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In-home antibiotic storage among Australian Chinese migrants



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SUMMARY

Objectives: To estimate the prevalence of in-home antibiotic storage among Australian Chinese migrants and to identify the risk factors associated with storing antibiotics at home.

Methods: Four hundred and sixty-nine Chinese migrants in Australia who were recruited through Chinese social websites completed an online questionnaire about antibiotic use. Logistic regression analysis was conducted to assess the associations between possible risk factors and storing antibiotics at home.

Results: According to the web-based survey, 220 (47%) out of 469 participants reported having antibiotics stored at home. Previous use of antibiotics, bringing antibiotics in from outside Australia, and a pro-attitude to the use of leftover antibiotics were significantly associated with storing antibiotics at home after adjusting for age, gender, and household annual income. Participants who self-reported an awareness of antibiotic side effects or resistance had a slightly higher but not significant risk of storing antibiotics at home.

Conclusions: Approximately half of the participants in this study had antibiotics stored at home. The risk of using the antibiotics stored at home without medical consultation is of concern. Education programs need to target those with high-risk behaviours to curtail the inappropriate practice of antibiotic use and storage among Australian Chinese migrants.

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1. Introduction

Antibiotic resistance is a global public health problem that is difficult to constrain within individual countries.^{1,2} All populations in the world are under threat of “Antibiotic resistance: no action today, no cure tomorrow”.³ However, people are still not prudent when handling antibiotics. Self-medication with antibiotics is a common practice in many countries and generally occurs in conjunction with implications such as taking antibiotics unnecessarily for viral infections, incorrect choices for various bacterial infections, incomplete course of treatment, under-dose, and overdose.^{1,4}

In developing countries, the use of antibiotics without medical consultation is prevalent due to the high cost of healthcare services, misconceptions, and a high expectation of antibiotics.^{5,6} Antibiotics available at home have been found to be an important risk factor for self-medication.^{7,8} In addition,

antibiotics are still freely available for purchase without a medical prescription in many countries, which aggravates self-medication.^{4,9} Migrants from these countries may continue to pursue their inappropriate practices in the new country of residence because of their previous knowledge and experience of antibiotic use.^{10–12} Studies in New Zealand found that misconceptions regarding antibiotics existed and the prevalence of non-prescribed antibiotic use was surprisingly high among Korean and Egyptian immigrant groups.^{10,11}

Australia has an increasing number of immigrants from developing countries including China, India, and other Asian and African countries.¹³ They may have different perceptions towards accessing and use of medicines due to distinctive cultural backgrounds, language, financial situations, and understanding of the medical systems.¹⁴ Thus, the knowledge and attitude towards antibiotics and their use amongst migrants and ethnic minorities in Australia are of concern and yet have not been reported in the literature. This study aimed to estimate the prevalence of in-home antibiotic storage among Chinese migrants who had resided in Australia for longer than 3 months, and to assess risk factors associated with storing antibiotics at home.

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This study provides important information regarding the practice of storing antibiotics at home among Australian Chinese migrants. The findings may also be useful for health professionals so that they are aware and understand the potential risk of Chinese migrants using antibiotics at home without medical consultation.

2. Materials and methods

2.1. Participants and procedures

In this cross-sectional study, participants who self-identified as Chinese and who had resided in Australia for more than 3 months were recruited through several Chinese social websites from July to October 2013. A structured questionnaire on antibiotic use was uploaded onto the University of Queensland Server using 'LimeSurvey', an online survey software.¹⁵ Participants were directed to the survey webpage, where they could complete the survey online, by clicking the provided link in the recruiting advertisement posts on the Chinese social websites. After reading the information about the study, participants were required to provide consent before undertaking the survey.

2.2. Measures

The structured questionnaire was developed in English and translated into both Simplified and Traditional Chinese, then translated back into English. To maintain consistency between the two language versions, the questionnaire was reviewed and revised by other English and Chinese bilingual researchers. The structured questionnaire was further tested and validated through a pilot survey with 10 participants from the targeted sample population.

The dependant variable of this study was measured by asking the following: "Please check if you have stored any antibiotics at home at present". Independent variables included (a) demographic characteristics such as age, gender, education, language, occupation, household annual income, marriage status, and parental status; (b) health-related behavioural factors such as "Do you have private health insurance?", "Are you entitled to the Medicare scheme?", and "Do you have a family doctor?"; (c) knowledge, attitude, and behavioural factors regarding antibiotic use such as "Which one of the following drugs do you think is an antibiotic", "Do you know about the side effects of antibiotics?", "Do you know about antibiotic resistance?", "Did you bring any antibiotics into Australia the last time you visited China or other countries?", "Will you use the leftover medicine if you have similar symptoms?", and "Did you take any antibiotics in the last 12 months?".

