The epidemiology of self-medication in Colombia: A systematic literature review and meta-analysis

Adriana Urbina [1]*, Mariana Morales-Cortés [2], Dario Mendoza Romero [3], Andrés M. Pérez-Acosta [2]

[1] Fundación Universitaria Sanitas, Calle 170 #8-41, Phone: +57-601-5895377, Fax: +57-601-5895377, Bogotá, Colombia.

[2] Psychology Program, School of Medicine and Health Sciences, Universidad del Rosario, Carrera 24 #63C-69, Phone: +571-2970222, extension 3370, Fax: +571-2970222, extension 3370, Bogotá, Colombia.

[3] Master Program in Epidemiology, Fundación Universitaria del Área Andina, Carrera 14A #70A-34, Phone: +571-7449191, Fax: +571-7449191, Bogotá, Colombia.

*Corresponding author: +57-601-5895377, E-mail: aurbinabo@unisanitas.edu.co
ORCID: https://orcid.org/0000-0002-7125-3801

Summary

Objectives: The reported frequency of self-medication in Colombia ranges from 32.3% to 84.7%, depending on the study sample and time frame. This study aimed to estimate a pooled prevalence of self-medication and its associated factors in Colombian youth and adults. Method: A comprehensive systematic literature review and meta-analysis of the studies on self-medication in Colombia published from January 2000 - June 2022 was conducted. **Results:** Twelve studies (n=5,668) from urban areas were included, and a pooled prevalence of self-medication of 64.2% (95% confidence interval [CI] 50.8%-77.5%) was found. However, the prevalence was lower when self-medication was assessed during the last 30 days (32.3%; 95%CI 25.4%-39.3%) than when longer time frames were used. Female university students had a higher frequency of self-medication (OR= 1.72; 95% CI 1.17-2.53) than males. The most common medications were analgesics (37.7%), anti-inflammatories (33.2%), antihistamines (14.8%), and antibiotics/antiparasitics (12.1%). Lack of time and delays in medical care were reported in 35.2% (95% CI 25.6%-44.7%) of the cases. **Conclusions:** The reported frequency of self-medication in urban areas

of Colombia changed across the studies depending on the time frame used; therefore, this should be considered when conducting and comparing studies on self-medication prevalence. Although over-the-counter drugs were the most frequently involved (85.7%), the reported use of prescription drugs such as antibiotics/antiparasitics was 12.1%. Considering that lacking time and delays in medical care were reported in a third of cases of self-medication, shortening the long waiting times for healthcare services might contribute to the proper use of medications.

Keywords: Self-medication, prevalence, Colombia, systematic review, meta-analysis.

Resumen

Epidemiología de la automedicación en Colombia: revisión sistemática de la literatura y metanálisis

Objetivos: La frecuencia reportada de automedicación en Colombia oscila entre 32,3% y 84,7%, según la muestra de estudio y el marco temporal utilizado. Este estudio tuvo como objetivo estimar la prevalencia agrupada de la automedicación y sus factores asociados en jóvenes y adultos colombianos. **Método**: Se realizó una revisión sistemática de la literatura y un metanálisis de los estudios sobre automedicación en Colombia publicados entre enero de 2000 y junio de 2022. **Resultados:** Se incluyeron 12 estudios (n=5.668) realizados en áreas urbanas y se encontró una prevalencia combinada de automedicación de 64,2 % (intervalo de confianza [IC] del 95 % 50,8 %-77,5 %). Sin embargo, la prevalencia fue menor cuando se evaluó la automedicación durante los últimos 30 días (32,3; IC95% 25,4%-39,3%) que cuando se utilizaron marcos de tiempo más prolongados. Las mujeres universitarias presentaron mayor frecuencia de automedicación (OR= 1,72; IC 95% 1,17-2,53) que los hombres. Los medicamentos más comunes fueron analgésicos (37,7%), antiinflamatorios (33,2%), antihistamínicos (14,8%) y antibióticos/antiparasitarios (12,1%). La falta de tiempo y las demoras en la atención médica se reportaron en el 35,2% (IC 95% 25,6%-44,7%) de los casos. **Conclusiones:** La frecuencia reportada de automedicación en áreas urbanas de Colombia cambió entre los estudios dependiendo del marco de tiempo utilizado; por lo tanto, esto debe tenerse en cuenta al realizar y comparar estudios sobre la prevalencia de la automedicación. Aunque los medicamentos de venta libre fueron los más frecuentemente involucrados (85,7%), el uso informado de medicamentos de prescripción como antibióticos/antiparasitarios fue 12,1%. Además, considerando que la falta de tiempo y las demoras en la atención médica fueron informadas en un tercio de los casos de automedicación, la

reducción de los largos tiempos de espera en los servicios de salud podría contribuir al uso adecuado de los medicamentos.

Palabras clave: Automedicación, prevalencia, Colombia, revisión sistemática, metanálisis.

Resumo

A epidemiologia da automedicação na Colômbia: revisão sistemática da literatura e metanálise

Objetivos: A frequência relatada de automedicação na Colômbia varia de 32,3% a 84,7%, dependendo da amostra do estudo e do período de tempo utilizado. Este estudo teve como objetivo estimar a prevalência da automedicação e seus fatores associados em jovens e adultos colombianos. **Método:** Foi realizada uma revisão sistemática e exaustiva da literatura e uma metanálise dos estudos sobre automedicação na Colômbia publicados entre janeiro de 2000 e junho de 2022. **Resultados:** Um total de 12 estudos (n=5668) realizados em áreas urbanas foram incluídos e encontraram uma prevalência agrupada de automedicação de 64,2% (intervalo de confiança [IC] de 95%: 50,8-77,5%). No entanto, a prevalência foi menor quando se avaliou a automedicação nos últimos 30 dias (32,3%; IC 95% 25,4%-39,3%) do que quando foram utilizados intervalos de tempo mais longos. As mulheres universitárias apresentaram maior frequência de automedicação (OR= 1,72; IC 95% 1,17-2,53) do que os homens. Os medicamentos mais comuns foram analgésicos (37,7%), anti-inflamatórios (33,2%), anti-histamínicos (14,8%) e antibióticos/antiparasitários (12,1%). Falta de tempo e demora no atendimento médico foram relatados em 35,2% (IC 95% 25,6%-44,7%) dos casos. **Conclusões:** A frequência relatada de automedicação em áreas urbanas da Colômbia variou entre os estudos, dependendo do período de tempo usado; portanto, isso deve ser levado em consideração na condução e comparação de estudos sobre a prevalência da automedicação. Embora os medicamentos de venda livre tenham sido os mais frequentemente envolvidos (85,7%), o uso relatado de medicamentos prescritos como antibióticos/antiparasitários foi de 12,1%. Além disso, considerando que a falta de tempo e a demora no atendimento médico foram relatadas em um terço dos casos de automedicação, a redução do longo tempo de espera nos serviços de saúde pode contribuir para o uso adequado dos medicamentos.

Palavras-chave: Automedicação, prevalência, Colômbia, revisão sistemática, metanálise.

