



# FREQUENCY OF SELF-MEDICATION WITH ANTIBIOTICS AND ITS ASSOCIATED FACTORS AMONG CHILDREN AT A PUBLIC HOSPITAL IN METROPOLITAN LIMA

## FREQUENCY OF SELF-MEDICATION WITH ANTIBIOTICS AND ITS ASSOCIATED FACTORS AMONG CHILDREN AT A PUBLIC HOSPITAL IN METROPOLITAN LIMA

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### ABSTRACT

**Introduction:** Self-medication with antibiotics in the pediatric population represents a growing public health concern. **Objectives:** To identify factors associated with antibiotic self-medication in children and to characterize its patterns of use. **Methods:** An analytical cross-sectional study was conducted at Hospital Santa Rosa (Pueblo Libre, Lima, Peru) between December 2023 and February 2024. The study included 402 parents of pediatric outpatients who lived with their children. A validated 27-item questionnaire, based on international studies and adapted to the local context, was administered. Sociodemographic, medical, and self-medication-related variables were collected. Descriptive, bivariate, and multivariate analyses were performed using binary logistic regression to identify factors associated with having “ever” self-medicated a child with antibiotics, with a significance threshold of  $p < 0.050$ . **Results:** A total of 39.1% of children had been self-medicated with antibiotics at least once. The frequency was higher among those over fifteen years old (60.0%), in families with three or more children (53.9%), and with a household income of  $\leq 275.5$  USD (56.7%). The most commonly used antibiotics were amoxicillin (59.1%) and azithromycin (16.0%). The most frequent reasons for use were fever, sore throat, and cough. Having an older child ( $aOR=5.19$ ; 95%CI: 2.02–13.33) and a greater number of children ( $aOR=2.20$ ; 95%CI: 1.13–4.27) increased the likelihood of self-medication. Higher household income significantly reduced this likelihood ( $aOR=0.38$ ; 95%CI: 0.17–0.88). **Conclusion:** Self-medication with antibiotics in children is associated with the child's age, number of children in the household, and family income, highlighting the need for targeted educational interventions.

**Keywords:** Self medication; Anti-bacterial agents; Parents; Child; Risk factors. (Source: MESH-NLM)

### RESUMEN

**Introducción:** La automedicación con antibióticos en población pediátrica representa un riesgo sanitario creciente. **Objetivos:** Determinar los factores asociados a la automedicación con antibióticos en niños; y caracterizar su uso. **Métodos:** Estudio transversal analítico realizado en el Hospital Santa Rosa (Pueblo Libre, Lima, Perú) entre diciembre de 2023 y febrero de 2024. Se trabajó con 402 progenitores de pacientes pediátricos que acudieron a consulta externa de Pediatría y conviven con sus hijos. Se aplicó un cuestionario validado de 27 ítems, diseñado con base en estudios internacionales y adaptado al contexto local. Se recolectaron variables sociodemográficas, médicas y relacionadas con la automedicación. Se realizó análisis descriptivo, bivariado y multivariado mediante regresión logística binaria para identificar factores asociados a la automedicación con antibióticos “alguna vez”. Se consideraron como significativos los valores de  $p < 0,050$ . **Resultados:** El 39,1% de los niños fueron automedicados al menos una vez. La frecuencia fue mayor entre los mayores de quince años (60,0%), en familias con tres o más hijos (53,9%) y con ingresos  $\leq 275,5$  dólares (56,7%). Los principales antibióticos utilizados fueron amoxicilina (59,1%) y azitromicina (16,0%). Las razones más frecuentes fueron fiebre, dolor de garganta y tos. Tener un hijo de mayor edad ( $ORa=5,19$ ; IC95%: 2,02–13,33) y más hijos ( $ORa=2,20$ ; IC95%: 1,13–4,27) aumentó las chances de automedicación. Ingresos familiares elevados redujeron significativamente esas chances ( $ORa=0,38$ ; IC95%: 0,17–0,88). **Conclusión:** La automedicación en población pediátrica está asociada con la edad del hijo, el número de hijos y los ingresos familiares, evidenciando la necesidad de intervenciones educativas focalizadas.

