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Sedentary behavior and self-harm in adolescents with asthma, rhinitis and eczema

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KEYWORDS

Adolescents;
Asthma;
Rhinitis;
Eczema;
Self-injurious
behavior;
Sedentary behavior

Abstract

Objective: To investigate the association between allergic diseases and the tendency to self-harm in adolescents, considering the role of sedentary behavior.

Methods: This was a population-based cross-sectional study, carried out in 2022, with 727 adolescents aged 12 to 19 years, from a capital in the Northeast of Brazil. The authors evaluated the association between each allergic disease (asthma, rhinitis and eczema) and self-harm, sedentary behavior and other variables. The authors performed an adjusted analysis of the associations between each allergy disease and the tendency to self-harm and then adjusted to the presence of family members and sedentary behavior.

Results: The prevalence of asthma, rhinitis and eczema were 18.76%, 36.21% and 12.86%, respectively. Sedentary behavior and tendency to self-harm were more frequently reported in asthmatics (PR 2.16; 95% CI: 1.55 – 3.00 and PR 1.98; 95% CI: 1.47 – 2.68, for sedentary behavior and self-harm respectively), rhinitis (PR 1.53; 95% CI: 1.25 – 1.88 and PR 1.33; 95% CI: 1.09 – 1.62, respectively) and eczema (PR 2.35; 95% CI: 1.54 – 3.58 and PR 1.55; 95% CI: 1.05 – 2.28, respectively). There was a reduction in the strength of this association in the three conditions, which included a loss of association.

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Conclusion: High rates of sedentary behavior and self-harm in those with asthma, rhinitis and eczema. Physical activity attenuated the risk for self-harm. It warns about the urgency in detecting these factors, whether in the diagnosis or in the implementation of therapy, seeking to reduce their harmful consequences in the short and long term.

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1 Introduction

Adolescence, the period between childhood and adulthood, is marked by several changes, including rapid physical, cognitive, social and emotional maturation.¹ Although genetics constitute one determinant, the environment has also been identified as an important influence on manifestations at this stage, in relation to behavior and vulnerability to risky habits, such as sedentary behavior and self-harm, for example.

Sedentary behavior is understood as a set of activities in which the individual spends most of their time in a sitting position, and is an important public health concern since it has been associated with the early emergence of chronic diseases, such as dyslipidemia, hypertension, diabetes and obesity, and mental disorders, such as depression and anxiety.² WHO (World Health Organization) data reveal that up to 81% of adolescents do not exercise in line with recommendations.² Common activities that are currently seen in adolescent routines, such as the use of mobile devices, computers, tablets, video games and television, have contributed to this increase in sedentary behavior and to lower levels of physical activity.³ Particularly following the COVID-19 pandemic, studies show that the amount of time adolescents spend sitting down has increased by approximately 159.5 ± 142.6 min per day.⁴

Particularly in relation to the association with mental disorders, sedentary behavior and time spent sitting down seem to be associated with symptoms of depression, depressed mood and anxiety among children and adolescents, with sedentary behavior being a probable modifiable risk factor for depression.^{5,6} Anxiety and impulsivity disorders can appear in early adolescence along with risky behaviors such as self-harm, which is a form of psychopathological externalization of anguish and pain aimed at relieving emotional pain, may become manifest. More common in girls, self-harm is a risky behavior with varying degrees of severity, which may even culminate in suicide attempts.⁷

The negative impacts of allergic diseases on general adolescent performance and health can culminate in a higher risk of psychological damage, especially in the case of chronic conditions which, depending on their severity, can affect self-esteem and quality of life.⁸ On the other hand, emotional stress itself affects the manifestation of disease symptoms, propagating a vicious cycle of increased clinical severity and poorer mental health.

However, few studies⁹ examine the association between allergic diseases and manifestations of, or tendency to, self-harm in adolescents. This study aimed to investigate the association of self-harm with asthma, rhinitis and eczema, considering sedentary behavior as a possible influence.

