



APPROACHES TO OVERCOME THE ANTIBIOTIC RESISTANCE

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ABSTRACT Antibiotics are often described as the miracle drugs. They have made a significant impact, on healthcare by saving countless lives each year. They represent a groundbreaking advancement in the field of science. However, the excessive use and improper administration of antibiotics have resulted in the rise of bacteria that are resistant to these drugs. This poses a serious risk to health. This article outlines the approaches used to overcome the issue of antibiotic resistance. The methods discussed include conducting prescription audits to pinpoint and rectify prescribing mistakes for the use of antibiotics. The WHO standards and AWARE classification system aim to standardize usage by encouraging evidence-based decisions and minimizing variations. Antibiotic stewardship initiatives are crucial, for maximizing the effectiveness of antimicrobials to improve outcomes and combat resistance. The practice of "time outs" entails reviewing therapy every 48 to 72 hours to confirm its requirement and prevent misuse. Prior approval processes guarantee that treatments are deemed essential before being approved to prevent use effectively. Enforcing limitations, around the availability of, over the counter antibiotics helps ensure that these drugs are only utilized under the supervision of professionals to deter self-medication and misuse. Lastly increasing knowledge through initiatives highlights the significance of following prescriptions diligently and comprehending the dangers associated with improper usage. This thorough strategy emphasizes the significance of using antibiotics and monitoring their usage consistently while also educating the public to maintain the effectiveness of antibiotics and tackle resistance effectively for safeguard health and ensure the continued efficacy of antibiotics, for future generations.

KEYWORDS :

INTRODUCTION

Antibiotics are the "magic bullets" acting against various pathogen and, as such, they are lauded as one of the greatest advances in modern medicine. The development of antibiotics revolutionized medicine and currently still saves millions of lives each year from pathogens. Antibiotics have most certainly been an enormous blessing on humankind, not only for medical usage but also, they have been used for all sorts of stuff, including animal husbandry and prophylaxis since decades. [1]

The overuse of antibiotics has been a big problem in modern medicine, and is a key driver in the emergence of antibiotic-resistant bacteria. It happens when unnecessary antibiotics are prescribed, for example for viral infections, or when broad-spectrum antibiotics are chosen over narrower drugs. These harmful practices have tremendous consequences that result in high morbidity, mortality and healthcare expenditure. According to the World Health Organization, WHO, antibiotic resistance is recognized as one of the greatest dangers to mankind, food and economic development. This review aimed to summarise the vast array of strategies in effect or under evaluation that have been introduced with intention of reducing inappropriate antibiotic prescribing. [2]

METHODS

Literature search was conducted using keywords antibiotic, resistance, inappropriate, irrational. The literature was conducted using PubMed, Google scholar. The literature of previous 5 years is included in this review. The literature is limited to previous 5 years as the literature published on the topic this enormous and the focus of this is to include latest interventions used to decrease inappropriate antibiotic prescribing.

RESULTS AND DISCUSSION.

The review includes the various method to overcome irrational or inappropriate use of antibiotics. In subsequent paragraphs the burden of antibiotics resistance and methods to overcome these have been explained.

BURDEN OF ANTIBIOTICS RESISTANCE IN INDIA

There have been epidemic of antibiotic resistance in India and the morbidity and mortality rates are affected by antibiotic resistant. In addition, misuse and overuse of antibiotics have promoted the rise of antibiotic-resistant bacteria: The conventional treatments are becoming ineffective at an alarming rate. These are some significant points defining the cause of antibiotics resistance in India. [3]

HIGH MORTALITY RATES: In 2019, antibiotics resistance was

directly responsible for approximately 297,000 deaths in India, with an additional 1,042,500 deaths associated with resistant infections. [4]

COMMON RESISTANT PATHOGENS: The most prevalent antibiotic-resistant pathogens in India includes *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Acinetobacter baumannii*, and *Mycobacterium tuberculosis*. These pathogens are responsible for a range of infections, including pneumonia, bloodstream infections and urinary tract infections. [5]