**Palabras clave:** Automedicación; Antibacterianos; Padres; Niño; Factores de riesgo. (Fuente: DeCS- BIREME)

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## INTRODUCTION

Self-medication refers to the use of a drug by one's own decision, without prior medical evaluation, with the aim of obtaining symptomatic relief or curing an illness<sup>(1)</sup>. Self-medication with antibiotics represents a global public health problem, with higher prevalence in low- and middle-income countries<sup>(2)</sup>. The frequency of this phenomenon in the pediatric population varies by continent: Middle East (34%), Africa (22%), Asia (20%), South America (17%), and Europe (8%)<sup>(3)</sup>.

Pediatric patients are the most susceptible population, as they receive the highest number of antibiotic prescriptions, mainly for the treatment of upper respiratory tract infections<sup>(4)</sup> and acute diarrheal disease<sup>(5)</sup>. This situation is concerning, as it may increase the inappropriate use of antibiotics, exposing the patient not only to the adverse effects of the medication itself but also contributing to the development of antimicrobial resistance—an issue that has increased exponentially in recent years<sup>(6)</sup>.

Various factors such as socioeconomic determinants, health system conditions, and the search for medical care influence the practice of self-medication<sup>(2)</sup>. However, discrepancies persist among global studies regarding the factors associated with self-medication in children<sup>(3)</sup>, making it necessary to consider the specific context of each country.

In this context, the main objective of the present study was to determine the frequency and associated factors of self-medication with antibiotics in a pediatric population. As a secondary objective, the study aimed to characterize the pattern of antibiotic use in this population over the past month.

## METHODS

### Study design and setting

An analytical cross-sectional study was conducted based on a self-developed survey administered by the authors to parents who attended the Hospital Santa Rosa with their children. The hospital is located in the

district of Pueblo Libre, Lima, Peru, and is a public tertiary care facility belonging to the Ministry of Health of Peru. Data collection took place between December 2023 and February 2024 (Supplementary Material 1).

### Population and sample

The study included parents of pediatric patients who attended the outpatient pediatric clinic, lived with their child, and provided informed consent. Other family members and those attending for emergencies or surgical consults were excluded.

To estimate the sample size, parental educational level and employment history were considered as factors associated with their children's self-medication, based on the results of a systematic review<sup>(3)</sup>. Due to the characteristics of the population, other variables such as socioeconomic level, health insurance coverage, and distance to the facility showed no prior variability. The sample size was calculated using EPIDAT software with the following assumptions: a) proportion of parents with low educational level who self-medicated their children (20%)<sup>(7)</sup>; b) proportion of parents with low educational level who did not self-medicate their children (8%)<sup>(7)</sup>; c) self-medication to non-self-medication ratio of one to five<sup>(7)</sup>; d) statistical power of 80%; and e) 95% confidence level. The estimated sample size was 414 individuals. Sampling was non-probabilistic and convenience-based, as there was no sampling frame of users during the study period.

### Variables and instruments

The frequency of self-medication (of the child) was assessed with three time-based items: "ever self-medicated," "self-medicated in the past year," and "self-medicated in the past month." Variables for characterizing self-medication referred to events that occurred in the past month. Factors associated with antibiotic self-medication included: child's age, child's sex, parent's age, parent's sex, parent's educational level, number of children, family income, health insurance, and presence of chronic illness in the child.





Family income was converted from Peruvian soles to U.S. dollars using the exchange rate of 3.72 soles per dollar as of September 29, 2024.

The questionnaire was based on previous studies conducted in Saudi Arabia<sup>(8)</sup>, China<sup>(9)</sup>, and Jordan<sup>(10)</sup>. It contained 27 items collecting information on factors associated with parental and child self-medication (items 1–13); frequency of self-medication over time (items 14–16); and self-medication characteristics: symptoms treated with antibiotics, duration of self-medication, information sources, types of antibiotics used, adverse events, among others (items 17–27). It also included questions on the practice of storing antibiotics at home, checking expiration dates, and having experienced side effects after self-medication (items 24, 25, and 26) (Supplementary Material 1).

