Knowledge, attitudes and practices concerning self-medication with antibiotics among university students in western China

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Abstract

OBJECTIVES To evaluate the knowledge, attitude and behaviours of university students on the use of antibiotics.

METHODS A knowledge–attitude–practice questionnaire was developed and distributed to undergraduate students of Xi’an Jiaotong University, comprising 18 schools/colleges in Shaanxi Province, western China. Chi-square test and logistic regression analysis were applied to identify risk factors associated with self-medication with antibiotics.

RESULTS Of the 731 respondents (response rate = 73.1%), 294 (40.2%) had self-medicated with antibiotics in the past 6 months. Most of the antibiotics (59.2%) for self-medication were purchased without prescription in retail pharmacies. The median score of students’ knowledge about antibiotics was 4 (IQR: 3–6) of a maximum possible score of 10. Students had moderately accurate beliefs towards antibiotics. More than half of the students (56.5%) were storing antibiotics frequently. During self-medication, 16.7% of students claimed to have experienced adverse reactions, and 30.6% had used antibiotics to prevent common colds. The majority preferred to use broad-spectrum antibiotics, and nearly half preferred intravenous antibiotics. Over 44% of students had changed antibiotic dosage, and 36.5% had switched to another antibiotic during the treatment course.

Logistic regression analysis identified college and home town as independent risk factors for self-medication with antibiotics ($P < 0.01$).

CONCLUSIONS Undergraduate students had inadequate knowledge, moderately accurate beliefs and inappropriate practices concerning antibiotics, and a high rate of self-medication. This highlights the need for focused educational intervention and stricter governmental regulation concerning antibiotic use and sale in retail pharmacies.

keywords university students, antibiotic, self-medication, rational use of drugs, knowledge–attitude–practice method

Introduction

Antibiotic resistance is one of the world’s most pressing public health problems. We are at the dawn of a post-antibiotic era (CDC 2013). The appearance of the super bacteria New Delhi metallo-beta-lactamase-1 (NDM-1)-positive Enterobacteriaceae in 2010, which are highly resistant to many antibiotic classes, has raised alarm about antibiotic resistance (Kumarasamy et al. 2010). This resistance may result in longer-lasting illnesses, more hospital stays, the need for more expensive and toxic medications, and even death (Holmberg et al. 1987; Davies 1994; Magee et al. 1999; Fischbach & Evans 2007).

Inappropriate use of antibiotics may contribute to the emergence of antibiotic resistance (Apisarnthanarak et al. 2008; Goossens 2009). Self-medication with antibiotics, in which antibiotics are used without medical consultation, can easily lead to their inappropriate use (Jose et al. 2013), yet this practice is highly prevalent in developing countries with lax regulatory systems (Borg & Scicluna 2002; Morgan et al. 2011; Laxminarayan & Heymann 2012).

Self-medication with antibiotics is also prevalent in China. Even higher rates of self-medication with antibiotics have been reported among Chinese university students...
Self-medication with antibiotics among undergraduates

(Bi et al. 2000; Pan et al. 2012). This requires particular attention for the reasons that higher education level and younger age are risk factors for self-medicating with antibiotics (Kuzujanakis et al. 2003), although the practice may be modifiable through education. At an individual level, knowledge and beliefs affect health-related behaviour, including behaviour concerning antibiotics use (Sawalha 2008; Widayati et al. 2011). Misconceptions about antibiotics among students potentially cause antibiotic abuse.

Given that abuse of antibiotics in undergraduates continues to be a significant problem in both developed and developing countries (Zafar et al. 2008), reducing misconceptions regarding antibiotic use among this population is imperative. Knowledge, attitudes and practices regarding self-medication with antibiotics in developed countries, among undergraduates in particular, have been widely reported (Buke et al. 2005; Grigoryan et al. 2007). A previous study found, at the national level, that a higher gross domestic product (GDP) was independently associated with a lower likelihood of self-medication (Grigoryan et al. 2008). The GDP in western China is lower than in other regions. One survey conducted in well-developed southern China (Pan et al. 2012) revealed a high prevalence of self-medication with antibiotics among university students. However, similar knowledge relating to China’s under-developed western regions is scarce. Therefore, this study was aimed at examining common knowledge, attitudes and beliefs, and practices concerning self-medication with antibiotics among students in a university in western China. The findings may help initiate effective interventions to decrease misconceptions about antibiotic use.

