



Major Article

Patient compliance with antimicrobial drugs: A Chinese survey

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Background: Antimicrobial therapy is among the mainstream treatment modalities employed in clinical settings. Antimicrobial sensitivity of the pathogen and patient compliance are key determinants of the efficacy of antimicrobial therapy.

Objective: In this study, we sought to investigate the factors that affect patient compliance to antimicrobial therapy in a Chinese teaching hospital to enhance patient compliance and to prevent abuse and misuse of antibiotics by patients.

Methods: A questionnaire survey was conducted among patients willing to answer all the questions who were prescribed antimicrobial drugs orally, and for whom at least half of the duration of therapy was not under the supervision of a doctor or nurse. Data analyses were performed using Kruskal–Wallis test and multivariate logistic regression.

Results: A total of 720 patients participated in the survey; of these, 714 patients provided complete data and were included in the analysis. Up to 86.97% of patients showed noncompliance to antimicrobial therapy (total compliance score < 8), whereas 13.03% of patients showed good compliance (total compliance score = 8). On multivariate analyses, understanding of the treatment was an important factor associated with compliance.

Conclusions: A range of factors were associated with compliance to antimicrobial therapy, including understanding of the treatment, gender, age, home address, education level, and family income.

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Antimicrobial therapy is among the greatest medical advances of all times. Antimicrobial drugs refer to chemicals that kill or inhibit the growth of microorganisms; these include antibiotics, semiantibiotics, and synthetic drugs. Clinical application of antimicrobial drugs has reduced morbidity from infectious diseases and saved countless lives.^{1–3}

Incorrect use and abuse of antibiotic agents are key drivers of the spread of antimicrobial drug resistance. Antimicrobial drug resistance is a key concern while instituting therapy for bacterial infections.^{4–7} Based on the involved molecular mechanisms, resistance to antimicrobial drugs can be divided into intrinsic resistance

and acquired resistance. Besides, the cultural perceptions, needs of patients, misdiagnosis, financial interests, competence of medical personnel, and aggressive drug marketing are known to affect the development of drug resistance.^{8–13} Despite several interventions to promote rational use of antimicrobial drugs, rapid spread of bacterial resistance and poor patient compliance continue to be a global challenge.^{8–13} China is among the most severely influenced countries with respect to inappropriate use of antibiotics; the number of infections caused by drug-resistant pathogens account for about 30% of all patients.^{14–17} Clinically isolated strains of *Escherichia coli* resistant to ciprofloxacin are a major concern in China.^{15,17} Therefore, concerted efforts to enhance patient compliance and to prevent abuse and misuse of antibiotics by patients are required.

In this study, we investigated the factors that affect patient compliance to antimicrobial therapy in a Chinese teaching hospital setting. The objective was to understand the factors that affect patient compliance and to identify the reasons for abuse and misuse of antibiotics. Our findings may help identify interventions for curbing antimicrobial drug resistance and help alleviate the associated disease burden.

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ST and JP contributed equally to this work as first authors.

Conflicts of interest: None to report.

METHODS

Ethics approval

The study was approved by the ethics committee at the involved institution.

Patients and study design

From October 2015–November 2015, we recruited a total of 720 patients from all clinical departments at a Chinese teaching hospital who were treated with antimicrobial drugs (Table 1). A questionnaire survey was administered to assess the level of compliance to the prescribed antimicrobial therapy. The reliability and validity of the questionnaire were tested in preliminary experiments conducted before the start of the survey.

Inclusion criteria were patients who were willing to answer all the questions and who were prescribed oral antimicrobial drugs, and for whom at least half of the duration of therapy was not under the supervision of a doctor or a nurse (patients in China must use antimicrobial agents prescribed by a qualified doctor and should not take any over-the-counter drugs from a pharmacy; in the context of the present study, “antimicrobial drugs” excluded antiviral, antifungal, and antiparasitic drugs). Patient who gave illegible feedback, those who could not read or speak clearly, and those who had a history of severe allergy to an antibacterial drug or drug addiction were excluded ($n = 6$).

The health team in the hospital consisted of doctors, clinical pharmacists, nurses, and qualified hospital managers. The necessary quality assurance mechanisms were in place and antimicrobial stewardship was strictly regulated during the entire study.