### Procedures

Content validity of the instrument was evaluated by two methodologists and an infectious disease specialist, who made observations and suggestions regarding the 26 preliminary items. By consensus, item 22 on reviewing information sources for self-medication was added, along with item 23, which allowed participants to specify such sources, resulting in a total of 27 items.

It was also agreed to measure household income using ordinal monthly categories to reduce the likelihood of non-response. A pilot test was conducted with twenty

parents in the pediatric outpatient clinic to gather feedback on question clarity, administration time, and appropriateness of the setting. No major concerns were reported by participants.

### Statistical analysis

All questionnaires were reviewed during the data cleaning process to avoid omissions. Statistical analysis was conducted using the JAMOV software and divided into descriptive, bivariate, and multivariate analyses. The descriptive analysis included frequencies and percentages. The bivariate analysis explored associations between factors and “ever” antibiotic self-medication using the chi-square test. Variables with a p-value  $<0.250$  were included in the multivariate analysis through binary logistic regression, with “ever” antibiotic self-medication as the dependent variable<sup>(11)</sup>. Results were expressed as odds ratios (OR) with their corresponding 95% confidence intervals (95% CI) and a significance level of  $p=0.050$ . The Variance Inflation Factor (VIF) was used to assess multicollinearity among variables in the multivariate model.

### Ethical considerations

The study protocol and questionnaire were approved by the Institutional Ethics Committee of Hospital Santa Rosa. The questionnaires were anonymous, and the confidentiality of the participants' information was ensured.



**Table 1.** Socioeconomic characteristics of children and their parents attending a public hospital in Metropolitan Lima.

Variable	N	%
<b>Child's sex</b>		
Male	221	55.0
Female	181	45.0
<b>Child's age (years)</b>		
0–4	143	35.6
≥ 5–9	147	36.6
≥ 10–14	82	20.3
≥ 15	30	7.5
<b>Parent's sex</b>		
Male	53	13.2
Female	349	86.8
<b>Parent's age (years)</b>		
< 30	78	19.4
≥ 30–39	178	44.3
≥ 40–49	110	27.3
≥ 50	36	9.0
<b>Parent's education level</b>		
Elementary	120	29.9
High	89	22.1
Higher	193	48.0
<b>Number of children</b>		
1	163	40.6
2	150	37.3
≥ 3	89	22.1
<b>Family income (USD)</b>		
≤ 275.5	67	16.7
> 275.5–537.6	160	39.8
> 537.6–806.5	98	24.4
≥ 806.5	77	19.1

\* One participant in the “School level” group had no formal education.



Out of 402 parents surveyed, 86.8% were mothers, and the most common age group was 30–39 years (44.3%). A total of 48% reported having a higher education level, and 39.8% had a monthly income between USD 275.5 and 537.6. In terms of family size, 40.6% had only one

child, and the majority of these children (72.2%) were under 9 years of age (Table 1). Additionally, 30.8% of the children had a chronic illness, with asthma being the most frequent (45.2%), and 86.8% were covered by health insurance (Table 2).

**Table 2.** Medical conditions of children attending a public hospital in Metropolitan Lima.

Variable	N	%
<b>Child has chronic illness</b>		
Yes*	124	30.8
Asthma	57	45.2
Allergic rhinitis	27	21.4
Anemia	14	11.1
Dermatitis	9	7.1
Obesity	7	5.6
Other	12	9.6
No	278	69.2
<b>Child has health insurance</b>		
Yes	349	86.8
No	53	13.2

\* Two patients had more than one chronic illness.

A total of 39.1% of parents had self-medicated their children at least once, 31.8% in the past year, and 21.9% in the past month. The most common place of acquisition was the pharmacy (85.2%), and the most frequently used antibiotic was amoxicillin (59.1%). The main symptoms leading to self-medication were fever,

sore throat, and cough. A total of 86.4% used at least one information source to self-medicate, with pharmacists and previous prescriptions being the most consulted sources. Furthermore, 60.2% stored antibiotics at home, and 85.2% checked the expiration date (Table 3).



**Table 3.** Characteristics of antibiotic self-medication during the past month among children attending a public hospital in Metropolitan Lima.

