Prevalence of self-medication and associated factors in adolescents aged 18-19 years: the 1997/1998 cohort in São Luís-MA, Brazil

Prevalência de automedicação e fatores associados em adolescentes de 18-19 anos: a coorte de 1997/1998 em São Luís-MA, Brasil

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Abstract *This article aims to assess the prevalence and factors associated with self-medication in adolescents. Cross-sectional study, nested in cohort, with 2,515 adolescents aged 18-19 years born in São Luís-MA. The use of medication in the last 15 days without a medical prescription or by a qualified professional was considered self-medication. Factors associated with self-medication were evaluated using Poisson regression with robust variances and hierarchical selection of variables. Medicines were used in the last 15 days by 48.05% of adolescents. Among these, 70.09% use it without a prescription or indication from another health professional. The most used medications for self-medication were "over the counter" (93.68%). Self-medication was positively associated with female gender (PR: 1.41; 95%CI: 1.25-1.59), screen time ≥5h/day (PR: 1.32; 95%CI: 1.05-1.67) and self-reported diagnosis of allergic rhinitis (PR: 1.19; 95%CI: 1.02-1.39); however, negatively associated with self-satisfaction with health (PR: 0.79; 95%CI: 0.67-0.94) and hospitalization in the previous year (PR: 0.70; 95%CI: 0.50-0.97). Self-medication was common among adolescents and to reduce this practice, greater attention should be given to women, individuals with intense exposure to meshes and allergic diseases.*
Key words *Self-medication, Adolescents, Prevalence, Risk factors*

Resumo *O objetivo deste artigo é avaliar a prevalência e os fatores associados a automedicação em adolescentes. Estudo transversal, aninhado a uma coorte, com 2.515 adolescentes de 18-19 anos nascidos em São Luís-MA. O uso de algum medicamento nos últimos 15 dias sem prescrição médica ou de profissional habilitado foi considerado automedicação. Os fatores associados a automedicação foram avaliados usando regressão de Poisson com variâncias robustas e seleção hierárquica das variáveis. Medicamentos foram utilizados nos últimos 15 dias por 48,05% dos adolescentes. Entre estes, 70,09% fazem uso sem receita médica ou indicação de outro profissional de saúde. Os medicamentos mais utilizados na automedicação foram os "over the counter" (93,68%). A automedicação foi positivamente associada ao sexo feminino (RP: 1,41; IC95%: 1,25-1,59), tempo de tela ≥5h/dia (RP: 1,32; IC95%: 1,05-1,67) e diagnóstico autorreferido de rinite alérgica (RP: 1,19; IC95%: 1,02-1,39); porém, negativamente associada a autossatisfação com a saúde (RP: 0,79; IC95%: 0,67-0,94) e hospitalização no ano anterior (RP: 0,70; IC95%: 0,50-0,97). A automedicação foi comum entre os adolescentes e para redução dessa prática uma maior atenção deve ser dada a mulheres, indivíduos com intensa exposição a telas e doenças alérgicas.*
Palavras-chave *Automedicação, Adolescentes, Prevalência, Fatores de risco*

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Introduction

Self-medication is defined as the use of medicines by the consumer for the treatment of self-recognized disorders or symptoms, or the intermittent or continued use of a medicine prescribed by a physician for chronic or recurrent diseases or symptoms. In practice the self-medication involves the use of medicines by the consumer by indication from family members, especially when it comes to the treatment of children, adolescents or the elderly[1].

The practice of self-medication is a growing and global public health phenomenon in general population in both developed and emerging countries[2]. Especially in adolescence, prevalence of self-medication ranged from 4.0% to 92.0% in different countries[3] while in Brazil has been reported frequencies between 10.3% and 52.6%[4-8].

Self-medication can bring risks to individuals, such as incorrect self-diagnosis, incorrect choice of therapy, delays in seeking medical advice and correct treatment, possible adverse reactions, dangerous drug interactions, incorrect route or form of administration; inadequate dosage, storage under improper conditions, masking of serious diseases, risk of dependence or abuse[9].

In adolescents, the practice of self-medication should not be scorned, since adolescence is an essential phase for the formation of habits and behaviors related to lifestyle and health that can impact the current and future morbidity and mortality of these individuals[10,11].

In this context, the issue of self-medication among the adolescents represents a relevant topic in the pharmacoepidemiology. Thus, this study aimed to evaluate the prevalence and associated factors of self-medication among adolescents aged 18 and 19 years in the birth cohort of São Luís, Maranhão, Brazil.

