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Antibiotic use and resistance: perceptions and ethical challenges among doctors, pharmacists and the public in Vellore, South India

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Abstract

Inappropriate antibiotic use and resistance are major public health challenges. Interventional strategies require ascertaining the perceptions of major stakeholders and documenting the challenges to changing practice. Towards this aim, a qualitative study was conducted in Vellore, South India, using focus group discussions among doctors, pharmacists and public. There were eight groups with six to eight participants each. The themes explored were: understanding of infections, antibiotics and resistance; practices and pressure driving antibiotic use; and strategies for appropriate use. Data were transcribed, analysed, verified and a summary prepared with salient features and quotations.

It was found that the public had minimal awareness of resistance, antibiotics and infections. They wanted symptomatic relief. Doctors reported prescribing antibiotics for perceived patient expectations and quick recovery. Business concerns contributed to antibiotics sales among pharmacists. Pharmaceutical industry incentives and healthcare provider competition were the main ethical challenges. Suggested interventional strategies by the participants included creating public awareness, better healthcare provider communication, improved diagnostic support, strict implementation of guidelines, continuing education, and strengthening of regulations.

Perceived patient benefit, unrestricted autonomy and business-cum-industry pressures are promoting inappropriate use of antibiotics. Strategies improving responsible use will help preserve their effectiveness, and provide distributive justice and benefit for future generations.

Background

Bacterial infections contribute significantly to mortality throughout the world (1). Antibacterial medicines (hereafter antibiotics) save many lives. Their effectiveness has diminished in recent years due to the rise of antimicrobial resistance (hereafter antibiotic resistance) throughout the world (2) including India (3). Antibiotic pressure is a major contributing factor directly related to use in the community, both at individual (4) and societal level (5).

There are wide variations in antibiotic therapy even for common infections (6). In high income countries (HIC), doctors make the primary choice through prescription antibiotics. In lower-middle-income countries (LMIC) such as India with poor access to doctors, and with the unacceptable practice of selling antibiotics over the counter (OTC), pharmacists and patients are also stakeholders in antibiotic choice (7).

The 58th World Health Assembly (WHA) urged states "to minimize the development and spread of antimicrobial resistance, in particular by promotion of the rational use of antimicrobial agents by providers and consumers" (8). Preparation of interventional strategies to promote rational use requires study of the reasons for inappropriate use. Some of this information is gained by ascertaining the perceptions of stakeholders. Such studies in non-metropolitan areas of India have been few (9, 10). With this purpose, a qualitative study was conducted as part of the second phase of a World Health Organization (WHO) surveillance project on antibiotic use and resistance. It is hoped that this study will not just help in preparing stakeholder-targeted interventions to contain antibiotic use, but also garner support to address the ethical issues raised, and strengthen policy to improve the appropriate use of antibiotics.

Method

Study design

A qualitative study using focus group discussions (FGD) was conducted (11). This design was chosen to ascertain the stakeholders' awareness, obtain perspectives and explore the ethical dilemmas faced.

Setting

This study was conducted in urban and rural areas of Vellore district in the state of Tamil Nadu, South India. This district has a literacy of 72% and agriculture is the main occupation, making it similar to the national profile (12). Vellore town (urban area) is the district headquarters with government and private hospitals, private general practice (GP) clinics and numerous pharmacy shops. KV Kuppam (rural area) is a development block with primary health centres, a not-for-profit hospital, a few GP clinics and pharmacy shops. Patients in both areas access healthcare mainly through allopathic facilities. Indian systems of medicine (ISM) such as Ayurveda, Siddha, Unani and Naturopathy are also utilised through individual practitioners.

Participants and sampling

The main stakeholders in human antibiotic use are healthcare providers and consumers. A total of eight focus groups were chosen to represent these stakeholders. They included two groups each (urban and rural) from among doctors, pharmacists, higher socioeconomic public (HSEP) and lower socioeconomic public (LSEP) (Table 1). HSEP consisted of teachers and housewives. LSEP consisted of relatives of patients attending hospitals catering to the poor. There were six to eight participants in each group.

Participant recruitment was through purposive sampling to obtain diversity of opinion. Providers were doctors mainly in private practice and hospitals, and pharmacists owning or attending pharmacy shops. Open invitations were given to these healthcare providers through their respective associations. Among those who came for the open meeting, participants were chosen based on their willingness and ability to commit time for the FGD. Consumers were representatives of civil society (public) from different strata. Open invitations were given through community forums, schools and health facility notice boards to attend a public meeting. The study purpose was introduced in this meeting. Those who expressed interest in joining the group discussions and were able to commit time were included.

