustainability, it's hard to refuse." He further emphasized ongoing pressure, stating that representatives "demand we stock and sell their antibiotics... and offer bonuses based on sales targets." These institutional incentives create conflicts of interest, effectively turning providers into salespeople. Stefan Ecks (2013) describes this as 'pharmaceutical citizenship,' in which economic participation is linked to drug sales and consumption. A younger pharmacist mentioned weekly approaches from reps, who offer gifts and commissions for meeting sales targets, blurring professional boundaries. Therefore, when it benefits us, we try to sell more of their products. Rynkiewich (2020) argues that dispensing practices are shaped by these economic incentives, transforming the pharmacy into a place where 'market logic' of profit and sustainability often overrides the 'medical logic' of stewardship.

Gender Relations, Household Decision-Making and Medical Pluralism

As noted above, the limited number of women who directly participated in this study reflects broad gender norms that restrict women's engagement in public discourse and research activities. Nonetheless, interviews with healthcare providers and male family members highlight how gender inequities influence healthcare access and decision-making processes.

Gender relations were an important factor shaping antibiotic use, acting as a socio-cultural filter through which medicine is accessed and administered. Women often face restrictions on mobility and decision-making within households, which can limit their access to professional healthcare services. Treatment decisions are frequently made by male relatives who purchase medications on behalf of female family members, as Dr Jameel, a pediatric specialist working in Khairpur, explained: “In many families, women are not allowed to visit a doctor even when they are sick. Men bring medicines, including antibiotics, without knowing the correct dosage or timing.” In these instances, male relatives act as gatekeepers; treatment decisions are mediated by patriarchal hierarchies rather than a direct clinical assessment of the patient, contributing to inappropriate antibiotic use. Social arrangements—in this case, gendered mobility—constrain individual agency and lead to suboptimal health outcomes.

The data also reveal that antibiotic use in Sindh coexists with traditional healing practices. Many participants described combining antibiotics with herbal remedies, honey, or other home-based treatments. Fayaz, a 47-year-old patient waiting at a public hospital in Khairpur, reflected on these changes: “In the past we used natural remedies such as honey and herbs for wounds or colds, but now people increasingly rely on antibiotics, even when they may not be necessary.” This transition illustrates how a community pragmatically adopts new technologies such as antibiotics and integrates them into a pre-existing ‘pluralistic medical system’ (Leslie, 1980). Rather than antibiotics displacing traditional medicine, they are ‘re-socialized’ into existing therapeutic landscapes, where they are often perceived as a modern ‘quick-fix’ used alongside time-tested remedies (Tompson, Manderson and Chandler, 2021).

A small number of participants also raised concerns about indirect antibiotic exposure through food production. Dr. Farzand Ali, a veterinary doctor, explained: “Many

people do not realize that antibiotics given to animals eventually enter the human body through the food we consume." Such observations underscore that antimicrobial resistance is a 'biosocial assemblage'—a complex web of biology, industry, and culture where the boundaries between human, animal, and environmental health are increasingly blurred. As Nading (2014) argues in his work on global health ecology, health is not an isolated human condition but is deeply entangled with the environments and animals we live alongside. Antibiotic use in agriculture and environmental contamination are significant, rendering resistance a 'total social fact' shaped by a combination of micro-social household dynamics and macro-ecological pressures (Collignon et al. 2018). In Pakistan, this socio-ecological entanglement is empirically grounded in the discovery of high concentrations of resistance genes, such as gyrA and parC, in the bulk soil of Karachi—a finding that confirms the environment's role as a pervasive reservoir for multi-drug resistant (MDR) pathogens (Rafi et al., 2026). This environmental contamination does not exist in a vacuum; it mirrors the escalating clinical crisis in which last-resort antibiotics are failing. Recent genomic evidence has confirmed the dissemination of clinical Escherichia coli harbouring the mcr-1 gene across Pakistan, indicating that plasmid-mediated resistance to colistin has breached the human-animal-environmental barrier (Abdullah et al., 2025). This shows that the 'bulk soil' of the city and the 'last-resort' treatments in the ward form part of the same interconnected phenomenon.

