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Distribution and Determinants of Antibiotic Self-Medication: A Cross-Sectional Study in Chinese Residents

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Abstract: Antimicrobial resistance (AMR) represents a critical global health threat, with inappropriate antibiotic self-medication (ASM) being a key contributor. China—as the world's largest antibiotic consumer—faces significant challenges despite regulatory efforts, compounded by limited contemporary data during the COVID-19 pandemic. A nationwide cross-sectional study was conducted using the 2021 China Family Health Index Survey (n=11,031 participants across 120 cities). Trained investigators administered face-to-face questionnaires assessing ASM practices, decision-making factors, and sociodemographic characteristics. Multivariate logistic regression identified determinants of ASM. Overall ASM prevalence was 33.7% (n=3,717), with no urban-rural difference (p>0.05). Physician advice (78.2%), drug safety (67.1%), and efficacy (64.2%) were primary selection criteria; rural residents prioritized drug price and salesperson recommendations more than urban counterparts (p<0.01). Key predictors included higher ASM odds among females (OR=1.30, 95%CI:1.18-1.43), middle-aged adults (46-59 years; OR=1.20, 95%CI:1.02-1.42), those with health insurance (resident: OR=1.33; commercial: OR=1.62), and individuals with drinking histories (OR=1.20, 95%CI:1.10-1.31). Lower odds were associated with primary education (OR=0.69, 95%CI:0.58-0.81), unemployment (OR=0.88, 95%CI:0.79-0.98), and absence of chronic diseases (OR=0.56, 95%CI:0.47-0.67). One-third of Chinese residents engaged in ASM during the pandemic, driven by intersecting demographic and behavioral factors. Despite converging urban-rural prevalence rates, distinct decision-making drivers necessitate context-specific interventions, including strengthened pharmacy regulation in rural areas, tailored education programs for high-risk groups, and insurance system reforms to disincentivize self-medication.

Keywords: antibiotic self-medication; antimicrobial resistance; determinants; distribution; china

1. Introduction

Antimicrobial resistance (AMR) constitutes a critical global health threat, imposing substantial economic and human costs, with projections indicating 10 million annual deaths and 2.5–3% global GDP reduction by 2050 if unaddressed [1,2]. This crisis is acutely pronounced in low- and middle-income countries like China, where antibiotic overuse remains prevalent—exemplified by >80% antibiotic prescription rates for upper respiratory infections and per capita consumption rates fivefold higher than Western nations [3,4]. Inappropriate antibiotic practices, particularly self-medication (ASM)—defined as antibiotic use without professional diagnosis or prescription—accelerate AMR propagation while risking adverse drug reactions, treatment failures, and increased healthcare expenditures [5-7].

Global initiatives, including WHO action plans (2011, 2015) and G20 commitments (2016), underscore AMR's urgency [8-10]. China has responded through surveillance systems (e.g., Center for Antibacterial Surveillance, 2005) and policies like the China's National Action Plan to Contain Antimicrobial Resistance (2016–2020) [11,12]. Despite these efforts, non-prescription antibiotic access persists nationwide, with 63–88% of pharmacies dispensing antibiotics without prescriptions [13,14], fueling widespread ASM. Internationally, ASM prevalence varies significantly—from 50.8% in Asian populations to <20% in France and Australia—reflecting disparities in healthcare access, regulatory enforcement, and cultural norms [15-17].

Critical knowledge gaps impede effective antibiotic stewardship interventions in China. First, while existing policies primarily target prescribers, patient-centered strategies remain underdeveloped [18]. Second, disparities in healthcare access between rural and urban areas—such as variations in pharmacy proximity versus hospital wait times—exacerbate ASM in underserved regions [19]. Third, although the COVID-19 pandemic has altered antibiotic usage patterns, population-level data during this period are scarce [20]. Finally, behavioral determinants—including substance use and socioeconomic factors—are not comprehensively assessed despite their documented influence on health decision-making [21].

This study addresses these gaps through a national survey of Chinese residents in 2021, aiming to quantify ASM distribution post-COVID-19 emergence, identify key considerations driving antibiotic procurement, and analyze sociodemographic, behavioral, and regional determinants of ASM, thereby informing targeted antimicrobial stewardship strategies aligned with Healthy China 2030 goals.