Methods

This is a cross-sectional study nested in a cohort study, with individuals born in 1997/1998 in the city of São Luís. São Luís, capital of the state of Maranhão, is located on an island at the north coast of the state, in the Northeast Region of Brazil. In 2019, São Luís had a population of 1,101,884 inhabitants[12] and, according to data from the Brazilian Institute of Geography and Statistics[13], the Municipality's Human Development Index was 0.768 in 2010.

In the São Luís cohort (1997/1998), one out of every seven live births to mothers living in the city was eligible for the first phase of the study, with delivery performed in ten public and private maternity hospitals from March 1997 to February 1998. The initial sample in the perinatal (N=2,831) corresponded to 96.3% of births in the studied period, excluding non-hospital births and those that occurred in hospitals with less than 100 births per year. Excluding non-residents in São Luís, twins and stillbirths, a final sample of the first phase of the study of 2,443 births was obtained, with 5.8% of losses due to refusals or early discharge[14].

This cohort was followed up at 7-9 years old and again at 18-19 years old. In this article, data from the second cohort follow-up, conducted with participants aged 18-19 years, in 2016/2017 were used. In this follow-up, all individuals included in the initial phase of the study were searched at the Military Enlistment Boards of São Luís, in the 2014 school census and in universities, totaling 687 participants. In order to increase the power of the sample and prevent future losses, the cohort was opened to include other individuals born in São Luís, in 1997. The first search stage took place by means of a drawing using data from the Information on Live Births (SINASC), considering the following criteria for registration: birth in a maternity hospital in the city of São Luís, in 1997. From this list, a random drawing was carried out, obtaining a total of 4,593 born in 1997 in the city of São Luís, from whom it was possible to make telephone or personal contact with 1,133 individuals. In a second stage, 695 volunteers born in the same year were identified in schools, universities and through social media. Thus, the total sample of participants aged 18-19, including both the prospective (original cohort) and retrospective cohort components, was 2,515 adolescents[15]. In this article, data from the second cohort follow-up, conducted with participants aged 18-19 years, in 2016/2017 were used.

In the follow-up at 18-19 years, data collection took place on the premises of UFMA and was carried out by health professionals who were trained to conduct interviews and operate the instrument used in the research.

Questionnaires were applied by interviewers to collect data from demographic, socioeconomic, lifestyle, health information and self-reported skin color and morbidity variables. Data on the use of illicit drugs, in turn, were obtained through a self-administered confidential questionnaire.

Leisure physical activity was assessed using the Physical Activity Survey, based on an adap-

tation of the Self-Administered Physical Activity Checklist (SAPAC)[16].

Screen time was measured by reporting exposure to television, video games, cell phones, tablets and computers in hours/days of the week, except on weekends, as they are considered atypical days.

Regarding data on medication use, the adolescent was asked specifically about the use of medicines in the last fifteen days (yes or no) and, in case of a positive answer, he was asked about the quantity (number) and type of medicine used (drug name), as well as who indicated/prescribed it (doctor, other health professional, mother, family member/friend, nobody (he/she took it on his/her own), other, does not know).

Conventional drugs used with the purpose of preventing, treating or alleviating their symptoms of diseases or health alterations, produced under strict technical control, were considered as medicines[17,18].

Self-medication, the outcome of the study, was defined how the ingestion of medicines on their own initiative, or on the advice of another person, without consulting a doctor or other health professional qualified to prescribe medication[1]. Thus, it was considered self-medication who answered the options mother, family member/friend, nobody (he/she took it on his/her own) or other in the question about who indicated the medications used.

The drugs used by self-medication were classified according to Anatomical Therapeutic Chemical Classification system[19]. Through this classification system, the drugs are classified in levels according to anatomical/pharmacological groups (1st levels) and pharmacological or therapeutic groups (2nd levels). We also classified the drugs in "over the counter" (OTC) medication using a list of the Brazilian National Health Surveillance Agency[20]. OTC drugs are drugs approved by health authorities for sale without the requirement of a medical prescription, being indicated to treat self-limited health problems[1].

In cases where a specific answer was not obtained regarding the type of drug used, for example when the adolescent did not know to inform the name of the drug, its commercial or generic name, or when only the therapeutic class was mentioned, these data were not considered.

To assess the factors associated with self-medication, a multiple regression analysis model with a hierarchical approach was used. Fuchs et al.[21], emphasizes the importance of balancing statistically significant associations with biological and social contexts, through theoretical models with a hierarchical approach. The independent variables were selected based on the previous literature on factors associated with self-medication in adolescents[22] and organized into levels according to hierarchical conceptual model for the outcome of self-medication in adolescents elaborated by the researchers (Figure 1).