NEONATAL INFECTIONS: Antibiotic-resistant infections are particularly devastating for newborns. Each year, nearly 60,000 newborns in India die due to antibiotic-resistant neonatal infections. [6]

RISING RESISTANCE TO KEY ANTIBIOTICS: This rise in resistance poses a serve threat to the treatment of life-threatening conditions like sepsis. The Indian Council of Medical Research (ICMR) has reported a significant increase in resistance to carbapenems, a powerful class of antibiotics used as a last resort for treating severe infections. [7]

ECONOMIC IMPACT: The burden of antibiotics resistance is substantial, leading to increased healthcare costs due to longer hospital stays, more intensive care, and the need for more expensive and complex treatments. [8]

CONTRIBUTING FACTORS: Factors contributing to the high levels of antibiotic resistance in India include the over-the-counter availability of antibiotics, lack of regulation in antibiotic prescribing, and insufficient public awareness about the dangers of misuse. [9]

METHODS TO REDUCE INAPPROPRIATE PRESCRIBING OF ANTIBIOTICS.

In literature search various methods to reduce inappropriate prescribing of antibiotics were identified such as prescription audit, antibiotic stewardship, AWARE criteria, antibiotic 'time out', prior authorization, restricting access to over-the counter antibiotics, raising consumers awareness. These methods are elaborated in subsequent paragraph.

APRESCRIPTION AUDIT

Prescription audit is one of the commonly used methods to study the inappropriate prescribing or irrational prescribing of antibiotics. It is one of the simplest methods to study the prescription patterns. [10]

A prescription audit (PA) is a comprehensive evaluation targeting the

quality of medical prescriptions provided to patients, which also incorporates the diagnostic and treatment procedures employed, resources utilization, as well as the impact on the patients' quality of life. [10]

There are many benefits to performing prescription audits, one of which is increased patient safety, due to the identification and subsequent correction of prescribing errors and potential drug interactions. They help with cost containment because they make sure the drug therapy is appropriate and that people don't take medication they don't need or in inappropriately large amounts. Audits also improve drug utilization by ensuring that treatment outcomes are the best they possibly can be, and they also have educational value because they pinpoint certain areas where healthcare providers might need some more education or training, so they do their part in continuing professional development. Even more importantly, they facilitate the rational use of medicines, which is a very important aspect of health care delivery.[11]

Prescription audits have been useful and few limitations are reported in literature. Complete audits need time, money, and resources, which might not be possible in some places with limited means. The audit method is as good as the data it uses: if the prescription records are old or wrong, the results won't be right. Often, doctors don't follow the audit feedback and suggestions if they don't want to change how they work in the areas that need to get better. These audits focus on one part of prescribing, like using antibiotics or following guidelines, so they don't think about other things that might affect patient care. Keeping up with frequent audits without implementation of outcomes in practice is not of any use.[12]

Conducting a prescription audit is very tedious and requires a lot of manpower. The process consists of collecting and studying prescriptions as per the laid down standards and this is critically great work that requires professionalism. The scope of work included research, analysis and report writing and it was all about hearings, factual information, and documents. Strategies such as automating data collection where possible, training staff, and creating basic procedures can help the situation to enhance productivity.[13]

In countries still developing, like India, it's tough to check prescriptions well because there's no central place with all the info. The resistance has to gather and look at manually, which takes a lot of time and manpower. To overcome the person, a local computer system can be set up to keep health records, teach people better ways to handle all this info, and come up with step-by-step guides for how to do things. [14]

BWHO CRITERIA

WHO has set up some criteria that would assist to curb the excessive, unnecessary use of antibiotics by physicians. One of the main initiatives is the AWARE classification system, which allocates the antibiotics into three ranks as follows: Access, Watch and Reserve. The purpose of this system is to minimize misuse of antibiotics such that Access antibiotics are cheap and easily affordable, Watch are antibiotics with high resistance possibility that should only be used when necessary and Reserve antibiotics are only used when all else has failed. The WHO indeed offers further detailed recommendations for instigating (empiric) and targeting antibiotics, thus helping practitioners in selecting the right antibiotics for the right infection in association direct resistance in the region.[15]

