International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 16; Issue: 11; November 2026
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Self-Medication and Non-Prescription Antibiotic Use Among Adults in an Urban Community of Ajmer, Rajasthan: A Community-Based Cross-Sectional Study

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DOI: https://doi.org/10.52403/ijhsr.20261101

Received: 16/05/2026; Revised: 06/09/2026; Accepted: 29/10/2026

ABSTRACT

Background: Self Medication, Especially the use of Antibiotics without Prescription may contribute to adverse drug event and antimicrobial resistance. There is limited Community Based evidence from Rajasthan regarding the extent of self-medication and use of antibiotic without prescription.
Objectives: To estimate the prevalence of self-medication among adults in an urban community of Ajmer, to identify its independent associated factors, and to describe patterns of non-prescription antibiotic use (classified by the WHO AWaRe system), reasons and medicine-safety knowledge.
Materials and Methods: A community-based cross-sectional study was carried out from May 2024 to April 2025 among 250 adults aged 18 years and above residing in Dholabhata Colony, Ajmer. Participants were selected using systematic random sampling. Data were collected by a pretested, interviewer-administered, semi-structured questionnaire. Self-medication was defined as use of a medicine without prescription from a registered practitioner in the preceding six months. Associations were examined using chi-square or Fisher's exact tests and multivariable binary logistic regression (adjusted odds ratios, aOR, with 95% confidence intervals, CI).
Results: The prevalence of self-medication was 45.6% (114/250; 95% CI 39.4-51.8). In multivariable analysis, illiteracy (aOR 3.10, 95% CI 1.21-7.95) and business occupation (aOR 2.58, 95% CI 1.16-5.75) were independently associated with self-medication. Pharmacies without prescription were the main source of medicines (77.2%); fever (74.6%), cold/cough (64.0%) and headache (47.4%) were the commonest indications. Non-prescription antibiotics were used by 32 participants (12.8% of all participants; 28.1% of self-medicators). Of the 23 who could name the antibiotic, 16 (69.6%) had used a WHO 'Watch' antibiotic, mainly azithromycin, and 9 of 32 (28.1%) could not name it. Keeping leftover medicines at home was strongly associated with antibiotic use (aOR 3.61, 95% CI 1.51-8.61). Only 34.2%, 24.6% and 19.3% knew the correct dose, adverse effects and antibiotic course, respectively.

Conclusion: Nearly half of the adults in this urban community reported self-medication, with pharmacies being the main source of medicines. Antibiotic use without prescription was also reported, and Watch-group antibiotics accounted for a considerable proportion of the antibiotics that participants could name. The findings indicate a need for better community awareness, counselling by pharmacists and appropriate enforcement of prescription-only antibiotic dispensing.

Keywords: Self-medication; Adults; Community-based study; Primary care; Antibiotic use; Rajasthan

What is already known: Self-medication is common in India, and pharmacies are an important source of medicines. However, information on antibiotic use without prescription in community settings in Rajasthan is limited.

What this study adds: This study provides community-based data from urban Ajmer on the prevalence and factors associated with self-medication. It also describes non-prescription antibiotic use according to the WHO AWaRe classification and shows an association between keeping medicines at home and antibiotic use without prescription.

INTRODUCTION

Self-medication refers to the selection and use of medicines by individuals to manage self-recognized illnesses or symptoms without direct consultation with a qualified healthcare professional [1]. It is an integral component of the broader concept of self-care, which the World Health Organization (WHO) defines as the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness, either independently or with the support of healthcare professionals [2,3]. Appropriate self-care can support formal health services, but it should not replace professional care. It requires reliable information, appropriate regulation and access to quality health services. [2,3].

Self-medication may provide quick and convenient relief for minor illnesses, but inappropriate use can lead to several health risks. These include incorrect self-diagnosis, delayed recognition of serious disease, inappropriate dose or duration, drug interactions, adverse effects and use of medicines that require professional supervision [4,5]. The public effects on health are particularly serious when antibiotics are used without prescription, because irrational antimicrobial use drives antimicrobial resistance [6].