Independent variables were grouped into three blocks, according to the hierarchical conceptual model (Figure 1): Block 1 (distal level) comprised socioeconomic and demographic variables categorized as: sex (male and female), skin color (white/yellow and black/brown), marital status (without partner and with partner), adolescent education (elementary school, high school, pre-university course, technical school and incomplete university graduate), head of household education (uneducated, elementary school, high school, incomplete university graduate, complete university graduate), current job (no and yes), family income (<1 minimum wage, 1 minimum wage and ≥2 minimum wages) - Minimum wages values: BRL 880.00 in 2016 and BRL 937.00 in 2017. Block 2 (intermediate level) was composed of lifestyle variables categorized as : smoking (never smoked, stopped smoking and current smoker), consumption of alcoholic beverages (never, ≤1 time/month, 2 to 4 times/month, ≥5 times/month), use of illicit drugs (never used, just experienced, already used, but stopped, only on weekends/one occasion and use every day/almost every day), physical activity level (sedentary, low, moderate and high), screen time (≤2 hours/day, 2 to 4.9 hours/day and ≥5 hours/day). In block 3 (proximal level) encompassed health-related variables categorized as: self-satisfaction with health (unsatisfied/very unsatisfied, regular and satisfied/very satisfied), hospitalization in the previous year (no and yes) health insurance (no and yes) hyperglycemia/diabetes (no and yes), hypercholesterolemia (no and yes), arterial hypertension (no and yes), allergic rhinitis (no and yes), skin allergy/eczema (no and yes).

Statistical analyzes were performed with the aid of the software Stata version 14.0. To characterize the study population, categorical variables were described using absolute and relative frequencies and quantitative variables using measures of central tendency and dispersion.

The analysis of factors associated to self-medication was performed using Poisson Regression, with robust variances. Initially, a crude analysis was performed, estimating the prevalence ratios
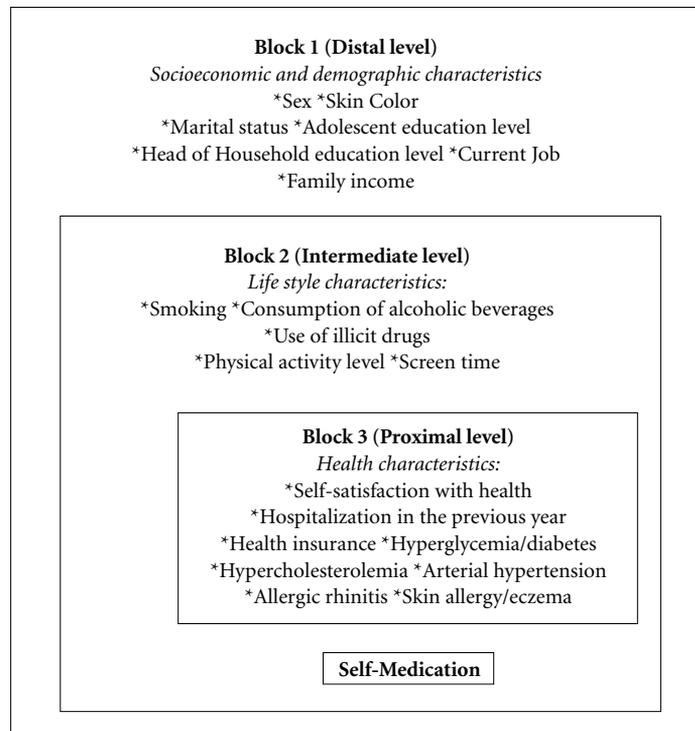
Figure 1. Hierarchical conceptual model of the determinants of self-medication in adolescents.

Source: Authors.

of self-medication and the respective 95% confidence intervals. Variables with a P-value less than 0.20 were included in the multivariate analysis, in a hierarchical manner, according to the blocks/levels of the conceptual model.

Firstly, the variables in block 1 were included (Model 1). After, the variables in block 2, adjusted by the variables with P-value<0.20 of the block 1 (Model 2). Finally, variables from block 3 were included, adjusted for the significant variables with P-value<0.20 of blocks 1 and 2 (Model 3). They were considered as significantly associated with self-medication the variables that presented P-value≤0.05 in each regression model. The Akaike criterion was used to compare the models.

The research project was submitted to and approved by the Research Ethics Committee from the University Hospital of Universidade Federal do Maranhão (substantiated opinion No. 1302489 of October 29, 2015), and conducted in accordance with the ethical standards set out in the 1964 Helsinki Declaration and its subsequent amendments. The informed consent form was signed by the study participants.