Procedure

Before starting, each group chose either Tamil (the local language) or English as the medium for discussion. For the four FGDs held in English, three of the authors (EM, ARF and SJC) were moderators. For the four FGDs in Tamil, the moderators were colleagues who were conversant with the language. All the moderators underwent training in FGD from a social scientist and moderated pilot groups for standardisation of technique. Each FGD was arranged at times convenient to and venues easily accessible to the participants. The study purpose and process were explained, and confidentiality issues discussed. Written informed consent was obtained from participants after allowing them sufficient time to understand the purpose and process of the study. Following introductions, the moderator communicated the objectives of the discussion. The moderator used a semi-structured discussion guide with predefined themes. This allowed continuity of discussion, an element of uniformity among groups, increased efficiency of data comparison and a broad platform of information. The themes explored were: (i) awareness and knowledge of infections and antibiotics; (ii) knowledge and understanding of resistance; (iii) patterns and practices in antibiotic use, and treatment preferences among healthcare providers; (iv) reasons, pressures and incentives for high antibiotic use; and (v) strategies to encourage appropriate antibiotic use. Each group continued discussing for up to two hours until all the themes were covered and no new information generated. A sociogram was maintained to ensure the active participation of all. Notes and audio recordings of each discussion by the note taker aided in collecting data comprehensively, increased transparency of process, and allowed for an audit trail.

Analysis

Transcription and translation of each FGD was done verbatim. Translation of Tamil into English was checked through back-translation and its reliability confirmed. A validated method involving content analysis with predefined themes was used (11). Transcripts were colour coded to ensure that relevant data were ascribed to specific groups. Tone and nonverbal communication was assessed through field notes. Study group members reviewed transcripts individually, met to compare segments of transcribed text, and reached consensus about their interpretation. Patterns, regularities and trends relating to the predefined themes were noted and verified. Data were summarised with salient features and quotations. Quotations were chosen which best represented the opinions of stakeholders. Follow-up workshops with participants were held, wherein results were presented and discussed. These also helped in the prioritisation of feasible interventional strategies.

Ethics clearance was obtained from the Institutional Review Board at Christian Medical College, Vellore (EC 8/04).

Findings

The findings are categorised based on predefined themes and reinforced with relevant stakeholder quotations. Explanations by the authors are mentioned in square brackets.

Theme 1: Awareness and knowledge of infections and antibiotics

Awareness was generally poor among LSEP about infections, their causes, types and treatment. Participants did not mention antibiotics by name, but they were able to physically identify some.

"*If we take Metacin* [paracetamol]*, fever comes down. But this tablet* [antibiotic displayed] *is better than Metacin.*" Rural LSEP

HSEP had basic knowledge about infections, could name some antibiotics, and felt that only certain infections needed antibiotics.

"My understanding of antibiotic is that it stops bacteria growing in body…I think amoxycillin is for throat infection." Urban HSEP

Doctors were well versed in infections and antibiotics, but needed continuing education updates. They were of the opinion that the public's knowledge was poor.

"People know about Analgin [metamizole]*, Aspirin* [acetylsalicylic acid]*, but not about antibiotics."* Rural doctor

Pharmacists had some knowledge of infections and antibiotic types but little awareness of dosing guidelines.

"Amoxycillin, 6 tablets is to be taken [for full course]*."* Rural pharmacist

Theme 2: Knowledge and understanding of resistance

Doctors were knowledgeable about resistance and its consequences and understood its relationship to antibiotic

misuse. Many felt the problem was restricted to hospitals, and were unaware that community resistance was high.

"Every time we give new antibiotics, the organisms mould accordingly." Rural doctor

Urban pharmacists had a fair knowledge of resistance. Their rural counterparts exhibited little concern for the issue.

"Patient's resistance power towards diseases will decrease. After sometime, no antibiotic will work." Urban pharmacist

"Not come across such patients; these are things for doctors" Rural pharmacist

Overall the public had minimal awareness of antibiotic resistance.

"*Sometimes, resistance happens to us. We go back to doctor with same problem. Then doctor changes medicines."* Rural LSEP

HSEP of the urban area had a better understanding of antibiotic resistance compared with rural HSEP.

"They don't complete the course. From my little knowledge, this creates resistance." Urban HSEP

Theme 3: Patterns, practices and preferences

Doctors made the following observations about antibiotic use practices: Common, inexpensive antibiotics were prescribed in government hospitals and costlier, newer antibiotics in private practice. The full course of antibiotics was not prescribed. Patients could not afford the full course, or would stop the antibiotic after getting relief. Many patients visited quacks (unqualified practitioners) and pharmacists directly for antibiotics.