Adriana Urbina, Mariana Morales-Cortés, Dario Mendoza Romero, Andrés M. Pérez-Acosta

Introduction

Self-medication involves using medicinal products to treat self-recognized disorders or symptoms or the intermittent or continued use of a medication prescribed by a physician for chronic or recurring diseases or symptoms [1]. According to the World Health Organization, responsible self-medication is carried out with over-the-counter (OTC) drugs, using medications for the intended indications, and reading and following the manufacturer's instructions on the label and package insert [2]. Unresponsible self-medication can result in health risks, such as delayed diagnosis and treatment of disease, adverse drug reactions, drug-drug interactions, and antimicrobial resistance [3, 4].

Although most of the world population self-medicates or has done so at some point, the frequency of self-medication and its associated factors varies depending on the population studied. Indeed, a recent global meta-analysis of 69 articles published between 2000 and 2018, including a total of 27,890 individuals, estimated a prevalence of self-medication of 55.9% (95% CI 42.4%-68.5%) in Africa; 71.2% (95% CI 63.0%-78.3%) in Asia; 74.0% (95% CI 56.2%-86.4%) in Europe; and 60.0% (95% CI 40.2%-77.0%) in South America [5]. In Colombia, different studies about self-medication have been conducted and reported frequencies ranging from 32.3% [6] to 84.7% [7], depending on the study sample and time frame used. However, there are no systematic reviews, nor is there a global quantitative estimate (meta-analysis) of its prevalence in the Colombian population. Therefore, this systematic review and meta-analysis aimed to estimate the pooled prevalence of self-medication and its associated factors in young people and adults in Colombia.

Methods

Comprehensive systematic literature search

Search strategy. A comprehensive systematic literature review was conducted and reported according to the standards set out in the *PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses* [8] and guided by the overview of Munn and colleagues [9]. The search was performed to identify studies published from January 2000 – June 2022 in English, Spanish, and Portuguese. The search was conducted in multiple electronic bibliographic databases: MEDLINE, PubMed, Academic Search, Web of Science (including Science Citation Index, Social Sciences Citation Index, and Arts and Humanities Citation Index), LILACS, the catalog of the Universidad Nacional de Colombia (UNAL), BIBLAT, and Google Scholar. Multiple combinations of the following keywords were used: cross-sectional study, statistics and numerical data,

prevalence, multivariate analysis, bivariate analysis, and Colombia. In addition, the citations in the relevant articles were manually screened.

Study selection. The inclusion criteria were: (i) primary and secondary sources studies; (ii) descriptive studies (cross-sectional, cohort, case-control, and prospective), carried out in Colombia and reporting the prevalence of self-medication in young people and adults, as well as its associated factors; and (iii) articles, theses, and book chapters. Studies were excluded if: (i) they were review articles, letters to the editor, editorials, comments, expert opinions, case studies, case series, or conference abstracts, and (ii) they were published in languages other than English, Spanish, or Portuguese. The selection of the studies was carried out by two investigators independently, and discrepancies were resolved by consensus.

Quality assessment of studies. Using a standardized form, each study's bias risk was assessed using Hoy et al.'s criteria [10]. Each criterion was assessed as 0 if the risk of bias was low; 0.5 if the risk was intermediate or unclear; and 1 if the risk was high. The sum of the scores for the ten criteria indicated the overall risk of bias of the study, was defined as criterion 11, and was used to determine whether a study was included in the analysis. Studies with scores of 0-3 were considered low risk and were included in the quantitative analysis; studies with scores of 4-6 had moderate risk and were excluded, as well as those with scores of 7-10, which had a high risk of bias. This process of assessing the quality and risk of bias of the studies was carried out independently by two investigators, and when discrepancies were found, the final scoring and the decision to include or exclude the study was made by consensus. The summary figure of the studies' risk of bias was prepared using the RevMan v5.0 package.

Data extraction. Using a standardized format in Microsoft Excel, two authors independently extracted data on study characteristics (first author, publication date, characteristics) and outcomes of interest (sample size, self-medication time frame, prevalence of self-medication, women who self-medicated, men who self-medicated, lack of time and delays in medical care as causes of self-medication, and use of analgesics, anti-inflammatories, antihistamines, antibiotics and antiparasitics). When the prevalence of self-medication was evaluated in several time frames in the same study, the data were extracted separately.

Data processing and meta-analysis. Relevant data extracted from the included studies in the Microsoft Excel format were exported to the statistical package Stata v17. A random-effects meta-analysis model was used to estimate DerSimonian and Laird's pooled effect to show heterogeneity. Subgroup analysis was conducted to adjust random variation between point estimates of the original studies and investigate how the prevalence of self-medication fluctuates across subgroups depending on the self-medication time

frame. The outliers within the included articles were checked using sensitivity analysis. Publication bias across studies was assessed using a funnel plot, Egger's regression test, and Begg's test (Z statistic) at 0.05. A forest plot format presented the point prevalence (percent) and 95% confidence intervals (CIs). In this plot, each crossed line referred to a 95% CI. The odds ratio (OR) was used to determine the association between self-medication and sex, and point prevalence (percent) was used for causes of self-medication and medications groups.

Results

Search results

Initially, the search yielded 31 studies. After removing one duplicate, 30 studies were screened using titles and abstracts, 24 of which (16 articles and eight theses) underwent methodological evaluation. Eleven studies with moderate and high risk of bias were excluded, and the reasons for their exclusion are presented in Supplementary Table 1. Ultimately, 13 were included for the qualitative and quantitative synthesis: 12 about general self-medication with 5,668 participants were used for the pooled prevalence estimation, and one about self-medication with antibiotics and 140 participants was used only when analyzing medication groups (Figure 1).