Self-medication is widespread in India, although estimates vary substantially with setting, population, recall period and operational definition. A recent systematic review and meta-analysis of Indian studies reported a high pooled burden and considerable heterogeneity [7]. Community studies show marked regional variation. In an urban-slum population in Jabalpur, Jain et al. reported a prevalence of 42.7%, with pharmacies the dominant source of medicines and perceived simple illness an important reason [8]. In western India, Limaye et al. found a higher prevalence in urban than in rural participants, underlining the influence of local access and health-seeking context [9]. High burdens have also been documented in urban Puducherry [10], among students in coastal South India [11], and in Bhutan and Bangladesh [12].

Retail pharmacies are an important source of medicines for people who self-medicate. They are often the most accessible point of contact for people seeking rapid relief, but inappropriate dispensing of prescription medicines increases medicine-related harm. Community pharmacists can be part of the solution through counselling, referral of patients with warning symptoms and antimicrobial stewardship [13].

Evidence from Rajasthan on community self-medication remains limited, and few community studies characterize the

antibiotics actually used without prescription or the household factors that sustain such use. Classifying antibiotics by the WHO AWaRe (Access, Watch, Reserve) framework provides a useful way to describe the antibiotics used without prescription. We therefore aimed to estimate the prevalence of self-medication among adults in an urban community of Ajmer district and to identify its independent associated factors (primary objectives), and to describe patterns of non-prescription antibiotic use by AWaRe group, factors associated with it, reasons for self-medication and selected medicine-safety knowledge indicators. These findings may help public-health programmes and family physicians plan interventions to promote safer medicine use in the community.

MATERIALS AND METHODS

Study design and setting

A community-based cross-sectional study was conducted in Dholabhata Colony, Ajmer City, Rajasthan, an urban field-practice area of the Department of Community Medicine, Jawaharlal Nehru Medical College, Ajmer, from May 2024 to April 2025. The study is reported according to the STROBE guidelines for cross-sectional studies.

Study population

Adults aged 18 years and above residing in the study area were eligible. Individuals who were seriously ill, unable to participate in the interview, or had cognitive or communication difficulties preventing reliable responses were excluded.

Sample size and sampling

The sample size was calculated using an expected self-medication prevalence of 42.7% [8], a 95% confidence level and 15% relative precision ($n = Z^2pq/d^2$), giving a minimum of 230, which was rounded up to 250. The achieved sample gave a 95% CI half-width of about 6 percentage points for the prevalence estimate. For the multivariable model, the 114 self-medicating participants provided about 16 events per estimated parameter, above the commonly used minimum of 10.

Approximately 1,000 households were present in three wards of the study area. Systematic random sampling was used, selecting every fourth household after a random starting household. Where more than one eligible adult was present, one was chosen by lottery. If the selected participant was unavailable after three visits, the next household was approached, until 250 participants were enrolled.

Data collection

Data were collected during house-to-house visits using an interviewer-administered, semi-structured questionnaire developed after reviewing the literature. The questionnaire was pretested on 20 individuals outside the study area to assess clarity and acceptability. It covered sociodemographic characteristics, self-medication during the preceding six months, source of medicine, source of information, symptoms treated, non-prescription antibiotic use, reasons, and selected knowledge indicators.

Operational definition

Self-medication was defined as using or buying a medicine without a prescription from a registered medical practitioner (including allopathic and AYUSH practitioners) during the preceding six months.

Non-prescription antibiotic use was defined as use of an antibiotic, among those who self-medicated, without a prescription. Antibiotics named by participants were classified using the WHO 2023 AWaRe classification **[14]**. Participants were also asked whether they kept leftover or stored medicines at home for future use.

Statistical analysis

Data were analysed using IBM SPSS Statistics version 29. Categorical variables were summarized as frequencies and percentages. Associations between

sociodemographic variables and self-medication were assessed using Pearson's chi-square test, or Fisher's exact test where any expected cell count was <5. Crude ORs with 95% CIs were calculated using prespecified reference categories.