Methods

Study population

The study population consisted of undergraduates at Xi’an Jiaotong University (XJTU), a university comprising 18 colleges in Shaanxi Province, western China. XJTU, covering a broad range of disciplines, such as science, engineering, medicine, economics and management, and liberal arts, has typical representativeness for universities in western China. Of 29,863 students of XJTU, coming from almost all the parts of China, 1000 undergraduates were randomly selected using a stratified sampling method. The study population was randomly selected according to their student ID numbers and stratified according to academy and grade. The number recruits was estimated based on the following factors: expected proportion of the population self-medicating with antibiotics in developing countries ($P = 50\%$); tolerated error/margin of error ($d = 0.05$); confidence interval ($CI = 95\%$); attrition rate $= 1/10$; design effect $= 1.5$ (Verma & Lê 1996). Ethical approval was obtained from the University’s Research Ethics Committee.

Survey instruments

Data were collected using a self-administered, pre-tested questionnaire containing 40 closed questions. The questionnaire consisted of four parts: the first part, which contained ten questions, was designed to obtain demographic data such as gender, grade (college level), college and allowance (living costs). The second part investigated the students’ knowledge of antibiotics, antibiotic resistance and the use of antibiotics. This part contained ten questions, assessed using ‘right’, ‘wrong’ and ‘uncertain’ responses. In the third and fourth parts, five-point Likert scales were used to determine the attitudes and practices, respectively, regarding students’ self-medication with antibiotics. The attitudes and beliefs section focused on the students’ attitudes regarding the selection and patterns of antibiotic use. The practices part evaluated the behaviour of students around the use of antibiotics, and their compliance to dose regimens and duration of treatment courses. Each part contained ten questions. Items in the questionnaire were structured based on published articles where people’s knowledge, attitudes and practices regarding antibiotic use in various countries were assessed (Bi et al. 2000; Belongia et al. 2002; Aronson 2006; Cespedes & Larson 2006; Xu & Yu 2007; You et al. 2008; Pan et al. 2012; Sarahroodi et al. 2012). The questionnaire was pre-tested for content, design, readability and comprehension on 40 students (13 medical students and 27 non-medical students). Necessary modifications were made so that the questionnaire was easy to answer and gave accurate data. The pre-test data were discarded in the final analysis. Cronbach’s alpha was used to assess the reliability of the questionnaire. The alpha coefficients of the knowledge, attitude and practice parts were 0.873, 0.842 and 0.821, respectively, and therefore confirming the adequacy of the internal consistencies of these questions.

Data collection

Information on the aims of our study was provided to the participants before verbal consent was obtained and participation. The final questionnaires were distributed and collected after completion in April and May 2013. To increase the response rate, questionnaires were sent to students and collected face-to-face by investigators.
Respondents were told in a covering letter that the information they provided would be anonymous and would be gathered for the purposes of research.

Data analysis

The data from the completed questionnaire were evaluated for various parameters. The responses from the knowledge, attitudes and beliefs, and practice sections were assessed by calculating the percentage of each response selected. Further, the questions relating to knowledge were estimated using a scoring scheme, with score of 1 for a correct response and 0 for an incorrect or uncertain response. The correct responses to the knowledge items were ‘wrong’ for Q11, and Q13–Q18, and ‘right’ for Q12, Q19 and Q20. The total correct responses were calculated to show the scores of overall knowledge (ranging from 0 to 10). Except for Q29, Q30 and Q40 (response frequencies and percentages for each question were calculated), questions relating to attitudes, beliefs and practices were assessed using the five-point Likert scales scoring scheme: scores of 1, 2, 3, 4 and 5 were assigned to each appropriate attitude item (Q23, Q27 and Q28). Response options were as follows: ‘strongly disagree’, ‘disagree’, ‘uncertain’, ‘agree’ and ‘strongly agree’. Conversely, scores of 5, 4, 3, 2 and 1 were assigned to each inappropriate attitude item (Q21, Q22, Q24, Q25, Q26), with the same response options listed above. Regarding the practice items, scores of 1, 2, 3, 4 and 5 were assigned to each appropriate behaviour item (Q37). Response options were as follows: ‘never’, ‘seldom’, ‘sometimes’, ‘often’ and ‘always’. Conversely, scores of 5, 4, 3, 2 and 1 were assigned to each inappropriate behaviour item (Q31–Q39, except Q37), with the same response options. Moreover, the median total scores based on responses to the three parts (knowledge, attitudes and beliefs, and practices) were estimated, with a maximum possible score of 95 and a minimum score of 17. For quantitative analysis, a score greater than 80% of the possible maximum score was considered good, between 60% and 80% was considered moderate and less than 60% was considered poor (Sawalha 2008). The median total score and the median score for the knowledge, attitudes and beliefs, and practices parts were compared based on the demographics of the students. The frequency of antibiotic use in the previous 6 months was also investigated.