2. Results

2.1. Study Participants

The study enrolled 11,031 eligible participants, comprising 8,008 (72.60%) urban and 3,023 (27.40%) rural residents. Over half were female, with nearly half aged ≤30 years. A normal BMI range was observed in 68.40% of participants, while more than half were married, highly educated, and unemployed. Most (70.57%) reported a monthly household income per capita exceeding ¥3,000 (US$420), and 17.63% had ≥1 chronic disease. Non-smokers and non-drinkers constituted 19.82% and 40.37% of the cohort, respectively.

Compared to urban residents, those in rural areas exhibited significantly higher proportions of individuals aged ≥60 years, without spouses, unemployed, with monthly household income per capita <¥3,000, covered by out-of-pocket payment medical insurance, and without alcohol consumption history, but lower proportions of higher education attainment, absence of chronic diseases, and no smoking history (Table 1).

Table 1. General characteristics of Chinese residents.

Variables	n (%)			$\chi 2$	*p*-Value
	Urban	Rural	Total		
Total	8008 (72.60)	3023 (27.40)	11031 (100.00)		
Gender				0.0831	0.7731
Male	3647 (45.54)	1386 (45.86)	5033 (45.63)		
Female	4361 (54.56)	1637 (54.15)	5998 (54.37)		
Age (years)				179.8654	<0.0001
0–30	3377 (42.17)	1288 (42.61)	4665 (42.29)		
31–45	2325 (29.03)	676 (22.36)	3001 (27.21)		
46–59	1652 (20.63)	566 (18.72)	2218 (20.11)		
60–	654 (8.17)	493 (16.31)	1147 (10.40)		
BMI (kg/m²)				3.7998	0.1496
<18.5	1103 (13.77)	459 (15.18)	1562 (14.16)		
18.5–24.9	5510 (68.81)	2035 (67.32)	7545 (68.40)		

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25–	1395 (17.42)	529 (17.50)	1924 (17.44)		
Spouse				34.7433	<0.0001
Yes	2243 (60.34)	3983 (54.56)	6226 (56.44)		
No	1474 (39.66)	3331 (45.54)	4805 (43.56)		
Education level				832.9165	<0.0001
Primary or below	473 (5.91)	654 (21.63)	1127 (10.22)		
Secondary	2272 (28.37)	1145 (37.88)	3417 (30.98)		
Higher	5263 (65.72)	1224 (40.49)	6487 (58.81)		
Occupation				527.0434	<0.0001
Unemployed	4496 (56.14)	2379 (78.70)	6875 (62.32)		
Blue-collar	992 (12.39)	295 (9.76)	1287 (11.67)		
White-collar	2520 (31.47)	349 (11.54)	2869 (26.01)		
Monthly household income per capita				1020.805	<0.0001
0–3000	1714 (21.40)	1532 (50.68)	3246 (29.43)		
3001–6000	3229 (40.32)	1025 (33.91)	4254 (38.56)		
6001–	3065 (38.27)	466 (15.42)	3531 (32.01)		
Medical insurance				60.1299	<0.0001
Resident/employee	6083 (75.96)	2206 (72.97)	8289 (75.14)		
Commercial	203 (2.53)	34 (1.12)	237 (2.15)		
Government-funded	168 (2.10)	38 (1.26)	206 (1.87)		
Out-of-pocket payment	1554 (19.41)	745 (24.64)	2299 (20.84)		
Number of chronic diseases				11.7185	0.0029
none	6644 (82.97)	2442 (80.78)	9086 (82.37)		
Single	932 (11.64)	369 (12.21)	1301 (11.79)		
Multiple	432 (5.39)	212 (7.01)	644 (5.84)		
Smoking history				15.2551	<0.0001
Yes	1514 (18.91)	672 (22.23)	2186 (19.82)		
No	6494 (81.09)	2351 (77.77)	8845 (80.18)		
Drinking history				42.7765	<0.0001
Yes	3383 (42.25)	1070 (35.40)	4453 (40.37)		
No	4652 (57.75)	1953 (64.60)	6578 (59.63)		

2.2. Distribution of ASM

Among 11,031 participants, 3,717 (33.70%) reported practicing ASM. ASM prevalence varied significantly across sociodemographic strata (Table 2), with higher rates observed among females, middle-aged adults (46–59 years), overweight individuals, married participants, highly educated respondents, white-collar workers, urban residents, and those with chronic diseases, smoking history, or drinking history. Lower ASM rates were associated with out-of-pocket medical insurance and absence of chronic diseases. No significant differences existed for income.

