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The Repercussions of Self-Medication in Africa and Best Practices for Developing Nations

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Introduction

According to the Food and Drug Administration, a drug is "a substance intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease." Since 1951, the US has classified drugs as one of the following: prescription or over the counter (OTC) [1]. Prescription drugs are drugs that require a drug order from a physician and are intended for use by only one person. The Durham-Humphrey amendment was passed by Congress on October 26, 1951. It required any drug that was habit-forming or potentially harmful to be dispensed under the supervision of a health practitioner as a prescription drug and to carry the statement, "Caution: Federal law prohibits dispensing without prescription." Until this law, there was no requirement for any drug to be labeled for sale by prescription only.

The Durham-Humphrey amendment established the distinction between so-called legend (prescription) drugs and over the counter (nonprescription) drugs. The amendment also authorized the taking of prescriptions verbally, rather than in writing, and the refilling of prescriptions to ease the process for both patients and practitioners. If a drug can be used safely and effectively without a health care provider's guidance and can be used for a condition that is reliably self-diagnosable like diarrhea, constipation, allergies, or fever, then it can be classified as over-the-counter [2]. The classifications are mainly in place to maximize patient safety and minimize the burden on the healthcare system.

In African nations, the picture is very different. In general, there is a lack of medical professional oversight into the practice of self-medication. This is understandable as some developing countries currently lack the infrastructure to fashion their health care systems after western models. Some nations may also be dealing with other, more pressing issues. However, this article aims to communicate the necessity of creating legislation around prescription drug classification by discussing the ramifications of allowing self-medication with potentially harmful medications such as antibiotics. It will also present some suggestions for a reasonable and economically feasible way to improve patient outcomes and reduce the magnitude of adverse events such as antimicrobial resistance (AMR) on the continent.

Causes of Antibiotic Resistance

Several factors contribute to the development of resistant strains of bacteria. One of the most well-understood causes of resistance is overuse. Epidemiological studies have proven a direct relationship between the consumption of antibiotics and the increase in resistant bacterial strains [3]. Antibiotics kill all drug-sensitive competitors and leave any resistant strains free to reproduce in their absence. Extended exposure to antibiotics provides selective pressure that drives antibiotic resistance [4]. An example of this is quinolone antibiotics. They were synthesized only 30 years ago, but after their widespread use, resistance is epidemic [5]. There is even evidence from whole genome studies that suggests that quinolone resistance was a key factor in the development of methicillin-resistant *Staphylococcus aureus* (MRSA) by reducing *S. aureus* microbial competition and providing selective pressure [6].

Antibiotic Resistance in Africa

Antibiotic resistance can be a major burden to the health care systems of developing nations. *Vibrio cholerae*, a pathogen that causes the watery diarrheal disease, cholera, has emerged as a dangerous multidrug resistant (MDR) enteric pathogen in the last few decades in Africa. Its mechanism of resistance is thought to be through the acquisition of mobile genetic elements such as plasmids, transposable elements, and insertion sequences from distant or closely related bacterial species [7]. The acquisition of resistant genetic material is a natural process that is driven by factors such as usage patterns of antibiotics in healthcare or farming/agriculture.

As the selective pressure increased with the overuse and misuse of antibiotics, antibiotic resistant *V. cholerae* has evolved and spread rapidly across the globe. With the acquisition of multiple mobile genetic elements, MDR *V. cholerae* has a risk of potentially spreading its resistant genes to other bacterial species [8]. This is a serious public health threat especially in developing nations where there is limited access to a variety of antibiotics [9].

According to a review by the World Health Organization, antibiotics typically reduce the fluid loss and duration of illness in patients with cholera. Unfortunately, without antibiotics, the illness will persist for almost twice as long which would lengthen the hospital stay and increase the amount of resources (replacement fluids) needed to treat the illness. Therefore, in this situation, it is better to use antibiotics. If there is resistance, however, the disease will progress as if no antibiotics were given, and the burden on the healthcare system would be great due to the increased treatment duration [10]. Cholera outbreaks typically occur in areas that have limited resources. Therefore, antibiotic resistance in those areas can lead to worse prognoses and more death.