The collected data were processed using the Statistical Packages for Social Sciences (SPSS), version 18.0. Data about demographic and socioeconomic characteristics of the students were presented as a percentage, along with the responses for each item. Because the score is not normally distributed, Wilcoxon rank test and Kruskal–Wallis test were used to evaluate associations between the median score and the characteristics of respondents. Chi-square test and logistic regression analysis were applied to identify risk factors associated with self-medication with antibiotics. The logistic regression model included only the variables significantly and independently associated with self-medication with antibiotics, as shown by the chi-square test. A P value of < 0.05 was considered to be statistically significant.

Results

Of 1000 questionnaires sent out, there were 750 usable returns (75.0% response rate). Nineteen questionnaires were subsequently excluded because of incomplete data, and the final response rate was 73.1% (731/1000). Of the 731 respondents, 294 (40.2%) had self-mediated with antibiotics in the previous 6 months. Most of the respondents (70.0%) characterised their allowance as 500–1000 Yuan (in RMB/month, 82–163 USD). 8% of students mentioned that they were uninsured. The relationships between the median total scores and demographic parameters of respondents are demonstrated in Table 1. The median total score of all respondents was 67 (Interquartile range, IQR: 62–73) of a possible maximum score of 95, meaning that the overall score for respondents was at a moderate level.

Knowledge

Of 731 respondents, 334 (45.7%) obtained information on judicious antibiotic use from instructions, 283 (38.7%) from physicians and 263 (36.3%) from relatives or friends. Only 68 (9.3%) students declared that they obtained information from class teachings. For 307 (42.0%) students, knowledge was based on their previous experience with antibiotics. 489 (66.9%) obtained information from media, including newspapers, magazines, the internet and TV advertisements.

In the knowledge part of the questionnaire, a median score of 4 (IQR: 3–6) was obtained from a maximum of 10. This demonstrated poor knowledge on aspects of antibiotics. The evaluation of the difference in the median score based on demographics of the respondents revealed significant differences in terms of grades (P < 0.001; Kruskal–Wallis test) and colleges (medical students vs. non-medical students, P < 0.001; Wilcoxon rank test), as illustrated in Table 1. Intern students, all of whom worked in hospitals, had significantly better knowledge about antibiotics than other students.

Figure 1 illustrates the responses to questions 11–20. A majority of students (54.8%, 400/731) held misconceptions that antibiotics can prevent skin infections when
they are poured onto wounds and that they can be effective for viral infections (43.8%, 320/731). Almost 28.0% (203/731) of students incorrectly believed that antibiotics are the same as anti-inflammatories. In terms of knowledge regarding antibiotic resistance, most students knew that antibiotic overuse can result in antibiotic resistance (89.5%, 654/731), but fewer than half of the students (42.1%, 308/731) knew that repeated non-compliance with the treatment course would increase bacterial resistance. Meanwhile, fewer than half of the students knew that antibiotics should be purchased with a doctor’s prescription (45.1%, 330/731). 77 (10.5%) students incorrectly believed that broad-spectrum antibiotics are more effective than those with a narrow spectrum, and 311 (42.6%) students believed that intravenous administration is preferable to oral administration under any circumstances.