Table 2. Distributions of ASM among Chinese residents.

Variables	ASM [n (%)]			$\chi 2$	*p*-Value
	Yes	No	Total		
Total	3717 (33.70)	7314 (66.30)	11031 (100.00)		
Gender				6.6819	0.0097
Male	1632 (43.91)	3401 (46.50)	5033 (45.63)		
Female	2085 (56.09)	3913 (53.50)	5998 (54.37)		
Age (years)				55.2949	<0.0001
0–30	1423 (38.28)	3242 (44.33)	4665 (42.29)		
31–45	1020 (27.44)	1981 (27.09)	3001 (27.21)		
46–59	876 (23.57)	1342 (18.35)	2218 (20.11)		
60–	398 (10.71)	749 (10.24)	1147 (10.40)		

BMI (kg/m2)				14.5356	0.0007
<18.5	471 (12.67)	1091 (14.92)	1562 (14.16)		
18.5–24.9	2548 (68.55)	4997 (68.32)	7545 (68.40)		
25–	698 (18.78)	1226 (16.72)	1924 (17.44)		
Spouse				34.7433	<0.0001
Yes	2243 (60.34)	3983 (54.46)	6226 (56.44)		
No	1474 (39.66)	3331 (45.54)	4805 (43.56)		
Education level					
Primary or below	324 (8.72)	803 (10.98)	1127 (10.22)	14.7739	0.0006
Secondary	1148 (30.89)	2269 (31.02)	3417 (30.98)		
Higher	2245 (60.40)	4242 (58.00)	6487 (58.81)		
Occupation				48.6309	<0.0001
Unemployed	2156 (58.00)	4719 (64.52)	6875 (62.32)		
Blue-collar	455 (12.24)	832 (11.38)	1287 (11.67)		
White-collar	1106 (29.76)	1763 (24.10)	2869 (26.01)		
Monthly household income per capita				4.7330	0.0938
0–3000	1045 (28.11)	2201 (30.09)	3246 (29.43)		
3001–6000	1454 (39.12)	2800 (38.28)	4254 (38.56)		
6001–	1218 (32.77)	2313 (31.62)	3531 (32.01)		
Medical insurance				60.5866	<0.0001
Resident/employee	2931 (78.85)	5358 (72.98)	8289 (75.14)		
Commercial	95 (2.56)	142 (1.94)	237 (2.15)		
Government-funded	70 (1.88)	136 (1.86)	206 (1.87)		
Out-of-pocket payment	621 (16.71)	1678 (22.94)	2299 (20.84)		
Number of chronic diseases				65.5118	<0.0001
none	2921 (78.58)	6165 (84.29)	9086 (82.37)		
Single	501 (13.48)	800 (10.94)	1301 (11.79)		
Multiple	295 (7.94)	349 (4.77)	644 (5.84)		
Smoking history				6.7482	0.0094
Yes	788 (21.20)	1398 (18.99)	2186 (19.82)		
No	2929 (78.80)	5916 (80.89)	8845 (80.18)		
Drinking history				19.8502	<0.0001
Yes	1609 (43.29)	2844 (38.88)	4453 (40.37)		
No	2108 (56.71)	4470 (61.12)	6578 (59.63)		
Residence				11.0567	0.0009
Urban	2772 (74.58)	5236 (71.59)	8008 (72.60)		
Rural	945 (25.42)	2078 (28.41)	3023 (27.40)		

2.3. Considerations of ASM Practitioners

The 3,717 ASM practitioners prioritized three key factors when selecting antibiotics: physician's advice (78.18%), drug safety (67.10%) and drug efficacy (64.22%) (Table 3; Figure 1). Rural residents placed significantly greater emphasis on drug price, salesperson recommendations, and after-sales service, whereas urban residents valued brand reputation and corporate credibility more highly.

Table 3. Considerations of ASM Practitioners by residence.