Conclusions

We demonstrate the multifaceted nature of antibiotic misuse in Sindh by showing that it stems not only from knowledge gaps but also from practices deeply embedded in the fragile structures and informal networks of Pakistan's healthcare system. Using the perspective of

Tompson, Manderson and Chandler (2021), we understand that the practicality of self-medication is a social act of survival driven by a state that has historically neglected rural areas. As reflected in the Pakistan Economic Survey 2024–25, economic stagnation has created a geography of exclusion, where medical resources are heavily concentrated in cities, leaving rural districts such as Khairpur with very limited infrastructure. Pharmacies become not just an alternative but the primary source of care, enabling consumers to avoid consultation fees and cascading costs associated with formal healthcare in favor of predictable, market-based transactions.

Gendered networks and domestic hierarchies control the flow of medicines, and excluding women from health-seeking decisions is a major structural barrier. As we have described, antibiotic use is often mediated by male heads of households, who rely on the informal authority of chemists to manage female and child health within the home. The indirect use of antimicrobials through livestock also connects local practices to the larger political economy of food production: the routine use of antibiotics as prophylactics in agriculture is a structural response to the need for food security in an economy vulnerable to climate-related risks.

Addressing AMR requires more than just changing individual behaviors; it necessitates transforming the structures and networks that make misuse seem like a practical necessity. While the government's financial commitment to health remains so low, antibiotics will continue to serve as a substitute for a functional state. Future efforts should go beyond awareness to address the socioeconomic factors that influence health, ensuring that the right to healing is not commodity but a structurally guaranteed right.

While concluding, we invite future studies to apply this ethnographic framework to other resource-limited global settings to determine whether 'networks of care' constitute a universal response to structural neglect, and to utilize multisited ethnography to compare how

varying political economies influence antimicrobial resistance. Furthermore, we suggest that longitudinal or broader gender-focused studies could explore how domestic hierarchies evolve under different socioeconomic pressures. By shifting from a localized case study to a comparative political economy approach, we have provided a scalable model to design culturally grounded health interventions that target the root structural drivers of medicine misuse rather than merely individual behavior.

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Ethical approval

All research procedures were conducted in accordance with the ethical standards of the Institutional Bioethics Committee (IBC) of Quaid-i-Azam University (letter (Reg. No. QAU-IBC-3006; Date of Approval: 21 October 2024) and adhered to the principles outlined in Helsinki, ensuring compliance throughout the study involving human participants.

Informed consent

We received verbal informed consent from all participants to join this study and they had the opportunity to withdraw at any point of time. We also received verbal informed consent from all participants to publish the results of this study. Verbal informed consent was obtained as people in Sindh become suspicious if someone takes their signatures.

Authors contributions

Conceptualization: Ahmed, S.; Ali, I.; Leghari, I. and Bhanbhro, S.; Methodology: Ahmed, S.; Ali, I.; and Bhanbhro, S.; IL; Investigation Ahemed, S.; Formal Analysis: Ahmed, S. and Ali, I.; Resources: Ahmed, S.; Ali, I.; Leghari, I. and Bhanbhro, S.; Data Curation: Ahmed, S.; Writing—Original Draft Preparation: Ahmed, S.; Ali, I.; Leghari, I. and Bhanbhro, S.; Writing—Review and Editing: Ali, I.; Supervision: Leghri, I. All authors have read and agreed to the published version of the manuscript.

Disclosure statement

The authors declare no known conflicts of interest that might have affected this manuscript.

Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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[i] In 2017, the WHO developed the Access, Watch, and Reserve (AWaRe) classification system for antibiotics as part of AMS. This milestone provided a more objective, user-friendly tool for organising antibiotics, categorising them by their spectrum of activity and potential for resistance. The Access group includes first- and second-line treatments, while the Watch group covers broad-spectrum antibiotics associated with a higher risk of resistance. The Reserve group consists of last-resort antibiotics for multidrug-resistant infections. The framework encourages responsible antibiotic use by classifying antibiotics according to their importance in human medicine and by promoting guidelines, surveillance, research, and new drug development. By 2023, the WHO recommends 60% of prescribed antibiotics be from the Access group. Implementing and following this framework supports AMS and reduces inappropriate antibiotic use. (further see Mudenda et al., 2023)

[ii] This conversion of PKR to USD is approximate, undertaken in May 2026