Methods

Participants and study design

This is a population-based cross-sectional study, conducted during the second school semester of 2022, with 727 students aged from 12 to 19, resident in all of Maceio's districts. To ascertain the proportion of public versus private schools, the authors consulted the ratio of enrolled students in the school census, based on lists provided by the Municipal Department of Education (SEMED). The authors then randomly selected schools based on a proportion of 80.6% public and 19.4% private schools. Adolescents with serious cardiorespiratory (as congenital and acquired cardiomyopathies with hemodynamic repercussions, cystic fibrosis, bronchiectasis, pulmonary fibrosis, for example) and dermatological diseases (such as psoriasis, lupus, leprosy, for example) were excluded.

The self-administered questionnaires were distributed in the classroom among adolescents, and answered anonymously to ensure the privacy and reliability of the responses. Conversely, the school was assured access to specialist psychological counseling services on demand from the institution.

Instruments and the definition of variables

The authors applied standardized and validated, self-completion written questionnaires (QE) to both children and adolescents, to obtain information about sociodemographic data; prevalence of allergic diseases (asthma, rhinitis and eczema); common mental disorders; tendency to self-harm; and sedentary behavior; in addition to complementary semi-structured questions, related to the instruments.

1. Identification of asthma, allergic rhinitis and atopic eczema: using the International Study of Asthma and Allergies in Childhood – ISAAC.¹⁰

2. Patient Health Questionnaire-9 - PHQ-9¹¹ for adolescents, to identify the presence of a mental disorder; the authors also posed the question “Over the last two weeks, how often have you been bothered by: thoughts about hurting yourself in some way, or that you would be better off dead?” to determine the tendency to self-harm.

3. Other variables: - Familial allergy: in first-degree relatives, defined by the presence of at least one first-degree relative with asthma, rhinitis, or atopic eczema. Socioeconomic stratification: using the Socioeconomic questionnaire from the Brazilian Association of Population Studies (ABEP),¹² in line with Brazilian Economic Classification Criteria, which categorizes economic classes into A, B, C, D and E. For the purpose of analysis, the classes

were recategorized for dichotomization into 1) A/B/C and 2) D/E. Household smoking: presence of a person living in the house who smokes. - Screen time: total daily time spent using screens (computers, tablets, smartphones, television or equivalent). Dichotomized into less than 2 h and greater than or equal to 2 h. - Gender, type of school (public or private), mother's, father's or legal guardian's education, in this order of priority (more or less than higher education).

110 Statistical analysis

111 The data were tabulated in a Microsoft Excel® spreadsheet
112 and, after coding, were entered into the statistical package
113 Stata version 13.0 (StataCorp, CollegeStation, TX, USA). The
114 variables were analyzed using Pearson's chi-square test,
115 with the associations between asthma, rhinitis and eczema
116 (dependent variables) and the categorical independent vari-
117 ables of interest, as well as between each allergic disease
118 and self-harm, sedentary behavior and the other variables.
119 The authors obtained an adjusted analysis of the associa-
120 tions between each allergic disease and the tendency to
121 self-harm, and then adjusted for the presence of family
122 allergy and sedentary behavior, in order to observe these
123 variables' interference on the association between asthma,
124 rhinitis and eczema, and a tendency to self-harm.

125 Ethical issues

126 The study was approved by the FAMED-UFAL Research Ethics
127 Committee under registration number
128 59311222.7.0000.5013; all the participants signed an
129 Informed Consent Form, when applicable.

130 Results

131 The authors considered 727 of the 823 adolescents for analy-
132 sis, that is, those who presented complete data. The preva-
133 lence of asthma, rhinitis and eczema were 18.76%, 36.21%
134 and 12.86%, respectively. Almost half the adolescents
135 described sedentary behavior and approximately 1/3 were
136 prone to self-harm. More than 80% exceeded the maximum
137 daily screen time (Table 1) recommended by the Brazilian
138 Society of Pediatrics (SBP).¹³ Sedentary behavior was more
139 frequent in girls (66.95% × 33.04%; PR: 1.85; 95%CI: 1.56 –
140 2.20), as was the tendency to self-harm (71.49% × 28.51%;
141 PR: 2.29; 95% CI: 1.80 – 2.92).