"More than 50% need antibiotics." Rural doctor

"Nobody completes the course. If you write 20, they take five." Urban doctor

"Quacks come on bicycles in mornings and afternoons, see patients for five rupees and give medicines." Rural doctor

Pharmacists initially denied dispensing antibiotics without prescription. On further probing, they admitted to doing so, rationalising that cure was impossible without antibiotics. Antibiotics, including amoxycillin, co-trimoxazole and combination antibiotics were dispensed for common colds and symptoms suggestive of viral infection. Often inadequate doses were dispensed.

"We are giving antibiotics to more than 75% of patients. Even for common cold, we prescribe two tablets of Septran [co-trimoxazole]" Rural pharmacist

"We give antibiotics for only one day…If doctors write 250mg of erythromycin for children, we ask parents to buy half the dose" Urban pharmacist

LSEP generally visited allopathic doctors only if they really needed to do so. Long distances and nonavailability of doctors during the nights in rural area, and doctor fees and investigation charges in urban areas were mentioned as reasons why patients resorted to self-medication and visiting pharmacy shops. Antibiotics were given for common symptoms such as cold, fever and body ache. Patients said doctors did not explain the medicines or their side effects to them. They also tended to stop antibiotics once the symptoms subsided.

"When they prescribe costly tablets, say for 100 rupees, we buy only half." Rural LSEP

"*If I have money I go to hospital. If not, I get medicine from pharmacy shop. If I get better, I stop and keep for future use"* Urban LSEP

HSEP visited doctors for illnesses requiring diagnosis, but visited pharmacy shops for immediate needs and to save time. Faster recovery and preventing prolonged illness were reasons given for antibiotic use.

"If I know about the illness and feel I can manage, I go to pharmacy shop. If I have a doubt, I go to doctor." Rural HSEP

"To see a doctor, we take leave, stand in queue. Finally doctor will prescribe, possibly the same drug. So we go to pharmacy shop." Urban HSEP

All public groups mentioned visiting ISM practitioners. Adverse effects with allopathic medicines, previous positive experiences with ISM, and perceived advantages of ISM in certain health conditions encouraged ISM use.

"For dysentery we have separate native treatment. Allopathic medicines have side effects." Rural HSEP

"Wherever they get chicken pox, they go to Alanthur [native medicine centre]. *If they go there, they recover."* Rural LSEP

Theme 4: Reasons, pressures and incentives for high antibiotic use

Doctors blamed unqualified practitioners and pharmacy shops for high antibiotic use claiming that antibiotics were given without proper diagnosis and prescription.

"Quacks provide 40 % [percentage of antibiotics used]*, medical shops 30%, doctors 30%."* Rural doctor

On detailed probing, doctors admitted to high antibiotic prescribing, attributing it to: (i) inadequate diagnostic facilities; (ii) lack of antibiotic guidelines; (iii) difficulty in observing patient progress; (iv) poor intensive care facilities in rural areas; (v) patient demand for quick relief, and (vi) perceived patient expectation.

"If we ask for investigations on first day, patient never turns up again. We immediately give antibiotics and watch for two days. Nobody bothers about diagnosis, only symptom relief." Urban, doctor

"We are compelled to give drugs. Sometimes they dictate to us! They have pre-conceived ideas." Urban doctor

Doctors admitted that pharmaceutical companies put pressure on them by introducing newer brands. Decisions and antibiotic

choice were influenced by incentives.

"Even reputed companies offer complimentaries. If you prescribe more, they offer air conditioned car or free tickets.... Of late, we are forced to try new antibiotics" Urban doctor

Pharmacists initially blamed doctors for high antibiotic prescriptions due to industry pressure. On probing, they admitted to receiving incentives from companies to achieve sale targets.

"Usually company representatives approach doctors. Certain companies give us extra strips of tablets as gifts." Rural pharmacist

On detailed probing pharmacists admitted to selling antibiotics, stating that this was necessary because of: (i) patient demand; (ii) a belief that cure is through antibiotics; (iii) competition from other pharmacy shops, and (iv) antibiotic sales promoting business.

"We cannot avoid antibiotics at time of necessity." Rural pharmacist

"Nobody likes to lose business. We give whatever they ask. Competition, location of shops, license issues…everything has become commercialised." Urban pharmacist

Theme 5: Strategies for appropriate antibiotic use

The main suggestion by doctors was to improve public awareness of infections to reduce antibiotic demand. Other strategies suggested were: (i) law enforcement for antibiotic sales by prescription only; (ii) improved laboratory facilities to differentiate viral and bacterial infections; (iii) development of antibiotic guidelines; (iv) continuing medical education; (v) development of a rational use module in the medical curriculum, and (vi) a ban on unqualified health practitioners.

"For this, you have to enforce law, avoid free availability, check legal status of pharmacy shop and eradicate quacks!" Urban doctor

The pharmacists were more reticent, saying that doctors were primarily responsible for antibiotic use. They however suggested the following: (i) restriction of higher potency antibiotics through prescriptions; (ii) continuing pharmacy education; (iii) inclusion of modules on rational use in the pharmacy curriculum, and (iv) public awareness programmes through the media.

