Antibiotic resistance in Africa: *Escherichia coli and Staphylococcus aureus*

ABSTRACT

 Antimicrobial resistance prevalence is where antimicrobials do not work against the pathogens they are supposed to kill. This is becoming a global problem among many infectious diseases killing at least 1.27 million people (about the population of New Hampshire) worldwide and associated with nearly 5 million deaths in 2019. These pathogens become untreatable and life threating since the antibiotics rendered are useless. The primary goal of this review is to give a better understanding and trace upcoming trends on antibiotic resistance and susceptibility patterns, we can trace and track information to better understand antibiotic resistance. The information has found the biggest problem to be with methicillin-resistance and an extended spectrum B-lactamase producing pathogens. Progress has been made given the World Health Organization which has stepped in to fight this global problem, including better information and standards concerning antimicrobial resistance. In addition to these conclusions, Africa and global efforts need to establish more surveillance to stop overusing and misusing one of our most valued assets in fighting infections.

INTRODUCTION: Antimicrobial resistance is a global health problem, where pathogens evolve and resist any form of conventional medication, such as penicillin and affecting anyone, of any age, and any part of the globe. Antimicrobial resistance is not limited to antibiotics only, antivirals, antiparasitic, and antifungals are also included. The microbes transform to become life threatening due to lack of medication working, where beforehand the said medication could have killed the pathogen. In 3rd world countries, there is an alarming number of deaths due to antimicrobial resistance. We will primarily look at Africa, where various parts of the countries have a different resistance to the variations of microbes, as well as the years that resistance is present. Antibiotic resistance occurs naturally; however, it is elevated with misuse of antibiotics. Communicable diseases are much higher in sub-Saharan Africa than any other place in the world. The rise of multidrug-resistant (MDR) bacteria can be life-threatening and cause significant effects on the healthcare system. Antimicrobial resistance not only affects humans and the healthcare system, but it also affects agriculture and veterinarian fields. Etiological agents of the bloodstream infections are staphylococcus aureus, Escherichia coli, Klebsiella spp., streptococcus pneumonia, and salmonella supp. We will look at the data complied with new standards set up by the World Health Organization to better plan for future dilemmas.

Recent progress

The data was compiled by the WHO (World Health Organization) of Africa and consisted of 47 countries that participated from 2008 to 2019 and had to include minute details in the data that was selected including key words, from this data it was further reduced to include the following information Escherichia coli and staphylococcus aureus from the details provided we can draw our attention to the common variance of antibiotic resistance from different regions and time limits. For example, we can take this data and separate it distinguishably into two groups Escherichia coli and Staphylococcus aureus and provided the pooled resistance see the resistance rate

E. coli, the pooled resistance

 Cloxacillin (34%)

Oxacillin (12%)

Vancomycin (0%)

*High degree of variation across studies (I2 >90%)

S. Aureus, calculated pool

 Cloxacillin (34%)

Oxacillin (12%)

Vancomycin (0%)

*High degree of variation across studies (I2 >90%)

The resistance is affecting many antibiotics, but most considerable are the extended spectrum B lactam. Extended spectrum B lactase breaks the bond on the ring in the center of the penicillin, breaking the chemical bond by water, these are third generation antibiotics. The labs tested blood samples using standards set up and information was then provided to the WHO. The reports were then cross examined using various words to get the information. There was then a confidence interval of 95%. Resistance rates with less than 30 were taken out of the report
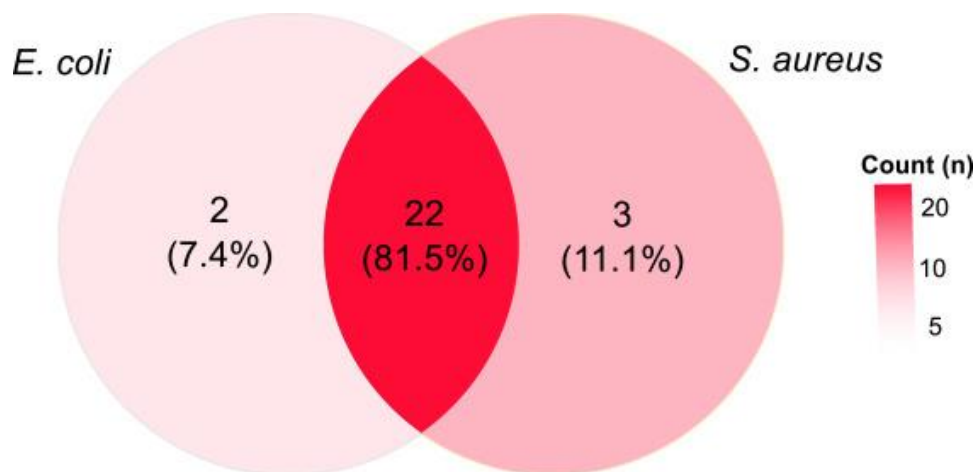
The blood samples were then tested against the following: cefuroxime (n = 521), oxacillin (n = 427), and cloxacillin (n = 339). Upon graphing the information shows that the antibiotic, ampicillin, had the highest pooled resistance rate of 85% (95% CI 0.41–0.98). In Kenya, this rate