Study characteristics

Table 1 shows that 12 studies with 5,668 participants were included in the systematic review and meta-analysis of self-medication prevalence. One additional study with 140 participants was included to analyze antibiotic and antiparasitic use through self-medication [11]. All the included studies had a cross-sectional design and were published between 2002 and 2021. All the included studies were conducted in urban areas and used randomized sampling, except one, whose sample selection was by convenience [12]. The sample sizes ranged from 140 in Cali [11] to 1,127 in Pereira [6]. The prevalence of self-medication varied from 32.3% in Pereira [6] to 84.7% in Neiva [7]. Regarding geographical distribution, five studies were conducted in the Caribbean region [12-16], three in the Andean región [6, 7, 17], four in the capital city Bogotá [18-21], and one in the Pacific region [11]. There were no studies from the Amazonia and Orinoco regions. Nine studies included adults from the general population [6, 11-15, 17-19], and four included university students [7, 16, 20, 21]. Six studies used instruments with no known validity or reliability [7, 16-19, 21], and seven used instruments with partially documented validity and reliability [6, 11-15, 20]. The overall risk of bias score of the included studies was between 0.5/10 and 2.5/10 (Supplementary Figure 1).
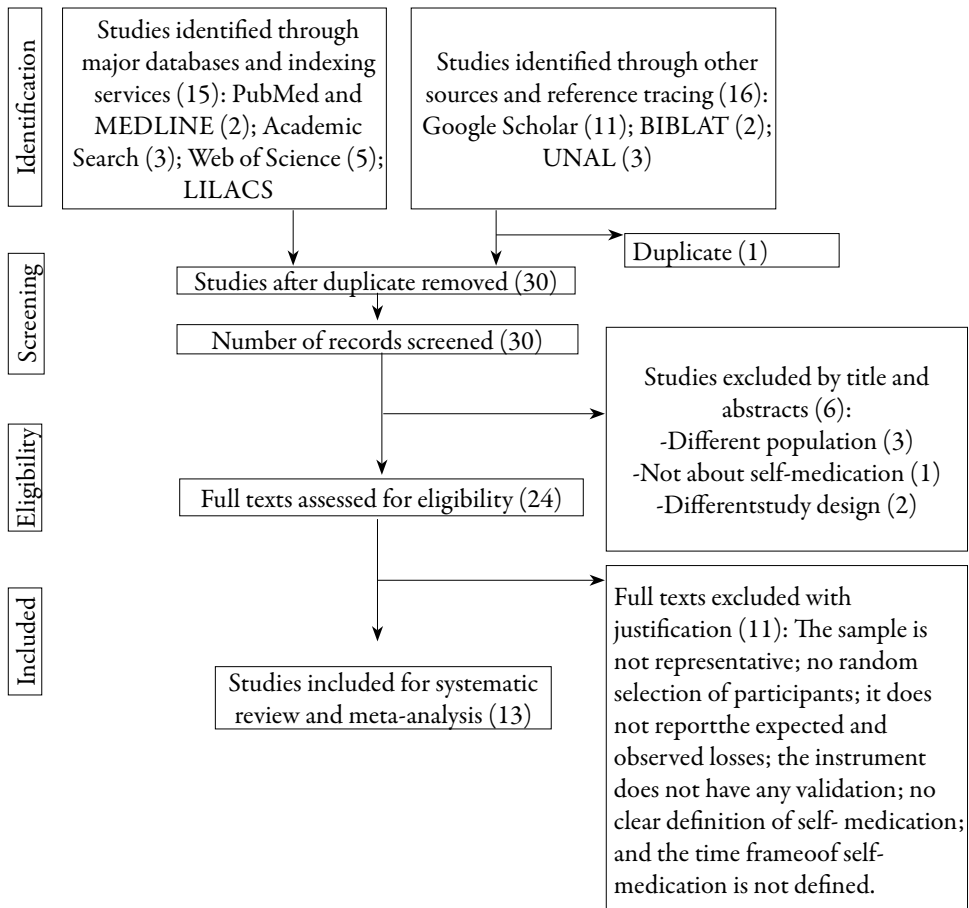
Figure 1. Flowchart of study selection.

Each study used a different self-medication time frame (Table 1), so they were categorized into three subgroups. Five studies with 2,344 participants were included in the subgroup that evaluated current self-medication in the last 30 days. Five studies with 2,355 participants were included in the subgroup that evaluated self-medication in the previous year and throughout life. Four studies with 1,383 participants were included in the subgroup that evaluated self-medication in university students during the last six months and throughout life. Two studies assessing self-medication in various time frames [12, 17] were simultaneously included in subgroups 1 and 2, and their data were extracted separately for meta-analysis. One study evaluated self-medication with antibiotics and was included only in the analysis by medication groups [11].

Table 1. Summary of included studies evaluating the frequency of self-medication and associated factors in young people and adults in Colombia 2000-2022.

First author	Year	Source	Study Area and Population	Sample size	Sampling	Self-medication time frame	Setting	Ref.
Feria-Mejía	2021	Thesis	Adults and their families in the city of Sincelejo, department of Sucre	150	Covenience	Self-medication in the last 30 days and throughout life	Neighborhood/ home	[12]
Peñuela	2002	Journal article	Inhabitants of the city of Barranquilla, department of Atlántico	350	Simple randomized	Self-medication in the last 30 days	Pharmacy	[13]
Machado-Alba	2014	Journal article	Adults from the city of Pereira, department of Risaralda	414	Simple randomized	Self-medication in the last 30 days and throughout life	Home	[17]
López	2009	Journal article	Adult heads of household in the locality of Suba, Bogotá	453	Simple randomized	Self-medication in the last 30 days	Home	[18]
Villegas-Cardona	2014	Journal article	Homes in the urban area of the city of Pereira; people belonging to the family nucleus (over 18 years of age)	1,127	Random, stratified by socio-economic stratum	Self-medication in the last 30 days	Home	[6]
Del Toro-Rubio	2017	Journal article	Inhabitants between 20 and 59 years old, from Locality 2 of the city of Cartagena	428	Simple randomized	Self-medication throughout life	Neighborhood/ home	[14]
Fajardo-Zapata	2013	Journal article	People older than 20 years, living in 20 localities in Bogotá	588	Multistage probabilistic	Self-medication throughout life	Neighborhood/ home	[19]
Macías-Vidal	2015	Thesis	Adults who go to grocery stores located in four municipalities of the department of Atlántico	775	Pobabilistic stratified	Self-medication throughout life	Grocery stores	[15]

(Continued)

First author	Year	Source	Study Area and Population	Sample size	Sampling	Self-medication time frame	Setting	Ref.
Bravo	2017	Thesis	First to fifth-semester medical students, UDCA University, Bogotá	201	Simple randomized	Self-medication in the last six months and throughout life	University	[20]
Lopez-Cabra	2016	Journal article	First to sixth-year medical students, Universidad del Rosario, Bogotá.	270	Randomized, stratified by semester	Self-medication throughout life	University	[21]
Oviedo-Córdoba	2021	Thesis	Undergraduate students enrolled in the second semester of 2019, Universidad del Magdalena, Santa Marta	312	Cluster randomized	Self-medication throughout life	University	[16]
Ortiz	2019	Journal article	University students, Universidad Cooperativa de Colombia, Neiva	600	Simple randomized	Self-medication throughout life	University	[7]
Castro-Espinosa	2014	Journal article	Adults who buy antibiotics in selected pharmacies in Commune 5 of the city of Cali	140	Simple randomized	Self-medication throughout life	Pharmacy	[11]

Meta-analysis

Self-medication prevalence. The pooled prevalence of self-medication among the Colombian youth and adult population was 62.4%, with a 95% CI from 47.2 to 77.7%. As the I^2 statistic revealed, there was a high degree of heterogeneity across studies (I^2= 99.6%, p<0.001). The random effects model was assumed for this meta-analysis.

Subgroup and sensitivity analysis. No significant change in heterogeneity was observed when trying to exclude outliers, or one or more studies. For this reason, all the studies were included in the meta-analysis, and a subgroup analysis was performed according to the self-medication time frame and the type of population (general population or university students). The subgroup analysis revealed a lower frequency of self-medication among the general population when evaluated during the last 30 days (32.3%; 95% CI 25.4%-39.3%). In contrast, the prevalence of self-medication was significantly higher when assessed in the general population during the last year or lifetime (74.6%; 95% CI 61.3%-87.9%) and in university students in the previous six months or lifetime (84.7%; 95% CI 75.1%-94.3%), with no significant difference between them (Figure 2). Therefore, the effect of the time frame during which the self-medication behavior is evaluated seems more important than the effect of age or the university student status. We did not find evidence of publication bias (Egger's regression test, one-tailed, p= 0.2924; Begg's correlation test, one-tailed, p= 0.3811).

Prevalence of self-medication according to sex. Data on the frequency of self-medication in women and men were extracted from 10 studies. In the meta-analysis, no significant association was observed between sex and self-medication, with a pooled OR of 1.12 (95% CI 0.87–1.44). Moreover, the subgroup analysis showed no association between self-medication and sex among the general population in the last 30 days (OR= 0.87; 95% CI 0.57-1.32); nor in the previous year or at some point in life (OR= 1.11; 95% CI 0.61-2.03). In contrast, female university students had a greater probability of self-medication in the last six months or throughout their lives than males (OR= 1.72; 95% CI 1.17-2.53) (Figure 3). We did not find evidence of publication bias (Egger's regression test, one-tailed, p= 0.7983; Begg's correlation test, one-tailed, p= 1.00).

