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Antibiotic resistance: Italian awareness survey 2016

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ABSTRACT

Antimicrobial resistance has become a public health priority worldwide. The WHO conducted a survey concerning the personal use of antibiotics, knowledge of appropriate use and awareness of the issue of resistance. A similar survey was conducted in Italy involving 666 young university students and 131 seniors attending courses of the University of the third age.

Antibiotics seem to be taken with moderate frequency and appropriately: 30% of respondents took them in the past six months and 94% took these drugs only prescribed by a doctor, in the correct dose and for the proper duration. Notable confusion concerning the conditions treatable with antibiotics was detected (only 30% indicated gonorrhea, and 30–40% believed that antibiotics should be employed for fever, cold, and flu), while 94% of participants seemed aware of the problem of antibiotic resistance. Most of the respondents identified the behaviors that can reduce the phenomenon of resistance (regular handwashing and use of antibiotics only when prescribed and needed).

The results of our survey, that involved people of high level of instruction and living in urban areas of northern regions, cannot be extended to all the Italian population. However, they provide valid elements to promote initiatives aimed to a more aware use of antibiotics.

Introduction

Antibiotic resistance has become a public health priority worldwide and its spread is currently faster compared to the development of new molecules [1–3]. A multidrug resistance increases patient treatment failures and mortality, and healthcare costs [1–4].

An excessive use and a misuse of antibiotics increase the selective pressure favoring the emergence, multiplication and spread of resistant strains. In addition, the transmission of resistant organisms between humans in all kinds of healthcare facilities as well as in the community, between animals and between humans, animals and environment contributes to the occurrence and spread of the antibiotic resistance [3].

Three-quarter of the antimicrobials agents used in livestock overlaps with antimicrobials used in humans [5]. The amount of antibiotics used for crops is relatively low in comparison to the quantities used in livestock. However the manure from farm animals is often used on crops as a fertilizer, contributing to the emergence, selection and spread of antimicrobial resistant bacteria [5–7].

The severity of the phenomenon and its global spread have prompted the World Health Organization (WHO) and the European Union (EU) to activate several surveillance systems [8–10]. The European Parliament has launched the "European Action Plan 2011–2015 on resistance to antibiotics", a series of strategic actions to preserve the effectiveness of the antibiotics, and ensure they remain an effective tool against disease [10]. An European network of national surveillance systems on antimicrobial resistance (EARS-Net), coordinated and financed by European Centre for Disease Prevention and Control (ECDC), has been created to collect data from 29 European countries and to analyze temporal and spatial trends of the phenomenon [3]. European data confirm the increase of the resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides especially in *Escherichia coli* and in *Klebsiella pneumoniae*, responsible for urinary tract infections, sepsis and other health-care related infections [3]. These resistances are often combined generating multi-resistant bacteria [3]. In the recent years, the resistance to the carbapenems has been added making some infections untreatable [3].

The antibiotic resistance situation is not uniform in EU, and in general higher resistance frequencies are reported by countries in eastern and southern Europe [3].

Data collected during the Antibiotic Resistance-Istituto Superiore di Sanità (AR-ISS) project confirmed that Italy is one of countries with highest levels of resistance in most pathogenic species under surveillance, namely 32.9% of *K. pneumoniae* iso-

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lates were resistant to carbapenems, 33.6% of *Staphylococcus aureus* to methicillin, and 28.7% and 43.9% of *E. coli* isolates to third-generation cephalosporins and fluoroquinolones respectively [2,3].

In addition, the AR-ISS project reported high levels of resistance in the central and southern regions of Italy, probably related to the high consumption of antibiotics in these geographic areas [2].

The increasing trend of resistance could be reversed by a combination of interventions focused on control strategies to stop the spread of multi-resistant bacteria in healthcare facilities, and on education and promotion of prudent use of antibiotics, as the European Day of Antibiotics or the Day of handwashing. A central point of these campaigns is that everyone, both private citizen and health care worker, can contribute to stop the antibiotic resistance [9]. Recently, in line with these objectives, WHO developed a plan to improve awareness and understanding of antimicrobial resistance. During 2015, WHO conducted a survey involving 9772 adults from 12 member States, two from each WHO Region, concerning the personal use of antibiotics, the knowledge of the appropriate use of antibiotics and the awareness of the issue of antibiotic resistance [9]. Italy was not included in this survey.