Because self-medication was a binary outcome (yes/no), multivariable binary logistic regression was used to identify independent associated factors. Variables with P<0.20 on bivariate analysis were included in the multivariable model using the enter method. Categorical predictors were entered as indicator variables against the reference categories in Table 1. Multicollinearity was assessed using variance inflation factors, and model fit using the Hosmer-Lemeshow test and Nagelkerke R^2. A sensitivity model including all sociodemographic variables (except religion, because of very small numbers in one category) was also fitted. Results are presented as adjusted ORs (aORs) with 95% CIs. A two-sided P value <0.05 was considered statistically significant.

For the secondary analysis of antibiotic use among self-medicators (n=114, 32 events), sociodemographic and behavioural factors were compared using chi-square or Fisher's exact tests. Because of the small number of events, the adjusted analysis was restricted to two predictors (stored medicines at home and sex) and is considered exploratory.

Ethical Approval

The study was approved by the Institutional Ethics Committee of Jawaharlal Nehru Medical College, Ajmer. Written informed consent was obtained from all participants. Participation was voluntary and confidentiality was maintained.

RESULTS

A total of 250 adults were included. Self-medication during the preceding six months was reported by 114 participants, a prevalence of 45.6% (95% CI 39.4-51.8).

Table 1 summarizes participants' sociodemographic characteristics and their bivariate association with self-medication. Educational status was the only variable with a statistically significant overall association (P=0.022). Illiterate participants had higher crude odds of self-medication than graduates/postgraduates (OR 2.47, 95% CI 1.01-6.04), but the pattern across intermediate education levels was non-linear. Age group 36-45 years also had higher crude odds than the youngest group (OR 2.43, 95% CI 1.01-5.85), although the overall association for age was not significant (P=0.261). Gender, income, occupation (P=0.098), marital status, religion and medical background (P=0.154) showed no significant association at the 5% level.

Table 1. Sociodemographic characteristics and their association with self-medication (N=250)

Characteristic	Total, N (%)	Self-medication, n (%)	Crude OR (95% CI)	P value
Age (years)				**0.261**
18-25	33 (13.2)	11 (33.3)	1 (Reference)	
26-35	50 (20.0)	25 (50.0)	2.00 (0.80-4.98)	
36-45	62 (24.8)	34 (54.8)	2.43 (1.01-5.85)	
46-60	79 (31.6)	34 (43.0)	1.51 (0.65-3.53)	
>60	26 (10.4)	10 (38.5)	1.25 (0.43-3.65)	
Gender				0.726
Male	166 (66.4)	77 (46.4)	1 (Reference)	
Female	84 (33.6)	37 (44.0)	0.91 (0.54-1.54)	
Education				0.022
Graduate/Postgraduate	96 (38.4)	43 (44.8)	1 (Reference)	
Secondary/Senior secondary	78 (31.2)	38 (48.7)	1.17 (0.64-2.13)	

Characteristic	Total, N (%)	Self-medication, n (%)	Crude OR (95% CI)	P value
Primary	49 (19.6)	15 (30.6)	0.54 (0.26-1.13)	
Illiterate	27 (10.8)	18 (66.7)	2.47 (1.01-6.04)	
Monthly income (INR)				0.411
Nil	78 (31.2)	32 (41.0)	1 (Reference)	
<10,000	51 (20.4)	27 (52.9)	1.62 (0.79-3.29)	
10,000-25,000	66 (26.4)	34 (51.5)	1.53 (0.79-2.96)	
25,000-50,000	41 (16.4)	16 (39.0)	0.92 (0.42-1.99)	
>50,000	14 (5.6)	5 (35.7)	0.80 (0.24-2.61)	
Occupation				0.098
Unemployed	90 (36.0)	36 (40.0)	1 (Reference)	
Business	40 (16.0)	23 (57.5)	2.03 (0.95-4.32)	
Government/retired	33 (13.2)	11 (33.3)	0.75 (0.32-1.73)	
Private sector/Labour	87 (34.8)	44 (50.6)	1.53 (0.85-2.78)	
Marital status				0.374
Unmarried/Other	50 (20.0)	20 (40.0)	1 (Reference)	
Married	200 (80.0)	94 (47.0)	1.33 (0.71-2.50)	
Religion				1.000*
Hindu	246 (98.4)	112 (45.5)	1 (Reference)	
Other (including Muslim)	4 (1.6)	2 (50.0)	1.20 (0.17-8.63)	
Medical background				0.154
Yes	68 (27.2)	36 (52.9)	1 (Reference)	
No	182 (72.8)	78 (42.9)	0.67 (0.38-1.17)	