"If doctors have intention, this problem can be reduced. Pharmacists are only like the arrow which has to be shot from the bow." Urban pharmacist

"We have to bring change at every level. This can be telecast on TV or newspaper and awareness created." Urban pharmacist

Public groups expressed concern that awareness of antibiotic resistance was poor in comparison to problems like AIDS. They shared the view that the primary strategy should focus on improving awareness through mass education possibly starting at school level. Children were receptive to new ideas and could influence parents. Other strategies suggested were: (i) better explanation by doctors about health and disease; (ii) improved communication from providers about antibiotics; (iii) improved awareness through self help, women's groups and the media, and (iv) implementation of laws for appropriate use of antibiotics.

"Awareness should start from schools. Teachers can spread awareness." "Doctors should explain to patients the problems related with antibiotic use. Even uneducated will understand if explained properly." Urban HSEP

Challenges and ethical issues

The challenges relating to inappropriate antibiotic use raised both subtle and overt ethical issues. These are summarised below:

1. Limited awareness among the public about infections, antibiotics, resistance and inadequate information from healthcare providers. This compromises an individual's autonomy, and the right to participate in decisions affecting their own welfare.
2. Varying knowledge of antibiotics and resistance among healthcare providers and limited continuing education. Patient beneficence and responsible caring may be compromised if professional competence and knowledge updates are lacking.
3. Limited access to healthcare encouraging purchase of OTC antibiotics through pharmacy shops and unqualified practitioners. Inequities in access coupled with lax implementation of regulations requiring antibiotic prescriptions contribute to irresponsible use.
4. Patient demand and perceived need for quick relief promoting inappropriate antibiotic use in non-bacterial conditions. Immediate perceived individual benefit masks long-term societal risk through resistance and its consequences.
5. Non-compliance with standard antibiotic guidelines among providers and consumers. Poor guideline adherence increases medication risks and decreases antibiotic benefit through wrong choice and dosing by the provider.
6. Inadequate diagnostic support in many healthcare facilities necessitating "just in case" antibiotic prescriptions. Inequities in healthcare infrastructure and laboratory support coupled with non-compliance to accreditation standards compromise responsible use.
7. Older and cheaper antibiotics are becoming ineffective due to rising resistance, leaving available the newer and costlier antibiotics which are more effective. The affordability barrier constrains access to these effective antibiotics thereby promoting health inequity.
8. High competition and business pressures among healthcare providers leading to antibiotic overuse. Provider benefit,

irresponsible use and commercialisation of healthcare is compromising evidence-based and ethical healthcare.

9. Undue pressures on healthcare providers for increased antibiotic use and costlier brands through unlimited incentives by the pharmaceutical industry. Healthcare providers are community leaders and therefore need to resist such pressures which may increase inappropriate use.
10. Poor implementation of regulations, guidelines and law regarding appropriate antibiotic use. Enforcement will strengthen responsible use of antibiotics.

Discussion

Antibiotic resistance is a global threat (2, 3). In 2005, the WHA adopted a resolution on 'Improving the containment of antimicrobial resistance' (8). Containment through appropriate antibiotic use is important in LMIC such as India with high burden of infection (13). Ascertaining stakeholder perceptions through this study has provided insights into various factors relating to inappropriate use. The discussion below dwells on these insights so that strategies can be developed that improve and encourage ethical use of antibiotics.

Knowledge and understanding of infections, antibiotics and resistance

In our study, awareness among the public about infections, antibiotics and their indications was minimal. There is limited awareness among other LMIC and some HIC too. A study from HIC revealed that some people believe antibiotics cure colds, and have poor knowledge of the treatment of bacterial and viral illnesses (14). A study in LMIC revealed a strong culture of self medication and some knowledge about antibiotics (15). These findings suggest the urgent need for creating greater public awareness about health, illness, hygiene and antibiotic indications. It is important that healthcare providers effectively communicate with their patients, so that this improves treatment compliance and health outcomes.

In our study, knowledge of antibiotic resistance was reasonable among doctors, but low in priority. In other countries too, many physicians recognised antibiotic resistance as a national problem, rather than a problem in their own hospitals (16). For many physicians, concerns about patient care and uncertainty about managing infections were a higher priority than antibiotic resistance issues (17). Similar to the findings in our study, pharmacists in other LMIC also revealed poor knowledge of resistance (18). This factor may be promoting higher antibiotic use as suggested by another Indian study (7). In our study, the public also had a poor understanding regarding antibiotic resistance. Media coverage of antibiotic resistance and its implications is negligible in comparison to issues such as AIDS and smoking. Lack of awareness of the public regarding antibiotics and resistance was revealed by both healthcare providers and consumers in our study. This indicates the need for urgent interventions to improve awareness.