We conducted a similar survey in Italy involving young students of the Università di Milano and seniors attending courses of the University of the third age, in order to have a snapshot of the situation to implement educational initiatives in these two populations.

Methods

The original WHO questionnaire "*Antibiotic resistance: multi-country public awareness survey*" [9] was translated into Italian and modified in some parts (see Supplementary material).

The survey included nine questions – five with multiple choice, three with true/false, and one with rating scale responses – looking at three areas: personal use of antibiotics, knowledge about antibiotics and about their resistance.

The questionnaire was anonymous and included demographic information, year and degree course (only for university students). The participants were asked to self-complete the survey during lesson time.

The survey was carried out between November 2015 and May 2016 in Lombardy, a region in the north part of Italy.

For statistical analysis, chi-square test was employed to compare the frequencies in two population categories. p-Values less than 0.05 were regarded as significant.

Results

The questionnaire was administered to a total 797 persons, divided in two different groups, namely 666 young university students (25% males; age: median 20 years, range 18–48), and 131 senior students (27% males; age: median 68 years, range 51–87).

Among the young university students, 50 (8%) were enrolled in the first year of medical school, 502 (75%) in the other medical area courses (dental medicine, orthotic and ophthalmologic assistance, nursing, health promotion, dietetics, environmental and workplace prevention techniques) and the remaining 114 (17%) were students of the social/law area of the Università degli Studi di Milano.

The senior students attended two different Universities of the third age, located in the area of Milano.

Personal use of antibiotics

A total of 243 respondents (30%) reported antibiotic use within the past six months, of these 10% having taken within the last month (question # 1). No differences emerged between the two groups of participants, except 1% of young people that never taken antibiotics while all seniors claimed a use at least once in their life.

Most individuals (85%) had taken an antibiotic prescribed by a doctor (question # 2) and 84% said they had received advice on dosage and timing by a doctor, a nurse or a pharmacist (question # 3). No statistically significant differences were observed between surveyed categories of participants.

Knowledge about antibiotics

The vast majority of respondents (94%) answered that all doses of prescribed antibiotics have to be taken and only 4% believed to stop treatment when they feel better (question # 4).

Most of the respondents (90%) believed that they should not use the antibiotics prescribed for other people (as friends or relatives) to treat the same illness, and only 3% thought that this behavior is correct (question # 5).

Question # 6 asked if it is correct buy or request to the doctor the same antibiotic that solved symptoms in a previous occasion: 42% answered correctly that it is false, and 21% did not know. Senior students were most likely than young students to agree that this statement is false (55% vs 39%; $p = 0.0007$). In addition, young people were more uncertain in the response than the older group (24% vs 7%; $p < 0.0001$).

Question # 7 proposed a list of different medical conditions asking if they can be treated with antibiotics. Pathologies to treat with antibiotics were gonorrhea, bladder/urinary tract infection, skin infection and traumatic wound. Others were infections caused by viruses (HIV/AIDS, cold and flu, measles), by *Plasmodium* (malaria) or different medical conditions, such as sore throat, diarrhea, fever, body aches, headache. Fig. 1 shows the answers of young and old students to each medical condition. As reported, the majority of respondents correctly indicated bladder/urinary tract (84%) and skin (66%) infection as condition treatable by antibiotics. However, there was a significant difference between young students and seniors (68% vs 52%; $p = 0.0003$), who believed correct to treat skin infections with antibiotics. Traumatic wound and gonorrhea were correctly identified as diseases treatable with antibiotics only by 30% of the responders. No significant differences were observed between young students and seniors, as well as between students of medical area and students of law area. On the contrary, first-year students were more frequently unaware of the bacterial origin of gonorrhea than other colleagues (22% vs 41%, $p < 0.0001$). Some of respondents were unaware of the pathogens involved in other pathologies, suggesting antimicrobial treatment for sore throats (39%), fever (36%), cold and flu (28%), measles (22%) (Fig. 1). Old people incorrectly indicated more frequently than students HIV/AIDS (18% vs 7%, $p < 0.0001$). On the contrary, seniors seemed to be more informed on the correct management of cold and flu, fever, diarrhea, sore throat, body aches, headaches, measles. Among the young students, those of medical area less frequently than those of law area supported the need of antibiotics for treatment of fever and measles (37% vs 51%, $p = 0.0056$ and 22% vs 41%, $p < 0.0001$, respectively) (Fig. 1).