*OR, odds ratio; CI, confidence interval. P values are from Pearson's chi-square test; *Fisher's exact test.*

Education, occupation and medical background (P<0.20) were entered into the multivariable logistic regression model (Table 2). The model was statistically significant (omnibus χ^2 = 20.58, df = 7, P=0.004) and showed adequate fit (Hosmer-Lemeshow P=0.607; Nagelkerke R^2 = 0.106); no multicollinearity was detected (maximum VIF 1.35). After adjustment, illiterate participants had about three times the odds of self-medication compared with graduates/postgraduates (aOR 3.10, 95% CI 1.21-7.95), and participants in business had 2.6 times the odds of those who were unemployed (aOR 2.58, 95% CI 1.16-5.75). Private-sector/labour occupation showed a similar but non-significant trend (aOR 1.86, 95% CI 0.98-3.50), and absence of a medical or health-care background in the family was not significantly associated with self-medication (aOR 0.61, 95% CI 0.34-1.12). In a sensitivity model including all sociodemographic variables except religion (only four participants in one category), the association for illiteracy persisted (aOR 3.73, 95% CI 1.23-11.30).

Table 2. Multivariable binary logistic regression of factors associated with self-medication (N=250)

Variable (reference category)	Adjusted OR (95% CI)	P value
Education (Graduate/Postgraduate)		
Secondary/Senior secondary	1.23 (0.66-2.28)	0.511
Primary	0.59 (0.27-1.25)	0.169
Illiterate	3.10 (1.21-7.95)	0.019
Occupation (Unemployed)		
Business	2.58 (1.16-5.75)	0.020

Variable (reference category)	Adjusted OR (95% CI)	P value
Government/retired	0.80 (0.33-1.91)	0.613
Private sector/Labour	1.86 (0.98-3.50)	0.057
Medical background (Yes)		
No	0.61 (0.34-1.12)	0.109

aOR, adjusted odds ratio. Model: omnibus $\chi^2 = 20.58$, df = 7, P = 0.004; Hosmer-Lemeshow P = 0.607; Nagelkerke $R^2 = 0.106$; maximum VIF = 1.35.