Variables	n (%)			χ2	*p*-Value
	Urban	Rural	Total		
Total	2772 (74.58)	945 (25.42)	3717 (100.00)		
Clinical factors					
1 Drug efficacy	1787 (64.47)	600 (63.49)	2387 (64.22)	0.2910	0.5896
2 Drug safety	1867 (67.35)	627 (66.35)	2494 (67.10)	0.3211	0.5710
3 Dosage form (e.g., capsules, patches)	609 (21.97)	199 (21.06)	808 (21.74)	0.3442	0.5574

Economic & accessibility					
4 Drug price	1036 (37.37)	455 (48.15)	1491 (40.11)	34.0566	<0.0001
5 Insurance reimbursement eligibility	847 (30.56)	292 (30.90)	1139 (30.64)	0.0392	0.8430
Convenience & experience					
6 Ease of administration	581 (20.96)	176 (18.62)	757 (20.37)	2.3697	0.1237
7 Taste of medication	264 (9.52)	78 (8.25)	342 (9.20)	1.3602	0.2435
8 Packaging aesthetics	112 (4.04)	34 (3.60)	146 (3.93)	0.3657	0.5453
Social & personal advice					
9 Physician's advice	2181 (78.68)	725 (76.72)	2906 (78.18)	1.5873	0.2077
10 Pharmacist's advice	1632 (58.87)	551 (58.31)	2183 (58.73)	0.0937	0.7596
11 Family member's suggestions	1181 (42.60)	421 (44.55)	1602 (43.10)	1.0879	0.2969
12 Friend's suggestions	753 (27.16)	238 (25.19)	991 (26.66)	1.4120	0.2347
13 Recommendations from sales personnel	732 (26.41)	308 (32.59)	1040 (27.98)	13.3816	0.0003
14 Personal experience	1502 (54.18)	511 (54.07)	2013 (54.16)	0.0035	0.9530
Brand & corporate					
15 Brand reputation	835 (30.12)	205 (21.69)	1040 (27.98)	24.8509	<0.0001
16 Corporate credibility	620 (22.37)	165 (17.46)	785 (21.12)	10.1830	0.0014
17 Advertising influence	243 (8.77)	83 (8.78)	326 (8.77)	0.0002	0.9874
18 After-sales service	269 (9.70)	120 (12.70)	389 (10.47)	6.7430	0.0094

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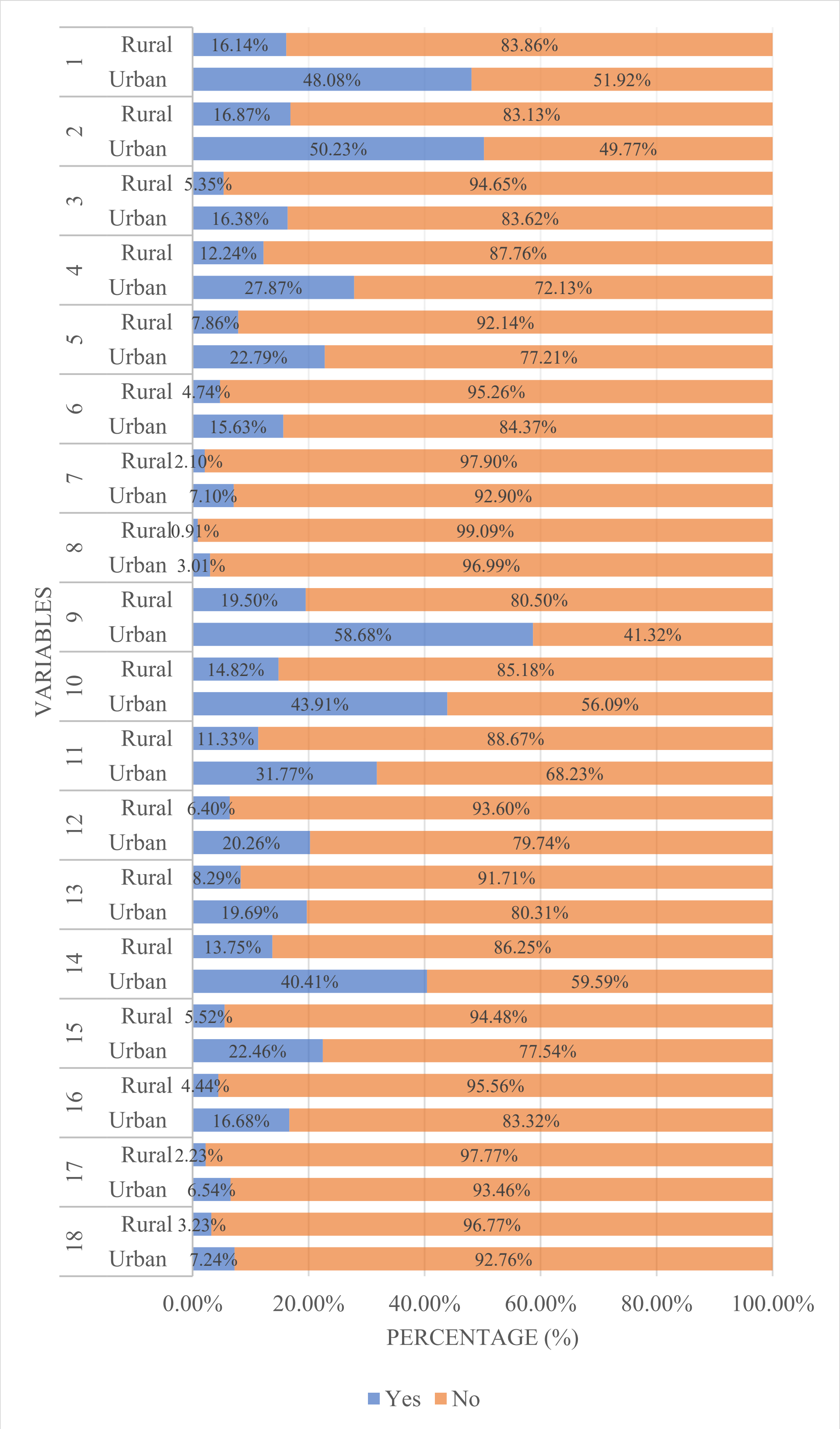