Knowledge about antibiotic resistance

The participants had to answer nine statements regarding antibiotic resistance with a true or false reply (question # 8).

A large proportion of the total of participants (more than 70%) identified correctly seven out of the nine statements (Fig. 2). Specifically, 89% of the respondents acknowledged that many infections are becoming increasingly resistant to treatment and as a consequence represent major risks for some medical procedures, such as surgery, organ transplants and cancer treatment (88%).

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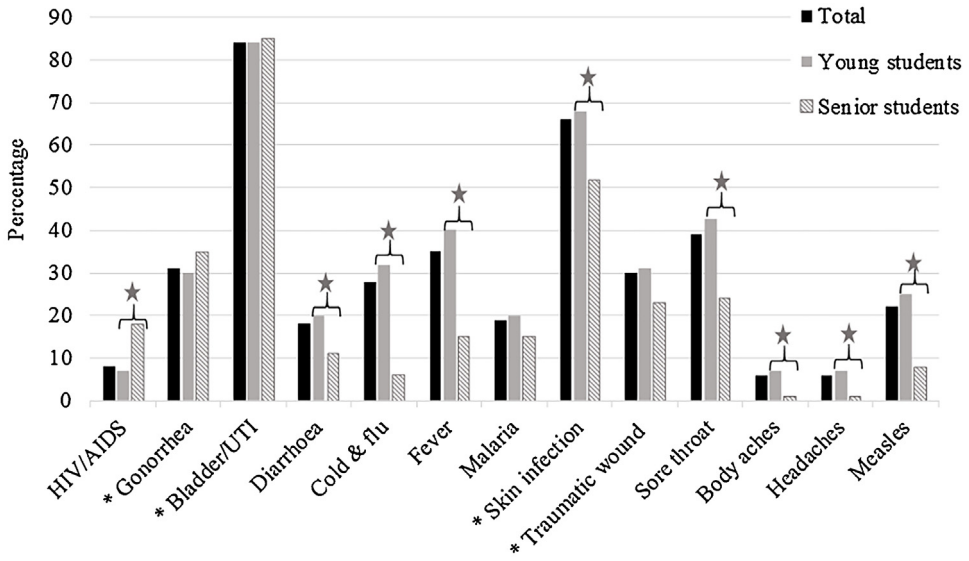

Fig. 1. Percentage of responses to question # 7: "Which of the following diseases/disorders do you think they can be treated with antibiotics?"; *medical conditions to be treated with antibiotics; ⋆ statistically significant difference.