142 History of familial allergy in first-degree relatives, as well
143 as sedentary behavior and tendency to self-harm, were
144 more frequently reported in adolescents with asthma, rhini-
145 tis and eczema. Allergic rhinitis was less prevalent among
146 adolescents in public schools (Table 2). Although adolescents
147 with asthma and rhinitis spent more time on their screens,
148 this trend was not statistically significant.

149 As additional data, a greater frequency of sedentary
150 behavior was also observed among adolescents with a ten-
151 dency to self-harm (82.93%; $n = 204$), compared to the group
152 that did not report these types of thoughts (17.07%; $n = 42$),
153 with a PR of 2.71 (95% CI: 2.34 – 3.14).

154 When the authors tested for the interference of seden-
155 tary behavior on the association between each allergic

Table 1 Characterization of the sample according to socio-demographic variables, allergic diseases and adolescent screen time, in Maceio, the state capital of Alagoas, 2022 ($n = 727$).

VARIABLES	N	(%)
Gender, Feminine	371	52,25%
Public school	583	80,19%
ABEP classification, D/E class	189	26,07%
Parents' education level, < High school graduate	480	70,59%
Smoking at home	381	53,06%
Family allergy history	250	35,77%
Screentime ≥ 2 h/day	483	85,64%
Tendency to self-harm	246	33,84%
Sedentary behavior	351	48,28%
Asthma	133	18,76%
Allergic Rhinitis	252	36,21%
Eczema	89	12,86%

Source: Authors.

disease and the presence of a tendency to self-harm, we
observed that, after adjusting for family allergy history,
there was a reduction in the strength of this association for
the three conditions: asthma, rhinitis and eczema, which
included a loss of association (Table 3).

161 Discussion

162 One-third of the adolescents in this study demonstrated a
163 tendency to self-harm, which was more frequently found
164 among girls and those with asthma, rhinitis and/or eczema;
165 this risk is twice as high as that reported in previous
166 studies.¹⁴

167 However, although the associations between asthma, rhi-
168 nitis and eczema, and mental disorders, notably anxiety and
169 depression, have been investigated,¹⁵ a gap remains, specifi-
170 cally in relation to self-harm behaviors. In adolescence, self-
171 harm can be perceived or suspected, based on signs that
172 involve the incidence of minor traumas, a range of self-muti-
173 lations, such as cuts to the skin, scratches, burns, as well as
174 exposure to risky circumstances, which may even culminate
175 in a tendency for, or actual, suicidal acts. With varying levels
176 of severity, this is characterized by a psychopathological
177 externalization of anguish and pain which, although not
178 expressed verbally, is manifested on one's own body, leaving
179 visible and invisible marks.⁷

180 In chronic diseases common in childhood and adoles-
181 cence, such as asthma, severe rhinitis and eczema, which
182 have significant impacts on quality of life, self-esteem and
183 psychological damage, the importance of early identifica-
184 tion of this type of risk behavior is even more pressing. In a
185 vicious cycle of chronic illness – mental damage – worsen-
186 ing manifestations of physical illness, risk behaviors such as
187 self-harm, symptoms of depression, anxiety and stress are
188 linked to more severe effects on asthma, for example, and
189 can affect self-control, poorer self-management of the dis-
190 ease, poorer control of triggers and interference in health
191 care, prevention and the management of symptoms.¹⁶

Table 2 Association between allergic diseases, tendency to self-harm, sedentary behavior and sociodemographic factors.