Variable	N	%
<b>Place of antibiotic acquisition</b>		
Pharmacy	75	85,2
Medicine cabinet (home)	8	9,1
Hospital	3	3,4
Store	2	2,3
<b>Antibiotic used</b>		
Amoxicillin	52	59,1
Azithromycin	14	16,0
Trimethoprim/sulfamethoxazole	4	4,5
Ampicillin	1	1,1
Metronidazole	1	1,1
Ciprofloxacin	6	6,8
Cannot remember	10	11,4
<b>Symptoms leading to self-medication*</b>		
Fever	34	26,2
Cough	20	15,4
Cold	12	9,2
Sore throat	35	26,9
Stomachache	9	6,9
Other	20	15,4
<b>Used information source</b>		
Yes	76	86,4
Pharmacist	35	46,1
Previous prescription	22	28,9
Friends or family	12	15,8
Other	7	9,2
No	12	13,6
<b>Keep antibiotics at home</b>		
Yes	53	60,2
No	32	36,4
Don't know	3	3,4

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Table 3. (Continuation)

Variable	N	%
Check expiration date		
Yes	75	85,2
No	8	9,1
Don't remember	5	5,7
Experienced side effects		
Yes	4	4,5
No	81	92,0
Don't remember	3	3,5

\*More than one symptom could be selected.

In the bivariate analysis for the outcome "ever" self-medicated with antibiotics, 21% of children aged 0–4 years had been self-medicated, compared to 60% of those aged 15 and above ( $p < 0.001$ ). In families with three or more children, the self-medication rate was 53.9%, compared to 28.8% in single-child families ( $p < 0.001$ ). Among parents with only elementary education, 46.7% practiced self-medication, while this figure dropped to 33.2% among those with higher

education ( $p = 0.050$ ). In households with incomes of USD 275.5 or less, the rate of self-medication reached 56.7%, compared to 29.9% in households earning USD 806.5 or more ( $p = 0.008$ ). Also, 49.2% of children with chronic illnesses were self-medicated, compared to 34.5% of those without ( $p = 0.005$ ). Lastly, 52.8% of uninsured children were self-medicated, compared to 37% of those with insurance ( $p = 0.027$ ) (Table 4).

Table 4. Bivariate analysis of factors associated with ever self-medicated with antibiotics among children in a public hospital in Metropolitan Lima.

Variable	n	Frequency of self-medication		n	%	p-value
		Yes	No			
Child's sex						
Male (n=221)	89	40.3		132	59.7	0.581
Female (n=181)	68	37.6		113	62.4	
Child's age						
0 - 4 (n=143)	30	21.0		113	79	<0.001
≥ 5 - 9 (n=147)	65	44.2		82	55.8	
≥ 10 - 14 (n=82)	44	53.7		38	46.3	
≥ 15 (n=30)	18	60.0		12	40.0	
Parent's sex						
Male (n=53)	21	39.6		32	60.4	0.928
Female (n=349)	136	39.0		213	61.0	



Table 4. (Continuation)

Variable	n	Frequency of self-medication		n	%	p-value
		Yes	No			
Parent's age (years)						
< 30 (n=78)	25	32.1	53	67.9		
≥ 30 - 39 (n=178)	66	37.1	112	62.9		
≥ 40 - 49 (n=110)	44	44.5	66	55.5	0.231	
≥ 50 (n=36)	17	47.2	19	52.8		
Parent's education level						
Elementary (n=120)	56	46.7	64	53.3		
High (n=89)	37	41.6	52	58.4	0.050	
Higher (n=193)	64	33.2	129	66.8		
Number of children						
1 (n=163)	47	28.8	116	61.2		
2 (n=150)	62	41.3	88	58.7		
≥ 3 (n=89)	48	53.9	41	46.1	<0.001	
Family income (USD)						
≤ 275.5 (n=67)	38	56.7	29	43.3		
275.5 - 537.6 (n=160)	59	36.9	101	63.1		
≤ 537.6 - 806.5 (n=98)	37	37.8	61	62.2		
≥ 806.5 (n=77)	23	29.9	54	70.1	0.008	
Chronic illness in child						
Yes (n=124)	61	49.2	63	50.8		
No (n=278)	96	34.5	182	64.5	0.005	
Child's health insurance						
Yes (n=349)	129	37.0	220	63.0		
No (n=53)	28	52.8	25	47.2	0.027	