2.3. Statistical analysis

Data were exported directly from the LimeSurvey to an Excel file. Means and standard deviations (SD), or numbers and percentages for the demographic characteristics of the total participant population were compared between two groups – those who stored antibiotics at home and those who did not. Chi-square tests and logistic regressions were performed to assess the associations of knowledge and behavioural factors with storing antibiotics at home. All analyses were performed using Stata version 12.¹⁶

3. Results

In total, the survey webpage recorded 600 visits; among these, 469 participants completed the online survey. Out of 469 participants, 220 (47%) claimed to have antibiotics stored at home at the time of the survey. Fifty-five percent of participants were

female. The mean (SD) age of participants was 33 (8.2) years, ranging from 14 to 63 years. Fifty-nine percent of participants had been living in Australia for longer than 5 years and the mean (SD) length of stay in Australia was 6 (4.2) years. Apart from household annual income, most demographic characteristic factors including age, gender, education level, residing states, marriage status, parental status, occupation, and English speaking skills, were not significantly different between the two groups (Table 1).

Distributions of knowledge, behaviour, and attitude factors and their associations with storing antibiotics at home are shown in Table 2. In general, 79% of participants were aware of the potential side effects of antibiotics and 84% of participants were aware of antibiotic resistance. Three hundred and sixty-two (77%) participants could correctly identify amoxicillin as an antibiotic out of three popular drugs including panadol, aspirin, and amoxicillin. Forty percent of participants believed non-prescribed antibiotics should be available for purchase in Australia.

The association of knowledge and attitude towards antibiotics with the storing of antibiotics at home were assessed using multiple logistic regression analysis. The crude and adjusted odds ratios and their 95% confidence intervals are listed in Table 2. After adjusting for age, gender, and household annual income, the following three factors were found to be independently associated with an increased risk of storing antibiotics at home: (1) a pro-attitude to the use of leftover antibiotics, (2) the use of antibiotics in the last 12 months, and (3) bringing antibiotics into Australia from China or another country. Moreover, participants who could identify amoxicillin as an antibiotic appeared to have a higher risk of storing antibiotics at home. Participants who claimed to be aware of antibiotic side effects or antibiotic resistance had a similar or slightly higher but not statistically significant risk of storing antibiotics at home.

4. Discussion

In this web-based bilingual survey, we found that almost half of Chinese migrants had antibiotics stored at home, which could increase the risk of inappropriate antibiotic use without medical consultation. Participants whose household annual income was higher than 50 000 AUD were less likely to store antibiotics at home. We also identified a number of risk factors for storing antibiotics at home including a pro-attitude to the use of leftover antibiotics, the use of antibiotics in the last 12 months, and bringing antibiotics in from outside Australia.

The majority of the participants self-reported being aware of antibiotic side effects and antibiotic resistance, and around three-quarters identified amoxicillin as an antibiotic. We found a slightly higher risk of storing antibiotics at home among those participants who self-reported that they were aware of antibiotic resistance or antibiotic side effects after controlling for age, gender, and household annual income ($p > 0.05$). At the same time we found that participants who could correctly identify amoxicillin as an antibiotic were more than twice as likely to store antibiotics at home as those who were not sure whether amoxicillin was an antibiotic.

There are a number of studies revealing a positive association between having a good knowledge of antibiotics and the use of antibiotics without a medical consultation.^{17–19} Our findings showed that Chinese migrants who self-reported having a good understanding of antibiotics were more likely to store antibiotics at home. In this case, the home antibiotic storage could be an easy and direct source of self-medication among Chinese migrants. Education campaigns are urgently required to minimize in-home antibiotic storage and to ensure safe practice of antibiotic use amongst Chinese migrants.

Table 1Comparison of characteristics between the two groups – those storing antibiotics at home and those not storing antibiotics at home, *n* (%)

| Variables | Storing antibiotics at home | Not storing antibiotics at home | <i>p</i> -Value |
|--|-----------------------------|---------------------------------|-----------------|
| Age, years | | | 0.85 |
| <30 | 75 (34) | 81 (33) | |
| 30–39 | 97 (45) | 115 (47) | |
| ≥40 | 45 (21) | 47 (20) | |
| Gender | | | 0.86 |
| Female | 122 (56) | 136 (55) | |
| Residing state | | | 0.20 |
| New South Wales | 39 (18) | 58 (24) | |
| Queensland | 109 (51) | 104 (43) | |
| South Australia | 8 (4) | 8 (3) | |
| Victoria | 40 (19) | 60 (24) | |
| West Australia | 17 (8) | 14 (6) | |
| Education | | | 0.29 |
| Undergraduate or higher degree | 192 (88) | 210 (85) | |
| Household annual income, AUD | | | 0.006 |
| ≥50 000 | 118 (58) | 160 (71) | |
| Occupation | | | 0.42 |
| Professional | 92 (42) | 113 (46) | |
| Marriage status | | | 0.85 |
| Married | 164 (75) | 186 (75) | |
| Parent | | | 0.997 |
| At least one child | 99 (48) | 112 (48) | |
| Length of residing in Australia, years | | | 0.38 |
| ≥5 | 116 (53) | 141 (58) | |
| Self-reported English proficiency | | | 0.50 |
| Above average | 100 (46) | 127 (51) | |
| Average | 98 (45) | 102 (41) | |
| Poor | 21 (9) | 20 (8) | |
| Main language spoken at home | | | 0.17 |
| English | 15 (7) | 26 (10) | |
| Entitled to Medicare | 187 (86) | 221 (89) | 0.33 |