VARIABLES	ASTHMA				ALLERGIC RHINITIS				ECZEMA			
	n (%)	PR (CRUDE)	CI (95%)	P	n (%)	PR (CRUDE)	CI (95%)	P	n (%)	PR (CRUDE)	CI (95%)	P
Gender, Feminine	76 (20,88%)	1,34	0,97 – 1,85	0,07	140 (38,78%)	1,2	0,97 – 1,47	0,08	52 (14,65%)	1,52	1,00 – 2,30	0,05
Gender, Masculine	51 (15,55%)				103 (32,39%)				31 (9,66%)			
Public school	103 (18,23%)	0,87	0,61 - 1,26	0,47	183 (33,03%)	0,68	0,55 – 0,83	<0,01*	73 (13,25%)	0,86	0,51 – 1,42	0,55
Private school	30 (20,83%)				69 (48,59%)				16 (11,35%)			
ABEP classification, D/E class	35 (19,13%)	1,02	0,72 – 1,45	0,89	55 (30,73%)	0,8	0,63 – 1,03	0,08	21 (11,73%)	0,88	0,56 – 1,39	0,59
ABEP classification, A/B/C class	98 (18,67%)				197 (38,25%)				68 (13,31%)			
Parents' education level, < High school graduate	34 (17,44%)	0,92	0,64 – 1,31	0,63	63 (32,81%)	0,85	0,68 – 1,08	0,18	29 (15,10%)	1,23	0,81 – 1,86	0,33
Parents' education level, > High school graduate	89 (19,02%)				176 (38,43%)				56 (12,31%)			
Smoking at home	75 (20,11%)	1,16	0,85 – 1,59	0,34	130 (35,42%)	0,97	0,80 – 1,19	0,78	55 (15,15%)	1,44	0,97 – 2,15	0,07
No smoking at home	57 (17,27%)				118 (36,42%)				34 (10,49%)			
Family allergy history	59 (24,08%)	1,54	1,13 – 2,10	0,01*	112 (47,06%)	1,57	1,29 – 1,91	<0,01*	45 (18,83%)	1,92	1,30 – 2,82	<0,01*
No family allergy history	69 (15,61%)				133 (29,95%)				43 (9,82%)			
Screentime ≥ 2 h/day	92 (19,45%)	1,56	0,85 – 2,86	0,15	174 (37,74%)	1,38	0,94 – 2,03	0,1	56 (12,25%)	1,18	0,58 – 2,38	0,64
Screentime < 2 h/day	10 (12,50%)				21 (27,27%)				8 (10,39%)			
Tendency to self-harm	67 (27,92%)	1,98	1,47 – 2,68	<0,01*	102 (43,40%)	1,33	1,09 – 1,62	<0,01*	39 (16,81%)	1,55	1,05 – 2,28	0,03*
No tendency to self-harm	66 (14,07%)				150 (32,54%)				50 (10,87%)			
Sedentary behavior	89 (25,95%)	2,16	1,55 – 3,00	<0,01*	148 (44,18%)	1,53	1,25 – 1,88	<0,01*	61 (18,32%)	2,35	1,54 – 3,58	<0,01*
No sedentary behavior	44 (12,02%)				104 (28,81%)				28 (7,80%)			

Source: Authors.

* Statistically significant associations ($p < 0,05$). PR, prevalence ratio; CI, confidence interval.

Table 3 Association between allergic diseases and tendency to self-harm, taking into account the effect of family allergy history and sedentary behavior.

VARIABLES	Model 1 (Tendency to self-harm)	Model 2 (Tendency to self-harm + History of family allergy)	Model 3 (Tendency to self-harm + History of family allergy + Sedentary behavior)
Asthma	1,98 (1,47 – 2,68); $p < 0,01$	1,84 (1,33 – 2,54); $p < 0,01$	1,43 (0,99 – 2,05); $p = 0,05$
Allergic Rhinitis	1,33 (1,09 – 1,62); $p < 0,01$	1,26 (1,03 – 1,54); $p = 0,02$	1,07 (0,85 – 1,34); $p = 0,57$
Eczema	1,55 (1,05 – 2,28); $p = 0,03$	1,41 (0,94 – 2,11); $p = 0,09$	0,99 (0,64 – 1,53); $p = 0,97$

Source: Authors.