**Attitudes and beliefs**

In the attitudes and beliefs section, the median score was 29 (IQR: 26–31) from a maximum of 40. The results of the difference in the median attitude score based on demographics of the respondents revealed that there were significant differences in terms of grades ($P = 0.005$; Kruskal–Wallis test), colleges ($P < 0.001$; Wilcoxon rank test) and gender ($P = 0.027$; Wilcoxon rank test), as illustrated in Table 1.

Figure 2 illustrates the responses to questions 21–30. More than 10% (87/731) of students incorrectly believed that antibiotics should be used for common colds. Sixty percentage (440/731) of the respondents agreed that the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed. The number of students who declared that they could cease treatment 1 or 2 days after recovery was 356 (48.7%). 578 (79.1%) students believed that limiting inappropriate use of antibiotics played an important role in preventing the emergence of antibiotic resistance. However, 119 (16.3%) students incorrectly believed that patients could ask physicians to prescribe antibiotics during the visit. The need to obtain further information regarding judicious antibiotic use was reported by 697 (95.4%) students.

**Practice**

The median practice score of 34 (IQR: 31–38) was obtained from a potential maximum of 45. Evaluating

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**Table 1** Median knowledge, belief, behaviour and total score based on demographics

<table>
<thead>
<tr>
<th>Demographic parameters</th>
<th>Total score Median (IQR)</th>
<th>P value</th>
<th>Knowledge score Median (IQR)</th>
<th>P value</th>
<th>Belief score Median (IQR)</th>
<th>P value</th>
<th>Practice score Median (IQR)</th>
<th>P value</th>
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<td>Gender</td>
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<tr>
<td>Female</td>
<td>68 (63–73)</td>
<td>0.062</td>
<td>4 (3–6)</td>
<td>0.507</td>
<td>29 (26–31)</td>
<td>0.027</td>
<td>34 (31–38)</td>
<td>0.093</td>
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<td>5 (3–6)</td>
<td></td>
<td>28 (25–31)</td>
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<td>34 (30–38)</td>
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<tr>
<td>Non-medical</td>
<td>66 (60–71)</td>
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<td>4 (3–5)</td>
<td>&lt;0.001</td>
<td>28 (25–30)</td>
<td>0.001</td>
<td>34 (30–38)</td>
<td>0.445</td>
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<td>Medical</td>
<td>70 (64–74)</td>
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<td>5 (4–7)</td>
<td></td>
<td>30 (27–32)</td>
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<td>34 (31–38)</td>
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<td>Grade (college level)</td>
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<tr>
<td>Freshman</td>
<td>68 (63–72)</td>
<td>0.001</td>
<td>4 (3–5)</td>
<td>0.001</td>
<td>29 (26–30)</td>
<td>0.005</td>
<td>35 (32–38)</td>
<td>0.001</td>
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<td>Sophomore</td>
<td>67 (62–72)</td>
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<td>4 (3–6)</td>
<td></td>
<td>29 (26–31)</td>
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<td>34 (31–37)</td>
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<tr>
<td>Junior</td>
<td>67 (60–73)</td>
<td></td>
<td>4 (3–6)</td>
<td></td>
<td>28 (25–30)</td>
<td></td>
<td>34 (29–38)</td>
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<tr>
<td>Senior</td>
<td>65 (60–72)</td>
<td></td>
<td>5 (3–6)</td>
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<td>28 (25–31)</td>
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<td>33 (30–36)</td>
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<tr>
<td>Intern</td>
<td>74 (70–78)</td>
<td></td>
<td>7 (6–8)</td>
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<td>30 (29–32)</td>
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<td>37 (34–39)</td>
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<td>Home town</td>
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<tr>
<td>Rural</td>
<td>68 (61–73)</td>
<td>0.820</td>
<td>4 (3–6)</td>
<td>0.091</td>
<td>29 (26–31)</td>
<td>0.527</td>
<td>34 (30–38)</td>
<td>0.162</td>
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<tr>
<td>Urban</td>
<td>67 (62–73)</td>
<td></td>
<td>5 (3–6)</td>
<td></td>
<td>29 (26–31)</td>
<td></td>
<td>34 (31–37)</td>
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<tr>
<td>Allowance (living costs, in RMB/month)</td>
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<tr>
<td>≤500</td>
<td>68 (62–74)</td>
<td>0.550</td>
<td>5 (3–6)</td>
<td>0.180</td>
<td>29 (26–31)</td>
<td>0.282</td>
<td>34 (31–38)</td>
<td>0.915</td>
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<tr>
<td>500–1000</td>
<td>68 (61–63)</td>
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<td>5 (3–6)</td>
<td></td>
<td>29 (26–31)</td>
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<td>34 (30–38)</td>
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<td>Whether attend school’s Health insurance</td>
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<tr>
<td>No</td>
<td>68 (61–73)</td>
<td>0.897</td>
<td>4 (3–6)</td>
<td>0.490</td>
<td>28 (25–31)</td>
<td>0.431</td>
<td>35 (30–38)</td>
<td>0.776</td>
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<td>Yes</td>
<td>67 (62–73)</td>
<td></td>
<td>4 (3–6)</td>
<td></td>
<td>29 (26–31)</td>
<td></td>
<td>34 (31–38)</td>
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</table>