In the binary logistic regression, children aged 15 or older were 5.19 times more likely to be self-medicated compared to those aged 0–4 (OR=5.19; 95% CI: 2.02–13.33). Having three or more children increased the odds of self-medication by 2.20 times compared to single-child families (OR=2.20; 95% CI: 1.13–4.27). Having a family income of USD 806.5 or more reduced

the odds of self-medication by 62% compared to families earning USD 275.5 or less (OR=0.38; 95% CI: 0.17–0.88). Having a child with a chronic illness (OR=1.37; 95% CI: 0.85–2.19) and having health insurance (OR=0.55; 95% CI: 0.29–1.03) were not significantly associated with self-medication (Table 5).





**Table 5.** Multivariate analysis of factors associated with ever self-medicated with antibiotics among children in a public hospital in Metropolitan Lima.

Variable	Odds Ratio (95% CI)	p-value
<b>Parent's education</b>		
High – Elementary	1.21 (0.63 - 2.33)	0.566
Higher – Elementary	0.88 (0.48 - 1.61)	0.679
<b>Child's age</b>		
≥5–9 years – 0–4 years	2.48 (1.42 - 4.32)	0.001
≥10–14 years – 0–4 years	4.15 (2.12 - 8.12)	<0.001
≥15 years – 0–4 years	5.19 (2.02 - 13.33)	<0.001
<b>Number of children</b>		
2 – 1 child	1.32 (0.76 - 2.27)	0.320
≥3 – 1 child	2.20 (1.13 - 4.27)	0.020
<b>Family income (USD)</b>		
275.5–537.6 – ≤275.5	0.44 (0.23 - 0.85)	0.015
537.6–806.5 – ≤275.5	0.47 (0.22 - 1)	0.049
≥806.5 – ≤275.5	0.38 (0.17 - 0.88)	0.024
<b>Parent's age</b>		
≥ 30 to 39 years – < 30 years	0.90 (0.47 - 1.74)	0.756
≥ 40 to 49 years – < 30 years	0.85 (0.39 - 1.85)	0.69
≥ 50 years – < 30 years	0.61 (0.22 - 1.68)	0.342
<b>Chronic illness in child</b>		
No - Yes	1.36 (0.85 - 2.19)	0.205
<b>Health insurance</b>		
No - Yes	0.54 (0.29 - 1.03)	0.063

Variance Inflation Factor (VIF) in parent's age: 1,10; education level: 1,14; number of children: 1,10; family income: 1,08; child's age: 1,06; chronic illness: 1,03; health insurance 1,0.

DISCUSSION

In this study, the frequency of ever self-medicating children with antibiotics was 39.1%, compared to the reported prevalence in South America (17%) and Europe (8%)<sup>(3)</sup>. In Peru, a study conducted in peri-urban areas of Lima among children under five found a prevalence of 28.7%<sup>(7)</sup>. The difference in frequency may be explained by the setting of our study, which was conducted in a hospital service where patients are more likely to use medications. In contrast, the Peruvian study

involved home visits asking about self-medication in the community. Older children and families with more children were more likely to self-medicate, consistent with a study from Spain that found similar results for both variables (>14 years OR: 3.51; 95% CI: 1.51–8.16, and ≥3 children OR: 3.14; 95% CI: 2.21–4.44, respectively) <sup>(12)</sup>. These risk factors may be related to parents' increasing confidence in managing their children's illnesses as they gain experience. Parents with more children tend to be more familiar with

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symptoms of common illnesses, which could increase their likelihood of self-medicating without consulting a physician<sup>(12)</sup>. However, a study conducted in rural communities in Peru did not find significant differences between family size and self-medication with antibiotics ( $p = 0.782$ )<sup>(13)</sup>. This discrepancy could be explained by the fact that in rural areas, regardless of the number of children, access to basic health services is limited, which contributes to self-medication.

