THE IMPACT OF ELECTRONIC CIGARETTES ON RESPIRATORY MUSCLE STRENGTH IN YOUNG ADULTS

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SUMMARY

This cross-sectional analytical observational study investigates the impact of electronic cigarette use on respiratory muscle strength in young adults. The research was conducted with 70 medical students from UniEVANGÉLICA, divided into two groups: electronic cigarette users and non-users. The body mass index (BMI), maximum inspiratory pressure (MIP), and maximum expiratory pressure (MEP) were evaluated through respiratory maneuvers. The results showed that electronic cigarette users had significantly higher values of Pimax (p=0.04) and Pemax (p=0.002), indicating superior inspiratory and expiratory respiratory function compared to non-users. Despite this, the percentages of Pimax and Pemax did not show a significant difference. The study contributes to the understanding of the effects of electronic cigarettes on the respiratory health of young adults.

Keywords: Electronic cigarette; respiratory muscle strength; young adults; respiratory health.

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Introduction

Obesity is a multifactorial disorder characterized by the accumulation of body fat that affects all age groups, with adolescence being one of the most critical periods for the acquisition and maintenance of excess weight in adulthood (OLIVEIRA et al., 2020). This condition can be identified through anthropometric measures such as the body mass index (BMI) (OLIVEIRA et al., 2020). In this sense, the ability of examinations and anthropometric indicators to predict the risk of chronic diseases, such as systemic arterial hypertension, and their possible complications in adulthood has been evidenced (WHO, 2000). That said, it is posited that, in addition to systemic impairment, the bodily overload related to excess adipose tissue contributes to the emergence of alterations in the musculoskeletal and respiratory systems (SANTOS et al., 2019).

Moreover, an emerging issue among the young population is the use of electronic cigarettes and hookah products (MÜNZEL et al., 2020). The increase in the popularity of these devices coincided with an outbreak of vaping-related lung injuries, and research has shown that e-liquid aerosols are associated with direct damage to the respiratory epithelium and have demonstrated alterations in pulmonary function, inflammation, mucociliary clearance, and pulmonary histology (HAMBERGER et al., 2020).

Given this, the need for the present study arises from the fact that there are not enough studies analyzing the concomitant effects of smoking and obesity in young adults, and obesity is a public health problem, and, as mentioned earlier, the use of e-cigarettes among young people is on the rise.

Methodology

Sample

This is a cross-sectional observational study. The study population will be the students of the Medicine course at UniEVANGÉLICA. The sample will be recruited for convenience, and 70 young people agreed to participate in the study. Students from the Medicine course at UniEVANGÉLICA from the 1st to the 8th semester, aged between 18 to 25 years, with BMI (<25 or ≥30Kg/m²), who agree to participate and sign

the informed consent form, will be included. Students who do not complete the questionnaire fully and those with chronic carbometabolic and respiratory comorbidities, as well as systemic diseases (hypertension, diabetes mellitus, and thyroid diseases) identified at the time of the questionnaire application, will be excluded. The work was approved by the Research Ethics Committee of UniEVANGÉLICA with number 6.215.903/2023.

Evaluation protocols

The body mass index (BMI) will be calculated based on body mass and height. To be considered the ideal BMI, the values must be < 25 kg/m² and obesity ≥ 30 kg/m² (WHO, 1998). To estimate respiratory muscle strength, static pressures will be used: maximum inspiratory pressure (Pimáx) and maximum expiratory pressure (Pemáx), which are pressures obtained from residual volume (RV) and total lung capacity (TLC), respectively (NEDER et al., 1999). The maneuvers were performed with the participants seated and connected to the Manovacuometer (Globalmed-MVD300, Porto Alegre, Brazil). The reference values will be obtained from two regression equations for the Brazilian adult population (NEDER et al., 1999):

Homens

Pimáx: y = -0.80 (age) + 155.3, SEE = 17.3 equação (1);

Pemáx: y = -0.81 (age) + 165.3, SEE = 15.6 equação (2);

Women

Pimáx: y = -0.49 (age) + 110.4, SEE = 9.1 equação (3);

Pemáx: y = -0.61 (age) + 115.6, SEE = 11.2 equação (4);

The results will be described as mean, standard deviation, frequencies, and percentages. To verify the normality of the data, the Kolmogorov-Smirnov test will be used. The comparison between the groups was performed using the t.Student test for independent samples (normal distribution) or Mann-Whitney (asymmetric distribution). The delta variation (Δ) was calculated between the means. The association between categorical variables was tested using the Chi-square test. The p-value considered will

be <0.05 and the data will be analyzed using the Statistical Package for Social Science (SPSS, version 23, IBM, Armonk, NY) software.

Results

In Table 1, the sample is characterized. The Pimáx (Δ=13.52, p=0.04), the %Pimáx (Δ=4.45, p=0.39), the Pemáx (Δ=24.77, p=0.002), and the %Pemáx (Δ=11.42, p=0.1) were higher in young people who use electronic cigarettes.

Table 1. Association between variables and the use of electronic cigarettes, n=70. Anápolis-GO, 2024.

	Electronic cigarette user		
Variables	**Yes**	**No**	***p***
Massa corporal	73,86±17,36	72,79±15,55	0,78
Height	1,71±0,08	1,70±0,09	0,66
IMC	24,99±4,97	25,55±4,74	0,99
Pimax	103,16±26,74	89,64±26,81	0,04
%Pimax	82,80±20,03	78,35±23,15	0,39
Pemax	126,65±31,62	101,88±31,43	0,002
%Pemax	96,29±21,79	84,87±23,08	0,10

Source: Elaborated by the authors (2024)

From the analysis of Table 2, it is observed that there was no significant difference between the groups regarding Pimax, with both groups showing similar proportions of normal results. However, for Pemax, the group that uses cigarettes showed a higher percentage of individuals with normal results (74.2%) compared to the group that does not use them (51.3%), indicating a tendency towards better expiratory performance in the "Yes" group (p=0.05), which suggests a possible association between the group and expiratory function.

Table 2. Association of electronic cigarette with respiratory muscle strength, n=70. Anápolis-GO.

		Usuário de cigarro eletrônico		
Variables	**Total (n=70) n (%)**	**Yes (n=43) n (%)**	**No (n=27) n (%)**	***p***
Pimax	70 (100)	31 (100)	39 (100)	0,97
Normal	36 (51,4)	16 (51,6)	20 (51,3)	
Below expectations	34 (48,6)	15 (48,4)	19 (48,6)	
Pemax	70 (100)	31 (100)	39 (100)	0,05
Normal	43 (61,4)	23(74,2)	20 (51,3)	
Below expectations	27 (38,6)	8 (25,8)	19 (48,7)	

Source: Elaborated by the authors (2024)

Conclusion

In the present study, young people who use electronic cigarettes have better Pimax (p=0.04) and Pemax (p=0.002) values, indicating superior inspiratory and expiratory respiratory function compared to the group that does not use them. The percentages of Pimax and Pemax, despite being higher in the group of young smokers, did not show a significant difference. The results of this study assist in the establishment of health promotion strategies to minimize the risks of smoking on respiratory health.

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