Figure 1. Considerations distribution of ASM Practitioners.

2.4. Determinants of ASM

Multivariate logistic regression identified several independent predictors of ASM (Table 4). Males exhibited 23% lower odds of ASM than females (OR = 0.770; 95% CI: 0.700–0.845; $p < 0.0001$). Middle-aged adults (46–59 years) had 20.3% higher odds than elderly participants (≥60 years) (OR =

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1.203; 95% CI: 1.020–1.418; $p = 0.0279$). Those with primary/below education showed 31.3% lower odds versus higher-educated counterparts (OR = 0.687; 95% CI: 0.580–0.813; $p < 0.0001$). Unemployed participants had 12.1% lower odds relative to white-collar workers (OR = 0.879; 95% CI: 0.788–0.981; $p = 0.0209$). Participants with resident/employee health insurance (OR = 1.327; 95% CI: 1.191–1.478; $p < 0.0001$) or commercial insurance (OR = 1.624; 95% CI: 1.227–2.149; $p = 0.0007$) demonstrated higher odds than those relying on out-of-pocket payment. Absence of chronic diseases predicted lower odds (none vs. multiple: OR = 0.561; 95% CI: 0.469–0.671; $p < 0.0001$; one vs. multiple: OR = 0.715; 95% CI: 0.588–0.869; $p = 0.0008$). Drinking history increased ASM odds by 20.1% (OR = 1.201; 95% CI: 1.097–1.314; $p < 0.0001$).

Table 4. Multivariate logistic regression on ASM among Chinese residents.

