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National action plan of the Islamic Republic of Iran for combating antimicrobial resistance during 2016 – 2021

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Abstract

Background: Antimicrobial resistance (AMR) is one of the most important threats to health worldwide. Therefore, the World Health Organization (WHO) have invited countries around the world to work together to inhibit AMR, and all the member states are expected to prepare a national plan for tackling AMR by 2017. This project was aimed to prepare the National Action Plan of the Islamic Republic of Iran for combating antimicrobial resistance (NAP-IRIAMR) during 2016 to 2021.

Methods: In this article, the literature and available documents were reviewed to identify key stakeholders. Moreover, interviews, brain storming sessions, and meetings with key stakeholders were held to determine NAP-IRIAMR objectives, strategies, policies, and indicators for monitoring and evaluation. To reach consensus and make a conclusion, participants' views and comments were analyzed using Delphi method and expert panel.

Results: In this national action plan for combating AMR, 13 key stakeholders were identified and 5 objectives were set: (1) raising public awareness and increasing trainings on AMR, (2) continuous monitoring of AMR, (3) preventing the spread of microorganisms resistant to antimicrobials, (4) promoting the rational use of antimicrobials, (5) promoting research and development in the field of AMR.

Conclusion: The NAP-IRIAMR was prepared for the years 2016- 2021. Intersectoral cooperation is needed to combat AMR. It is expected that implementing the NAP-IRIAMR and reaching the determined goals will help overcome the problems related to AMR.

Keywords: Antimicrobial resistance, Antimicrobial, Infectious disease, National Action Plan, Iran

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Introduction

AMR is one of the most important threats to health worldwide (1). AMR occurs naturally but misuse of antibiotics in human and animals significantly accelerates the process of developing AMR (2). Antimicrobial agents and drugs are valuable resources that are used every day around the world to treat infections in humans and animals. They save millions of lives in the world each year. However, with the emergence of strains resistant to the antimicrobial agents and drugs, the efficacy of these valuable resources has decreased and public health and economy are threatened (3). The results of the studies by the European Center for Disease Prevention and Control in 2009 showed that selected multidrug-resistant bacteria were responsible for 25 million deaths and the related costs are estimated at about 1.5 billion Euros in European Union annually (1). In addition, the yearly cost that AMR imposes on the health system in the United States of America has been estimated to be 21 to 34 billion dollars (4).

As reported by the WHO, Iran is one of the countries with more than 5 multidrug-resistant bacteria (5). In addition, as stated by the WHO, AMR is changing into a significant public health issue. Taking into consideration the AMR crisis, a Global Action Plan on Antimicrobial Re-

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↑What is "already known" in this topic:
AMR is a global threat and the available evidence suggests that Iran is not insusceptible to the risks of resistant microorganisms. The WHO expects that all the member states prepare a national document for tackling AMR based on the suggested framework by 2017.

→What this article adds:
The first National Action Plan of the Islamic Republic of Iran for combating AMR was prepared for the years 2016- 2021.

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sistance (GLASS) was adopted by the World Health Assembly in May 2015 (3). It listed the 5 following objectives:

1- Promoting effective communication, education, and training to improve awareness and understanding of AMR

2- Promoting surveillance and research to strengthen knowledge and evidence

3- Promoting effective sanitation, hygiene, and infection prevention measures to reduce the incidence of infection

4- Optimizing the use of antimicrobial medicines in human and animal health

5- Developing the economic case for sustainable investment to consider the needs of all countries and increase investment in new medicines, diagnostic tools, vaccines, and other interventions.

The GLASS is aimed to guarantee, for as long as possible, the endurance of effective treatment and prevention of infectious diseases with effective and harmless medicines that are quality-assured, used in a responsible way, and accessible to all who need them. WHO expected that all member countries will develop their own national action plans on AMR in line with the GLASS. Therefore, this project aimed to prepare the first National Action plan of the Islamic Republic of Iran for combating antimicrobial resistance (NAP-IRIAMR). To prepare the NAP-IRIAMR, the literature and strategic plans for the inhibition of resistance designed by pioneer countries were reviewed and the views of the experts and key stakeholders in the field of AMR were obtained.

Methods

The following steps were taken to prepare the NAP-IRIAMR:

1. Conducting a literature review to identify the national action plan, goals, and strategies of other countries to combat AMR

2. In the first stage, key stakeholders were identified through reviewing the literature and available documents and holding a meeting with the team members of the project administration committee that included some experts from the Ministry of Health, Centre for Communicable Diseases (Table 1).

3. In the second step, representatives of the main stakeholders of the program were invited and the framework proposed by the WHO was presented to them. Then, taking into consideration the goals proposed by the WHO, the literature was reviewed, brain storming sessions were held, and the stakeholders were interviewed. As a result, 5 major areas for combating AMR were identified and 5 objectives were set.

4. In the third step, a series of meetings with all the key stakeholders was held and, using interviews and brain storming sessions, some strategies for each objective, some policies for each strategy, and some measures and indicators for each policy to determine a guide for monitoring and evaluation were determined.

5. In the fourth step, the initial draft of the action plan was sent by email to the main stakeholders to study, review, and approve.

