Anarchically Open Officine's in South Kivu (DRC): Their Role in the Emergence of Antibiotic Resistance

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Abstract: *With the rather worrying situation, on resistance to antibacterials, a study was carried out on pharmacies anarchically open to the public in the city of Bukavu and its surroundings; in order to identify the factors that contribute to the emergence of resistance from them.*

Keywords: Antibiotic Resistance

1. Introduction

Antimicrobial chemotherapy in the 20th century made a big step in infectious pathology. She revolutionized medical treatment by defeating illnesses that contributed to great suffering, disability and death. Over time, more powerful antimicrobials have been produced and made available to the world for the best treatment. However, several pathogens are increasingly developing resistance to antimicrobials, which makes it impossible for effective treatment. As epidemics occur, they could lead to high morbidity and mortality. Antimicrobial resistance has contributed significantly to the rise in morbidity and mortality from infectious and parasitic diseases over the past half century. Antimicrobial resistance therefore becomes a major public health problem

The use of antimicrobials has contributed significantly to the decline in morbidity and mortality from infectious and parasitic diseases over the past half century. These results are however increasingly compromised by the rapidly increasing problem of resistance to these drugs. Infectious and parasitic diseases such as tuberculosis, sexually transmitted infections, acute respiratory infections, malaria, dysentery and HIV / AIDS have become increasingly difficult and expensive to treat, resulting in a very heavy burden. especially in developing countries where resources are very limited in the face of high infection rates. Rising costs from resistant infections severely hamper efforts to prevent, control and treat infectious and parasitic diseases worldwide, and undermine the benefits of health investments.

Drug resistance has emerged in all categories of pathogens: viruses, fungi, parasites and bacteria. Some of the major pathogens that have become resistant to antimicrobials include:
- Bacteria causing various infections, such as staphylococci, enterococci and E. coli;
- Agents causing respiratory infections, such as streptococcus pneumonia and tuberculosis and influenza agents;
- Foodborne pathogens, such as Salmonella and Amylobacter;
- Sexually transmitted microorganisms, such as Neisseria gonorrhoeae;
- Candida and other fungal infections;
- Parasites, such as Plasmodium falciparum, the malaria agent;
- Human immunodeficiency virus (HIV), the agent of AIDS.

From contributing factors to accelerated resistance include the ineffectiveness of chloroquine as a primary antimalarial, multi-resistant tuberculosis (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB), various diarrheal diseases and acute antibiotic-resistant respiratory infections , HIV / AIDS, and methicillin-resistant Staphylococcus aureus (MRSA). Many complex mechanisms of resistance to antifungals have been observed. Resistance to antibacterials has gradually gained ground. This is the case with:
1) Penicillin has lost much of its effectiveness againstpneumonia, meningitis and gonococcal disease in many countries. In the United States of America, 80% of Staphylococcus aureus isolates are resistant to penicillin;
2) Associated multi-resistant Salmonella infections are now a major public health problem in Asia;
3) Shigella's resistance to ampicillin, tetracycline, cotrimoxazole and chloramphenicol is widespread in Africa, while these drugs are still used for the first-line treatment of dysentery in many places. The introduction of nalidixic acid was followed by the emergence of resistance in Shigella;
4) The emergence and spread of resistance of Salmonella dysenteriae type 1 to cotrimoxazole, ampicillin, tetracycline, chloramphenicol and increasingly, nalidixic acid over the past twenty years means that these inexpensive and widely available antibacterials can no longer be used empirically;
5) Resistance to penicillin and erythromycin is an emerging problem with community-acquired Streptococcus pneumoniae infections in Asia, Mexico, Argentina and Brazil, as well as parts of Kenya and Uganda;
6) The spread of resistance in Neisseria gonorrhoeae meant that penicillin and tetracycline had to be replaced by more expensive second-line drugs, for which resistance quickly developed. In the Caribbean and South America, 72% resistance to azithromycin has been found in many isolates from various locations; which led to the recommendation to replace this drug in turn with ceftriaxone, spectinomycin or quinolones. The high cost

of other options, such as third generation cephalosporins, also makes their use prohibitive in many developing countries;

7) Resistance of cholera to antibacterials is increasingly common in developing countries, up to 90% of isolates of Vibrio cholerae are resistant to at least one antimicrobial.