Determinants of self-medication. Due to the lack of a standardized and validated instrument to evaluate self-medication, each study addressed different determinants for this phenomenon. However, among these, the most recurring determinants reported were the lack of time and delays in medical care. Data on these causes could only be extracted from eight studies. In the meta-analysis, the lack of time and delays in medical care were reported with an overall frequency of 35.2% (95% CI 25.6%-44.7%). Moreover, the subgroup meta-analysis showed that the frequency with which these

causes were reported by university students who self-medicated in the last six months or throughout their lives was significantly lower (19.7%; 95% CI 10.3-29.2) than that of the general population who self-medicated in the last 30 days (47.8%; 95% CI 31.5-64.2) (Figure 4).
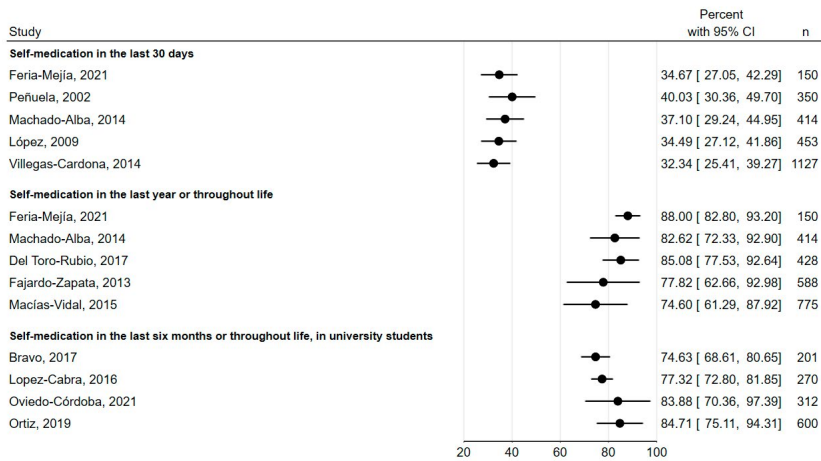

Figure 2. Subgroup analysis of studies describing the prevalence of self-medication disaggregated by time frame and the type of population (general population or university students).
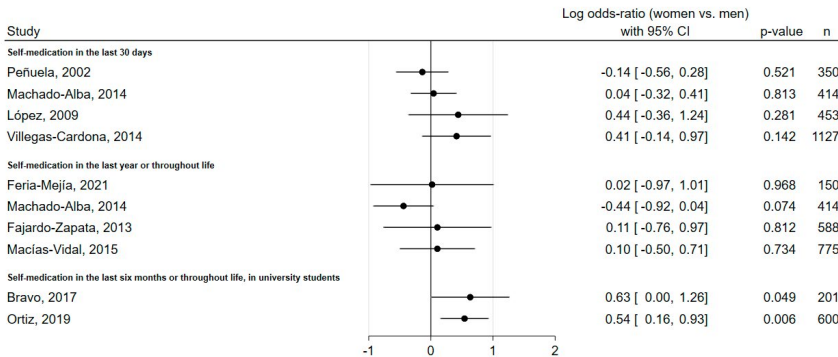

Figure 3. The association between self-medication and sex, disaggregated by time frame and the type of population (general population or university students), with results presented as the neperian logarithm of the OR.
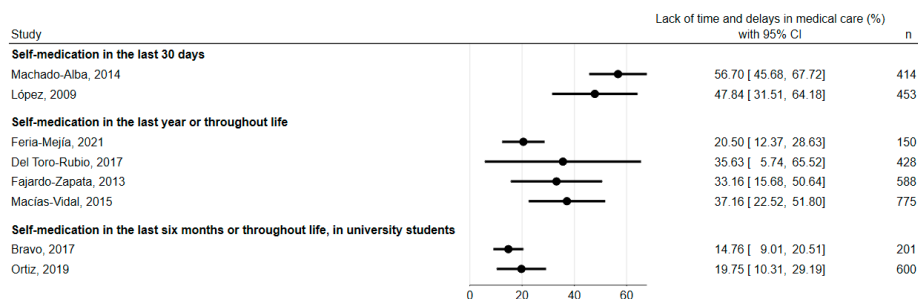
Figure 4. The frequency of reporting the lack of time and delays in care as causes of self-medication.

Medication groups used for self-medication. Data on the medication groups used for self-medication could be extracted from nine studies. The meta-analysis showed that the pooled frequency of self-medication with analgesics was 37.7% (95% CI 15.8%-47.6%), anti-inflammatories 33.2% (95% CI 15.4%-51.0%), and antihistamines 14.8% (95% CI 6.8%-23.0%), while the pooled frequency for antibiotics and antiparasitics was 12.1% (95% CI 7.4%-16.9%) (Table 2).

Table 2. Medication groups used for self-medication.

Subgroup	Studies	Effect size (95% CI)			
		Analgesics	Anti-inflammatories	Antihistamines	Antibiotics and antiparasitics
Subgroup 1: Self-medication in the last 30 days	Machado-Alba, 2014	44.3% (39.5 - 49.1)	36.4% (31.8 - 41.0)	8.5% (5.8 - 11.2)	6.3% (4.0- 8.6)
	López, 2009	15.0% (11.7 - 18.3)	18.0% (14.5- 21.5)	8.0% (5.5 - 10.5)	1.0% (0.1 - 1.9)
	Villegas-Cardona, 2014	58.0% (55.1 - 60.9)	12.0% (10.1 - 13.9)	12.0% (10.1 - 13.9)	4.0% (2.9 - 5.1)
	Peñuela, 2002	19.8% (15.6 - 24.0)	30.1% (25.3 - 34.9)	5.1% (2.8 - 7.4)	16.6% (12.7 - 20.5)
	Castro-Espinosa, 2014 *	-	-	-	7.0% (2.8 - 11.2)
	Subgroup 1	34.3% (11.9 - 56.7)	24.0% (12.9 - 35.0)	8.4% (5.3 - 11.5)	6.6% (3.0- 10.1)

(*Continued*)

Subgroup	Studies	Effect size (95% CI)			
		Analgesics	Anti-inflammatories	Antihistamines	Antibiotics and antiparasitics
Subgroup 2: Self-medication in the last year or throughout life	Macías-Vidal, 2015	46.1% (42.6 - 49.6)	74.4% (71.3 - 77.5)	53.7% (50.2 - 57.2)	10.2% (8.1 - 12.3)
Subgroup 3: Self-medication in the last six months or throughout life, in university students	Bravo, 2017	1.6% (0.2 - 3.3)	14.5% (9.6 -19.4)	11.2% (6.8 - 15.6)	13.5% (8.8 - 18.2)
	Ortiz, 2019	44.0% (40.0 - 48.0)	67.0% (63.2 - 70.8)	16.0% (13.1 - 18.9)	5.0% (3.2- 6.7)
	Lopez-Cabra, 2016	14.4% (10.2 - 18.6)	3.9% (1.6 - 6.2)	3.6% (1.4 - 5.8)	4.4% (2.0 - 6.8)
	Oviedo-Córdoba, 2021	42.4% (36.9 - 47.9)	42.4% (36.9 - 47.8)	15.8% (11.8 - 19.9)	58.4% (52.9 -63.9)
	Subgroup 3	25.5% (15.8 - 47.6)	31.9% (0.3 - 64.1)	11.6% (4.6 - 18.5)	20.1% (3.9 - 36.4)
Overall		37.7% (15.8 - 47.6)	33.2 (15.4 - 51.0)	14.8% (6.8- 23.0)	12.1% (7.4 - 16.9)

*This study only evaluated self-medication with antibiotics.