192 In the period during and following the COVID-19 pan- 240
 193 demic, these relationships between risk behavior, mental 241
 194 disorders and chronic diseases were exacerbated, with con- 242
 195 sequences that have yet to be well defined. Face-to-face 243
 196 contact, touch, exchange, meetings and communication 244
 197 were quickly replaced with virtual contact, due to the high 245
 198 level of health risks and government containment measures, 246
 199 which greatly affected physical and mental health, and had 247
 200 an emotional impact on a large part of the population.¹⁷ 248
 201 Home confinement encouraged inappropriate behavior in all 249
 202 age groups. Adolescents, that is, individuals exposed to vari- 250
 203 ous stressors, both internal and external, faced the greatest 251
 204 challenges in the pandemic, due to academic pressure to 252
 205 maintain high quality, intellectual commitment, and previ- 253
 206 ous levels of productivity. 254

207 Adolescents reflected behaviors immediately post-pan- 255
 208 demic, as these data were collected in 2022, consistent with 256
 209 other national studies, in which social distancing related to 257
 210 the pandemic promoted significant changes in the lifestyle 258
 211 of children and adolescents, increasing screen time, reduc- 259
 212 ing activity physical activity and worsening the quality of 260
 213 food and sleep.¹⁸ Other studies have also identified an asso- 261
 214 ciation between low levels of physical activity and prolonged 262
 215 use of screen time with increased risk of depression, anxiety 263
 216 and self-harm behavior, with the risk being highest among 264
 217 adolescent boys.¹⁹ 265

218 This context further reinforced the maintenance of sed- 266
 219 entary behaviors in the school environment, given that stud- 267
 220 ies of both groups, asthmatics and controls, undertaken 268
 221 prior to the pandemic, had already revealed sedentary 269
 222 behavior.²⁰ 270

223 In the present study, the authors identified rates for sed- 271
 224 entary behavior that were 1.5 to 2 times as high among ado- 272
 225 lescents with allergic diseases and among girls. Our finding 273
 226 of more frequent sedentary behavior in girls is in line with 274
 227 data in the literature.²¹ The authors know that guidelines 275
 228 about physical activity must be adapted to individual physi- 276
 229 cal condition, age and gender, taking account of sociocul- 277
 230 tural determinants and the adolescent's own preferences.²² 278
 231 Differences in exercising and sedentary behavior between 279
 232 genders can be explained by sociocultural differences, given 280
 233 that from childhood, boys are encouraged to play games 281
 234 that involve sports and more strenuous physical effort, while 282
 235 girls are encouraged to perform lower-intensity practices, 283
 236 linked to the domestic environment.²³ 284

237 In the specific case of allergic diseases, adolescents with 285
 238 asthma and rhinitis who stop exercising due to shortness of 286
 239 breath, often experience a worsening of muscular 287

240 conditioning, limiting their ability to exercise, resulting in 241
 242 more shortness of breath, since this decrease in perfor- 243
 244 mance requires the individual to ventilate more in order to 244
 245 maintain this exercise.²⁴ In this sense, systematic reviews 245
 246 reveal positive findings regarding regular exercise in asth- 246
 247 matic adolescents and children, leading to improved cardio- 247
 248 vascular function and few effects on bronchial 248
 249 hyperreactivity.²⁵ Exercising regularly is related to a number 249
 250 of health benefits, such as improved cardiorespiratory fit- 250
 251 ness, body composition, and cardiometabolic profile.² 251

252 According to this study asthma, rhinitis and eczema are 252
 253 relatively common diseases in adolescence, with frequen- 253
 254 cies of 18.76%, 36.21% and 12.86%, respectively, and which 254
 255 are on the rise. The increasing number of allergic respiratory 255
 256 diseases in adolescents is related to a combination of envi- 256
 257 ronmental and genetic factors, such as air pollution, fre- 257
 258 quent contact with synthetic materials, changes in diet, and 258
 259 level of physical activity.²³ Higher sitting time to study and 259
 260 short sleep time were associated with asthma, allergic rhini- 260
 261 tis, and atopic dermatitis in a Korean study. The associations 261
 262 between obesity and these allergic diseases were inconsis- 262
 263 tent after adjustment for other factors.²⁶ 263