Antibiotic Stewardship

Health care providers have a responsibility to use antibiotics as efficiently and responsibly as possible. This responsibility is known as antibiotic stewardship. In a study by Nkrumah et al. in Ghana, they found that of the study participants, 69% self-medicated and the most common medications used were antibiotics (23%) pain killers (20%), and herbal medications (19%). Of those who self-medicated, only 33% reported any relief in symptoms [11]. Not only are medications like antibiotics being used without professional guidance, but patients are also not seeing the benefits they desire. Even special populations such as pregnant women are engaging in a practice which could potentially cause harm to their unborn children. Self-medication undermines antibiotic stewardship, is often ineffective, and can lead to potentially dangerous consequences.

In order to find solutions to the issue, it is important to first understand the state of the continent when it comes to prescription laws regarding dispensing antibiotics. Data regarding whether each country in Africa required prescriptions for their antibiotics were gathered in order to identify areas for improvement and to formulate a recommendation about practical best practices for the future.

Methods

Information was gathered using various databases such as Google Scholar, PubMed, MEDLINE, and a focused Internet search. The search strategy consisted of controlled vocabulary using keywords such as: prescription/drug laws in (country), self-medication in (country), antibiotic dispensing laws in (country), drug/prescription policy. The main search topics were prescription drug policy regarding antibiotics and the implications thereof. The search was limited to English language documents. Where no laws were found, country profiles published by the World Health Organization were utilized. No filters were applied to limit publication time frame due to the nature of the search (laws could have been in place for decades). Internet links were included where available.

Results

Rx Not Required or do not enforce	Rx Required	Data Unavailable
Algeria [33]	Angola [22]	South Sudan
Benin [12]	Botswana [23]	
Burkina Faso [41]	Mauritius [34]	
Burundi [13]	Mozambique [35]	
Cameroon [42]	Namibia [27]*	
Central African Republic [32]	Somalia [30]	
Chad [49]	South Africa [36]	
Comoros [43]	Zimbabwe [31]	
Democratic Republic of the Congo [44]		
Republic of the Congo [15]		
Cote d'Ivoire [50]		
Djibouti [16]		
Egypt [24]		
Equatorial Guinea [14]		
Eritrea [17]		
Ethiopia [18]		
Gabon [51]		
The Gambia [19]		
Ghana [25]		
Guinea [45]		
Guinea-Bissau [46]		
Kenya [13]		
Lesotho [26]		
Liberia [52]		
Libya [20]		

Madagascar [47]		
Malawi [21]		
Mali [53]		
Mauritania [54]		
Morocco [14]		
Niger [55]		
Nigeria [48]		
Rwanda [21]		
Sao Tome and Principe [56]		
Senegal [57]		
Seychelles [28]		
Sierra Leone [29]		
Sudan [58]		
Swaziland [38]		
Tanzania [37]		
Togo [14]		
Tunisia [59]		
Uganda [40]		
Zambia [39]		
*Pharmacists have prescriptive authority; Rx: Prescription		

Table 1: List of countries and their status of prescription requirements for antibiotics.

Forty five out of 53 (84.9%) of countries do not require a prescription to dispense antibiotics, or if they do, they do not enforce it. One out of 53 (1.8%) had data that was unavailable due to lack of infrastructure or national unrest. Eight out of 53 countries (15%) require prescriptions and enforce their regulations. Angola, Botswana, Namibia, Mauritius, Mozambique, South Africa, Somalia, and Zimbabwe are the only countries to require prescriptions for antibiotics and enforce their laws in any capacity. Egypt for example does not strictly enforce its laws regarding what can be sold over the counter. Antibiotics are considered prescription only but are often dispensed at patient request [10]. Therefore, medications are generally available for purchase without a prescription; however, due to the abuse of tramadol in the country, the government strictly enforces its laws for controlled medications. Similarly, the Ethiopian government classifies antibiotics as prescription only, but a study by Erku et al. demonstrated the willingness of pharmacies to dispense them to patients without prescriptions [18]. This is a common problem in the region. Even if a country has a national drug policy that restricts the sale of antibiotics without prescription, often it is possible to acquire them anyway through traditional means (pharmacies) or through informal markets. Mozambique has a similar issue. Though antibiotics are considered prescription only and there is some compliance, there are still extemporaneous marketplaces where patients can acquire antibiotics OTC [64].