IQR, Interquartile range.
Q11) Antibiotics are the same as anti-inflammatories.

Q12) Antibiotic should be purchased with a doctor’s prescription.

Q13) Antibiotic can be effective for viral infections.

Q14) Broad-spectrum antibiotics are more effective than those with a narrow spectrum.

Q15) Antibiotic can prevent skin infections when they are poured onto the wounds.

Q16) Take many types of antibiotics at the same time during the course of a single illness.

Q17) Intravenous administration is preferable to oral administration under any circumstance.

Q18) You can stop treatment as soon as the symptoms had disappeared.

Q19) Antibiotic overuse can result in antibiotic resistance.

Q20) Repeated non-compliance to the treatment course of antibiotic would increase bacterial resistance.

Figure 1 Students’ responses (%) to questions related to knowledge (Q11–Q20).
Q30) What do you think about self-medication with antibiotics?
Q29) Do you agree that it is necessary to get further information regarding judicious antibiotic use?
Q28) Do you agree the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed?
Q27) Do you agree that limiting inappropriate use of antibiotics play an important role in preventing the emergence of antibiotic resistance?
Q26) Do you agree that instruction dosage is not enough to reach the treatment effect?
Q25) Do you agree patients could ask the physician to prescribe an antibiotic during the visit?
Q24) Do you agree that one can self-medicate with antibiotics rather than to see a doctor when he/she got minor illness?
Q23) Do you agree that you could cease treatment one or two days after recovery?
Q22) Do you agree expensive antibiotics are more effective and have less side effect?
Q21) Do you agree you should take antibiotics when got common cold?

**Figure 2** Students' responses (%) to questions related to attitudes and beliefs (Q21–Q30).
the difference in the median practice score based on
demographics of the respondents showed that there was
a significant difference in grade only ($P = 0.001$; Kruskal–Wallis test) (Table 1).

Of the 731 respondents, 294 (40.2%) had self-medi-
cated with antibiotics over the study period. Figure 3
illustrates the responses to questions 31–40. To have
immediate access to antibiotics, 56.5% (413/731) of stu-
dents stored antibiotics frequently, while 16.7% (122/731)
of students had ever experienced adverse reactions
during self-medication. Using antibiotics to prevent the
common cold was reported in 30.6% (244/731) of stu-
dents. Broad-spectrum antibiotics were chosen by 66.8% (488/731) of students, and nearly 50% (365/731) chose
intravenous antibiotics, which they believed could hasten
recovery. To recover more quickly, 19.5% (143/731) of the students reported that they might take multiple anti-
biotics during the course of a single infectious disease.
We found that 81.3% (594/731) of students read the
package insert carefully before taking antibiotics, while
44.5% (325/731) of students changed antibiotic dosage,
and 36.5% (267/731) switched to another antibiotic dur-
ing the treatment course.

Factors associated with self-medication of antibiotics

Table 2 shows the rate of self-medication with antibiot-
ics, taking into account the demographic parameters of
the participants, as well as the odds ratio and 95% confi-
dence intervals. The rate of self-medication was signifi-
cantly affected by college ($P < 0.01$; chi-square test) and
home town ($P < 0.05$; chi-square test). Further logistic
regression analysis showed that medical students self-
medicated with antibiotics 1.612 times more frequently
than non-medical students (95% CI 1.147–2.080, $P = 0.004$),
Those from urban areas were 1.495 times more likely to self-medicate than those from rural areas
(95% CI 1.052–1.916, $P = 0.013$), as shown in Table 3.