Discussion

A systematic review and meta-analysis were carried out to estimate the prevalence of self-medication in Colombia and its associated factors in the population over 16. The pooled prevalence of self-medication found in young people and adults from urban areas of Colombia (64.2%; 95% CI 50.8%-77.5%) was similar to that recently found in a global meta-analysis, according to which the prevalence of self-medication was 60.0% (95% CI 40.2%-77.0%) in South America [5]. All the studies included in this meta-analysis were conducted in the urban population, which, according to the 2018 Colombian population census, constitutes 77% of the total Colombian population [22]. Additionally, 11 of the 12 included studies used randomized sampling. Only one study used a convenience sample, which had a low weight on the pooled calculations because of its small sample size (n= 150 subjects) [12]. Therefore, the pooled prevalence could be considered representative of the Colombian population, specifically those living in municipal capitals.

On the other hand, since there is no universal and standardized definition of self-medication, most studies use different time frames to measure its frequency [23]. This has led most of the systematic literature reviews to establish comparisons of the prevalence of self-medication between diverse populations without analyzing in depth the effect that these different time frames could have on the reported frequency. To address the problem of the different time frames used for measuring self-medication, which can undoubtedly contribute to the high heterogeneity observed, we performed a meta-analysis by subgroups, according to the time frame and the study population (General population vs. University students). Our results showed that when self-medication was evaluated for long periods, such as the previous 6-12 months or throughout life, the reported frequency was significantly higher, both in the general population (74.6%; 95% CI 61.3%- 87.9%) and in university students (84.7%; 95% CI 75.1%-94.3%). In contrast, when self-medication was assessed during the previous 30 days, a significantly lower prevalence of self-medication was found (32.3%; 95% CI 25.4%-39.3%). This suggests that, at least in the urban population of Colombia, the time frame during which the self-medication behavior is evaluated could be more important than the effect of age or the university student status. However, the impact that the variables, time frame, age, socioeconomic status, and educational level have on the frequency of self-medication is complex and requires in-depth study. Previous studies have already reported an effect of time frame on the reported frequency of self-medication. This is the case of a systematic review from Brazil that reported a pooled prevalence of self-medication in the last 15 days of 35.0% (95% CI 39.0%-40.0%) [24]; meanwhile, a study evaluating self-medication during lifetime found a frequency of 66.6% (95% CI 61.3%-71.4%) [25]. In another case, a community-based cross-sectional study conducted in southwestern Ethiopia reported that the prevalence of self-medication changed depending on the time frame (58.2% for lifetime vs. 31.2% for current use) [26]. Indeed, when a behavior is evaluated by self-reporting, a long time frame does not allow recent changes to be detected and is associated with recall bias. For this reason, to assess the frequency of self-medication through questionnaires, surveys, and interviews, it is essential to select the recall period appropriately. Generally, a short recording period is preferable to a long one, especially when asking about recurring or frequent events [27].

Although the second objective of this study was to evaluate the factors associated with self-medication in Colombia, only some of the included studies assessed the same characteristics. However, it was possible to extract and analyze the data related to sex, groups of medications used for self-medication, and some causes associated with self-medication behavior. Regarding self-medication in men and women, we did not find differences within the general population, but we did find a higher frequency of self-

medication in female university students compared to males (OR= 1.72; 95% CI 1.17-2.53), a finding that other authors have previously reported, and that can be explained as a strategy for relieving headaches, colds, and dysmenorrhea [28].

This meta-analysis found that, within the population that self-medicated, 37.7% used analgesics, 33.2% anti-inflammatories, and 14.8% antihistamines. Other studies have also shown these drugs to be the most used for self-medication. For example, in Ethiopia, the frequency of analgesics and anti-inflammatories was 46.1% [29], and in Iran, the frequency of analgesic use was 53.2%, with 39.3% for anti-inflammatories and 24.3% for antihistamines [30]. The non-responsible use of OTC medicines is an essential cause of adverse effects and severe drug interactions [31-33]. It is favored by selling in large-area stores without mediating the dispensing process and providing the user with the required information rather than by the insert that needs to be read.

The use of antimicrobials without a medical prescription is a cause for concern due to its implications for developing antimicrobial resistance, to which 1.27 million deaths were attributed in 2019 [34]. We found that antibiotics and antiparasitics were used for self-medication in 12.1% (95% CI 7.4-16.9%) of the cases, a lower frequency than that reported in other studies and systematic reviews. Within low- and middle-income countries, the pooled prevalence of self-medication with antimicrobials has been found to range from 39 to 78%, depending on the countries included in each analysis [35-37]. Therefore, given this high heterogeneity, it is essential to conduct investigations by countries within the same income level group [38]. In Colombia, in particular, it was observed that by 2011, up to 80% of pharmacies did not comply with the rule of dispensing antibiotics only with a medical prescription, and the pharmacy staff did not provide the required information to the user [39]. This phenomenon contributes substantially to using antibiotics through self-medication and is added to other associated factors, such as those discussed below.

Finally, some of the determinants of self-medication were explored; however, despite these causes being so varied and complex, it was only possible to extract information about two: lack of time and delays in care. These two situations were reported by those who self-medicated in 35.2% (95% CI 25.6%-44.7%) of the cases, although their frequency in university students was significantly lower (19.7%; 95% CI 10.3%-29.2%). Another systematic review also reported that the lack of time to see a doctor is reported recurrently by those who self-medicate [40], reaching a frequency of up to 68% in a high-income country such as Saudi Arabia [41]. Therefore, shortening the long waiting times for healthcare services and improving pharmaceutical services might encourage the proper use of medications [42]. However, these strategies must be accompanied by others that involve pharmacy staff, who must have the appropriate formation and

training, comply with the rules for dispensing prescription drugs, and provide the user with the required information on the adequate use of drugs [43, 44]. As limitations of the present study, it should be considered that some studies included in the meta-analysis evaluated self-medication by self-report (memory bias). In contrast, others did so by direct pharmacy observation (information bias), which may contribute to the observed heterogeneity. Additionally, the studies analyzed did not use a standardized time frame. These limitations are common to all studies on self-medication and point to the need for standardized definitions and tools. Therefore, within the recommendations and prospects for future studies, the need to develop and validate instruments to assess the occurrence of self-medication, especially responsible self-medication, as defined by the World Health Organization, is emphasized. These instruments should set a specified time frame, ideally short, as this minimizes recall bias, allows for population assessments, and can detect recent changes in behavior, for example, after an intervention. Additionally, given the impact of self-medication globally, these instruments must be developed and validated in different languages and cultural contexts, and they must evaluate the medications used.