Antibacterial resistance has a negative impact not only on therapeutic gain: resistance to antibacterials increases morbidity andportability in patients with a wide variety of diseases. The period of infectiousness is prolonged, hence an increased risk of transmission of resistant microorganisms. For example, a study on ultra-resistant tuberculosis carried out in 2006 in South Africa showed that out of 53 identified cases, 52 died from this disease. These resistant TB patients have most certainly had the opportunity to pass the disease on to the other person.

Second, economically: the cost to individuals and society of antimicrobial resistance is enormous.

For example, treating multidrug-resistant tuberculosis costs about 300 times more than treating non-resistant tuberculosis. The cost of an MRSA infection is three times that of penicillin-sensitive staph infections.

Using second-line antimicrobials to treat resistant infections is not only more expensive, but can also lead to an increased incidence of unwanted resections.

Not only do several mechanisms explain the occurrence of resistance, particularly in the case of malaria; resistance of the chromosomal type, transmission of the plansmide type which are mutations causing a biochemical modification which will disturb the action of the drugs (either by loss of assertiveness of the receptors, or by modification of the transport of the drug and enzymatic modifications changing l 'metabolic activity) whereas in bacteria, mutations, generic transfer using transformation; the conjugation ; lysogenic transduction or conversion are generally reported.

However, it should be added that many factors contribute to resistance, including, inter alia, inappropriate prescribing by healthcare providers and inappropriate self-medication by patients; poor adherence to treatment is also an important factor contributing to drug resistance. In addition, limited access to health care, lack of regulations regarding the availability of antimicrobials, substandard products, and counterfeit or not up to standards, poor storage conditions and insufficient infection control in health care settings are all factors in the health care system that contributes to the development and spread of resistance.

The state of the pharmaceutical sector conducted in 2019 showed that of the 365 health facilities operating as HGRs that were investigated,

Only 55, or 15%, had at the time of the survey all the tracer drugs selected. With a very limited availability of medicines in most health facilities in our country in general and the province of South Kivu in particular. Public pharmacies are the alternative for drug availability. As such, their uncontrolled openness could compromise the quality of the drugs dispensed to the population.

We conducted a study of pharmacies anarchically open to the public in the city of Bukavu to identify the factors that contribute to the emergence of resistance to antibacterials.

2. Material and Method

Given the severity of the problem, we had conducted, by survey, a cross-sectional study among pharmaceutical establishments open to the public previously identified by the provincial sanitation commission. Three techniques were used during this study, namely interviewing, observation and documentary review. Pharmaceutical establishments in the city of Bukavu were submitted to the form (WHO model). However, since in the majority of cases, these establishments did not have any type of management tool: stock card, inventory card, receipt report, register, receipt book, cash book, etc., it was difficult to assess the indicator on expired, altered and other drugs that were out of use.

The study focused on the adequate conditions of storage of medicines, functioning and handling of medicines.

3. Results

The city of Bukavu had a population estimated at 7,911,874 inhabitants according to the provincial plan for the development of health zones in the Sicilian health pyramid drawn up in 2019. Thus, we were able to identify, by a systematic survey, 320 pharmacies open to the public presenting the characteristics summarized in the tables below.

Table I: Results according to storage conditions

Criteria	Results
Sales room area> or = 20m2	17%
Ceiling placed at a height of 3m and more	19%
Windows that open and shut for easy ventilation	43%
Lacquered wooden or metal shelves 3 and more	67%
Smooth pavement for thermolabiles	53%
Refrigerator for thermolabiles	0%
Air conditioning by a ceiling light	0%
Lockable cabinet for psychotropic drugs	0%

The observation for these pharmacies:
- 67% have enough shelves for storing medicines;
- 43% have devices for ventilation;
- 19% have ceilings to protect drugs from heat;
- 17% have sufficient workspace;
- None with air conditioning or fridge.

Table II: Results according to the operating conditions

Criteria	Results
Have qualified personnel for dispensing medicines	17%
Have a notice of establishment	2,5%
Exercise only retail or wholesale	23%
Being located at 500m and more distance	7%

In these pharmacies we find:
- 23% have a notice of establishment from the Ministry of Health;

- 15% are distant by standards;
- 7% respect the single sale (either retail or wholesale);
- 2.5% have trained personnel to act as the delivery belt for information.