The use of WHO criteria for antibiotic use has many important advantages. With the Aware classification system, antibiotic use becomes a standardized language worldwide that reduces discrepancies through different parts of the world and allows health care providers to make evidence-based decisions with the same language. Standardization is key because this will help ensure that antibiotics are used properly in all settings and regions. Patient outcomes will improve as we prescribe the right antibiotics for the right infections as well as decreasing antibiotic resistance pressure on microorganisms. The empiric therapy and targeted therapy guidelines provide very good bedside instructions so health care practitioners can easily select antibiotic, dosing, and duration. The WHO criteria also support surveillance systems to identify rates of antibiotic resistance and consumption but more importantly track their trends to monitor the effectiveness of policies implemented by public health professionals. WHO educating the public regarding the danger of antibiotic

resistance decreases public demand for antibiotics that is not needed so they indirectly enforce prescribing stewardship strategies as well. Lastly, by using WHO as a guide it helps us put into context all interventions implemented by public health officials like we should tackle both sides of antibiotic consumption: supply (example, issue with over-the-counter access), policy development and enforcement; demand (public) knowledge/attitude regarding AMR; stewardship program targeting hospitals' prescribers.[16]

Sometimes the WHO criteria, by virtue of their use of a standardised checklist, might not capture local variations in resistance trends or local health infrastructure that vary by region so dramatically. Educating patients and ensuring adherence to guidelines can be challenging, particularly in low-health literacy settings These added challenges relating to implementation of the WHO criteria to rationalise antibiotic use might lead us to ask: do the costs outweigh any potential benefits.[17]

CANTIBIOTIC STEWARDSHIP

An Antimicrobial Stewardship Program (ASP) is a programmatic approach in healthcare facilities to help promote and optimize the appropriate use of antimicrobials, with the goal of enhancing patient outcomes, reducing resistance to antibiotics, and decreasing the spread of infections caused by multidrug-resistant organisms. These programs typically consist of: commitment through allocating necessary resources; accountability by designating a leader responsible for program outcomes; and drug expertise provided by a pharmacist. Intervention components include implementing prospective audit with intervention and feedback, monitoring antibiotic prescribing practices and resistance patterns, and reporting details on these aspects within healthcare facilities. It is also important to educate prescribers about resistance as well as optimal prescribing strategies. By applying these core elements and interventions, busy practitioners can know that antibiotics are being used optimally to minimize patient harm from bacterial infections as well as the emergence of new resistant bacteria.[18]

Along with their clear benefits, the WHO guidelines for use of antibiotics are difficult to implement in resource-limited settings where some antibiotics and diagnostics tools are unavailable, complicated training efforts are some necessary, and clinicians might resist changes to long-held prescribing habits. Also, the AWARE may not be applicable in various places as the resistance would be different antibiotic in different place. This can mean an uphill struggle to procure and support surveillance systems and stewardship programmes; these efforts require significant financial, human and technological outlays.[19]

WHO also proposes antibiotic stewardship programmes in healthcare facilities which include monitoring antibiotic use, feedback to prescribers and education on rational use of antibiotics for health workers. Also, key is regular surveillance of antibiotic consumption and resistance prevalence which WHO urges countries to establish or strengthen. In addition, WHO highlights the role of communication, education and public awareness in promoting prudent use of antimicrobials among the public and patients. Finally, WHO recommends the use of appropriate tests for diagnosis of infectious diseases so that antibiotics are prescribed only when they are needed. All these measures are expected to promote rational prescription practices and to prevent further emergence of resistance to antibiotics.[20]

DANTIBIOTIC "TIME OUT"