Discussion

This descriptive, quantitative study believed to be the first
of its kind conducted in western China, focused on the
knowledge, attitudes and practices of undergraduate stu-
dents and identified the main source of antibiotics and
factors for self-medication.

Knowledge

The results indicated that most of the participants
based the use of antibiotics on their previous expe-
rince. An study of adults (Al-Azzam et al. 2007) found
that the strongest predictor of patients’ belief in the
effectiveness of antibiotics was having previously
received antibiotics for a similar illness. A systematic
review (Yin et al. 2013) found that the percentage of
outpatient encounters in which one antibiotic and two
antibiotics were prescribed was 69.4% and 26.9%,
respectively, in western China. It is probable that phy-
sicians’ inappropriate antibiotic prescribing behaviours
contribute to the misconceptions of patients around
antibiotic use (Cho et al. 2004).

This study revealed that over 40% of students incor-
rectly believed that antibiotics could be helpful for viral
illnesses, similar to findings from the study conducted
in Karachi (Zafar et al. 2008). It is noted that antibiot-
cics certainly do not have any effects against viruses;
however, they may indeed be useful to cure bacterial
superinfections of underlying viral diseases (McCullers
2011). Nearly half of the students incorrectly thought
that they could stop treatment as soon as their symp-
toms had disappeared. Using antibiotics for a short per-
iod of time, or ceasing antibiotic treatment as soon as
the symptoms subside, exposes the infecting or even
commensal bacteria to subtherapeutic levels of the drug
(Austin et al. 1999). This may lead to bacterial resis-
tance.

The study showed that antibiotic knowledge of medical
students is significantly better than that of non-medical
students, and interns also have significantly better knowl-
edge than students of other grades. This may because
medical students receive a series of didactic lectures on
antibiotics and interns practice at hospitals, where they
observe doctors’ antibiotic prescribing practices.

Attitude and beliefs

More than 10% of students incorrectly believed that
antibiotics can cure the common cold, which is in line
with the practice of 30% of the students who fre-
cently used antibiotics for that purpose. With minor
infectious disease, nearly 40% of students strongly
believed in self-medication instead of going to hospital.
This is also a common reason for self-medication with
antibiotics by participants in previous studies (Mainous
et al. 2008).

In the current study, 16.3% of students agreed that
patients could ask the physician to prescribe an antibiotic
during the visit. A previous study showed that doctors
prescribed antibiotics 62% of the time if they thought
patients wanted them, and 7% of the time if they thought
they did not (Mangione-Smith et al. 1999). This proved
that patients’ expectations may contribute to inappropri-
ate antibiotic prescription.
Q40) How often do you experience adverse reactions during self-medication?

Q39) How often do you switch antibiotics during the course of self-treatment?

Q38) How often do you change the dosage during the course of self-treatment?

Q37) How often do you read the instruction in the package insert carefully before taking antibiotics?

Q36) Do you take multiple antibiotics at the same time during the course of a single infectious disease?

Q35) Do you choose more expensive or new antibiotics when you are sick?

Q34) Do you choose intravenous antibiotics earlier when you are sick?

Q33) Do you choose broad-spectrum antibiotics when you are sick?

Q32) How often do you use antibiotics to prevent common cold?

Q31) Do you store antibiotics frequently?