Results

Among 2,515 adolescents included in this study, 52.45% of whom were female, most of them black/brown, without partner, with high school/pre-university course and family income greater than two minimum wages (Table 1). As for lifestyle characteristics, most adolescents reported never having smoked and never consuming alcoholic beverages, on the other hand, most were sedentary (Table 2). Regarding health characteristics, the majority reported being satisfied/very satisfied with their own health, they were not hospitalized in the previous year and did not have a health insurance. Among self-reported morbidities, the most frequent were allergic rhinitis, skin allergy/eczema and hypercholesterolemia (Table 2).

When asked about the use of medications in the last 15 days, 48.05% of the adolescents reported the use of some type of medication (totalizing 1197 medications), with the average number of medications used among the adolescents being 1.57 (Standard deviation: 0.95). The prevalence of self-medication in the total population (among

Table 1. Socioeconomic and demographic characteristics of adolescents aged 18-19 years old in the São Luís 1997/1998 birth cohort, prevalence of self-medication and respective crude prevalence rates (PR) and 95% confidence intervals (95%CI). São Luís-MA, Brazil, 2016/2017.

Variable/Category	N (%)	Self-medication		
		Prevalence (%)	Crude PR (95%CI)	P-Value
Sex				<0.0001*
Male	1,196 (47.55)	27.68	Ref.	
Female	1,319 (52.45)	38.51	1.39 (1.24-1.56)	
Skin color				0.0843
White/Yellow	497 (19.86)	36.57	Ref.	
Black/Brown	2,005 (80.14)	32.55	0.89 (0.78-1.02)	
Marital status				0.2500
Without partner	2,422 (96.30)	33.51	Ref.	
With partner	93 (3.70)	27.47	0.82 (0.58-1.15)	
Adolescent education level				0.0944
Elementary School	27 (1.07)	18.52	Ref.	
High school/pre-university course	1,673 (66.57)	31.37	1.69 (0.77-3.75)	
Technical school	141 (5.61)	35.46	1.91 (0.84-4.36)	
Incomplete University Graduate	672 (26.74)	38.30	2.07 (0.93-4.59)	
Head of Household education level				0.1811
Uneducated	29 (1.28)	28.57	Ref.	
Elementary School	564 (24.99)	30.36	1.06 (0.58-1.93)	
High School	1,258 (55.74)	34.27	1.20 (0.66-2.17)	
Incomplete University Graduate	81 (3.59)	38.27	1.34 (0.70-2.56)	
Complete University Graduate	325 (14.40)	37.65	1.32 (0.72-2.41)	
Current Job				0.8700
No	2,118 (84.21)	70.04	Ref.	
Yes	397 (15.79)	69.46	0.99 (0.89-1.09)	
Family Income[a]				0.1153
<1 minimum wage	290 (12.96)	76.86	Ref.	
1 minimum wage	735 (32.84)	71.22	0,92 (0.82-1.04)	
≥2 minimum wages	1,213(54.20)	68.39	0.88 (0.79-0.99)	

*P<0,01. [a]Minimum wages values: BRL 880.00 in 2016 and BRL 937.00 in 2017.

Source: Authors.

those who did not take medication and those who did) was 33.36%. Among the adolescents who used any medication in the last 15 days, 70.09% reported using it without a doctor's prescription or from another health professional, of which 93.68% were OTC (data not shown in table).

Based in ATC classification, the most used drugs without a prescription were: analgesics 34.80% (292), muscle relaxants 21.57% (181), anti-inflammatory and anti-rheumatic drugs 17.64% (148), drugs for functional gastrointestinal disorders 11.08% (93), cough and cold preparations 8.58% (72). In addition, among the drugs used 3.58% (30) represented prescription drugs (antibacterials for systemic use) and 0,84% (7) of medicines subject to special control (antiepileptics, psycholeptics/anxiolytics, psychoanaleptics/antidepressants and psychoanaleptics/psychostimulants, agents used for attention deficit hyperactivity disorder and nootropics) (Table 3).

In the bivariate analysis, among the socioeconomic and demographic variables, sex, skin color, adolescent education, head of household education level and family income were included in the multiple model (Table 1). Among the lifestyle variables, with the exception of smoking, all were included in the multiple analysis. Among the health-related characteristics, self-satisfied health, hospitalization in the previous year, hyperglycemia/diabetes, hypercholesterolemia, allergic rhinitis and skin allergic/eczema were included in the multiple analysis (Table 2).

Table 2. Lifestyle and health characteristics of adolescents aged 18-19 years old in the São Luís 1997/1998 birth cohort, prevalence of self-medication and respective crude prevalence ratios (PR) and 95% confidence intervals (95%CI). São Luís-MA, Brazil, 2016/2017.