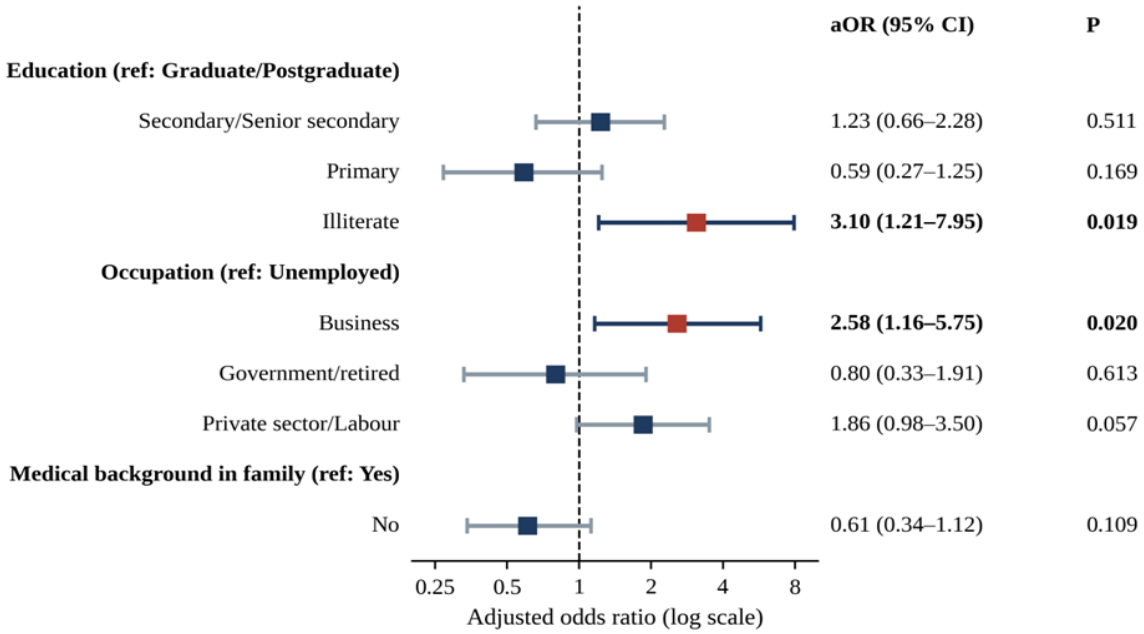


Figure 1. Adjusted odds ratios (95% CI) for factors associated with self-medication (multivariable logistic regression).

Among those who self-medicated, most obtained medicines from pharmacies without a prescription (Table 3). Previous experience was the leading source of information (Figure 2). Medicines were mostly used for the participant (94 of 114; 82.5%), followed by a child (8.8%) or other relatives. Besides fever, cold/cough and headache, abdominal pain (25.4%) and joint pain (21.9%) were treated. Other reasons for avoiding a doctor included belief that doctors would prescribe the same medicine (23.7%) and unavailability of doctors (19.3%). Key patterns and reasons are summarized in Table 3.

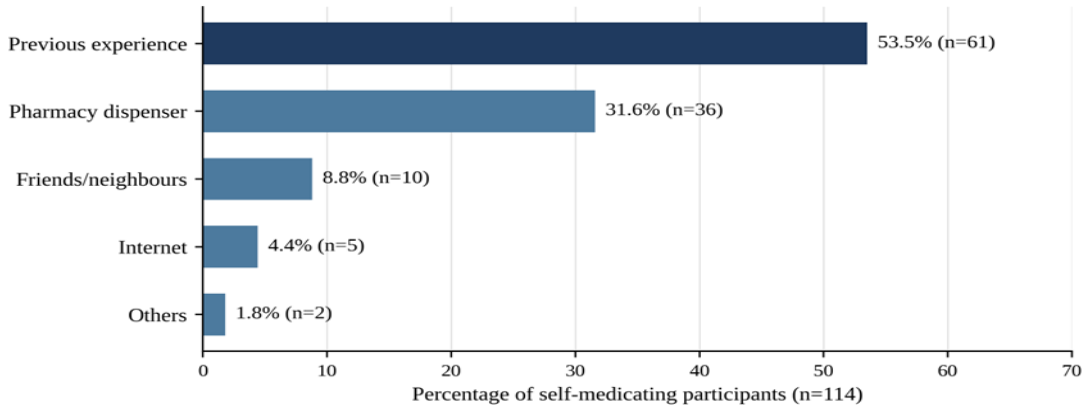


Figure 2. Principal sources of information for self-medication among participants (n=114).