Figure 3 Students’ responses (%) to questions related to practices (Q31–Q40).
Prevalence of and risk factors for self-medication with antibiotics

In our study, 40.2% of respondents reported self-medicating with antibiotics in the previous 6 months. This finding is similar to that of a study (Pan et al. 2012) conducted on university students in southern China (47.8%), but less than findings of a study (Xing & Kang 2007) conducted in Beijing (90.4%). The GDP is lower in western China than in southern China and Beijing. Seeing a doctor is more expensive and requires longer waiting in more developed regions, especially in Beijing. As a result, the rate of self-medication with antibiotics in Shaanxi is lower than the other two regions. We found that the risk factors for self-medication with antibiotics were the students’ college and home town. Students from medical college have a false sense of confidence in self-diagnosis and self-management. Previous studies indicated that the common reasons for self-medication with antibiotics were convenience and cost-savings and that non-prescribed antibiotics can be purchased conveniently and affordably in community pharmacies (Belongia et al. 2002; Aronson 2006; Cespedes & Larson 2006; Xu & Yu 2007; You et al. 2008). Compared with rural areas, access to pharmacies and information is more adequate in urban areas. With the loose regulation regarding the sale of antibiotics in retail pharmacies, students from urban areas may be accustomed to buying antibiotics in retail pharmacies. This may help to explain why students from urban areas prefer to self-medicate.

Regarding the source of antibiotics, most of the students in our study obtained their medication from retail pharmacies without prescription (59.2%). In retail pharmacy settings, sales people often recommend medicines that will gain them more profit. This, coupled with patients’ lack of knowledge about their medications, may

Table 2 Demographic parameters and self-medication with antibiotics among students (n = 731)

<table>
<thead>
<tr>
<th>Demographic parameters</th>
<th>Total students (n = 731) n (%)</th>
<th>Self-medicated students (n = 294) n (%)</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>390 (53.4)</td>
<td>155 (52.7)</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Male</td>
<td>341 (46.6)</td>
<td>139 (47.3)</td>
<td>1.204</td>
<td>0.891–1.627</td>
<td>0.249</td>
</tr>
<tr>
<td>College</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-medical</td>
<td>378 (51.7)</td>
<td>133 (45.2)</td>
<td>1</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Medical</td>
<td>353 (48.3)</td>
<td>161 (54.8)</td>
<td>1.545</td>
<td>1.147–2.080</td>
<td>0.004</td>
</tr>
<tr>
<td>Grade (college level)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>148 (20.2)</td>
<td>61 (20.7)</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Sophomore</td>
<td>238 (32.6)</td>
<td>98 (33.3)</td>
<td>0.981</td>
<td>0.640–1.503</td>
<td>0.930</td>
</tr>
<tr>
<td>Junior</td>
<td>197 (26.9)</td>
<td>70 (23.8)</td>
<td>1.240</td>
<td>0.791–1.942</td>
<td>0.348</td>
</tr>
<tr>
<td>Senior</td>
<td>111 (15.2)</td>
<td>53 (18.0)</td>
<td>0.788</td>
<td>0.468–1.327</td>
<td>0.371</td>
</tr>
<tr>
<td>Intern</td>
<td>37 (5.1)</td>
<td>12 (4.2)</td>
<td>1.696</td>
<td>0.775–3.711</td>
<td>0.522</td>
</tr>
<tr>
<td>Home town</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>326 (44.6)</td>
<td>116 (39.5)</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Urban</td>
<td>405 (55.4)</td>
<td>178 (60.5)</td>
<td>1.420</td>
<td>1.052–1.916</td>
<td>0.013</td>
</tr>
<tr>
<td>Allowance (living costs, in RMB/month)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>≤500</td>
<td>139 (19.0)</td>
<td>58 (19.7)</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>500–1000</td>
<td>447 (61.1)</td>
<td>175 (59.5)</td>
<td>1.141</td>
<td>0.761–1.711</td>
<td>0.522</td>
</tr>
<tr>
<td>1000–2000</td>
<td>131 (17.9)</td>
<td>56 (19.0)</td>
<td>0.995</td>
<td>0.592–1.672</td>
<td>0.986</td>
</tr>
<tr>
<td>&gt;2000</td>
<td>14 (2.0)</td>
<td>5 (1.8)</td>
<td>1.261</td>
<td>0.385–4.129</td>
<td>0.701</td>
</tr>
<tr>
<td>Whether attend school’s health insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>52 (7.2)</td>
<td>15 (5.1)</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yes</td>
<td>679 (92.9)</td>
<td>279 (94.9)</td>
<td>1.721</td>
<td>0.926–3.195</td>
<td>0.106</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval.