Patterns, practices and preferences relating to antibiotic use

Infections are widely prevalent in India (13). Bacterial infections which need antibiotics form only a small proportion. In our study though, doctors felt more than 50% of patients received antibiotics. This should raise an alarm. Our findings were supported by a Chinese study which found that antibiotics were given for predominantly viral conditions such as diarrhoea and cough (19). The wide range of antibiotics and brands available in the Indian market may increase the temptation to prescribe these medicines. The National List of Essential Medicines (NLEM) contains only 21 antibiotics and two combinations, co-trimoxazole and co-amoxiclav (20). The Indian market however offers more than 10,000 formulations, many of which are irrational combinations (21). Such a spread may create confusion between brand and generic names, quality and price variability. There may be pressure to sell higher margin brands. Affordability is also a concern. Buying an antibiotic course for Rs 100 is approximately two days' average daily earnings for a casual worker in India (22), a major factor that prevents them from purchasing a full course.

The practice of purchasing antibiotics directly from pharmacy shops – apparently to avoid spending extra time and money for consulting doctors – is worrying. OTC antibiotic sales are not permitted in HIC whereas studies in countries such as Tanzania have demonstrated that patients with cough, diarrhoea and other complaints were dispensed OTC antibiotics (23). Patient demand and lack of guidelines and updates echoed in our findings too. Ignorance of pharmacists about the dose of antibiotics, particularly the newer ones, indicates the need for continuing education. Antibiotic prescribing and dispensing practice should conform to scientific evidence and ethical norms. In India, many pharmacy shops are attended by untrained personnel and have only one qualified pharmacist. This could be a major factor leading to errors in dispensing of medicines.

Another issue raised by doctors was that of unqualified practitioners and ISM practitioners prescribing antibiotics when in fact they were not qualified to do so. This issue deserves serious attention and clear policies are needed to designate eligible prescribers. There is no doubt that quacks should not prescribe antibiotics. However, the debate continues about whether ISM practitioners should prescribe allopathic medicines. In some states, members of Ayurveda, Unani, Siddha and Homeopathy (AYUSH) are permitted to prescribe allopathic drugs. In other states, this is restricted to emergency cases only (24).

Reasons, pressures and incentives for antibiotic use

Perceived patient expectation was a reason for high antibiotic use in our study. Doctors claimed inadequate diagnostic facilities and patient demand as justification for prescribing antibiotics. Interestingly, GPs in the UK think prescribing antibiotics is part of their social responsibility (25). In contrast, a Swedish study showed the public trusted doctors more when antibiotics were not prescribed (14).

The perception of pharmacists in the study that doctors receive major incentives for antibiotic prescriptions was supported by a study from Orissa (10). Pharmacists however stated that OTC demand, business competition and incentives were major drivers of antibiotic use. An ethnographic study done on pharmaceutical behaviour revealed reciprocal relationships between pharmacy shops, wholesale distributors and the pharmaceutical industry (26). Many pharmacists in our study viewed their profession as a business. This attitude will be difficult to change as livelihoods are often at stake.

The fear, among GPs, of losing patients, and competition between pharmacy shops were mentioned as factors that were perceived to increase antibiotic prescribing and dispensing. This pressure could be minimised through policies and systems that allocate patients into health provider registries based on geographical area of stay. Patients could then visit allocated GP clinics and get medicines dispensed from adjacent pharmacy shops. This may improve relationships and communication between patients, doctors and pharmacists. This system is prevalent in the UK, where patients are assigned to GP practice groups, with patients being allowed a change of GPs based on their needs (27).

Strategies to contain antibiotic use

Among various strategies mentioned, one key suggestion was that of empowering the public through education and media. An interventional study has shown that an empowerment technique using leaflets and posters improves awareness of antibiotics and generates relevant questions to doctors (28). Stakeholders in our study supported the idea that school children, teachers, women's and self-help groups could be key partners in the process. Improved patient communication from healthcare providers about illness and antibiotics was another suggestion. Studies have shown that interventions for improving patient communication reduce antibiotic prescription rates by 60% (28). Developing guidelines for antibiotic use, continuing education programmes and rational use modules in healthcare curricula were other suggestions by healthcare providers in our study. Implementing such programmes could improve prescribing and dispensing practices, restrict irrational prescriptions and contain OTC sales.

Strengthening the legal requirements for antibiotic prescriptions and prescriber eligibility, and prevention of antibiotic sales by quacks was suggested by stakeholders. Audit and feedback systems through antibiotic use surveillance would help to improve responsible use and evaluate the success of strategies implemented.