Conclusion

A systematic review and meta-analysis were carried out to estimate the prevalence of self-medication in Colombia and its associated factors in the population over 16. A total of 12 studies with 5,668 were included, and a pooled prevalence of self-medication in young people and adults in Colombia (64.2%; 95% CI 50.8%-77.5%) was calculated. However, the prevalence was significantly lower when self-medication was evaluated during the last 30 days (32.3%) compared to more extended time frames (six months, one year, or throughout life). The self-medication frequency was higher in female university students than in males. The most frequently used medications were analgesics (37.7%), anti-inflammatories (33.2%), antihistamines (14.8%), and antibiotics/antiparasitics (12.1%). As determinants of self-medication, lack of time and delays in medical care were reported in 35.2% (95% CI 25.6%-44.7%) of the cases. The reported frequency of self-medication in Colombia changed across the studies depending on the time frame used; therefore, this should be considered when conducting and comparing studies on self-medication prevalence. Although over-the-counter drugs were the most frequently involved (85.7%), the reported use of prescription drugs such as antibiotics/antiparasitics was 12.1%. Moreover, considering that lacking time and delays in medical care were reported in a third of cases of self-medication, shortening the long waiting times for healthcare services might contribute to the proper use of medications.

Conflict of interests statement

The authors have no relevant financial or non-financial interests to disclose.

Author contribution

All authors contributed to the study conception and design, data collection and analysis, prepared and approved the final version of this manuscript.

References

1.   World Health Organization, *WHO guidelines for the regulatory assessment of medicinal products for use in self-medication: general information*, WHO Drug Inf 2000 141 18-26, 2000. URL: https://apps.who.int/iris/handle/10665/57624

2.   World Health Organization, *The Role of the pharmacist in self-care and self-medication: report of the 4th WHO Consultative Group on the Role of the Pharmacist*, 1998. URL: https://apps.who.int/iris/handle/10665/65860, accessed: Oct 28, 2022.

3.   A.M. Ruiz-Sternberg, A.M. Pérez-Acosta, Automedicación y términos relacionados: una reflexión conceptual, *Rev. Cienc. Salud*, **9**(1), 83–97 (2011).

4.   I.A. Rather, B.-C. Kim, V.K. Bajpai, Y.-H. Park, Self-medication and antibiotic resistance: Crisis, current challenges, and prevention, *Saudi J. Biol. Sci.*, **24**(4), 808–812 (2017).

5.   S. Ghasemyani, M.R. Benis, H. Hosseinifard, R. Jahangiri, A. Aryankhesal, H. Shabaninejad, *et al.*, Global, WHO regional, and continental prevalence of self-medication from 2000 to 2018: A systematic review and meta-analysis, *Ann. Public Health*, 1, 585 (2022).

6.   F. Villegas-Cardona, K.M. Nasner-Posso, D.P. Buitrago-Gómez, S. Cruz-Calderón, S.R. Restrepo, J.E. Bedoya-Arias, *et al.*, Patrón de automedicación en la zona urbana de la ciudad de Pereira (Colombia) en el trimestre marzo-mayo 2013, *Investig. Andina*, **16**(29), 1073–1085 (2014).

7. C.P. Ortiz, O.D. Fúnez-David, H. Rubiano-Daza, C.L. García-Rojas, C.A. Calderón-Ospina, D.R. Delgado, Automedicación en estudiantes de la Sede Neiva de la Universidad Cooperativa de Colombia, *Rev. Colomb. Cienc. Quím. Farm.*, **48**(1), 128–144 (2019).

8. A. Liberati, D.G. Altman, J. Tetzlaff, C. Mulrow, P.C. Gøtzsche, J.P.A. Ioannidis, *et al.*, The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration, *PLoS Med.*, **6**(7), e1000100 (2009).

9. Z. Munn, S. Moola, K. Lisy, D. Riitano, C. Tufanaru, Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data, *Int. J. Evid. Based Healthc.*, **13**(3), 147–153 (2015).

10. D. Hoy, P. Brooks, A. Woolf, F. Blyth, L. March, C. Bain, *et al.*, Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of inter-rater agreement, *J. Clin. Epidemiol.*, **65**(9), 934–939 (2012).

11. J. Castro-Espinosa, J.F.A. Arboleda-Geovo, P. Samboni-Novoa, Prevalencia y determinantes de automedicación con antibióticos en una comuna de Santiago de Cali, Colombia, *Rev. Cubana Farm.*, **48**(1), 43–54 (2014).

12. D.M. Feria-Mejía, G.A. Romero-Martínez, K.J. Carrascal-García, *Caracterización de la práctica de la automedicación en adultos beneficiarios de un centro de desarrollo integral de la Comuna Ocho de la Cuidad de Sincelejo, Sucre en 2020*, College Thesis, Universidad de Sucre, Sincelejo, Colombia, 2021. URL:: https://repositorio.unisucre.edu.co/bitstream/handle/001/1136/T615.856%20F356.pdf?sequence=1&isAllowed=y

13. M. Peñuela, A. De la Espriella, E. Escobar, M.V. Velásquez, J. Sánchez, A. Arango, *et al.*, Factores socioeconómicos y culturales asociados a la autoformulación en expendios de medicamentos en la ciudad de Barranquilla, *Salud Uninorte*, **16**, 30–38 (2002).

14. M. Del Toro-Rubio, A. Díaz-Pérez, Z. Barrios-Puerta, I.Y. Castillo-Avila, Automedicación y creencias en torno a su práctica en Cartagena, Colombia, *Revista Cuidarte*, **8**(1), 1509 (2017).

15. M. Macías-Vidal, *Factores asociados a la automedicación con productos farmacéuticos de venta libre, adquiridos en tiendas, por personas mayores de 18 años de cuatro municipios del departamento del Atlántico en el 2014*, Master Thesis, Universidad del Norte, Barranquilla, Colombia, 2015. URL: https://manglar.uninorte.edu.co/bitstream/handle/10584/10023/Mac%c3%adas%20Vidal.pdf?sequence=1&isAllowed=y

16. H. Oviedo-Córdoba, C.E. Cortina-Navarro, J.A. Osorio-Coronel, S.M. Romero-Torres, Realidades de la práctica de la automedicación en estudiantes de la Universidad del Magdalena, *Enfermería Global*, **62**, 531–543 (2021).

17. J.E. Machado-Alba, L.F. Echeverri-Cataño, M.J. Londoño-Builes, P.A. Moreno-Gutiérrez, S.A. Ochoa-Orozco, J.O. Ruiz-Villa, Social, cultural and economic factors associated with self-medication, *Biomedica*, **34**(4), 580–588 (2014).

18. J.J. López, R. Dennis, S.M. Moscoso, Estudio sobre la Automedicación en una Localidad de Bogotá, *Rev. Salud Pública*, **11**(3), 432–442 (2009).

19. A.L. Fajardo-Zapata, F.J. Méndez-Casallas, J.F. Hernández-Niño, L.H. Molina, A.M. Tarazona, C. Nossa, *et al.*, La automedicación de antibióticos: un problema de salud pública, *Salud Uninorte*, **29**(2), 226–235 (2013).