Variable/Category	N (%)	Self-medication		
		Prevalence (%)	Crude PR (95%CI)	P-Value
Smoking				0.4060
Never smoked	2,283 (91.21)	33.42	Ref.	
Stopped smoking	131(5.23)	36.92	1.10 (0.88-1.39)	
Current smoker	89 (3.56)	28.09	0.84 (0.60-1.18)	
Consumption of alcoholic beverages				0.0447*
Never	1,459 (58.50)	30.94	Ref.	
≤1 time/month	431 (17.28)	35.03	1.13 (0.97-1.32)	
2 a 4 time/month	455 (18.24)	38.11	1.23 (1.07-1.42)	
≥5 time/month	149 (5.97)	37.84	1.22 (0.98-1.52)	
Illicit drug use				0.1321
Never used	1,552 (70.55)	32.47	Ref.	
Just experienced	258 (11.73)	38.28	1.18 (0.99-1.40)	
Already used, but stopped	188 (8.55)	36.56	1.13 (0.92-1.38)	
Only on weekends/on occasion	164 (7.45)	39.02	1.20 (0.98-1.47)	
Every day/almost every day	38 (1,.73)	27.03	0.83 (0.49-1.42)	
Physical activity level				0.0085**
Sedentary	1,123 (44.88)	35.96	Ref.	
Low	289 (11.55)	37.28	1.04 (0.88-1.23)	
Moderate	608 (24.30)	30.64	0.85 (0.74-0.98)	
High	482 (19.26)	28.75	0.80 (0.68-0.94)	
Screen time				0.0057**
≤2 hours/day	245 (10.80)	25.82	Ref.	
2 to 4.9 hours/day	586 (25.83)	30.98	1.20 (0.94-1.53)	
≥5 hours/day	438 (63.38)	35.64	1.38 (1.10-1.73)	
Self-satisfaction with health				<0.0001**
Unsatisfied/Very Unsatisfied	313 (12.45)	39.94	Ref.	
Regular	801 (31.86)	37.95	0.95 (0.81-1.12)	
Satisfied/Very satisfied	1,400 (55.69)	29.29	0.73 (0.63-0.86)	
Hospitalization in the previous year				0.0690
No	2,386 (94.87)	33.78	Ref.	
Yes	129 (5.13)	25.58	0.76 (0.56-1.02)	

it continues

In the hierarchical multivariate analysis (Table 4), in block 1, an association was observed between sex and self-medication: female had higher prevalence of self-medication when compared to male (Adjusted PR: 1.41; 95%CI: 1.25-1.59) - Model 1. In block 2, only the variable screen time was significantly associated with the outcome. The prevalence of self-medication was 32% higher among adolescents with screen time ≥5 hours/day when compared to those with ≤2 hours/day (Adjusted PR: 1.32; 95%CI: 1.05-1.67) - Model 2. In block 3, self-satisfaction with health, hospitalization in the previous year and allergic rhinitis were significantly associated with self-medication. The prevalence of self-medication was 21% lower among adolescents satisfied/very satisfied with their own health in relation to unsatisfied/very unsatisfied (Adjusted PR: 0.79; 95%CI: 0.67-0.94). In addition, the prevalence of the outcome was 30% lower among adolescents who were hospitalized in the year prior to the interview (Adjusted PR: 0.70; 95%CI: 0.50-0.97). In the order hand, it was observed higher prevalence of self-medication in the adolescents that reported allergic rhinitis (Adjusted PR: 1.19; 95%CI: 1.02-1.39) - Model 3.

Table 2. Lifestyle and health characteristics of adolescents aged 18-19 years old in the São Luís 1997/1998 birth cohort, prevalence of self-medication and respective crude prevalence ratios (PR) and 95% confidence intervals (95%CI). São Luís-MA, Brazil, 2016/2017.

Variable/Category	N (%)	Self-medication		
		Prevalence (%)	Crude PR (95%CI)	P-Value
Health insurance				0.2050
No	2,006 (79.76)	32.70	Ref.	
Yes	509 (20.24)	35.63	1.09 (0.95-1.24)	
Hyperglycemia/diabetes				0.0379*
No	2,395 (95.42)	32.94	Ref.	
Yes	115 (4.58)	41.74	1.27 (1.01-1.58)	
Hypercholesterolemia				0.1435
No	2,215 (88.39)	32.91	Ref.	
Yes	291 (11.61)	37.11	1.13 (0.96-1.32)	
Arterial hypertension				0.3237
No	2,439 (97.13)	33.58	Ref.	
Yes	72 (2.87)	27.78	0.83 (0.57-1.21)	
Allergic rhinitis				0.0014**
No	2,155 (85.93)	32.20	Ref.	
Yes	353 (14.07)	40.51	1.26 (1.09-1.45)	
Skin allergy/eczema				0.1049
No	2,157 (86.28)	32.68	Ref.	
Yes	343 (13.72)	37.03	1.13 (0.97-1.32)	

*$P<0,05$; **$P<0,01$.