Challenges and ethical dilemmas

The factors contributing to inappropriate antibiotic use and resistance intertwine with major ethical principles. In this context, autonomy has two sides. On the one hand, patient autonomy is compromised, as poor awareness about infections, antibiotics and resistance minimise patients' participation in treatment decisions. On the other, the public enjoys autonomy to choose healthcare providers and often too much freedom to access OTC antibiotics from pharmacy shops and unqualified practitioners. This creates a major risk to health. This risk is compounded by variable factors in LMIC such as the poor quality of drugs (29), unsatisfactory storage conditions of antibiotics, potential medication errors, and improper diagnosis.

The risks and benefits of prescribing antibiotics are also worth debating. It is often a case of access versus excess. Underuse of antibiotics due to poor access can prolong illness, increase potential for infection transmission and complications from untreated infection, thereby increasing cost through hospitalization and wages lost. Giving antibiotics may actually save lives especially in cases of severe bacterial infection. Conversely, as expressed by stakeholders, antibiotics were often given on patient demand, for symptomatic relief and often for mild non-bacterial conditions. This misuse of antibiotics will deplete government allocation for the medicines budget and lead to denial of antibiotic therapy for patients with severe infections who genuinely need antibiotics. Availability of better laboratory facilities may improve diagnosis and generate data on community resistance patterns that is essential for empirical antibiotic prescriptions. However, patient costs may increase. Inappropriate antibiotic use may also have other consequences. Antibiotics destroy normal protective bacteria in the gut (commensal flora) thereby allowing survival of pathogenic bacteria that may be resistant to many antibiotics (4). This may have grave consequences, with antibiotics subsequently becoming ineffective for serious infections. Resistant bacteria may also spread through unhygienic habits and conditions to others in the vicinity and community. Besides individual risk, high use of antibiotics may lead to rising community antibiotic resistance (30).

Justice demands that antibiotics be accessible and affordable, but balanced by evidence-based therapy through healthcare providers. This principle is often compromised as revealed by our study, through pressures of competition between healthcare providers, business concerns, the powerful influence of the pharmaceutical industry and lax implementation of policies and law. Enforcing regulation to ensure antibiotics are sold only through prescriptions from qualified practitioners appears difficult to implement. This difficulty is compounded by OTC sales of antibiotics and prescription by unqualified practitioners, but is, on the other hand complicated by the need for access to life saving antibiotics and inaccessible healthcare in many rural areas. Control of narcotic drugs for healthcare in India is a shining example of good implementation of regulation, balancing control and access (31). It raises the hope that discipline is possible, and that antibiotic availability through prescription alone is not just a distant dream.

Pharmaceutical incentives, business concerns and competition have one common thread: money. Tackling this needs a multipronged approach requiring the cooperation of all stakeholders. There is no easy solution; it needs the imbibing of professional values by healthcare providers, development

of relevant professional guidelines, and a refinement of existing laws. The step by the Medical Council of India to ban practitioners from taking free gifts and the subsequent move by the Central Board of Direct Taxes to charge income tax on pharmaceutical industry gifts *are* encouraging (32). However practical implementation on the ground remains to be seen. On the part of the pharmaceutical industry, a more scientific and humanitarian concern to true public service and meeting the actual needs of society is the need of the hour.

Ultimately, the ethical issue is one of the individual versus society. In the case of antibiotic use and resistance, considering all that has been expressed by stakeholders, should autonomy and benefits to the individual get preference over the risks to society and distributive justice for health? Individual antibiotic use must be appropriate and regulated. Otherwise the whole society is at risk with infections not responding to the prescribed antibiotics due to the phenomenon of resistance.

Methodological considerations

The FGD methodology served its purpose in bringing out various views, attitudes, interactions, areas of consensus, and community practices. Supplementation with in-depth interviews could have strengthened information on sensitive issues. Purposive sampling helped to select interested stakeholders. The public were stratified into HSEP and LSEP so that knowledge, attitudes and practices from diverse backgrounds could be explored. Participant numbers in groups were restricted for easier management and to provide participants more opportunities for expressing their views. A follow-up workshop was conducted where the results were presented and the participants agreed to the authors' interpretation of their statements. This study looked at three major stakeholders. Other stakeholders -- ISM practitioners, the pharmaceutical industry, policy makers and antibiotic users in agriculture and animal husbandry -- need inclusion in further studies.

Conclusion

This study found that healthcare providers had a basic knowledge of antibiotics and infections, whereas the public had little awareness. Antibiotic use for non-bacterial infections, inadequate dosages, non-compliance, and antibiotic sales directly from pharmacy shops and quacks were observed as common practices. Perceived patient expectation, immediate relief, inadequate diagnostic facilities, competition and industry incentives contributed to irresponsible antibiotic use. Suggested remedial strategies dwelt on improving public awareness, better communication, improved diagnostic support, continuing education, and regulation enforcement. Empowering the public, curbing pharmaceutical industry incentives, and encouraging healthcare providers to have a scientific and professional approach, rather than a business approach, would address some of the major ethical challenges.