Table 3. Key patterns and reasons for self-medication among self-medicators (n=114)

Characteristic	n (%)
Source of medicine	
Pharmacy without prescription	88 (77.2)
Leftover medicine at home	22 (19.3)
Family/relatives	4 (3.5)
Frequency of self-medication episodes	
Once	8 (7.0)
2-3 times	66 (57.9)
4 or more times	40 (35.1)
Commonest symptoms treated†	
Fever	85 (74.6)
Cold/cough	73 (64.0)
Headache	54 (47.4)
Main reasons for self-medication†	
Illness perceived as minor	95 (83.3)
Previous experience	93 (81.6)
Pharmacy nearby	87 (76.3)
Time saving	84 (73.7)
Medicines affordable	59 (51.8)
Hospital far from residence	54 (47.4)
Leftover medicines stored at home	
Yes	**36 (31.6)**

†Multiple responses permitted; percentages may exceed 100. Other symptoms, reasons and the person for whom medicine was used are given in the text.

Non-prescription antibiotic use

Thirty-two participants reported antibiotic use without prescription, corresponding to 12.8% of all participants (95% CI 8.7-16.9) and 28.1% of self-medicators (95% CI 19.8-36.3). Twenty-three (71.9%) could name at least one antibiotic, whereas nine (28.1%) could not. Azithromycin was named most often (13 participants), followed by amoxicillin (6), cefixime (3), doxycycline (2) and amoxicillin-clavulanate (2) (Table 4). By AWaRe group, 16 of the 23 participants who named an antibiotic (69.6%) had used at least one Watch antibiotic (azithromycin or cefixime) and 10 (43.5%) at least one Access antibiotic, three having used both; no Reserve antibiotic was reported. Of 26 antibiotic mentions, 16 (61.5%) were Watch and 10 (38.5%) were Access agents.

Table 4. Antibiotics used without prescription, by WHO AWaRe group (n=32)

Antibiotic (as named)	WHO AWaRe group	Participants, n (%)
Azithromycin	Watch	13 (40.6)
Cefixime	Watch	3 (9.4)
Amoxicillin	Access	6 (18.8)
Doxycycline	Access	2 (6.3)
Amoxicillin-clavulanate	Access	2 (6.3)
Any Watch antibiotic		16 (50.0)
Any Access antibiotic		10 (31.3)

Percentages are of the 32 antibiotic users; nine could not name the antibiotic. Participants could name more than one antibiotic. AWaRe group per WHO 2023 [14].

Keeping leftover medicines at home was the strongest correlate of antibiotic use (Table 5): 17 of 36 participants (47.2%) who stored medicines used antibiotics without prescription, compared with 15 of 78 (19.2%) who did not (crude OR 3.76, 95% CI 1.58-8.91). The association persisted after adjustment for sex (aOR 3.61, 95% CI 1.51-8.61; P=0.004). Four participants reported keeping azithromycin at home. Antibiotic use also varied by occupation (P=0.042), being lowest among business owners (8.7%), although cells were sparse and this result should be interpreted cautiously. Sex, age, education, income, medical background, source of medicine and knowledge of the antibiotic course were not significantly associated with antibiotic use.

Table 5. Factors associated with non-prescription antibiotic use among self-medicators (n=114)

Characteristic	Antibiotic use, n/N (%)	P value
Stored medicines at home: Yes	17/36 (47.2)	0.002
Stored medicines at home: No	15/78 (19.2)	
Occupation: Unemployed	14/36 (38.9)	0.042*
Occupation: Business	2/23 (8.7)	
Occupation: Government/retired	5/11 (45.5)	
Occupation: Private sector/Labour	11/44 (25.0)	

*P values from Pearson's chi-square test. *Sparse cells (expected count <5); interpret with caution. Sex, age, education, income, medical background, source of medicine and knowledge of antibiotic course were not significantly associated (all P>0.05).*

Knowledge regarding safe medicine use was limited (Figure 3). Only 34.2% knew the correct dose, 24.6% were aware of adverse effects and 19.3% knew the antibiotic course or frequency, whereas 62.3% knew that self-medication should be avoided in pregnancy.