Source: Authors.

Discussion

In the present study, the prevalence of self-medication in the total population (among those who did not take medication and those who did) and among adolescents who reported using medication in the last 15 days was 33.36% and 70.09%, respectively. Among the drugs used for self-medication, most were OTC drugs, however, prescription drugs and medicines subject to special control were also reported. Self-medication in adolescents aged 18-19 was associated with sex, screen time, self-satisfaction with health, hospitalization in the previous year and allergic rhinitis.

Regarding the prevalence of self-medication, in Brazil, literature has shown very heterogeneous results. Studies based on self-report of self-medication, carried out with Brazilian adolescents of different age groups already showed higher prevalence[5,6], however, also has been observed lower frequencies ranging 10.3% and 26.7%[4,7,8]. In the northeast region, in turn, in a study conducted with adolescents from public and private schools in the city of Fortaleza, a prevalence of 20.8% of self-medication was observed[7]. Howev-

er, it is important to highlight that most studies were carried out with adolescents in younger age groups[5-8], and only the study by Bertoldi et al.[4] evaluated subjects on similar age group to our study, reporting a prevalence of self-medication of 26.7% among adolescents 18 years old.

In this study, the most used drugs by self-medication among adolescents were OTC drugs. This finding corroborates the results of studies in several countries. According to this systematic review of 163 studies published between January 2000 and December 2013, the most used drugs for self-medication among adolescents were pain relievers, followed by vitamins and nutritional supplements, antiallergic agents and remedies for colds and coughs[22]. Among Brazilian adolescents' studies, Silva et al.[7] and Bertoldi et al.[4] also reported a higher frequency of OTC drugs among drugs used for self-medication.

The high frequency of use of OTC drugs for self-medication among adolescents may be related to the easy access to these drugs in drugstores associated with the low use of health services by individuals in this age group[23].

Although OTC drugs are considered safe, the indiscriminate use of these drugs can exacerbate

Table 3. Frequency of drugs used for self-medication by adolescents aged 18-19 years old in the São Luís birth cohort of 1997/1998 in the last 15 days according to therapeutic group by the ATC classification. São Luís-MA, Brazil, 2016/2017.

ATC Code - Level 1	ATC Code - Level 2	N (%)
N02 Analgesics	N02 Analgesics	292 (34.80)
M03 Muscle relaxants	M03 Muscle relaxants	181 (21.57)
M01 Antiinflammatory and antirheumatic products	M01 Antiinflammatory and antirheumatic products	148 (17.64)
A03 Drugs for functional gastrointestinal disorders	A03 Drugs for functional gastrointestinal disorders	93 (11.08)
R05 Cough and cold preparations	R05 Cough and cold preparations	72 (8.58)
R06 Antihistamines for systemic use	R06 Antihistamines for systemic use	30 (3.58)
A11 Vitamins	A11 Vitamins	30 (3.58)
J01 Antibacterials for systemic use	J01 Antibacterials for systemic use	30 (3.58)
A02 Drugs for acid related disorders	A02 Drugs for acid related disorders	17 (2.03)
G03 Sex hormones and modulators of the genital system	G03 Sex hormones and modulators of the genital system	16 (1.91)
A04 Antiemetics and antinauseants	A04 Antiemetics and antinauseants	13 (1.55)
A16 Other alimentary tract and metabolism products	A16 Other alimentary tract and metabolism products	11 (1.31)
R01 Nasal preparations	R01 Nasal preparations	7 (0.83)
J02 Antimycotics for systemic use	J02 Antimycotics for systemic use	5 (0.60)
D10 Anti-acne preparations	D10 Anti-acne preparations	3 (0.36)
C10 Lipid modifying agents	C10 Lipid modifying agents	3 (0.36)
N03 Antiepileptics	N03 Antiepileptics	2 (0.24)
B03 Antianemic preparations	B03 Antianemic preparations	2 (0.24)
H02 Corticosteroids for systemic use	H02 Corticosteroids for systemic use	2 (0.24)
N05 Psycholeptics (N05B - anxiolytics)	N05 Psycholeptics (N05B - anxiolytics)	2 (0.24)
N06 Psychoanaleptics (N06A - antidepressants)	N06 Psychoanaleptics (N06A - antidepressants)	2 (0.24)
A15 Appetite stimulants	A15 Appetite stimulants	2 (0.24)
A07 Antidiarrheals, intestinal antiinflammatory/antiinfective agents	A07 Antidiarrheals, intestinal antiinflammatory/antiinfective agents	1 (0.12)
N06 Psychoanaleptics (N06B - psychostimulants)	N06 Psychoanaleptics (N06B - psychostimulants)	1 (0.12)
B01 Antithrombotic agents	B01 Antithrombotic agents	1 (0.12)
A06 Drugs for constipation	A06 Drugs for constipation	1 (0.12)

ATC: Anatomical Therapeutic Chemical Classification.