The autonomy to use antibiotics needs to be balanced against the risk of rising resistance and beneficial outcome with prudent antibiotic therapy. Interventional strategies need to emphasise improving appropriate and ethical use of antibiotics. This would help keep effective antibiotics available for use and preserve this precious resource, not just for the present, but also for future generations.

Acknowledgements

We thank all participants for their valuable contributions. We express our gratitude to Dr Shubha Kumar, social scientist, for training moderators in FGD and reviewing the study. We are grateful to WHO for funding the second phase of the AMUREC project. This phase included surveillance, and preparation for intervention through this qualitative study. We thank the AMUREC group for their support towards this.

Funding

The work was financially supported by the World Health Organization, Geneva. SJC received a scholarship from the Erasmus Mundus External Cooperation Window Lot 15, India.

TABLE 1: Socio-demographic description of focus groups

Group	Area	Group name	Qualification*/ Occupation	Participant numbers	Age range
1	Urban	Doctors	4 MBBS, 2 MD	6	33-63
2	Rural	Doctors	6 MBBS	6	29-54
3	Urban	Pharmacists	3 B.Pharm, 3 D.Pharm	6	23-55
4	Rural	Pharmacists	6 D.Pharm	6	21-66
5	Urban	Public – HSEP	Teachers, Housewives	6	30-53
6	Rural	Public – HSEP	Teachers, Housewives	8	35-60
7	Urban	Public– LSEP	Relatives of patients	8	19-65
8	Rural	Public– LSEP	Relatives of patients	7	24-66

**MBBS: Bachelor of Medicine, Bachelor of Surgery, MD: Doctor of Medicine, B.Pharm: Bachelor of Pharmacy, DPharm: Diploma in Pharmacy*