20. K. Bravo, E Espinel, A. Pardo, A. Robles, *Automedicación en estudiantes de medicina de la Universidad de Ciencias Aplicadas y Ambientales UDCA en el segundo semestre de 2017*, College Thesis, Universidad de Ciencias Aplicadas y Ambientales, Bogotá, 2017. URL: https://repository.udca.edu.co/bitstream/handle/11158/830/28-10-2017%20AUTOMEDICACION%20final.pdf?sequence=1&isAllowed=y

21. C.A. López-Cabra, J.M. Gálvez-Bermúdez, C. Domínguez-Domínguez, A. Urbina-Bonilla, C.A. Calderón-Ospina, A. Vallejos-Narváez, Automedicación en estudiantes de medicina de la Universidad del Rosario en Bogotá D. C., Colombia, *Rev. Colomb. Cienc. Quím. Farm.*, **45**(3), 374–384 (2016).

22. Departamento Administrativo Nacional de Estadística (DANE), *DANE - ¿Dónde estamos?*, 2023. URL: https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018/donde-estamos, accessed: Aug 28, 2023.

23. D. Baracaldo-Santamaría, M.J. Trujillo-Moreno, A.M. Pérez-Acosta, J.E. Feliciano-Alfonso, C.A. Calderon-Ospina, F. Soler, Definition of self-medication: A scoping review, *Ther. Adv. Drug Saf.*, **13**, 20420986221127501 (2022).

24. P.H.F. Domingues, T.F. Galvão, K.R.C. de Andrade, P.T.T. de Sá, M.T. Silva, M.G. Pereira, Prevalence of self-medication in the adult population of Brazil: A systematic review, *Rev. Saude Publica*, **49**, 36 (2015).

25. M.C.X. Pinto, F. Ferré, M.L.P. Pinheiro, Potentially inappropriate medication use in a city of Southeast Brazil, *Braz. J. Pharm. Sci.*, **48**(1), 79–86 (2012).

26. W.A. Adedeji, M.D. Dairo, P.M. Nguku, A. Oyemakinde, F.A. Fehintola, Pattern and predictors of medication use among adults in southwestern Nigeria: A community-based cross-sectional study, *Pharmacol. Res. Perspect.*, **11**(1), e01017 (2023).

27. A. Althubaiti, Information bias in health research: Definition, pitfalls, and adjustment methods, *J. Multidiscip. Healthc.*, **9**, 211–217 (2016).

28. Z. Klemenc-Ketis, Z. Hladnik, J. Kersnik, A cross sectional study of sex differences in self-medication practices among university students in Slovenia, *Coll. Antropol.*, **35**(2), 329–334 (2011).

29. M. Sisay, G. Mengistu, D. Edessa, Epidemiology of self-medication in Ethiopia: A systematic review and meta-analysis of observational studies, *BMC Pharmacol. Toxicol.*, **19**, 56 (2018).

30. S. Azami-Aghdash, M. Mohseni, M. Etemadi, S. Royani, A. Moosavi, M. Nakhaee, Prevalence and cause of self-medication in Iran: A systematic review and meta-analysis article, *Iran. J. Public Health*, **44**(12), 1580–1593 (2015).

31. Q. Zhang, C. Bal-dit-Sollier, L. Drouet, G. Simoneau, J.-C. Alvarez, S. Pruvot, *et al.*, Interaction between acetaminophen and warfarin in adults receiving long-term oral anticoagulants: A randomized controlled trial, *Eur. J. Clin. Pharmacol.*, **67**(3), 309–314 (2011).

32. R. Gualtierotti, A. Zoppi, A. Mugellini, G. Derosa, A. D'Angelo, R. Fogari, Effect of naproxen and acetaminophen on blood pressure lowering by ramipril, valsartan and aliskiren in hypertensive patients, *Expert Opin. Pharmacother.*, **14**(14), 1875–1884 (2013).

33. I.M. MacIntyre, E.J. Turtle, T.E. Farrah, C. Graham, J.W. Dear, D.J. Webb, *et al.*, Regular acetaminophen use and blood pressure in people with hypertension: The PATH-BP trial, *Circulation*, **145**(6), 416–423 (2022).

34. Antimicrobial Resistance Collaborators, Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis, *Lancet* (Lond Engl.), **399**(10325), 629–655 (2022).

35.   M. Ocan, E.A. Obuku, F. Bwanga, D. Akena, S. Richard, J. Ogwal-Okeng, *et al.*, Household antimicrobial self-medication: A systematic review and meta-analysis of the burden, risk factors and outcomes in developing countries, *BMC Public Health*, **15**(1), 742 (2015).

36.   G. Nepal, S. Bhatta, Self-medication with antibiotics in WHO Southeast Asian Region: A systematic review, *Cureus*, **10**(4), e2428 (2018).

37.   G. Sulis, P. Adam, V. Nafade, G. Gore, B. Daniels, A. Daftary, *et al.*, Antibiotic prescription practices in primary care in low- and middle-income countries: A systematic review and meta-analysis, *PLoS Med.*, **17**(6), e1003139 (2020).

38.   N. Mallah, N. Orsini, A. Figueiras, B. Takkouche, Income level and antibiotic misuse: A systematic review and dose–response meta-analysis, *Eur. J. Health Econ.*, **23**(6), 1015–1035 (2022).

39.   C.P. Vacca, C.Y. Niño, L. Reveiz, Restricción de la venta de antibióticos en farmacias de Bogotá, Colombia: estudio descriptivo, *Rev. Panam. Salud Publica*, **30**(6), 586–591 (2011).

40.   A. Shaghaghi, M. Asadi, H. Allahverdipour, Predictors of self-medication behavior: A systematic review, *Iran. J. Public Health*, **43**(2), 136–146 (2014).

41.   A.H.M.A. Faqihi, S.F. Sayed, Self-medication practice with analgesics (NSAIDs and acetaminophen), and antibiotics among nursing undergraduates in University College Farasan Campus, Jazan University, KSA, *Ann. Pharm. Fr.*, **79**(3), 275–285 (2021).

42.   K. Tripković, A. Nešković, J. Janković, M. Odalović, Predictors of self-medication in Serbian adult population: cross-sectional study, *Int. J. Clin. Pharm.*, **40**(3), 627–634 (2018).

43.   J. Aponte-González, A. González-Acuña, J. Lopez, P. Brown, J. Eslava-Schmalbach, Perceptions in the community about the use of antibiotics without a prescription: Exploring ideas behind this practice, *Pharm. Pract.*, **17**(1), 1394 (2019).

44.   J. Aponte-González, P. Brown, J. Eslava-Schmalbach, Preferences based interventions to address the use of antibiotics without prescription: A discrete choice experiment, *Pharm. Pract.*, **19**(3), 2401 (2021).

