Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Der Pharmacia Lettre, 2016, 8 (7):31-33
(http://scholarsresearchlibrary.com/archive.html)

Der Pharmacia Lettre
Scholars Research Library
ISSN 0975-5071
USA CODEN: DPLEB4

Rising Antimicrobial Resistance in Iran

J. Sharifi-Rad[1,2], A. Van Belkum[3], F. Fallah[4,5] and M. Sharifi-Rad[6*]

[1]Zabol Medicinal Plants Research Center, Zabol University of Medical Sciences, Zabol, IR Iran
[2]Department of Pharmacognosy, Faculty of Pharmacy, Zabol University of Medical Sciences, Zabol, Iran
[3]BioMérieux SA, Unit Microbiology, R&D Microbiology, La Balme Les Grottes, France
[4]Pediatric Infections Research Center, Mofid Children Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Department of Microbiology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[6]Zabol University of Medical Sciences, Zabol, Iran

ABSTRACT

Early in the twentieth century, the first microbe-cidal and -static drugs were identified. The clinical use of antibiotics was initiated mid-twentieth century after the discovery of penicillin. However and quite soon, it was documented that microbes broadly developed resistance to antimicrobial drugs. This prompted research into the discovery of new antibiotics or research aimed to develop prophylactic and therapeutic approaches differing from the straightforward use of antibiotics. Thus began a race between drugs and microbes that has continued into modern day and has culminated in the recent detection of bacterial strains that are essentially resistant against all clinically useful antimicrobial agents. Treatments that were simple and successful in the past have now been compromised; 70 years ago penicillin could be universally used in the treatment of infections caused by Staphylococcus aureus, now penicillin is ineffective in the vast majority of staphylococcal infections. It is believed by many and accepted by most that this scenario will apply to any classical antibiotic that enters the market, effectiveness will be limited until microbes have developed a or more ways around the static or cidal effects.

Key words: Antibiotic resistance, Infections

INTRODUCTION

The discovery and medical application of anti-viral, -parasitic and -microbial drugs has without a doubt been one of the most important advances in the field of human healthcare in history. It has saved millions of lives. Infections caused by resistant microorganisms do not readily resolve and hence lead to enhanced morbidity and a higher percentage of casualties.

Antibiotic resistance happens when bacteria change in a way that reduces or eliminates the effectiveness of drugs, chemicals, or other agents designed to cure or prevent infections. The bacteria survive and continue to multiply bringing about additional harm. Bacteria can do this through several mechanisms including development of the ability to neutralize the antibiotic, rapidly pump the antibiotic out of the cell, and change the antibiotic attack site so it can no longer affect the function of the bacteria [1-7].

Iran is a country in Western Asia. It is bordered to the northwest by Armenia, the de facto independent Nagorno-Karabakh Republic and Azerbaijan. It connects with Kazakhstan and Russia across the Caspian Sea and to the northeast it borders Turkmenistan. To the east there are Afghanistan and Pakistan and to the south the Persian Gulf and the Gulf of Oman delineate the frontier. Finally, to the west Iran borders Turkey and Iraq. Comprising an area of 1,648,195 km^2 (636,372 sq mi), it is the second-largest nation in the Middle East and the 18^{th}-largest in the world. With 78.4 million inhabitants, Iran is the world's 17^{th} most populous nation.

Antimicrobial resistance (AMR) is one of the major health problems, also in Iran. Public and private sectors are exploring various ways to address the problem and knowledge of accurate prescription and optimal use of antibiotics for different groups of patients is poor. Antibiotic susceptibility testing is rarely asked for by clinicians. AMR has been a topic for discussion in Iran for several years.

In 2014 the World Health Organization [8] reported extensive antibiotic resistance in *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Salmonella*, Shigella species, *Neisseria gonorrhoeae* and others. They reported that *Escherichia coli* resistance to fluoroquinolones and *Klebsiella pneumoniae* resistance to carbapenems were most frequent with 54% among all microorganisms tested in Iran (Table 1).