Children with chronic illnesses were more frequently self-medicated, similar to findings from a study in Mexico where having a child with a chronic illness significantly increased the likelihood of self-medication (OR: 1.90; 95% CI: 1.65–2.18)<sup>(14)</sup>. Asthma is one of the most common chronic conditions in children, and its symptoms can be mistaken for bacterial infections such as bronchitis or pneumonia<sup>(15)</sup>. We also suggest that many parents lack a clear understanding of the difference between viral and bacterial infections, or between asthma management and other respiratory conditions. This may lead them to rely on antibiotics as a broad-spectrum treatment for any respiratory symptom, when in fact they are not effective for asthma or viral infections. Self-medicating children with antibiotics affects the microbial balance, increasing the risk of secondary infections from opportunistic pathogens, contributing to antimicrobial resistance, and generating greater susceptibility to allergies and asthma<sup>(16)</sup>.

Higher household income acts as a protective factor against self-medication. A study in Jordan found similar results: self-medication was 8.5 percentage points lower in families earning more than USD 1,000 (35.1%) compared to those earning less than USD 500 (43.6%)<sup>(10)</sup>. We suggest this may be due to greater access to formal health services among higher-income families, who are less financially constrained in seeking private medical care and therefore less dependent on advice from relatives, pharmacists, or previous prescriptions. Having health insurance was not significantly

associated with self-medication in our study. However, in Mexico, having insurance was shown to reduce the likelihood of self-medicating children by 38% compared to those without insurance<sup>(14)</sup>. Similarly, in China, having insurance reduced the likelihood by 64%<sup>(17)</sup>. This difference may be explained by the limited availability of immediate healthcare services in Peru's public and private systems due to increased demand.

Amoxicillin was the most used antibiotic for self-medication, reported by 59.1% of parents in the past month. Similar findings were reported in a health center in Colombia (56%)<sup>(18)</sup>. A study in Spain that evaluated preventable medication incidents in pediatric emergency services found that amoxicillin was used in 26.5% of the cases, with 71.3% of those experiencing some type of adverse effect<sup>(19)</sup>. Therefore, it is important to regulate access to antibiotics without prescription.

The main symptoms leading to self-medication with antibiotics were fever, cough, sore throat, and stomach pain. These findings are consistent with a study in Colombia on self-medication in cases of respiratory infections and acute diarrheal disease in children, where 51% of parents reported that their children's condition "remained the same" despite self-medication<sup>(20)</sup>. As a result, parents bring their children to the hospital when there is no clinical improvement after using antibiotics for respiratory and gastrointestinal symptoms. However, most of these conditions are viral in origin and do not require antibiotic treatment<sup>(21)</sup>.

A total of 9.1% of parents obtained antibiotics from a home medicine cabinet, and 60.2% stored antibiotics at home. A systematic review assessing the prevalence of antibiotic storage in households across 21 countries found that 52.65% stored them, for reasons including not completing treatment, saving medications from other family members, or acquiring them informally for future use or emergencies<sup>(22)</sup>. It is important to note that the practice of storing antibiotics at home is increasing not only in developing countries (e.g., Peru, Ecuador,



Colombia, Mexico), but also in developed countries such as Australia, the United States, and Spain<sup>(22)</sup>. This study has some limitations to consider when interpreting the results. First, the intended sample size was not reached due to time constraints during data collection. Additionally, the sample was non-probabilistic, as no defined sampling frame was available, which limits the generalizability of the findings to other populations. There is also the potential for recall bias, inherent in survey-based studies.

To mitigate this, the characterization of self-medication focused on participants who reported self-medicating in the past month. Social desirability bias may have also influenced participant responses. Finally, because this is a cross-sectional study, it is not possible to establish a

temporal relationship between the evaluated factors and self-medication, and cohort studies and controlled trials are needed to determine causal effects.

## CONCLUSIONS

A total of 39.1% of children included in the study had been self-medicated with antibiotics at least once. The main factors associated with self-medication were older child age, greater number of children in the family, and lower household income. Amoxicillin was the most commonly used antibiotic, and the main symptoms that led to self-medication were fever, cough, and sore throat. Overall, our findings highlight the need for educational interventions targeting families with these characteristics.

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