Supplementary Material
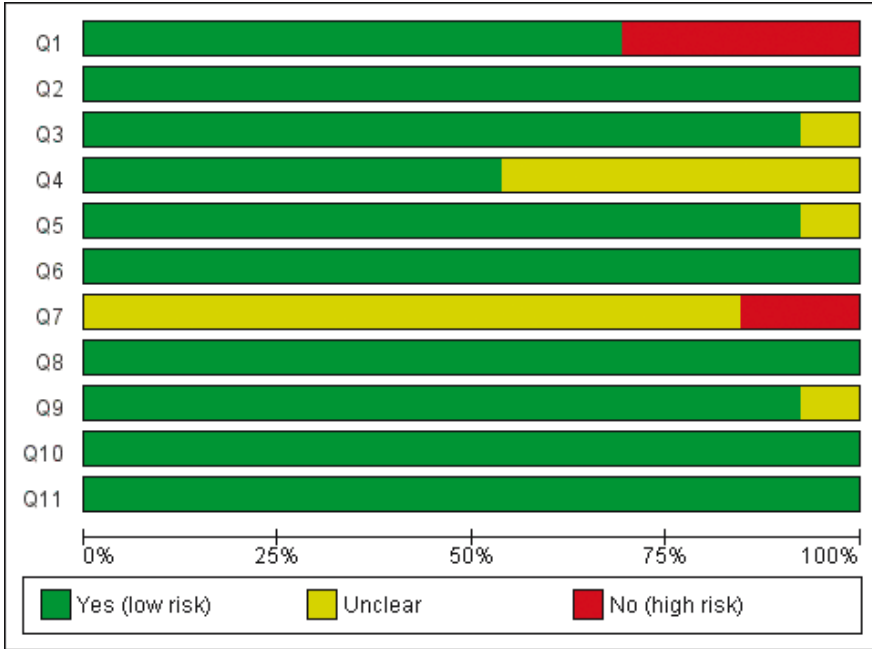
Supplementary Figure 1. Risk of bias graph.

Supplementary Table 1. Excluded studies.

First author	Year	Reference	Reasons for exclusion
Tobón-Marulanda	2002	[1]	The sample does not represent the Colombian population; it only partially reports the obtained and expected losses; the instrument needs to be validated; and it does not specify the self-medication time frame.
Mejía	2017	[2]	The sample does not represent the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; it does not establish a clear definition of self-medication; the instrument does not have any validation; and it only partially specifies the self-medication time frame.

First author	Year	Reference	Reasons for exclusion
Mejía	2018	[3]	The sample is not representative of the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; it does not establish a clear definition of self-medication; the instrument does not have any validation; it only partially specifies the self-medication time frame.
Martínez-Domínguez	2013	[4]	The sample is not representative of the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; and the instrument does not have any validation.
Gallardo	2011	[5]	The sample does not represent the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; the instrument does not have any validation; and it only partially specifies the self-medication time frame.
Suárez	2019	[6]	The sample is not representative of the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; and the instrument does not have any validation.
Calderón	2009	[7]	The sample is not representative of the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; it does not establish a clear definition of self-medication; the instrument does not have any validation; and it only partially specifies the self-medication time frame.
Luna	2021	[8]	The sample does not represent the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; the instrument does not have any type of validation; and it only partially specifies the self-medication time frame.
Atehortúa	2011	[9]	The sample does not represent the Colombian population; there is no random selection of participants; it does not report the expected and observed losses; the instrument does not have any validation; and it only partially specifies the self-medication time frame.

First author	Year	Reference	Reasons for exclusion
Fajardo-Zapata	2018	[10]	The sample is not representative of the Colombian population; it does not establish a clear definition of self-medication; the instrument does not have any validation; and it only partially specifies the self-medication time frame.
Flórez-Molina	2020	[11]	The sample is not representative of the Colombian population; convenience sampling; expected and observed losses are not reported; and the time frame of self-medication is not defined.

SUPPLEMENTARY REFERENCES

1. F.A. Tobón-Marulanda, Estudio sobre automedicación en la Universidad de Antioquia, Medellín, Colombia, *Iatreia*, **15**, 242–247 (2002).

2. M.C. Berruet-Mejía, M. Lince-Restrepo, D. Restrepo-Bernal, Automedicación de analgésicos y antibióticos en estudiantes de pregrado de medicina, *Medicina U.P.B.*, **36**, 115–122 (2017).

3. M.C. Berruet-Mejía, M. Lince-Restrepo, D. Restrepo-Bernal, Actitudes, conocimientos y prácticas frente a la automedicación con productos herbales y psicofármacos en estudiantes de medicina de Medellín-Colombia, *Medicina U.P.B.*, **37**, 17–24 (2018).

4. M.D.A. Martínez-Domínguez, L.M. Martínez-Sánchez, G.I. Martínez-Domínguez, Características del consumo de medicamentos de venta libre en una población de adultos de la ciudad de Medellín (Colombia), *Salud Uninorte*, **29**, 360–367 (2013).

5. E.T. Gallardo, G.A. Ortiz-Ochoa, J.N. Muñoz-Restrepo, J.O. Higuita-Restrepo, K.C. Ceballos-Borja, *Análisis sobre la automedicación en Colombia: un problema de todos*, College Report, Universidad Nacional Abierta y a Distancia, Palmira, Valle, Colombia, 2011. URL: https://repository.unad.edu.co/bitstream/handle/10596/26382/TRABAJO%20CURSO%20DE%20PROFUNDIZACION%20EVELYN.pdf?sequence=1&isAllowed=y#:~:text=Las%20razones%20por%20las%20que,recibir%20el%20mismo%20analg%C3%A9sico%20y

6. A.J. Suárez-López, Automedicación con antibióticos en habitantes de la comuna tres del municipio de San Juan de Pasto, *Revista Criterios*, **26**, 37–55 (2019).

7. A.A. Calderón-Murillo, L.M. Castaño-Mejia, M.M. Gómez-Samper, D.N. Rojas-Ortiz, G.E. Rendón-Restrepo, D. Pineda-Álvarez, *La automedicación: una costumbre sin control adecuado, que atenta contra la salud y calidad de vida de los ciudadanos*, College Report, Universidad Nacional Abierta y a Distancia, Medellín, Colombia, 2009. URL: https://repository.unad.edu.co/bitstream/handle/10596/1701/2009-09T-05.pdf?sequence=1

8. M.A. Luna-Narvaéz, L.Y. Sierra-López, L.M. Solar-Jimenez, J.P. Ruíz-Castro, *Automedicación en estudiantes de una universidad pública de la ciudad de Montería*, College Report, Universidad de Córdoba, Montería, Córdoba, Colombia, 2021. URL: https://repositorio.unicordoba.edu.co/bitstream/handle/ucordoba/4469/lunanarvaezmaira-sierralopezlaura-solarjimenezluis-ruizcastrojessica.pdf?sequence=1&isAllowed=y

9. J. Atehortua, L. Castaño-Díaz, L. Hernández-Posso, A. Monje-Trujillo, O. Ordoñez-Galindo, *Prevalencia de la automedicación en veinticinco droguerías de los municipios de Pradera, Neiva, Itahui, Otanche y Dos Quebradas*, College Report, Universidad Nacional Abierta y a Distancia, Palmira, Valle, Colombia, 2011. URL: https://repository.unad.edu.co/bitstream/handle/10596/26413/LEYNER%20HERNANDEZ.pdf?sequence=1&isAllowed=y

10. A.L. Fajardo-Zapata, Consumo de psicofármacos en la ciudad de Bogotá D.C. (Colombia): una nueva realidad, *Archivos de Medicina*, **18**, 404–412 (2018).

11. J. Flórez-Molina, P.E. Chaparro-Narváez, *Automedicación y factores asociados en docentes de dos instituciones educativas en Bogotá y Cali (Colombia): un estudio transversal*, Master Thesis, Universidad Santo Tomás, Bogotá D.C., Colombia, 2020. URL: https://repository.usta.edu.co/bitstream/handle/11634/22816/2020jhonflorez.pdf?sequence=5&isAllowed=y

How to cite this article