Variables	β	SE	Wald χ^2	*p*-Value	OR (95%CI)
Intercept	-0.2714	0.1474	3.3924	0.0655	
Gender (Ref: Female)					
Male	-0.2619	0.0480	29.7837	<0.0001	0.770 (0.700, 0.845)
Age (Ref: 60–)					
0–30	-0.0321	0.0953	0.1133	0.7364	0.968 (0.803, 1.167)
31–45	-0.0108	0.0857	0.0159	0.8997	0.989 (0.836, 1.170)
46–59	0.1848	0.0841	4.8313	0.0279	1.203 (1.020, 1.418)
BMI (Ref: 25–)					
<18.5	-0.1350	0.0771	3.0688	0.0798	0.874 (0.751, 1.016)
18.5–24.9	-0.0362	0.0553	0.4279	0.5130	0.964 (0.865, 1.075)
Spouse (Ref: No)					
Yes	0.0408	0.0610	0.4482	0.5032	1.042 (0.924, 1.174)
Education level (Ref: Higher)					
Primary or below	-0.3759	0.0863	18.9833	<0.0001	0.687 (0.580, 0.813)
Secondary	-0.0769	0.0509	2.2792	0.1311	0.926 (0.838, 1.023)
Occupation (Ref: White-collar)					
Unemployed	-0.1291	0.0559	5.3329	0.0209	0.879 (0.788, 0.981)
Blue-collar	-0.0905	0.0729	1.5406	0.2145	0.913 (0.792, 1.054)
Monthly household income per capita (Ref: 6001–)					
0-3000	0.0330	0.0570	0.3365	0.5618	1.034 (0.924, 1.156)
3001-6000	0.0203	0.0492	0.1707	0.6795	1.021 (0.927, 1.124)
Medical insurance (Ref: Out-of-pocket payment)					
Resident/employee	0.2826	0.0552	26.2324	<0.0001	1.327 (1.191, 1.478)
Commercial	0.4848	0.1430	11.4930	0.0007	1.624 (1.227, 2.149)
Government-funded	0.2163	0.1572	1.8926	0.1689	1.241 (0.912, 1.690)
Number of chronic diseases (Ref: Multiple)					
None	-0.5776	0.0913	39.9822	<0.0001	0.561 (0.469, 0.671)
Single	-0.3353	0.0997	11.3167	0.0008	0.715 (0.588, 0.869)
Smoking history (Ref: No)					
Yes	0.0849	0.0608	1.9542	0.1621	1.089 (0.966, 1.226)
Drinking history (Ref: No)					
Yes	0.1830	0.0461	15.7526	<0.0001	1.201 (1.097, 1.314)
Residence (Ref: Rural)					
Urban	0.0454	0.0501	0.8211	0.3648	1.046 (0.949, 1.154)

3. Discussion

This nationwide study reveals a 33.7% prevalence of ASM among Chinese residents during the COVID-19 pandemic. Notably, despite significant urban-rural socioeconomic disparities, no difference in ASM prevalence was observed, suggesting this practice remains deeply embedded across diverse communities. This finding highlights the urgent need for context-specific interventions to address AMR, a critical global health threat projected to cause 4.73 million in Asia annual deaths by 2050 that imposes substantial economic burdens [2].

China's ASM rate aligns with previous national studies reporting 37.1-45.7% prevalence [23,24], but exceeds rates in high-income nations like the UK (5%) and France (18%) [17,25]. While lower than India (58%) [26], it surpasses WHO's recommended threshold of 30% [27]. This intermediate position reflects China's unique healthcare landscape where rapid economic development coexists with persistent self-medication traditions. The convergence of urban and rural ASM rates underscores how cultural norms and medication accessibility may transcend geographic and socioeconomic boundaries [28,29], particularly during healthcare disruptions like the COVID-19 pandemic which affected medication dispensing patterns [30].

Our analysis identified several demographic predictors of ASM. Females exhibited 30% higher odds than males (OR=1.299), consistent with studies from Sudan and UK [30,31]. This gender disparity may stem from differential care-seeking behaviors, higher antibiotic prescription rates for women, and greater access to leftover medications [32]. Middle-aged adults (46-59 years) showed elevated risk, potentially due to time constraints and healthcare access barriers [34]. Counterintuitively, higher education correlated with increased ASM (OR=1.456 vs. primary education), mirroring patterns observed in Italy [31]. This education paradox suggests knowledge alone is insufficient to modify behavior, potentially reflecting overconfidence in self-diagnosis among educated individuals [35]. Participants with health insurance demonstrated significantly higher ASM odds (Resident/Employee: OR=1.327; Commercial: OR=1.624), aligning with Iranian evidence that insured individuals perceive self-medication as financially lower-risk [36]. Multiple chronic diseases amplified ASM risk (OR=1.782 vs. disease-free), likely due to symptom familiarity and frequent medication exposure [37], while drinking history increased odds by 20.1% (OR=1.201), corroborating European associations between substance use and self-medication [38].