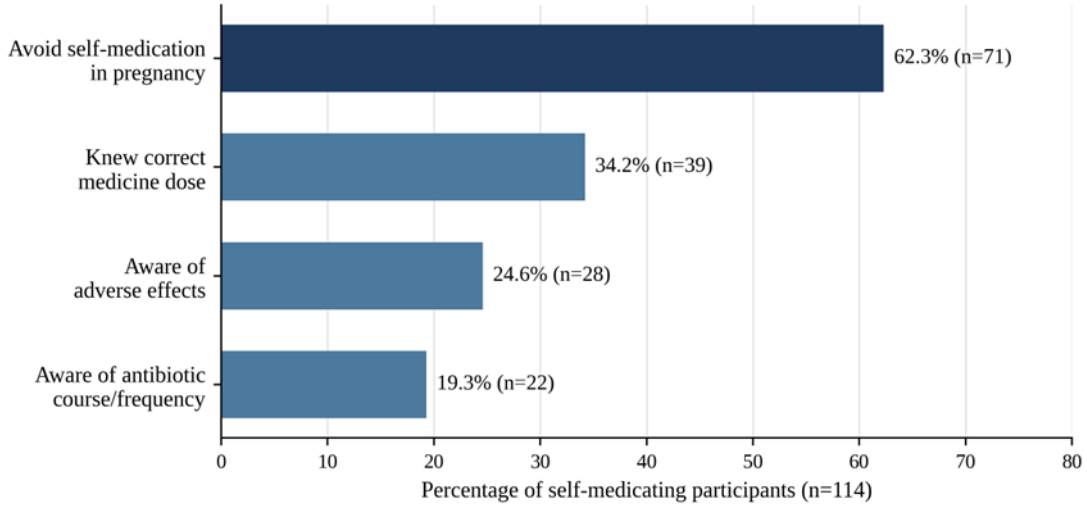


Figure 3. Selected knowledge indicators regarding safe medicine use among participants (n=114).

DISCUSSION

In our study, 45.6% of participants reported using or purchasing medicines without a prescription during the previous six months. Thus, self-medication was fairly common in the study population The estimate is close to the 42.7% reported by Jain et al. in urban Jabalpur [8]. Differences in recall period, population and operational definitions

contribute to the heterogeneity seen across Indian studies [7].

Educational status was significantly associated with self-medication, with the highest odds among illiterate participants (crude OR 2.47; adjusted OR 3.10 vs graduates/postgraduates). The findings suggest that education alone may not explain the differences in self-medication. Health literacy, socioeconomic conditions and health-seeking behaviour may also play a role. The association remained after adjustment for occupation and family medical background. However, the relationship between educational status and self-medication may also be influenced by health literacy and other social factors. The higher odds among business owners may reflect time pressure and flexible access to local pharmacies, but this was not explored and should be interpreted cautiously, given the wide confidence interval and the exploratory nature of the model.

Pharmacies were the principal source of non-prescribed medicines, accounting for over three-quarters of episodes. This mirrors findings from western and central India [8,9] and from other developing regions [15]. Community pharmacies may therefore have an important role in reducing inappropriate self-medication: while they can facilitate inappropriate access to prescription medicines, Trained pharmacists can provide counselling, identify warning signs and help reduce inappropriate antibiotic use [13].

Previous experience was the most commonly reported source of information for self-medication. Combined with the predominance of fever and cold/cough as indications, These findings suggest that convenience and the perception that the illness is minor are important reasons for self-medication. Just over half of self-medicating participants cited affordability. Given high out-of-pocket health expenditure in many Indian communities, self-medication may be seen as a cheaper alternative to a formal consultation.

Non-prescription antibiotic use was reported by 12.8% of all participants and 28.1% of self-medicators. The quality of this use is as concerning as its frequency: among those who named the antibiotic, most had used a Watch-group agent, chiefly azithromycin, and Access-group agents made up only 38.5% of named mentions, well below the WHO target that at least 60% of antibiotic consumption should come from the Access group [14]. This comparison is indicative only, because the WHO target concerns total consumption rather than self-reported episodes. In addition, nearly three in ten participants could not name the antibiotic they had taken, and only 19.3% of self-medicators knew the correct course. These findings indicate gaps in knowledge about antibiotic selection and duration of treatment, which may contribute to inappropriate antibiotic use. [6].