264 Compared to asthma, rhinitis is less severe, but, depend- 264
 265 ing on the frequency and intensity of symptoms, it can also 265
 266 cause significant limitations in daily activities and quality of 266
 267 life with repercussions on both psychological status, physical 267
 268 activity and behavioral risk. sedentary. Atopic eczema, on 268
 269 the other hand, in addition to limiting daily activities due to 269
 270 itching, which can be intense, also induces the stigma of 270
 271 skin lesions, which affect body self-image, self-esteem, and 271
 272 quality of life, also being a risk for behavioral risks such as 272
 273 sedentary lifestyle and self-harm. 273

274 Finally, the authors also found that sedentary behavior, 274
 275 which is common in adolescents at risk of self-harm (82.93% 275
 276 of cases), can modify and attenuate the association between 276
 277 this behavior and allergic diseases. The authors did not find 277
 278 evidence of this effect modification for this association in 278
 279 the literature. The role of an unhealthy lifestyle in suicidal 279
 280 behaviors has become a matter of concern and growing 280
 281 interest,²⁷ studies show that more leisure time being seden- 281
 282 tary is associated with higher odds of suicide attempts.²⁸ 282
 283 This observation is important because changes in lifestyle 283
 284 habits and sedentary behavior are modifiable factors that 284
 285 can affect mental health since active behavior is beneficial 285
 286 for improving cognitive function, depression and self- 286
 287 esteem.²⁹ In fact, sedentary behavior may have been con- 287
 288 founding in the association between allergic diseases and 288
 289 self-harm, since it was associated with both. Confounding is 289

288 a bias because it can result in a distortion in the measure of
289 association between an exposure and a health outcome.
290 This was a limitation of our findings.

291 Another study limitation is that, since it involves cross-
292 sectional research, a causal relationship cannot be estab-
293 lished between allergic diseases, sedentary behaviors, and
294 self-harm. Further, assessment through questionnaires
295 depends on possible changes in mood and on the adolescent's
296 willingness to reveal the information requested, particularly
297 in relation to self-harm. The delivery of questionnaires for
298 self-completion results in losses and may have contributed
299 to a return rate of around 88.3% (727 / 823).

300 Other research has found that low physical activity/high
301 screen time subgroups, who did not meet WHO recommen-
302 dations for PA and screen time, had significantly more
303 depression, anxiety and self-harm behaviors, highlighting
304 the potential role of the interaction between PA and screens
305 in preventing depression, anxiety and self-harm behaviors in
306 adolescents of both sexes.³⁰

307 Similar to what the authors did in the collection in
308 schools, the study opens up the possibility of identifying
309 risk behaviors such as sedentary lifestyle and self-harm, in
310 routine consultations, of adolescents with chronic condi-
311 tions, using a simplified instrument, low-cost and quick-
312 to-apply, very useful in primary care. The identification of
313 the risk of self-harm should be referred for specialized
314 psychological care, as an early intervention that can block
315 the progression to suicidal thoughts and ideation or even a
316 suicide attempt, for example. On the other hand, seden-
317 tary behavior is a modifiable factor, which can also be
318 identified and subject to intervention, including having an
319 effect on the risk of self-harm in these adolescents. In par-
320 ticular, in a scenario of increasing frequency of allergic
321 diseases and following a pandemic, in which an increase in
322 both sedentary behavior and mental disorders has been
323 observed, early identification and intervention should be
324 a priority.

325 Therefore, it is essential that health professionals are
326 aware of these factors and include the assessment of physi-
327 cal activity and mental health when monitoring allergic
328 patients. Promoting healthy habits, encouraging physical
329 exercise and psychological support can be important meas-
330 ures to minimize the negative impact of sedentary behavior
331 and mental disorders on the health of allergic patients.

332 Conflicts of interest

333 The authors declare no conflicts of interest.

334 Authors' contributions

335 All authors have approved the final manuscript.

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