Table 1. Major Antibiotic resistance in Iran between 2013- 2014 (WHO, 2014)

Microorganisms	Data source	Resistance (%)	No. tested isolates	Type of surveillance, population or samples	Period for data collection	Year of publication or report
Escherichia coli (Resistance to third-generation cephalosporins)	National data	41	885	Invasive isolates	2012	2013
Escherichia coli (Resistance to fluoroquinolones)	National data	54	885	Invasive isolates	2012	2013
Klebsiella pneumoniae: Resistance to third-generation cephalosporins	National data	48	110	Invasive isolates	2012	2013
Klebsiella pneumoniae: Resistance to carbapenems	National data	54	35	Invasive isolates	2013	2013
Staphylococcus aureus: Resistance to methicillin (MRSA)	National data	53	2690	Invasive isolates	2012	2013
Streptococcus pneumoniae: Resistance, or non-susceptibility, to penicillin	National data	33.9	115	Invasive	2007	2013
N ontyphoidal *Salmonella* (NTS): Resistance to	National data	6.3	125	Invasive isolates	-	2013
fluoroquinolones						
Shigella species: Resistance to fluoroquinolones	National data	2.7	260	Targeted	2012	2013
Neisseria gonorrhoeae: Decreased susceptibility to third-generation cephalosporins	National data not available	-	-	-	-	2013

In April 2015 WHO [9] reported 3–5.9% of all new Iranese tuberculosis (TB) cases being multidrug-resistant. Even more pronounced, the percentage of previously treated TB cases that developed multidrug-resistant tuberculosis in Iran was 30-49.9 %. New Iranian data on other microorganisms showed multi-resistant strains in *Pseudomonas aeruginosa*, *Campylobacter jejuni*, *Acinetobacter baumannii*, Arcobacter species, *Helicobacter pylori*, *Bordetella pertussis*, Enterococcus spp., Acinetobacter spp., Candida spp., and others. Also for viral infections including human influenza virus, Hepatitis B virus and HIV the numbers of isolates resistant towards key antiviral agents are also on the rise. Most notable is the increase in so-called multi-drug resistant hospital pathogens, including vancomycin-resistant enterococci.

The current catastrophe that Iran is facing is most likely due to decades of irresponsible antibiotic overuse, both in human healthcare and environmental and veterinary applications. Unfortunately, in clinical microbiology much remains invisible to the eye but we fear that the phenomenon of antibiotic resistance could well have extensive long term consequences on the continuing battle against infectious diseases in general. The future of Iranian healthcare will strongly depend on our capacity to optimize the use of antibiotics in general.

REFERENCES

[1] J. Sharifi-Rad, M. Sharifi-Rad, S.M. Hoseini-Alfatemi, M. Iriti, M. Sharifi-Rad, M. Sharifi-Rad. *Int. J. Mol. Sci*. **2015**, 16(8):17812-25.
[2] J. Sharifi-Rad, S.M. Hoseini-Alfatemi, M. Sharifi-Rad, M. Sharifi-Rad, M. Iriti, M. Sharifi-Rad, R. Sharifi-Rad, S. Raeisi. *Molecules* 2015, 20(4):7034-7047.
[3] J. Sharifi-Rad, S.M. Hoseini-Alfatemi, M. Sharifi-Rad, W.N. Setzer. *J. Food Saf*. **2015**, 35(1):19-25.

[4] J. Sharifi-Rad, S.M. Hoseini-Alfatemi, M. Sharifi-Rad, J.A. Teixeira da Silva. *3 Biotech* , **2015**, 5(5):677-684.
[5] S.M. Hoseini Alfatemi, J. Sharifi Rad, M. Sharifi Rad, S. Mohsenzadeh, J.A. Teixeira da Silva. *3 Biotech*. **2015**, 5(1):39-44.
[6] J.S. Rad, S.M.H. Alfatemi, M.S. Rad, Iriti M. *Ancient Sci Life*. **2013**, 33(2):109-13.
[7] Sharifi-Rad J, Hoseini-Alfatemi SM, Sharifi-Rad M, Miri A, Sharifi-Rad M. *Minerva Biotecnol*. **2014**, 26:287-293.
[8] World Health Organization (WHO). Antimicrobial resistance: global report on surveillance **2014**.
[9] World Health Organization (WHO). Antimicrobial resistance. Fact sheet N°194. Updated April **2015**.