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Review article

Antibiotic Resistance in Libya and the Prevalence of Antibiotic Self-Medication: A Review

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Abstract
Antibiotic resistance is a significant public health challenge globally, and Libya is no exception. The misuse and overuse of antibiotics, particularly through self-medication, have contributed to the emergence and spread of resistant bacterial strains. This review explores the current state of antibiotic resistance in Libya, the prevalence and drivers of antibiotic self-medication, and the implications for public health. It also discusses potential strategies to address the issue, including public awareness campaigns, regulatory reforms, and improved healthcare infrastructure.
Keywords: *Antibiotic resistance, Self-medication, Misuse.*

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Introduction

Antibiotic resistance (ABR) is one of the most pressing global public health challenges of the 21st century. The emergence and spread of resistant bacterial strains threaten to undermine decades of medical progress, rendering many life-saving antibiotics ineffective [1]. According to the World Health Organization (WHO), antibiotic resistance is projected to cause 10 million deaths annually by 2050 if urgent action is not taken [2]. While this is a global issue, the problem is particularly acute in low- and middle-income countries (LMICs), where healthcare systems are often under-resourced, and regulatory frameworks are weak [3]. Libya, a North African nation grappling with political instability, economic challenges, and a fragile healthcare system, is no exception to this growing crisis. In Libya, the misuse and overuse of antibiotics have become widespread, driven by factors such as limited access to healthcare, lack of public awareness, and the availability of antibiotics without a prescription. One of the most significant contributors to antibiotic resistance in the country is the practice of self-medication, where individuals use antibiotics without consulting a healthcare professional [4]. Studies have shown that self-medication with antibiotics is alarmingly common in Libya, with rates exceeding 80% in some regions [5]. This practice is triggered by cultural beliefs, economic constraints, and the ease of obtaining antibiotics from pharmacies or informal sources [5].

The consequences of antibiotic resistance in Libya are far-reaching. Resistant infections lead to longer hospital stays, higher treatment costs, and increased mortality rates. Furthermore, the lack of a robust regulatory framework to control the sale and distribution of antibiotics has further compounded the issue, making it easier for individuals to misuse these drugs [6]. This review aims to provide a comprehensive analysis of the current state of antibiotic resistance in Libya, with a particular focus on the prevalence and drivers of antibiotic self-medication. It also explores the public health implications of this practice and discusses potential strategies to address the problem.

The global and local burden of ARB

The global burden of ABR is a critical public health issue that threatens to undermine decades of medical progress. Resistant infections are responsible for hundreds of thousands of deaths annually, with projections suggesting this number could rise to 10 million by 2050 if no action is taken [7,8]. The economic impact is equally alarming, with costs expected to reach $100 trillion globally due to increased healthcare expenditures and lost productivity [9]. While ABR is a worldwide problem, its burden is disproportionately felt in LMICs,

where healthcare systems are often under-resourced and regulatory frameworks are weak [10]. In Libya, the widespread practice of self-medication, driven by limited access to healthcare and the availability of antibiotics without a prescription, has significantly contributed to the emergence and spread of resistant bacterial strains [11]. Studies have documented high levels of resistance to commonly used antibiotics, such as beta-lactams and fluoroquinolones, among pathogens like Escherichia coli and Klebsiella pneumoniae [12-14].

Addressing the burden of antibiotic resistance requires a multifaceted approach. Globally, efforts must focus on promoting the appropriate use of antibiotics, investing in the development of new drugs, and strengthening surveillance systems to monitor resistance patterns [15]. In Libya, specific measures are needed to combat self-medication, enforce stricter regulations on the sale of antibiotics, and improve access to healthcare services. Public awareness campaigns are also essential to educate the population about the dangers of antibiotic misuse and the importance of completing prescribed treatment courses [16].

Factors contributing to ARB in Libya

ABR in Libya is a multifaceted issue driven by a combination of behavioral, structural, and systemic factors. The country's fragile healthcare system, political instability, and cultural practices have created an environment where the misuse and overuse of antibiotics are widespread, accelerating the emergence and spread of resistant bacterial strains [6]. Self-medication is one of the most significant contributors to antibiotic resistance in Libya. Studies have shown that a large proportion of the population uses antibiotics without consulting a healthcare professional, often relying on previous prescriptions, advice from friends or family, or over-the-counter purchases from pharmacies [17]. This practice is driven by limited access to healthcare services, economic constraints, and a lack of public awareness about the dangers of antibiotic misuse. Self-medication often leads to inappropriate dosing, incomplete treatment courses, and the use of antibiotics for non-bacterial infections, all of which contribute to the development of resistance. Libya lacks stringent regulations on the sale and distribution of antibiotics [1]. Pharmacies frequently dispense antibiotics without a prescription, and there is limited enforcement of existing laws [18]. This lax regulatory environment makes it easy for individuals to obtain antibiotics without medical supervision, further fueling the misuse of these drugs. Strengthening regulatory frameworks and enforcing stricter controls on antibiotic sales are essential to addressing this issue. Cultural factors also play a significant role in the misuse of antibiotics in Libya. Many individuals believe that antibiotics are a "cure-all" for any illness, including viral infections like the common cold or flu [19]. This misconception, combined with a preference for self-reliance and a lack of trust in healthcare providers, drives the widespread use of antibiotics without medical consultation. Public awareness campaigns are needed to educate the population about the appropriate use of antibiotics and the dangers of self-medication [20].