References

1. World Health Organization. *Health statistics and informatics. Causes of death 2008: data sources and methods* [Internet]. Geneva: WHO; 2011 Apr 28 [cited 2012 Nov 24]. Available from: http://www.who.int/healthinfo/global_burden_disease/cod_2008_sources_methods.pdf
2. Levy SB. Antibiotic resistance-the problem intensifies. *Adv Drug Deliv Rev.* 2005 Jul 29; 57(10):1446-50.
3. Mathai E, Chandy SJ, Thomas K, Antonisamy B, Joseph I, Mathai M, Sorensen TL, Holloway K. Antimicrobial resistance surveillance among commensal *Eschericia coli* in rural and urban areas in Southern India. *Trop Med Int Health*. 2008 Jan;13(1):41-5.
4. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay AD. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and metanalysis**.** *BMJ*. 2010 May 18;340: c2096. doi: 10.1136/bmj.c2096.
5. Goossens H, Ferech M, Vander Stichele R, Elseviers M. ESAC Project Group. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet*. 2005 Feb 12-18;365(9459): 579-87.
6. Mathai E, Thomas RJ, Chandy SJ, Mathai M, Bergstrom S. Antimicrobials for the treatment of urinary tract infection in pregnancy: practices in southern India. *Pharmacoepidemiol Drug Saf*. 2004 Sep;13(9):645-52.
7. S KI, Chandy SJ, Jeyaseelan L, Kumar R, Suresh S. Antimicrobial prescription patterns for common acute infections in some rural and urban health facilities of India. *Indian J Med Res*. 2008 Aug;128(2): 165-71.
8. World Health Organization. *Improving the containment of antimicrobial resistance*[Internet]. Geneva:World Health Assembly 58; 2005 May 25[cited 2012 Nov 24]. Available from: apps.who.int/medicinedocs/documents/s16340e/s16340e.pdf
9. Sivagnanam G, Thirumalaikolundusubramanian P, Mohanasundaram J, Raaj AA, Namasivayam K, Rajaram S. A survey on current attitude of practicing physicians upon usage of antimicrobial agents in southern part of India. *MedGenMed*. 2004 May 11;6(2):1.
10. Sahoo KC, Tamhankar AJ, Johansson E, Lundborg CS. Antibiotic use, resistance development and environmental factors: a qualitative study among healthcare professionals in Orissa, India. *BMC Public Health*. 2010 Oct 21;10:629.
11. Krueger RA, Casey MA. *Focus groups: a practical guide for applied Research*. 3rd ed. Thousand Oaks, CA: Sage Publications; 2000. Pp 320.
12. District Administration, Vellore. District Profile[Internet]. Vellore: Government of Tamil Nadu[date unknown]cited 2012 Nov 24]. Available from: http://www.vellore.tn.nic.in/distprof.htm
13. Government of India, Ministry of Health and Family Welfare. *Integrated Diseases Surveillance Project* [Internet]. New Delhi: MoHFW;2004[cited Nov 24]. Available from: http://www.idsp.nic.in/
14. André M, Vernby A, Berg J, Lundborg CS. A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden. *J Antimicrob Chemother*. 2010 Jun;65(6):1292-6.
15. Hoa NQ, Ohman A, Lundborg CS, Chuc NT. Drug use and health-seeking behaviour for childhood illness in Vietnam-a qualitative study. *Health Policy*. 2007 Aug;82(3):320-9.
16. Wester CW, Durairaj L, Evans AT, Schwartz DN, Husain S, Martinez E. Antibiotic resistance: a survey of physician perceptions. *Arch Intern Med.* 2002 Oct 28;162(19):2210-6.
17. Björkman I, Berg J, Röing M, Erntell M, Lundborg CS. Perceptions among Swedish hospital physicians on prescribing of antibiotics and antibiotic resistance. *Qual Saf Health Care.* 2010 Dec;19(6):e8.
18. Hounsa A, De Mol P. Knowledge and perceptions of staff working in private dispensaries in Abidjan as regards bacterial resistance. *Ann Pharm Fr.* 2009 Jul;67(4):284-90.
19. Reynolds L, McKee M. Factors influencing antibiotic prescribing in China. An exploratory analysis. *Health Policy*. 2009 Apr;90(1):32-6.
20. Ministry of Health and Family Welfare, Government of India, National List of Essential Medicines of India. 2011[Internet]. New Delhi: MoHFW; 2011[cited 2012 Nov 24]. Available from: http://pharmaceuticals.gov.in/NLEM.pdf
21. Brand names and generic equivalents with price details[Internet]. Chennai: Med India Network for Health; 2012 [cited 2012 Nov 24]. Available from: http://www.medindia.net/drug-price/index.asp.
22. Government of India, Ministry of Labour and Employment. Annual report to the people on employment. 2010 Jul 1. Table 5: Average daily wages/earnings (Rs) across social groups in India, 2004-05[Internet]. New Delhi: MoLE, 2010[cited 2012 Nov 24]. Available from: http://labour.nic.in/Report_to_People.pdf
23. Viberg N, Kalala W, Mujinja P, Tomson G, Lundborg CS. "Practical knowledge" and perceptions of antibiotics and antibiotic resistance among drugsellers in Tanzanian private drugstores. *BMC Infect Dis*. 2010 Sep 16;10:270.
24. Singh A. AYUSH for integrating allopathy with Indian systems of medicine. *The Statesman*[Internet];Perspective:2012 Jun 21[cited 2012 Nov 24]. Available from: http://www.thestatesman.net
25. Wood F, Simpson S, Butler CC. Socially responsible antibiotic choices in primary care: a qualitative study of GPs' decisions to prescribe broad-spectrum and fluroquinolone antibiotics. *Fam Pract.* 2007 Oct;24(5):427-34.
26. Kamat VR, Nichter M. Pharmacies, self-medication and pharmaceutical marketing in Bombay, India. *Soc Sci Med*. 1998 Sep;47(6):779-94.
27. Department of Health, United Kingdom. Choice of GP practice: The Patient Choice Scheme[Internet]. UK: Department of Health; 2012 April 30[cited 2012 Nov 24]. Available from: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_133411.pdf
28. Altiner A, Brockmann S, Sielk M, Wilm S, Wegscheider K, Abholz HH. Reducing antibiotic prescriptions for acute cough by motivating GPs to change their attitudes to communication and empowering patients: a cluster-randomized intervention study. *J Antimicrob Chemother*. 2007 Sep;60(3):638-44.
29. Bate R, Tren R, Mooney L, Hess K, Mitra B, Debroy B, Attaran A. Pilot study of essential drug quality in two major cities in India [Internet]. *PLoS One.* 2009 Jun 23[cited 2012 Nov 24];4(6):e6003.
30. Tello A, Austin B, Telfer TC. Selective pressure of antibiotic pollution on bacteria of importance to public health. *Environ Health Perspect.* 2012 Aug;120(8):1100-6.
31. Government of India. Narcotic Drugs and Psychotropic Substances Act. 1985 September 16 [Internet]. New Delhi: GoI, 1985[cited 2012 Nov 24]. Available from: http://india.gov.in/allimpfrms/allacts/2482.pdf
32. Ministry of Finance, Income Tax Department. Circular No 5/2012. Inadmissibility of expenses incurred in providing freebees to medical practitioner by pharmaceutical and allied health sector industry[Internet]New Delhi: IT Department, 2012[cited 2013 Jan 2]. Available from: http://law.incometaxindia.gov.in/DIT/Circulars.aspx