Table 2

Associations between variables and storing antibiotics at home

| Variables | Storing antibiotics at home | Not storing antibiotics at home | Crude OR (95% CI) | Adjusted OR (95% CI) ^a |
|---|-----------------------------|---------------------------------|-------------------|-----------------------------------|
| Identify amoxicillin is an antibiotic | 188 (85) | 174 (70) | 2.53 (1.59–4.02) | 2.73 (1.63–4.55) |
| Aware of antibiotic side effects | 177 (81) | 193 (78) | 1.18 (0.75–1.85) | 1.15 (0.71–1.87) |
| Aware of antibiotic resistance | 190 (87) | 200 (81) | 1.62 (0.98–2.70) | 1.73 (0.98–3.06) |
| Non-prescribed antibiotics should be available for purchase | 98 (45) | 92 (37) | 1.38 (0.95–2.00) | 1.32 (0.89–1.96) |
| Pro-attitude to the use of leftover antibiotics | 167 (76) | 121 (49) | 3.37 (2.26–5.02) | 3.24 (2.12–4.94) |
| Use of antibiotics in the last 12 months | 110 (51) | 79 (33) | 2.12 (1.45–3.09) | 2.09 (1.40–3.13) |
| Brought antibiotics into Australia in the last 12 months | 114 (52) | 34 (14) | 6.80 (4.34–10.65) | 6.18 (3.84–9.94) |

OR, odds ratio; CI, confidence interval.

^a Adjusted for age, gender, and household annual income.

In-home antibiotic storage could increase the risk of self-prescription of antibiotics to families and friends.^{4,20} In a review of 17 studies on non-prescribed antibiotic use, the sources of non-prescription antimicrobials included pharmacy or friends and family members.⁴ A survey of in-home drugs in the United Kingdom reported that around 13.9% of participating households had antibacterial drugs including current prescriptions and leftover and standby antibacterial drugs.⁷ Studies among Latino immigrants to the USA found that they tended to obtain antibiotics from leftovers or outside the country.²¹

In Australia, antibiotics are restricted from sale over the counter without a prescription. However we found a considerable number of participants claimed to have brought antibiotics into Australia from China or other countries where they could obtain antibiotics without a prescription. The risk of storing antibiotics at home among participants who had reported bringing antibiotics in from outside Australia was about six times that among those who had not. We did not measure how many participants had kept leftover drugs directly; instead we found that participants who would use

leftover antibiotics for similar symptoms had three times the risk of storing antibiotics at home as those who would not use leftover antibiotics. The reported in-home storage of antibiotics may consist of leftover antibiotics and antibiotics that the Chinese migrants had brought in from outside Australia.

In addition, participants who had used antibiotics in the last 12 months were found to have a higher risk of storing antibiotics at home. Given the fact that we did not separate the antibiotic consumption by prescribed and non-prescribed antibiotic use, the elevated risk could be due to participants storing leftover antibiotics or having non-prescribed antibiotics available at home, or a combination of the two. Our findings suggest that education campaigns should include the appropriate administration of antibiotics, the avoidance of leftover antibiotics, the correct disposal of leftover drugs, and the harmful effects of consuming non-prescribed antibiotics in the Chinese migrant community.

We have identified several risk behaviours around antibiotic use in this population. Despite a self-reported good understanding of antibiotics, Chinese migrants may have a high risk of keeping

and consuming leftover antibiotics as well as bringing antibiotics into the country from outside Australia. Furthermore, 40% of participants claimed that antibiotics should be available for sale without prescription in Australia. Health education campaigns should be targeted at Chinese migrants with the above risk behaviours to ensure the safe practice of antibiotic use in the community.

We acknowledge that there are several limitations in this study. First, the results were based on participant response data. Since we could not verify the storage of antibiotics in person, the prevalence of in-home antibiotic storage was likely to be under-reported.⁷ Second, 107 (23%) participants could not correctly identify amoxicillin as an antibiotic out of three popular drugs including panadol, aspirin, and amoxicillin. The reported storage of antibiotics at home among this group may not accurately reflect the real stock. Third, the study sample may not be representative of the whole Chinese migrant community. Participants were recruited from Chinese social websites. As a result, participants were generally young and well educated. The results may not represent the actual behaviour of those elder Chinese migrants who might be more likely to use and store their medications inappropriately.^{22,23} Participants were residing in five different states of Australia when they completed the survey. In some states, the number of participants was small.

In conclusion, we identified a high prevalence of storing antibiotics at home among Australian Chinese migrants. The risk of using antibiotics stored at home without medical consultation is of concern. Education programs should be targeted at migrants with a pro-attitude to the use of leftover antibiotics and those migrants who would bring antibiotics into the country from outside Australia. Further investigations are needed to understand the mechanism and consequences of self-medication with antibiotics including dosing, course of treatment, and choice of antibiotics in this population.

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Conflict of interest: The authors declare no conflicts of interest.

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