Another strategy, known as an Antibiotic 'Time Out', requires an objective review, 48 to 72 hours after initiating antibiotic therapy, of the patient's response to therapy, including series of tests. After an Antibiotic 'Time Out', providers can once again consider whether to continue or switch antibiotics, narrow the range of antibiotic coverage, or convert to oral antibiotics. An objective review helps to make sure that antibiotics are only used if absolutely needed, reducing resistance and improving patient outcomes.[21]

This approach provides several benefits, such as enhancing patient care by aligning treatments with the most current clinical data, and helping to combat antibiotic resistance by avoiding unnecessary prescriptions. It also results in cost savings by reducing the need for prolonged antibiotic courses and possible hospital admissions. Furthermore, it improves diagnostic precision, making sure that the

treatment effectively addresses the specific pathogen causing the infection. In summary, antibiotic time-outs refine antibiotic usage, aiding in the battle against antibiotic resistance and ensuring the continued effectiveness of these essential medications.[22]

Antibiotic "Time Outs" have numerous positive incentives; however, they also carry drawbacks. They take extra time for healthcare providers to re-assess and document such information in an already busy clinical environment. Next, staff may be resistant to change as they will view the process as another added layer of complexity into their existing workflows. Furthermore, the performance of Antibiotic "Time Outs" is limited by the presence or availability of timely and accurate diagnostic data that may not always be available. How to identify core processes. Finally, should the policies not be supported and implemented optimally, this could also render the potential benefits of reduced inappropriate antibiotic use and resistance not achieved.[23]

E PRIOR AUTHORIZATION

Prior authorization is a utilization management process through which medical expert insurers review the need for a prescribed service, procedure or medication before that service is provided. While prior authorization helps control healthcare spends, prevent overuse, and confirm that treatments are medically necessary, it can also delay care delivery and result in excessive administrative work for physicians or other healthcare providers as well as anxiety and bewilderment among patients faced with delayed or denied therapy. In general, although it intends to safeguard patient care and expenditure management, it brings challenges that should be cautiously managed to prevent patient care disruption.[24]

Prior authorization helps manage healthcare costs and ensures antibiotics are prescribed only when necessary, reducing inappropriate use and antibiotic resistance. It confirms treatments are medically necessary, improves patient safety, and supports antibiotic stewardship programs.[25]

Prior authorization can delay patient care, add administrative burdens for healthcare providers, and cause frustration for patients if treatments are delayed or denied.[26]

F RESTRICTING ACCESS TO OVER-THE COUNTER ANTIBIOTICS

Restricting access to over-the-counter (OTC) antibiotics involves making these medications available only through a prescription from a healthcare provider. This measure aims to combat antibiotic resistance and ensure that antibiotics are used appropriately.[27]

Advantages of limiting access to over-the-counter (OTC) antibiotics are that this helps to protect the inappropriate use and overuse of antibiotics that, in turn, drives antibiotic resistance. It also guarantees that antibiotics are used only when needed, responsibly and always associated with a correct medical diagnosis, providing greater efficacy in the treatments. Moreover, it fosters efforts to optimize the use of antibiotics and helps ensure that these medicines will be available for beseeching patients. In addition, by limiting antibiotics over-the-counter, patient safety is promoted as the adverse events and complications that are associated with inappropriate use of antibiotics are reduced. Ultimately, this is a key strategy in the fight against antibiotic resistance and in making sure we will have antibiotics available for future treatments.[28]

There are numerous disadvantages to restricting access to over-the-counter (OTC) antibiotics despite the many benefits. For starters, this restriction creates access barriers that prevent patients from receiving medicines. While providers ensure patient safety, access restrictions can be counterproductive, particularly in places where healthcare services are less available. This can cause delay in treatment and patients have to seek doctor's approval which also adds cost to the treatment.[28]