Notable urban-rural divergences emerged in antibiotic selection criteria. Rural residents prioritized drug price, salesperson recommendations, and after-sales service, whereas urban consumers emphasized brand reputation and corporate credibility. These differences likely reflect rural healthcare access barriers, medication literacy gaps, and targeted marketing strategies by community pharmacies [39,40]. The substantial rural reliance on salesperson advice is particularly concerning given frequent deficiencies in formal medical training among pharmacy staff.

These findings suggest four strategic interventions. First, pharmacy regulations require reinforcement through strict enforcement of prescription-only dispensing policies, particularly in rural communities where non-prescription access remains prevalent. Pharmacist certification programs should incorporate AMR stewardship training. Second, contextual public education campaigns should address specific misconceptions such as viewing antibiotics as "panaceas" [41], leveraging frameworks like WHO's World Antibiotic Awareness Week. Such messaging must specifically target educated populations whose knowledge doesn't translate to appropriate use. Third, insurance systems need reform through reevaluation of co-payment structures to reduce financial incentives for self-medication while maintaining healthcare accessibility [42]. Finally, China should capitalize on its advanced telemedicine infrastructure through digital health integration, utilizing platforms like WeChat health portals for AMR education and remote consultations in underserved regions [43].

Several methodological limitations warrant acknowledgment. The cross-sectional design precludes causal inference regarding ASM determinants. Self-reported data introduces potential recall and social desirability biases. Regional specificity limits generalizability beyond China, and exclusion of healthcare provider perspectives omits critical stakeholders in antibiotic dispensing. Future research should employ longitudinal designs to track ASM evolution post-pandemic and incorporate provider insights.

4. Materials and Methods

4.1. Study Design and Population

Data were derived from the 2021 China Family Health Index Survey (CFHI-2021) [22], conducted from July 10 to September 15, 2021, across 120 cities in 22 provinces and 5 autonomous regions. Trained investigators in each city administered questionnaires via the online Questionnaire Star platform (https://www.wjx.cn/), using a one-on-one, face-to-face approach. After investigators entered unique questionnaire IDs, respondents independently completed the survey by accessing the provided link. For participants with cognitive capacity but physical limitations, investigators recorded responses based on verbal input. The inclusion criteria were as follows: (1) Age ≥16 years; (2) Response to the ASM question; (3) Provision of written informed consent.

4.2. The Questionnaire and Data Collection

The structured questionnaire comprised two sections: 1. Socio-demographic and clinical characteristics: Gender, age, BMI, marital status, education, occupation, monthly household income per capita, medical insurance, chronic disease count, smoking/drinking history, and residence (urban/rural); 2. Antibiotic self-medication behavior: Question 1 (single-response): "Have you ever purchased and used antibiotics without a prescription?" (Yes/No). Question 2 (multiple-response, for ASM practitioners only): "What factors influenced your antibiotic purchase decisions?" Participants selected from 18 options: (1) Efficacy; (2) Safety; (3) Dosage form; (4) Price; (5) Insurance coverage; (6) Ease of use; (7) Taste; (8) Packaging; (9) Physician advice; (10) Pharmacist advice; (11) Family suggestions; (12) Friend suggestions; (13) Salesperson recommendations; (14) Personal experience; (15) Brand reputation; (16) Manufacturer credibility; (17) Advertising; (18) After-sales service. Respondents selected 1–18 options.

4.3. Statistical Analysis

Descriptive statistics summarized categorical variables as frequencies (%) and normally distributed continuous variables as mean ± standard deviation. Chi-square tests identified potential determinants of ASM and urban-rural differences. Binary logistic regression assessed associations between ASM (dependent variable) and socio-demographic factors (independent variables), reporting adjusted odds ratios (adjusted ORs) with 95% confidence intervals (CIs). Statistical significance was set at $p < 0.05$. Analyses used SAS 9.4 (SAS Institute, Cary, NC, USA).

5. Conclusions

This study reveals persistent antibiotic ASM practices across both urban and rural China, mediated through factors including gender, education level, insurance status, and health-related behaviors. The convergence of ASM prevalence despite divergent regional socioeconomic profiles necessitates multifaceted interventions. Future research should employ longitudinal designs to track post-pandemic ASM trends and incorporate healthcare provider perspectives. Immediate action is imperative to integrate pharmacist education, public awareness campaigns, and insurance reforms within China's evolving primary healthcare framework to mitigate the escalating AMR crisis.

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