Impact of gender inequality and social stratification on antimicrobial resistance in developing countries

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Abstract

Antimicrobial resistance (AMR) is a global health threat and is in the limelight for the past few years. The biosocial aspects related to AMR along with its biological and microbiological data should be considered now. A study was aimed to assess the impact of gender differences and other socio-economic factors on AMR in Pakistan. It is important to understand and acknowledge how men and women and different groups in society may be differently at risk of impact by AMR. The range of health programs and services are not equally available, accessible, affordable and acceptable to all groups within the population. It is widely acknowledged that a gender equity focus in all aspects is required to protect and improve population health.

Antimicrobial resistance (AMR) is the potential in bacteria to persist and grow as a response to a specific concentration of antimicrobial agents. Discovery of antibiotics is still considered as one of the greatest achievements of medical sciences for the successful treatment of various diseases of bacterial origin. AMR is a serious threat as it makes the antibiotics ineffective and leads to severe health implications which could lead to death. The pace of emergence of AMR is quite fast as compared to progress in discovery of new antimicrobial drugs, making the situation quite alarming [1,2,3].

Factors contributing to the increasing trend of AMR

The most widely accepted reason for the increasing trend of AMR is the excessive, inappropriate and non-judicious use of antibiotics in the healthcare, veterinary and agriculture sectors [2]. The bacteria have the tendency to affect multiple hosts including humans, animals and plants, as the same set of antibiotics are used which in turn is contributing towards increased AMR worldwide [4,5]. AMR is already causing approximately 700 000 deaths per year globally, which could rise to over 10 million per year by 2050 [5]. Therefore, it is extremely important to look deeper at the core issues and factors associated with AMR.

The major contributing factors for increased AMR include an increase in human population size and population density from urbanization, natural adaptation of bacteria to survive the antimicrobial treatment and the behaviour of people who are consuming either wrong antibiotic or consuming inappropriate amounts of antibiotics. This third factor is a major cause of the AMR crisis and largely driven by human behaviour but is nevertheless amenable to change. This is a broad topic but is often overlooked by clinicians, microbiologists as well as behavioural scientists [6].

AMR and gender

Public perception and behaviour have played an important role in todays over use of antibiotics. Everyone wishes to be healthy and they frequently associate good health with being microbe-free themselves and in their environment. In the name of good hygiene and a germ-free environment, segments of modern society have developed this perception that using more antibiotics will keep them safe and healthy. In addition, the prophylactic use of antibiotics in humans, companion animals, livestock and agriculture is contributing adversely to mankind [7]. In low- and middle-income countries (LMIC), the affordability and ease of access of antibiotics, together with their unreliable and substandard quality, has resulted in a rapid increase in AMR among the population [8,9].

There is an urgent need for effective coverage to tackle AMR which is affected by a multi-faceted social and cultural system including gender and equity issues. In a society with gender-defined roles, gender differences could have an impact on AMR as well. There are social and cultural barriers among various countries and among various groups within a country, which causes differences in behaviour and differences in terms of availability of healthcare facilities. Further, different subgroups of a population, including gender, may have different work and domestic activities which may give

different AMR exposure profiles. This is crucial to understand who and how different groups in society are at risk of AMR-related exposures and their clinical, economic and social impacts [10]. Very few studies have been reported so far to explain the differences in men and women in terms of antimicrobial use and AMR, and even fewer studies have focused on the comprehensive analysis in terms of gender norms and its relationship with AMR.

A pilot study on AMR and gender

A pilot study has been conducted to develop the foundation for the research on the given subject. A total of 482 subjects were used in this study. A logistic regression model using the glm function in R [11] together with the emmeans package in R [12] was used to assess associations between patients' AMR status and several explanatory factors, namely gender, age, marital status, number of family members, education level, and employment status. While there was no direct association between gender and AMR, interactions between gender and the remaining explanatory variables have shown statistically significant results showing some clues about having some association with it. This identified higher incidence of infection in women in the 15-30 yr and over 60 yr groups and also gender differences across education levels. The reasoning behind these differences is still not established, and to better understand the patterns, pathways and key drivers more comprehensive large-scale studies are required.

Important Queries

A knowledge attitude practice (KAP) study which includes gender-related factors for AMR can provide better insight of the major underlying issues. This better understanding could later serve as a foundation to trigger a paradigm shift for AMR management. The following are some questions regarding AMR that should be addressed.

1. What is the difference in incidence of AMR in men and women?
2. If there are differences, what is the reason?
3. Is it sampling bias, a biological reason, differences in behavior towards use of antibiotics, differences in terms of availability of healthcare facilities, or differences due to social pressure and extra burden on women?
4. What is the level of education among both genders and general knowledge about the antibiotics?
5. Is there a difference in how men and women behave when they are ill? Is maternity and extra parenting burden contributing towards it? What is the impact of employment status on AMR resistance?
6. Are their differences in the impact of AMR across different segments of society?

These questions will help us formulate targeted strategies to combat AMR. AMR has escalated further by exerting more pressure on the healthcare system for the densely populated countries like Pakistan where disease burden is already high. Meanwhile, there is almost no surveillance for antibiotic use.

A way forward

The World Health Organization (WHO) has published a working paper to highlight the neglected area of probable relationship of AMR and gender equity [13,14,15]. It describes an urgent need of focused research in this area, as the better we understand the risk factors, the better we can control AMR by formulating new and relevant strategies. It is the time to recognize both biological and social determinants of health which has an impact on increasing trend of AMR [16].

Pakistan is the third highest antibiotic consuming country among LMICs with a high rate of morbidity and mortality related to infectious diseases [17]. Many individual studies on AMR surveillance in Pakistan have been reported in previous years but, unfortunately these are unable to provide a comprehensive picture of the status of AMR at the national level. However, an increasing trend of AMR is evident from various reported studies where disease responsiveness is badly affected over the time for treatments with routinely used antibiotics.

In the light of the above discussion, we propose the following set of recommendations to be taken into account at individual, society, national and global level.

- Finding current evidence and identify priority linkages related to gender and AMR research
- Development of guidance on how to strengthen the gender inclusiveness of AMR intervention and implementation research projects in LMICs

- Determination of the key drivers of AMR with a special focus on gender equity, income, education, age and other gender-related differences
- Assessing differences in behavior of men and women towards use and misuse of antibiotics
- Strictly controlling the prophylactic and without prescription sale and use of antibiotics at all levels
- Liaison-based activities for developing antibiotic stewardship programs both at public and private sectors
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Conclusion

To summarise, it is time to seriously consider the importance of AMR and change this perception that we still have time to wait and act. This extremely important component of the risk factor analysis and its association with gender should be on the priority list to better understand and act. While tackling this issue is not straight forward, creating awareness and working together on the subject will help us deal with our fears related to AMR. For a successful program to address AMR, it is necessary that surveillance and research look beyond the aggregate to examine its patterns, pathways and key drivers. Understanding of the effect of social stratification on AMR in the population studied will be used to improve surveillance and to make recommendations for changes in policy for control of AMR.

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