G RAISING THE CONSUMER AWARENESS

Awareness mechanisms should be developed oriented to the right use of antibiotics by consumers to curb resistance. An educational effort can teach the public about the risks of using antibiotics incorrectly and advise them to adhere strictly to prescriptions. Physicians should openly discuss with patients when antibiotics are necessary and not, and the risks of using them excessively. Incorporating antibiotic education in school curriculums help indoctrinate children with the

idea of appropriate use from a young age. The media, especially social media could be used to create awareness on how antibiotic resistance is established. Simple leaflets and brochures contain an explanation in the clinics and pharmacies of how to take antibiotics properly as well as showing the consequences if they are used for other purposes. Public education through community workshops and seminars can create awareness amongst the people about what they can do or equally avoid to prevent antibiotic resistance.[28]

Consumer awareness of how to use antibiotics rightly carries many benefits. It diminishes misuse and abuse of antibiotics—the only way to combat antibiotic resistance. Informed consumers are likely to stick strictly to prescriptions, thus yielding positive health results and minimally adverse effects from the taken prescription. Demand for unnecessary antibiotics can also be brought down by public awareness programs, hence less pressure on the health system. If consumers understand the importance of proper antibiotic use, they can ensure that their treatments today remain useful for generations to come. Also, if better-informed individuals share their awareness with others, it is not only people who start adopting more responsible use of antibiotics but also help spread the word that puts other people on the right track. In a word, making consumers aware is the first need to protect public health and keep antibiotics effective.[29]

While awareness of responsible usage of antibiotics among consumers has several benefits, it also has some adverse effects. Misinformation will spread and may be spread to a high extent through social media, which may bring about confusion and mistrust. Long-term resource input is needed in awareness raising campaigns in terms of time, money, and effort. Another threat is that increased awareness may be linked to anxiety or fear on the part of consumers in using antibiotics which, in turn may fear to seek necessary treatments. Additionally, some people may not act with the information they get so that individual efforts may be minimal. Lastly, cultural and language issues can hinder the practice of awareness campaigns due to the access and communication barriers to the different stakeholders. Despite these challenges, well-planned and implemented awareness campaigns can still play a meaningful role in promoting responsible antibiotic use.[30]

CONCLUSION

The introduction of antibiotics into medicine proved to be one of the most significant advances in medicine history as it changed the way bacterial infections were treated and helped many people live longer. Still, inappropriate use, abuse, and self-medication have caused another very dangerous threat to the world today, and that is the global antibiotic resistance. In this review, we discuss various ways how this problem has been accruing and what steps can be undertaken towards the appropriate use of antibiotics.

Audits of prescriptions have been very useful in both detecting and addressing inappropriate habits of prescribing medications which in turn increases the safety of patients as well as enhances the use of medications. The WHO criteria, which include AWARE classification system, define appropriate antibiotic usage across the world allowing for maximum evidence-based decision making and minimal abuse. The objectives of the antibiotic stewardship programs include promotion of the appropriate use of the antimicrobials which in turn helps to decrease their resistance and to enhance the outcomes of the patients. One of the approaches focused on minimizing unnecessary prescriptions of antibiotics is the concept of 'timeout' for antibiotics, which incorporates a review of the need for continued therapy with antibiotics. Pre-approval mechanisms provide oversight of spending in the pharmacy benefits aspect of healthcare and ensure that antibiotics are prescribed only when appropriate. Walking into a pharmacy and buying a course of antibiotics over the counter can result in frustration and inappropriateness when the surgery was not needed. Mass education and marketing of the products to the target population stresses the need to follow prescription directions and to be aware of the dangers of abuse. Tackling the menace of antimicrobial resistance is not an easy task and involves active surveillance, awareness campaigns, and adherence to evidence-based recommendations, among others. All these are important steps in the fight against the deterioration of the health of the society and in the need to preserve the effectiveness of antibiotics for as long as possible. But if we adopt these measures that are proven strategies, we will be able to defeat antibiotic resistance, and keep these important drugs for the next generation.

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