stood at 45% (73 of 162 isolates) in the year 2010. Ghana recorded 90% (234/260) and 100% (34/34) resistance in 2016 and 2017, respectively. A moderate pooled resistance rate of 46% (95% CI: 0.07–0.92) against co-trimoxazole was found. Ceftriaxone resistance was 20% in Nigeria in 2010. Cefuroxime (n = 521) pooled resistance was 24% (95% CI: 0.07–0.58), which is comprised of the composite data from Kenya (2010), Nigeria (2011), and Ghana (2016). Oxacillin resistance was 21% and 23% in Kenya and Ghana in the years 2010 and 2016, respectively. The pooled resistance rate for oxacillin was 18% (95% CI: 0.09–0.31).

The results for the Escherichia coli: the testing went ciproflaxin, co-trimozole, and ceftriaxone. Again, a high resistance was found in ampilliciin while resistance against the cephalosporins group was lower. high resistance was found for co-trimoxazole and ampicillin: 75% (95% CI: 0.57–0.87) and 87% (95% CI: 0.46–0.98), respectively. median resistance for the second-generation cephalosporin, cefuroxime, was 58 (95% CI: 0.47–0.69), with high resistance of 70% (73/104) found in Ghana in 2016. The median resistance and 95% CI for the third generation cephalosporins were 32% (95% CI: 0.09–0.69) and 42% (95% CI: 0.28–0.58) for ceftriaxone and cefotaxime, respectively. Ceftazidime median resistance was 19% (95% CI: 0.05–0.52) (ScienceDirect.com) . Review is compared with other countries around the world and continents, by comparison there are similarities to against Methicillin –resistant staphylococcus aureus with other European countries along with Asia although widely varied. Overall, it was slightly lower than compared to Africa. In comparison with extended spectrum B-lactamase resistance, there is evidence this is on an upward trend and becoming more prevalent. The studies included where from United States, Germany, and an overall worldwide study.

CONCLUSION

What we can infer from this information is that antibiotics in this region are being given too much and wrongfully. 3rd world countries do not have the proper diagnosis or follow up care, nor do they have access to doctors firsthand, as a result the patient can take the wrong antibiotics, not take the medication as would normally be prescribed, or follow up to make sure the medication is working. This can cause problems in the future with any other antibiotics given to treat diseases and further delay other treatments for others. If the wrong antibiotics are given or given in access, we will hinder further delay of treatment used for other infections and diseases. This will become a global problem which is what the trend is implying from the information. You can see from various information the antimicrobial resistance is becoming increasingly high in the later years. We will need to start addressing the problem of new antibiotics, keeping track of treatments, following up with the patients and using the correct antibiotic and the correct amount of the antibiotic. WHO has set up various precautions to address the subject including better tracking of antibiotics, giving information to countries regarding hygiene, giving various tools for healthcare providers and professionals to better aide in tracking antibiotics and treatment of diseases. . The World Health Organization has recognized the pattern and has sent up action plans for the world to try to contain the problem, with these steps in place we can better assess the situation for a long-term solution to maintain the future with antibiotics that work effectively and efficiently.

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