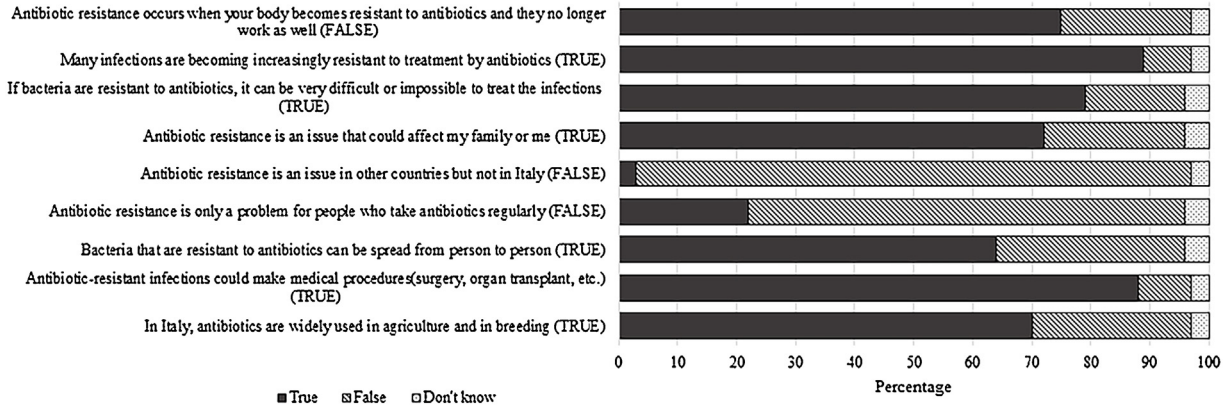

Fig. 2. Percentage of responses to statements to determine knowledge about antibiotic resistance (question # 8).

Most (94%) of the respondents thought that antibiotic resistance is an issue also in Italy, but 72% believed that it could affect them and their family judging at risk especially people who take antibiotic regularly (74%). 70% of respondents thought that antimicrobials are widely used in agriculture and farms for breading (Fig. 2).

The most misunderstood statement was "Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well": only 22% of respondents correctly disagreed. This is the only statement showing significant differences between categories of respondents: only 11% of older people answered correctly compared to 24% of young students ($p = 0.0013$), as well as a difference was detected between medical area and social/law students (27% vs 11%, $p = 0.0005$) (Fig. 2).

The awareness of the antibiotic resistance was investigated with three items (question # 9): only few respondents (42%) were aware that antibiotic resistance is one of the biggest problems in the world and were worried about the impact on their own health and of their family (54%). However, 40% of respondents believed not to be at risk of getting an antibiotic-resistant infection, as long as they take antibiotics correctly (Fig. 3).

The last part of the questionnaire explored people's opinions on how to counter the phenomenon of antibiotic resistance expressing their agreement or disagreement (in 1 to 5-scale order) with seven statements (question # 9). The large majority of people strongly or slightly agreed that washing hands regularly (97%), use of antibiotics only when prescribed by a doctor (95%) and only when needed (97%), not to use leftover antibiotics from a previous treatment (80%), and limit the use of antibiotics in animal farms (79%) would help to minimize the problem. Only 38% of respondents believed that a single person could do something to fight this problem (Fig. 3).

Discussion

The present survey that utilized a modified WHO questionnaire on *Antibiotic resistance* aimed to investigate the use of antibiotics, the level of knowledge about their appropriate use and the level of perception of the problem of antibiotic resistance among 666 university students and 131 senior students attending courses of Universities of the third age of northern Italy. Our results were compared with those of the WHO survey conducted on 9772 adults with different educational degree from 12 countries with lower (Egypt, India, Indonesia, Nigeria, Sudan, Vietnam) or higher incomes (Barbados, China, Mexico, Russian Federation, Serbia, South Africa) [9].

As it concerns the use of antibiotics, 30% of our respondents took them in the past six months, without variations between young and adult people. This proportion is lower compared to 65% reported in