Source: Authors.

their adverse effects, leading to health complications in individuals. The highest risks in the use of these drugs without professional guidance are related to the excessive frequency of use and their use in high doses Chronic toxicity effects have already been reported with the use of OTC drugs[24].

Despite the low frequency, our study also observed the use of medicines that requires a medical prescription according to the legal provisions of the Brazilian National Health Surveillance Agency. Among adolescents who self-medicated, it was reported the use of antibacterials for sys-

temic use[25] and drugs subject to special control, such as antiepileptics, psycholeptics/anxiolytics, psychoanaleptics/antidepressants and psychoanaleptics/psychostimulants, agents used for attention deficit hyperactivity disorder and nootropics[26]. These findings are worrying, since the use of medications that require presentation or retention of medical prescription in self-medication directly impacts several important clinical aspects, such as increased risk of developing bacterial resistance to antimicrobials, adverse reactions to medications, masking important symp-

Table 4. Hierarchical multivariable analysis of factors associated with self-medication in adolescents aged 18-19 years old in the São Luís 1997/98 birth cohort. São Luís - MA, Brazil, 2016/17.

Block/Variable/Category	Model 1[a] Adjusted PR (95%CI)	Model 2[b] Adjusted PR (95%CI)	Model 3[c] Adjusted PR (95%CI)
Block 1 (Distal level)			
Sex			
Male	Ref		
Female	1.41 (1.25-1.59)**		
Block 2 (Intermediate level)			
Screen time			
≤2 hours/day		Ref	
2 to 4.9 hours/day		1.17 (0.91-1.50)	
≥5 hours/day		1.32 (1.05-1.67)*	
Block 3 (Proximal level)			
Self-satisfaction with health			
Unsatisfied/Very Unsatisfied			Ref
Regular			0.94 (0.79-1.12)
Satisfied/Very satisfied			0.79 (0.67-0.94)**
Hospitalization in the previous year			
No			Ref
Yes			0.70 (0.50-0.97)*
Allergic rhinitis			
No			Ref
Yes			1.19 (1.02-1.39)*

[a]Adjusted by socioeconomic and demographic variables (block 1); [b]Adjusted by the variables in blocks 1 and lifestyle variables (block 2); [c]Adjusted by the variables in blocks 1, 2 and health-related variables (block 3). *P<0,05; **P<0,01. Akaike criteria: Model 1: 3141.707; Model 2: 3102.327; Model 3: 2782.648.

Source: Authors.

toms, acute and chronic toxicity, as well as delay in looking for health services[27,28].

Our study observed a higher prevalence of the outcome in females. According to the systematic review carried out by Shehnaz *et al.*[22], the prevalence of self-medication was higher in female adolescents in most countries, including in Brazil[4,8]. This association can be explained, in part, by the occurrence of dysmenorrhea and the beginning of sexual life in adolescence, which leads adolescents to make frequent use of medications for the relief of dysmenorrhea symptoms and oral contraceptives. According to Sanctis *et al.*[29], most adolescents discuss dysmenorrhea with family and friends, and rarely seek medical advice in this situation. As for the use of oral contraceptives, although it is a hormonal method, whose dispensation in the country is still permeated by the formal request for a medical prescription[30], it cannot be ruled out that the acquisition of these drugs by Brazilian adolescents can often take place in commercial pharmacies and drugstores, where the prescription require-

ment is flexible and prices are relatively low[31], which favors self-medication. Another explanation is that, unlike men, who constantly ignore the presence of health symptoms, women tend to better recognize and express their health needs, initiating more curative health actions[32], which often includes the practice of self-medication.