Ghana compiles a drug register and classifies drugs as prescription only, pharmacist recommended, and OTC, but antibiotics are sold over the counter [25]. In Lesotho, only injectables such as insulin require a prescription. Namibia has a robust drug policy detailing the prescription requirements for medications and enforces them. They consider antibiotics to be prescription medication. Their laws also give prescriptive authority to pharmacists [27]. In Libya, a prescription is not required, but a consultation with a pharmacist is required before dispensing an antibiotic [20]. In Zimbabwe, a prescription is required for antibiotics and the law is enforced by pharmacists despite high patient demand [31]. Zimbabwe, Mauritius, and South Africa have also created a national AMR action plan that details their plans to reduce antimicrobial resistance (AMR) in their country [61-63].

Discussion

Namibia's policies could set an example for other developing nations. In Namibia, a prescription is required to dispense medication, but pharmacists have prescriptive authority. In this way, there is both some oversight, and a patient's access to medication is not impaired [27]. This lowers the burden on the healthcare system while still allowing for some guidance for patients. Giving pharmacists prescriptive authority does not adequately address the problem if the pharmacists are not fully equipped to dispense responsibly and according to guidelines.

Giving pharmacists prescriptive authority is a good step to both control the use of medications but also maintain the same level of access to healthcare. A country can take this step if their pharmacists are well-trained in treatment guidelines and can make sound recommendations. For countries where this is not the case, licensing requirements could be updated to require greater clinical expertise. In some countries that require prescriptions for antibiotics like Angola, it is a common practice for patients to discontinue the antibiotic when they start feeling better and reserve their excess medication for later use [60]. Saving antibiotics for future use constitutes the inappropriate and potentially harmful practice of self-medication. Pharmacists are instrumental for patient education and counseling on proper use of medications because of their accessibility to the public. Educating pharmacists on proper dispensing and drug utilization guidelines so that they can advise patients is key to reducing misuse and abuse on the continent.

Another important facet of reducing AMR on the continent is adequate AMR surveillance. Tracking resistance trends in a region-specific manner is key to making public health decisions and deciding what drugs should be used to treat certain conditions. Several countries are actively participating in collecting AMR data like Zimbabwe, Mauritius, and South Africa because they have ongoing action plans to prevent AMR. In these plans they detail how they will prevent unrestricted access to antibiotics by both patients and farmers. Also, they will conduct electronic surveillance activities and promote an evidence-based approach to the utilization of antibiotics [61-63]. All of these approaches can help reduce AMR because resistance is a multifaceted problem that requires action from many angles to combat.

The best place to begin the battle is with the enforcement of restrictive policies. For example, in Zimbabwe, most pharmacists do not dispense antibiotics without prescriptions. This is due to nationwide policy and education. While more can be done to regulate the non-compliant dispensaries, it is a step in the right direction. Extending government purview from only controlled medications like narcotics to potentially harmful medications like antibiotics is a crucial first step in reducing preventable adverse events across the continent. There are also issues in many countries with illegal or unregulated markets selling medications to patients. Regulating these markets is not only important to prevent AMR, but to also reduce the sale of adulterated medications [64]. Each country can tailor their policies depending on the resources that are available to them and the problems they face. Even America with its structured health system can fall victim to epidemics like the opioid epidemic. But our experiences can lend insight into how to better structure a health care system to be both accessible and accountable to the people it serves.

Conclusion

According to the World Health Organization, the only way to reverse the trend of rising antibiotic resistance rates is to reduce the selective pressure that drives it. To do this, countries need to adopt policies that favor antibiotic stewardship. Since it is not feasible for pharmaceutical researchers to discover and produce new antibiotics at the same rate that resistant species emerge, we must use the ones we have strategically. Removing antibiotics from widespread circulation can help improve overall patient outcomes and prolong the usefulness of a mostly unrenewable and precious resource.

In most African nations, medications like antibiotics are available OTC without even a pharmacist consult. Some nations like Libya require at least a recommendation from a pharmacist, but most do not.[20] The practice of self-medication is not only potentially harmful to the individual because of the possibility of adverse events or inadequate/inappropriate diagnosis and treatment, but also because of the impact on the nation's health systems.

Looking to the future, the World Health Organization launched the Global Antimicrobial Surveillance System (GLASS) in 2015. Its aim is to collect AMR data from participating nations. The countries that are currently participating are: Burundi, Chad, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Nigeria, South Africa, Uganda, Tanzania, Zambia, and Zimbabwe. 2019 was the first year that data was collected, so we can anticipate some helpful information that can help inform both policy decisions and treatment guidelines in a region-specific manner in the future.

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