Keeping leftover medicines at home was the strongest correlate of antibiotic use (aOR 3.61). Household stocks probably allow repeat use without any fresh contact with a pharmacist or clinician, and four participants reported keeping azithromycin. Reverse causation is possible in a cross-sectional design, since people who have used antibiotics are more likely to have leftover doses. Keeping medicines at home may be an important area for intervention. People should be encouraged to complete prescribed courses and safely dispose of unused medicines. However, this finding was based on only 32 events and needs confirmation in larger studies. Knowledge indicators revealed substantial safety gaps: only about a third knew the correct dose and fewer than a quarter were aware of adverse effects or the appropriate antibiotic regimen. Self-care requires an enabling environment of reliable information and appropriate regulation [2,3].

The findings have some practical implications. First, pharmacist-led counselling and antimicrobial stewardship should focus on Watch-group antibiotics and on fever and cold/cough, the commonest indications for self-treatment.

Second, community education should prioritize less-educated adults and should also reach self-employed people, for example through market-based outreach. Third, regulators should strengthen enforcement of prescription-only dispensing of antibiotics, while primary-care teams add brief medicine-safety and safe-disposal counselling to routine contacts.

Strengths and limitations

Strengths include the community-based design with systematic random sampling, a pre-specified multivariable analysis, and classification of antibiotics by the WHO AWaRe framework. Limitations should be considered. The study was conducted in a single urban colony with 250 participants, which limits generalizability and the power to detect modest associations. The sample was male-predominant (66.4%), possibly reflecting who was available at home, and prevalence may differ if men and women self-medicate differently. Self-medication was self-reported over a six-month recall period, so recall and social-desirability bias are possible; antibiotics were identified from participants' own naming (28.1% could not name the drug), which may misclassify AWaRe groups, and use was not verified against pharmacy records or packaging. The questionnaire was pretested but not formally validated. Knowledge items were asked only of self-medicators, so comparison with non-users is not possible. The antibiotic analysis rested on 32 events and is exploratory, and the many bivariate comparisons may have produced chance findings, such as the occupation association. Finally, the cross-sectional design precludes causal inference.

CONCLUSION

Nearly half of the adults in this urban community practised self-medication, facilitated by easy pharmacy access and reliance on previous experience. Illiteracy and business occupation were independently associated with self-medication. About one in eight adults used antibiotics without prescription, predominantly Watch-group agents, and keeping leftover medicines at home was strongly linked to this use. Improving community awareness, pharmacist counselling, safe disposal of unused medicines and prescription-only dispensing of antibiotics may help promote safer medicine use.

Declaration

Informed Consent: Written informed consent was obtained from all participants.

Thesis Statement: This paper is derived from a thesis submitted in partial fulfilment of the requirements for the degree of MD (Community Medicine), Department of Community Medicine, Jawaharlal Nehru Medical College, Ajmer.

Use of AI assistance: The authors used an AI language assistant (Claude, Anthropic) to assist with statistical code checking, language editing and manuscript formatting. All data were collected by the authors, and the authors verified all results, interpretations and references and take full responsibility for the content.

Data availability: The dataset is available from the corresponding author on reasonable request.

Ethical Approval: Approved by the Institutional Ethics Committee, Jawaharlal Nehru Medical College, Ajmer. IEC approval number: [02555/Acad - III/MCA/2024]; date: [24-08-2024].

Acknowledgement: The authors thank the study participants and the Department of Community Medicine, Jawaharlal Nehru Medical College, Ajmer, for their support.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Kalal MK, Khanna M, Joshi DP, Kumar A, Saini Y. Self-medication and non-prescription antibiotic use among adults in an urban community of Ajmer, Rajasthan: a community-based cross-sectional study. *Int J Health Sci Res.* 2026; 16(11):1-11. doi: *https://doi.org/10.52403/ijhsr.20261101*

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