Table 3 Logistic regression analysis of factors influencing self-medication with antibiotics among students (n = 731)

<table>
<thead>
<tr>
<th>Demographic parameters</th>
<th>Coefficient (β)</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>College</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-medical</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Medical</td>
<td>0.478</td>
<td>1.612</td>
<td>1.193–2.178</td>
<td>0.002</td>
</tr>
<tr>
<td>Home town</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Urban</td>
<td>0.402</td>
<td>1.495</td>
<td>1.103–2.026</td>
<td>0.010</td>
</tr>
</tbody>
</table>

Prevalence of and risk factors for self-medication with antibiotics

In our study, 40.2% of respondents reported self-medicating with antibiotics in the previous 6 months. This finding is similar to that of a study (Pan et al. 2012) conducted on university students in southern China (47.8%), but less than findings of a study (Xing & Kang 2007) conducted in Beijing (90.4%). The GDP is lower in western China than in southern China and Beijing. Seeing a doctor is more expensive and requires longer waiting in more developed regions, especially in Beijing. As a result, the rate of self-medication with antibiotics in Shaanxi is lower than the other two regions. We found that the risk factors for self-medication with antibiotics were the students’ college and home town. Students from medical college have a false sense of confidence in self-diagnosis and self-management. Previous studies indicated that the common reasons for self-medication with antibiotics were convenience and cost-savings and that non-prescribed antibiotics can be purchased conveniently and affordably in community pharmacies (Belongia et al. 2002; Aronson 2006; Cespedes & Larson 2006; Xu & Yu 2007; You et al. 2008). Compared with rural areas, access to pharmacies and information is more adequate in urban areas. With the loose regulation regarding the sale of antibiotics in retail pharmacies, students from urban areas may be accustomed to buying antibiotics in retail pharmacies. This may help to explain why students from urban areas prefer to self-medicate.

Regarding the source of antibiotics, most of the students in our study obtained their medication from retail pharmacies without prescription (59.2%). In retail pharmacy settings, sales people often recommend medicines that will gain them more profit. This, coupled with patients’ lack of knowledge about their medications, may
lead to the inappropriate use of antibiotics. It is almost 10 years as China’s drug watchdog, the China Food and Drug Administration, announced that the sale of antibiotics without a doctor’s prescription would be prohibited. However, people can still buy almost all types of antibiotics without prescription in retail pharmacies.

Nearly half of the students use previously prescribed antibiotics stored in the household (48.0%). The surplus medicine prescribed the last time reflected the doctor’s over-prescription and/or the patient’s non-compliance with the prescription (Reynolds & McKee 2009), both of which are quite common in China. This study also found that 56.5% of students were storing antibiotics frequently. This behaviour may contribute to antibiotic misuse in the community (Kuzujanakis et al. 2003; McNulty et al. 2007).

Liberal self-medication with antibiotics among students in China should be considered an alarming problem. Immediate action should be taken to alter this trend and to avoid serious health consequences. Firstly, there is an urgent need to improve education on antibiotic treatment and antibiotic resistance in medical curricula and to make use of health centres of universities to provide information on judicious antibiotic use. Secondly, there need to be stricter and more practical regulations enforcing supervision of the sale of antibiotics in retail pharmacies. Finally, the government should deepen the healthcare reform to ensure easy and affordable access to doctors, and eliminate economic incentives for drug sales, thus reduce unnecessary prescribing and overuse of antibiotics.

Limitations of this study included a recall bias in terms of the self-reporting of antibiotic experience and use. It is possible that the study population was not representative of all university students in China, thus limiting the generalisability of our results. This study may have overestimated the prevalence of non-prescription antibiotic use because it was carried out in the capital city, where access to pharmacies and information is more adequate than in rural settings.

Conclusions

The undergraduates’ liberal practice of self-medication with antibiotics in China should be considered an alarming problem. Students’ knowledge about antibiotics seems to be inadequate, and their practices were inappropriate. There is a need for harsher legal regulations and supervision on the sale of antibiotics without prescription in retail pharmacies. Deepening healthcare reform is highly necessary to ensure easy and affordable access to doctors. Health education is also important for students to decrease the inappropriate use of antibiotics and self-medication.

Acknowledgements

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References


Self-medication with antibiotics among undergraduates

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