6. In the fifth step, the comments were obtained from the stakeholders and the NAP-IRIAMR was developed. To reach consensus and make a conclusion, the participants' views and comments were analyzed using Delphi method and expert panel.

Results

The key stakeholders who were identified to have a role in combating AMR are listed in Table 1.

Table 2 presents the 5 important fields to slow down the development of AMR and prevent its spread and also the goals associated with these fields.

Discussion

Five main fields were identified to formulate the NAP-IRIAMR. Considering these main fields, 5 objectives were identified. Then, strategies and policies were determined for each of these objectives.

The objectives set for the national action plans for combating AMR in different countries are largely similar to each other. Different countries, including the United States (6), Australia (7), Sweden (8), the United Kingdom (9), Japan (10), Afghanistan (11), Bangladesh (12) and Kenya (13), have similar objectives as follow:

1. Slowing down the emergence of microbial resistance and preventing its spread

2. Strengthening one health surveillance system to combat AMR

3. Encouraging and strengthening research and development for discovering new antimicrobials

4. Training and raising awareness about microbial resistance

5. Strengthening international cooperation to combat

Table 1. Key stakeholders identified to have a role in combating AMR in Iran

No.	Key stakeholders involved in combating AMR
1	Deputy of Health, Ministry of Health and Medical Education
2	Deputy of Treatment, Ministry of Health and Medical Education
3	Food and Drug Administration, Ministry of Health and Medical Education
4	Health Reference Laboratory, Ministry of Health and Medical Education
5	Reference Laboratory for Food and Drug Control, Ministry of Health and Medical Education
6	Deputy of Equipment, Research and Development, Ministry of Health and Medical Education
7	Hospital Management and Clinical Excellence Office, Curative Affairs Deputy, Ministry of Health and Medical Education
8	Iran Veterinary Organization
9	Iran Health Insurance Organization
10	Islamic Republic of Iran Broadcasting (in meetings was absent)
11	IRI Medical Council (in meetings was absent)
12	IRI Nursing Council
13	Ministry of Education and Training

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Table 2. Fields, objectives, strategies, and policies of the National Action Plan of the Islamic Republic of Iran for combating antimicrobial resistance

Fields	Objectives	Strategies	Selected Policies
Knowledge and information	1. Raise public awareness and promote education and trainings for related professional groups	1.1. Promote activities to raise awareness about AMR in the community	-Implement targeted activities to raise awareness on the prevention and control of AMR -Integrate educational activities in the field of AMR for specific groups, such as children, their parents, and the elderly -Start campaigns to raise the awareness of people who are working in the fields related to AMR, such as staffs working in health care and animal health
		1.2. Promote education and training for professionals in the fields related to AMR	-Prepare clinical guidelines to provide solutions to reduce AMR -Monitor and evaluate health care staff's commitment to antibiotic stewardship guideline -Monitor and evaluate health care staff's commitment to antibiotic stewardship guideline -Create and promote a system of continuing education on AMR for undergraduate, graduate, doctoral, and postgraduate students -Improve awareness and understanding of health care organizations through a contract with insurance agencies about AMR
Monitoring and Evaluation	2. Continuously monitor resistance and the use of antimicrobial drugs and on-time diagnosis of the signs of change and spread of AMR	2.1. Strengthen AMR surveillance system in health care centers and medical institutions (limited surgery centers, day care, medical offices, and clinics)	Strengthen the surveillance system in the health care sector Monitor the trend of AMR in people Rational prescribing of antibiotics
		2.2. Monitor the trend of prescribing and use of antimicrobial drugs in inpatient and outpatient service centers	-Develop a surveillance system to monitor the prescription and use of antimicrobial drugs -Formulate, update, and monitor some criteria for prescription and use of antimicrobial drugs
		2.3. Strengthen the surveillance and monitoring of AMR in the fields of veterinary medicine, livestock production and poultry farming, and aquaculture	-Strengthen the capacity and structure of AMR laboratories -Strengthen monitoring and evaluation systems through the establishment of a research system
		2.4. Standardize laboratory tests and strengthen the performance of antimicrobial tests for diagnosis in laboratories	-Improve the level of testing technology and the availability of an evaluation system -Conduct research on antimicrobial surveillance systems -Study the feasibility of introducing and utilizing new technologies to improve their capacity in the field of AMR
		2.5. Implement integrated health care system for 3 sectors, including human, animals, environment, and food	-Create a national working group to integrate data obtained from various monitoring and evaluation systems -Create and strengthen a monitoring and evaluation system for prescription, monitoring, and evaluation of resistant microorganisms and antimicrobial residues
Prevention and control of infection	3. Prevent the spread of microorganisms resistant to antimicrobial drugs via implementing appropriate control and prevention programs	3.1. Prevent and control infections in healthcare services and promote intersectoral cooperation	-Prevent and control infections via promoting the system of integrated collaboration between different sectors -Promote activities for prevention and control of infection in coordination with regional hospitals and related organizations -Promote research to provide technical support -Promote the use of vaccination
		3.2. Promote the prevention and control of infections in livestock production, aquaculture, veterinary medicine, and food chain	-Make efforts to raise awareness about the prevention and control of infections -Promote hazard analysis and critical control point in the process of food production and distribution
		3.3. Strengthen the capacity in response to AMR outbreaks	-Develop instructions and guidelines for responding to health care-associated infections -Strengthen the response capacity and build networks -Create a rapid response system through sending experts to all parts of the country to evaluate the epidemiological status

AMR

The NAP-IRIAMR similarly includes the above-mentioned objectives.