Another factor positively associated with self-medication in our study was screen time ≥5 hours/day. This association may be related to the effects caused by excessive exposure to screens, simultaneous to the long time spent in inappropriate positions when in front of the screens, such as headaches and muscle pain. In a study with Norwegian adolescents aged 15 and 16, it was found that headaches and muscle aches were common and that half of individuals with severe headaches/migraines self-medicated with analgesics daily or weekly. Among several reasons for feeling pain and discomfort, the adolescents reported the excessive time spent in front of several screens[33]. In addition, the longer screen time exposes the individual to various advertisements

for medications such as OTC drugs, which are most often used for self-medication. The provision of based advertising campaigns, with purely commercial ones, stimulates the indiscriminate and growing consumption of medicines[34]. In the study by Silva *et al.*[7], 34.1% of the evaluated adolescents revealed that they had already been influenced by the media in the purchase of medicines. In this context, advertising becomes harmful when it induces self-medication by people who do not have a critical attitude in receiving medication advertising to recognize the limit of its use within health care[35].

Our study also reported an association between Self-satisfied health and self-medication, and similar finding was reported by Bertoldi *et al.*[4]. Self-rated health affects the use of medications, so poorer self-rated health is associated with a higher frequency of use of different types of medication among adolescents[36]. It is suggested that individuals with poor self-perception of poor health seek medication for immediate resolution of their health problems, often without professional guidance, which favors the practice of self-medication.

We also observed association between hospitalization in the previous year and self-medication. This association may be the result of greater knowledge about the proper use of medicines acquired through counseling received during hospitalization and at hospital discharge. Literature show that advice received during hospitalization seems to assist the patient in better understanding the information received about his medication and requesting additional information, if necessary. In addition, at hospital discharge, the patient is usually referred to the responsible physician in his community, where he should receive additional advice[37]. Thus, it is suggested that adolescents who went through the remarkable experience of hospitalization in the last year would be better informed and more aware about the use adequate of medicines, leading them to avoid the practice of self-medication.

Finally, self-reported diagnosis of allergic rhinitis was associated with higher prevalence of self-medication in adolescents. Regarding this finding, literature shows that the use of self-medication medications has been restricted to acute self-limited diseases, including allergic rhinitis[38], which is a common reason for self-medication with OTC drugs[39-41]. Nasal congestion is among the most common symptoms of allergic rhinitis, leading to the frequent use of nasal decongestants by patients. However, the repetitive and prolonged use of intranasal decongestants can result in hypertrophy of the nasal mucosa, leading to "medicated rhinitis"[42]. Thus, indiscriminate self-medication in the treatment of allergic rhinitis can worsen the condition of the individual.

This study has some limitations. One of them is the possibility of information bias in obtaining data regarding the classification and prescription of drugs used. Many drugs whose individuals did not remember their names or were unspecified notified (eg.: "anti-inflammatories", "analgesics") could not be classified according to their therapeutic group, so the frequencies of some drug classes may be underestimated. It is also possible that the prevalence of self-medication is underestimated, as without the specified drug it was not possible to identify the prescriber and another cause would be the fact that self-medication is a behavior that is not socially acceptable.

Another limitation is the possibility of information bias in verifying the use of illicit drugs, which is generally underestimated due to the possible embarrassment in responding to this issue. However, the use of a confidential and self-administered questionnaire to obtain this information may have minimized this bias.

Also, another limitation concerns morbidities. Considering the limited availability of data on morbidities in this research, especially symptomatic ones, the association with health problems with self-medication in adolescents cannot be better explored. Thus, the association with other morbidities not evaluated in this study should not be disregarded. In addition, the morbidities assessed in the present study were self-reported, which is also subject to information bias. However, self-reported morbidities remain one of the most widely used methods in epidemiology and their validity in terms of measuring health problems, already was established in different studies[43].

On the other hand, this study also has strengths. As far as we know, this is one of the few studies on the subject with northeastern adolescents. In addition, the large sample size stands out, which represents a high statistical power, because the large population sample allows us to better stratify the different pharmacological classes used in the practice of self-medication in these adolescents.

Conclusions

Self-medication, a common practice among the adolescents evaluated in this study, represents a

relevant topic in pharmacoepidemiology. The findings of the present study are fundamental for directing and implementing and encouraging health education programs and actions aimed to promoting the rational use of medicines in this age group. Based on the data presented, highlighting that in interventions to reduce this practice, greater attention should be given to women, individuals with intense exposure to screens and allergic diseases.

Collaborations

JLP Godinho and EIS Magalhães contributed to the conception and design of the study, analysis and interpretation of data and draft of the manuscript. MTSSB Alves contributed to the conception and design of the study, analysis and interpretation of data and critical review of intellectual content. AM Santos, JRO Pinho, DC Chagas, CCC Ribeiro and MHSS Brito contributed to the conception and design of the study and critical review of the intellectual content. All authors approved the final version of the manuscript and assume responsibility for all aspects of the work, including ensuring its accuracy and integrity.

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