Antimicrobial stewardship programs, which aim to optimize the use of antibiotics and reduce resistance, are virtually nonexistent in Libya [16]. The absence of such programs means that there is little oversight of antibiotic prescribing practices, and healthcare providers are not adequately trained in the principles of antimicrobial stewardship [16]. Implementing these programs in hospitals and clinics could help reduce the overuse and misuse of antibiotics.

Prevalence of antibiotic self-medication in Libya

Antibiotic self-medication is a widespread and deeply entrenched practice in Libya, contributing significantly to the growing problem of ABR in the country [21]. Studies conducted in Libya have consistently shown alarmingly high rates of antibiotic self-medication. For example, a study in Tripoli found that 42.9% of participants had used antibiotics without consulting a healthcare professional [22]. Another study in Benghazi reported similar findings, with self-medication rates of 87.9% among surveyed individuals [23]. Moreover, in Sebha city, the self-medication was even higher, with a rate of 96.1% [24]. Meanwhile, a

systematic review study conducted in Libya reported that the overall pooled proportion of self-medication of drugs was 53.6% (95% CI: 0.93% - 1.08%). The records ranged from 15.3% (95% CI 0.61–1.65) in Misurata to 76.6% (95% CI 0.80–1.25) in Tripoli [11]. These high rates indicate a broader cultural and systemic issue, where antibiotics are often viewed as a quick and accessible solution for a wide range of ailments, including viral infections like the common cold or flu.

Pharmacies are the primary source of antibiotics for self-medication in Libya. Many pharmacies dispense antibiotics without requiring a prescription, despite regulations that mandate otherwise [25]. In addition to pharmacies, individuals often obtain antibiotics from friends or family members who have leftover medications from previous treatments. This informal distribution of antibiotics further exacerbates the problem, as it bypasses any form of medical oversight [26]. The antibiotics most frequently used for self-medication in Libya include amoxicillin, ciprofloxacin, and azithromycin [21,22]. These drugs are often used to treat respiratory infections, urinary tract infections, and gastrointestinal disorders. However, they are frequently misused for conditions that do not require antibiotic treatment, such as viral infections. This inappropriate use contributes to the development of resistance and reduces the effectiveness of these antibiotics for future treatments [27,28]. The high cost of healthcare services and consultations often forces individuals to self-medicate with antibiotics, which are relatively inexpensive and readily available. Also, there is a general lack of awareness about the dangers of antibiotic misuse and the importance of completing prescribed treatment courses. Public education campaigns are needed to address this gap [29,30].

Strategies to combat ARB in Libya

Educating the public about the dangers of antibiotic misuse and the importance of appropriate use is critical. Awareness campaigns should target both healthcare providers and the general population [31]. Libya needs to implement and enforce stricter regulations on the sale and distribution of antibiotics. This includes requiring prescriptions for all antibiotic purchases and penalizing pharmacies that violate these rules [32]. Moreover, investing in healthcare infrastructure, including diagnostic tools and laboratory capacity, can help reduce the overuse of antibiotics. Access to healthcare services should also be improved to discourage self-medication [33]. Furthermore, antimicrobial stewardship programs can help optimize the use of antibiotics in healthcare settings. These programs should focus on educating healthcare providers, developing treatment guidelines, and monitoring antibiotic use [16]. Libya should collaborate with international organizations, such as the WHO and the Global Antibiotic Research and Development Partnership (GARDP), to address antibiotic resistance. This includes sharing data, best practices, and resources.

Conclusion

Antibiotic resistance is a pressing public health issue in Libya, driven by the overuse and misuse of antibiotics, particularly through self-medication. Addressing this problem requires a multifaceted approach, including public education, regulatory reforms, and improvements in healthcare infrastructure. By taking urgent action, Libya can mitigate the impact of antibiotic resistance and protect the health of its population.

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