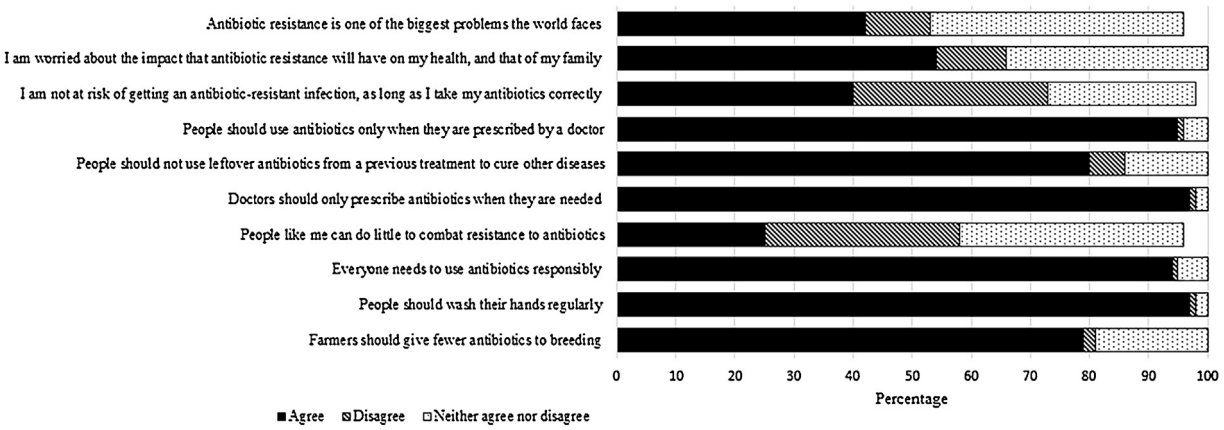

Fig. 3. Percentage of responses to question # 9.

the WHO survey. All our respondents are at a high level of education and live in urban areas. This is in agreement with the observation that people having no/poor education are more likely to have taken antibiotics compared to people at high level of education [9].

Antibiotics seemed to be appropriately taken by more than 85% of Italian individuals, as these drugs are mandatory prescribed by a doctor in Italy. 94% of respondents follows advice on dosage and timing and takes in the right dose and for the proper duration. All these correct behaviors should limit the emergence of resistance that was favored by under-dosage and by early suspension of treatment [11].

Purchase or request doctor to prescribe the same antibiotic that solved symptoms in a previous occasion is thought right by 36% of our respondents. Older people more correctly answered to this question compared to young people, as reported also by WHO survey [9].

The knowledge of the conditions that can be treated with antibiotics was investigated. As in the WHO survey, we detected a notable confusion concerning this issue. While more than 80% of respondents correctly identified bladder/urinary tract infections as conditions treatable with antibiotics, only 30% indicated gonorrhea. In addition, 30–40% of Italian respondents, mainly young people, believed that antibiotics should be employed for fever, cold, flu and sore throat.

As in the WHO survey, a large part of respondents (78%) believed that antibiotic resistance occurs when the body becomes resistant. Probably this question was not carefully read by the participants.

A significant proportion of participants (94%) seemed aware of the problem of antibiotic resistance and of the serious consequences that can occur also in their country, even if only 42% considered it one of the biggest problems in the world. The possible impact of the antibiotic resistance on their own health and on that of their family was recognized by 72% of respondents. However, when the question was requested in another way, only 54% were worried about this and 34% was in doubt. Only 33% believed that taking antibiotics correctly does not protect them from the risk that resistant bacteria can spread from person to person. Anyway, this proportion is higher than that reported in the WHO survey also in higher income countries (18%).

It is positive that most of the respondents (>94%) identified the behaviors that can reduce the phenomenon of resistance, such as regular handwashing, use of antibiotics only when prescribed and needed. Unfortunately, only 33% believed that the single person can do something to combat resistance to antibiotics and 70% had knowledge of the large use of these drugs in agriculture and breeding, that in Italy amounts to 300 mg/Kg of livestock biomass, one of the greatest in Europe [5].

Conclusions

The results of our survey, that involved people of high level of education and living in urban areas of northern regions, may not be transferable to all of the Italian population that has never been investigated. However, they provide valid elements to promote initiatives aimed to a more aware use of antibiotics. In particular it should be stressed that antibiotic resistance can be hindered taking antibiotics in the appropriate way, completing the prescribed treatment to eliminate all bacteria, using these drugs only for bacterial infections, avoiding a misuse that favors development of resistance. In addition it will be important to make the public aware of the importance of the issue and conscious that even the single person can make something to fight antibiotic resistance taking these drugs responsibly, only when needed, and limiting their use by farmers by an informed purchase.

Contributors

AP contributed to the study design, data analysis, statistical analysis, all drafts of the manuscript.

LR contributed to the study design, data collection and critical review of the manuscript.

FA contributed to the study design, data collection and critical review of the manuscript.

SC contributed to the study design, data collection and critical review of the manuscript.

AMT contributed to the study design, data collection, statistical analysis and all drafts of the manuscript.

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Competing interests

None declared.

Ethical approval

Not required.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jiph.2017.02.010.

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