The fight against AMR requires intersectoral cooperation between different sectors, including the sectors working in the fields of health, agriculture, veterinary medicine, education, academic education, and research and development.

Every national action program needs some indicators for monitoring and evaluation of the accomplishment of the set objectives. In view of that, the following indicators were set.

Human-related indices

- Reduce the resistance of S. pneumonia to penicillin to the level set by the National Committee by 2021

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Table 2. Cntd

Rational use of antimicrobials	4. Promote the appropriate use of antimicrobial drugs in the fields of health care, livestock production, and poultry farming, aquaculture	4.1. Promote antimicrobial drugs and materials stewardship in medical institutions	-Create a working group at the national level to promote AMR stewardship and formulate guidelines -Develop guidelines to empower every medical institution to develop manuals and guidelines for their antimicrobial stewardship -Perform strategic purchases based on the quality of antibiotics in the national health care system
		4.2. Ensure prudent use of antibiotics and antimicrobials in the fields of veterinary medicine, livestock production, poultry farming, and aquaculture	-Develop risk management measures -Evaluate and promote the participation of experts in the use of veterinary antimicrobials and antibiotics for aquatic animals -Develop and strengthen the procedures required to ensure safe and appropriate use of veterinary antimicrobials
Research, development, and partnership	5.Promote research and development in the field of AMR	5.1. Promote research to reveal the mechanisms of emergence and transmission of AMR and its socioeconomic effects	-Promote research to clarify and explain the emergence and transmission of AMR -Promote a surveillance system for AMR genomes to detect AMR mechanisms -Create a database of genome-resistant bacteria -Conduct studies to estimate the impact of AMR on health and economy
		5.2. Promote research on public awareness by providing training in the field of AMR, preventing and controlling infections, and antimicrobial drugs stewardship	-Create a positive attitude toward decreasing AMR -Change the pattern of community behaviors toward infection prevention and control -Conduct research on intervention methods and benchmarking methods to raise public awareness and knowledge on antimicrobial stewardship
		5.3. Promote clinical research on the optimization of existing methods of prevention, diagnosis, and treatment of infectious diseases	-Revise methods of prevention, diagnosis, and treatment of infectious diseases that helps control AMR -Promote research to collect scientific evidences and utilize them to develop AMR measures
		5.4. Promote research and development activities in the fields of new methods of prevention, diagnosis, and treatment, and promote cooperation among universities, industry, and related sectors	-Promote research to help develop new methods of prevention, diagnosis, and treatment of infectious diseases -Form a working group to promote intersectoral cooperation between the public and private sectors in the field of AMR
		5.5. Promote international collaboration for conducting research on AMR and promote research and development for introducing new methods of prevention, diagnosis, and treatment of AMR infections	-Promote research and development on a global level through supporting international research and participation in international research projects in the field of AMR -Promote research and development on new drugs through international cooperation

- Reduce the resistance of S. aureus to the level set by the National Committee by 2021
- Reduce the resistance of E. coli to fluoroquinolones to the level set by the National Committee by 2021
- Reduce the resistance of Pseudomonas aeruginosa to Carbapenems (Imipenem) to the level set by the National Committee by 2021
- Maintain the resistance of Escherichia coli and Klebsiella Pneumonia to Carbapenems in the level set by the National Committee by 2021
- Reduce the daily prescription and use of antimicrobial drugs per 1000 people by 10% by 2021
- Reduce the daily use of oral cephalosporin, fluoroquinolones, and macrolides per 1000 people by 25% by 2021
- Reduce the use of intravenous antimicrobial drugs per 1000 people by 20% by 2021

Animal-related indices

- Reduce resistance of E. coli to tetracycline to the level set by the National Committee or lower
- Reduce the resistance of E. coli to third-generation cephalosporin to the level set by the National Committee
- Reduce the resistance of E. coli resistant to fluoroquinolones to the level set by the National Committee

Limitations

In spite of inviting all key stakeholders, some stakeholders were absent in the meetings.

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tal Management and Clinical Excellence Office, Iran Veterinary Organization, Iran Health Insurance Organization, Islamic Republic of Iran Broadcasting, IRI Medical Council, IRI Nursing Council, Ministry of Education and Training and Social Determinants of Health Research Center of Kurdistan University of Medical Sciences.

Conclusion

The first National Action Plan of the Islamic Republic of Iran for Combating AMR was prepared to be implemented from 2016 to 2021. This national action plan includes 5 main objectives and 17 strategies. This national action plan is expected to help provide a proper response to AMR and overcome the related problems in Iran.

Conflict of Interests

The authors declare that they have no competing interests.

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