Table III: Results according to medication handling

Criteria	Results
Are the drugs dispensed according to the request made by an authorized prescriber	6%
Are medicines properly labeled and delivered in packaging compatible with their storage	3%
Tablets are not handled by bare hand?	10%
Is the antibacterial treatment well conducted in sufficient doses and within the indicated interval?	2,5%

In these pharmacies we find:

- In 10% of cases, Med. Are not handled with bare hands;
- In 6% of cases, the request is made by an authorized prescriber;
- In 3% of cases the packaging and labeling are adequate;
- In 2.5% of cases, the dose is insufficiently delivered, in the time interval not indicated.

4. Discussing

4.1 Related to storage conditions

Workspace: in 83% of pharmacies the surface is insufficient to be used on the one hand for technical activities (reception, storage, dispensation), on the other hand, for administrative activities (writing of entries on technical and financial management tools ; Receipt report; stock card, inventory card; receipt book, cash book). Thus, such a workspace limits the range of drugs and the activities essential for these establishments.

Storage conditions: in 57% of cases there is no openable window and 81% without suitable ceilings, none have air conditioner or refrigerator. Given that temperature, air, humidity and light are factors involved in storage and that antibiotics are particularly sensitive to light and temperature, compliance with storage standards indicates on the instructions. or manufacturers' labels are required. While in these pharmacies, antibiotics are insufficiently protected against these factors so that they would not only become less active following the deterioration resulting from poor storage conditions, therefore would not cure, but would also favor the appearance of resistant strains. For some antibiotics, such as penicillins and cephalosporins, if they are insufficiently protected, they may pose a risk of an increase in their allergenic power when expired cyclins become toxic to the kidney.

4.2 Related to the operating conditions

The type of activity: in 93% of cases, it is mixed selling, and in 85% are distant from each other within 500m.
In accordance with minimum standards, the dispensary delivers in detail to patients while the depot distributes wholesale to health facilities.

These standards also define the agglomeration in terms of separation distance and population to be served. Indeed, the strategy of administrative monitoring obliges, on the one hand, the revenue generating services (DGRAD, DGI, Environment, Economy, Town Hall, Municipality, etc.), to proceed to the collection, even before the technical service health go to the preliminary inspection to certify the compliance of these pharmacies; on the other hand, the strategy of individual monitoring being the fundamental reason, the drug is exploited not for its therapeutic value, but earlier for its commercial value.

Management: in 2.54% of cases, qualified personnel. However, qualified personnel are needed. Indeed, it is not only a question of verifying the prescription (dosage, regulatory validity, control of interactions and risks of contraindications), but it is also necessary to provide advice to patients. In some cases an adjustment of the dosage of antibacterials is necessary. In higher doses may be necessary when dealing with infections caused by micro (less sensitive organisms or infections in hard-to-reach organs (eg, prostate). In addition, it is important for the dispenser to know the normal characteristics of each drug (color, odor, solubility, consistency) in order to be able to detect changes in appearance which could reflect its degradation with a decrease in activity as a main consequence.

4.3 In connection with the handling of drugs

Good dispensing practices: in 90% of cases, the counting is done freehand, and 97% the label is not suitable however, the drugs (including antibiotics), must be protected from contamination as well as chemical than microbiological. In general, surface contact with sources not known to contain pathogens does not require special precautions with regard to hand hygiene.

However, hand contact or any other significant contact with potentially infected material requires strict hand hygiene before and after each contact. Unfortunately, in these pharmacies, contamination is inevitable.

5. Conclusion

In pharmacies anarchically open to the public, drugs and antibacterial are stored in conditions incompatible with their storage. Furthermore, the inappropriate self-medication of antibacterial is widely practiced by patients. Also, substandard, counterfeit, or substandard products are handled by 97% staff unable to assess the quality, safety and efficacy of the drugs. Consequently, these establishments, which offer dubious quality pharmaceutical services, constitute a danger to the emergence of resistance to antibacterial. On the other hand, between 20 to 50% of antibiotics are used in agriculture and not in humans; 40 to 80% of antimicrobials for veterinary use are of questionable interest. In addition, limited access to health care, lack of regulation regarding the availability of antimicrobials, substandard, counterfeit or substandard products, poor storage conditions and insufficient infection control in health care settings is all factors in the health care system that contribute to the development and spread of resistance.

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