The questionnaire collected information related to 3 key domains: demographic information (eg, age, sex, residential address, and education level), socioeconomic information (eg, marital status, occupation, employment status, and family income), and patients' understanding (eg, basic knowledge about antimicrobial drugs and their side effects, correct timing and dose for antimicrobial drugs, criteria for drug discontinuation, and drug switching).

Criteria for patients' understanding

All participants were required to answer 8 questions¹⁸ (Supplementary Material).

For the first 7 questions, each “no” was awarded a score of 1, whereas no score was awarded in case of a “yes” response. For question 8, answer “oral consumption” or “intramuscular injection” was awarded 1 point, whereas the answer “intravenous injection” was not awarded a score. A total score < 6 indicated poor understanding of antimicrobial drugs, a score between 6 and 8 indicated an

average rating (ie, common level), and a total score of 8 points was rated as good.

Outcomes of patient compliance with antimicrobial therapy

Patient compliance to antimicrobial therapy was evaluated using a Chinese version of the Morisky Medication Adherence Scale,¹⁹ which includes 8 questions.

For the first 7 questions, each “no” was awarded a score of 1, whereas no score was awarded for answer “yes.” For question 8, the answers “never,” “occasionally,” “sometimes,” “often,” and “always” were awarded a score of 2, 1.5, 1, 1.5, and 0, respectively. A total score < 8 indicated noncompliance and a score of 8 indicated good compliance. We also listed potential reasons for poor compliance based on the published literature. All subjects were asked to indicate the reason(s) applicable in their case. Incident rate for each reason was calculated.

Statistical analysis

Data pertaining to continuous variables are expressed as mean \pm standard deviation; those pertaining to categorical variables are expressed as frequency or percentage. Continuous variables were compared using Kruskal-Wallis test and χ^2 test was used for categorical variables. Multiple logistic regression analyses was performed to estimate the effect of marital status, family income, and understanding after adjusting for gender and age, and the effect of understanding after adjusting for gender, age, home address, marital status, occupation, education level, employment status, and family income. All analyses were performed with the statistical software package R (R Foundation for Statistical Computing, Vienna, Austria). A 2-sided significance level of .05 was used to evaluate statistical significance.

RESULTS

Questionnaires were distributed to 720 subjects; of these, 714 subjects provided complete data and were included in the analysis. Out of 714 patients from various departments in a Chinese teaching hospital (Table 1), 621 (86.97%) patients had a total score < 8, which indicated noncompliance, whereas only 93 (13.03%) patients showed good compliance (Fig 1).

Table 1
Source of recruited patients according to clinical department

Name	n (%)
Department of Obstetrics and Gynecology	64 (8.96)
Department of Orthopedics	78 (10.92)
Department of Respiratory	30 (4.20)
Department of Gastroenterology	86 (12.04)
International Medical Care Center	12 (1.68)
Ambulatory Care Unit	49 (6.86)
Department of Neurosurgery	57 (7.98)
Department of Thoracic Surgery	55 (7.70)
Department of Ophthalmology	46 (6.44)
Department of Otorhinolaryngology, Head, and Neck Surgery	33 (4.62)
Department of Cardiology	135 (18.91)
Department of Urology	44 (6.16)
Department of General Surgery	25 (3.50)

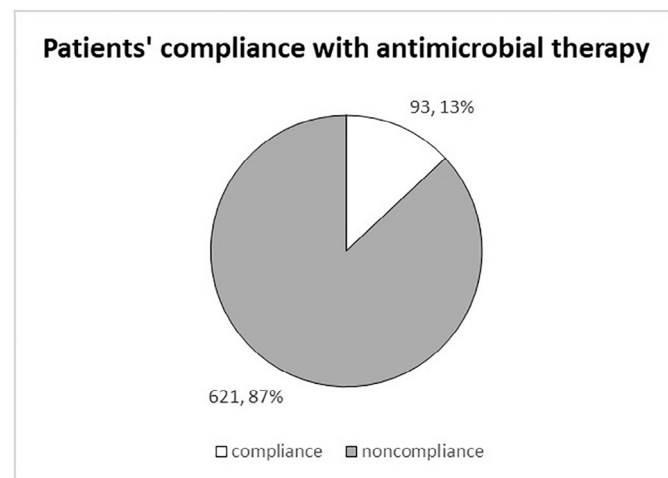


Fig 1. Proportion of study population with compliance and noncompliance to antimicrobial therapy. 621 patients (87%) had a total score < 8 (noncompliance) and 93 patients (13%) scored 8 (compliance).

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