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IMPACT OF ELECTRONIC CIGARETTE USE ON QUALITY OF LIFE AND AUTONOMIC NERVOUS SYSTEM FUNCTION IN YOUNG ADULTS

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Abstract

Introduction. The global decline in traditional tobacco smoking has been accompanied by the rise of heated tobacco products and electronic cigarettes, marketed as safer alternatives. Despite their popularity among youth, especially due to aggressive marketing and appealing flavors, the long-term health effects of heated tobacco products remain insufficiently studied.

Aim. To evaluate the effects of heated tobacco product use on the quality of life and autonomic nervous system function in healthy young adults using the SF-36 and Wayne questionnaires, with a focus on gender-specific differences.

Materials and methods. This case-control study involved 92 participants divided into two groups: 66 heated tobacco products users and 26 non-smokers. Inclusion criteria for main group comprised daily use of these devices for up to five years, somatic health, and a body mass index within normal limits. Non-smokers had no active or passive exposure to tobacco products. Quality of life was evaluated using the SF-36 questionnaire, which measures physical and mental health components through eight subscales. The nervous function was assessed using the Wayne questionnaire, which evaluates the balance between sympathetic and parasympathetic regulation.

Results. Heated tobacco product users demonstrated significantly lower quality of life scores compared to non-smokers, particularly in physical and mental health components. Women showed more pronounced declines in role-physical functioning, mental health, vitality, and social functioning. Longer use of heated tobacco products correlated with reduced social functioning in men and greater declines in emotional state, general health, and pain intensity in women. Autonomic nervous system dysfunction, assessed via the Wayne questionnaire, was strongly associated with reduced quality of life in both genders, though gender-specific patterns of impact were identified.

Conclusions. Heated tobacco product use significantly impairs the quality of life and autonomic nervous system function in healthy young adults. Women are more vulnerable to these effects, experiencing greater declines in physical and mental health domains. The findings highlight the need for gender-specific prevention strategies and further research into the long-term health consequences of heated tobacco product use.

Keywords: heated tobacco product, mental health, gender differences, preventive strategies

INTRODUCTION

The global trend of declining prevalence of smoking traditional tobacco products is observed in the modern world. This positive trend, driven by active anti-smoking campaigns and increased public awareness of its harmful effects [1, 2], is accompanied by the emergence and aggressive marketing of new forms of nicotine delivery, particularly electronic cigarettes and heated tobacco products (HTPs). Thanks to their eye-catching designs, diverse flavors, and positioning as a «safer» alternative,

these devices have become especially popular among young people, creating new challenges for public health [3, 4].

Despite the fact that HTPs are often advertised as tools to reduce the harm caused by smoking, scientific data on their health impact remains limited and contradictory. A particularly pressing issue is the long-term consequences of using HTPs, as most of the available studies cover relatively short observation periods [5]. This creates significant difficulties in fully assessing potential health risks, as many smoking-related diseases develop over

extended periods. However, recent studies predominantly indicate proven potential short-term negative effects of using HTPs, including impacts on the cardiovascular, respiratory, and nervous systems [6, 7, 8]. An important aspect of this research is also the study of the effect of HTPs on quality of life (QoL) and autonomic status, which are vital integrative indicators of overall health.

Quality of life reflects an individual's subjective perception of their physical, psychological, and social well-being [9]. A decline in quality of life can lead to limitations in daily activities, worsening emotional states, and social maladaptation. Autonomic status, in turn, characterizes the functional state of the autonomic nervous system, which regulates the functioning of internal organs and systems. Dysregulation of autonomic control can manifest through various symptoms, such as disturbances in heart rhythm, blood pressure, digestion, sleep, and emotional stability.

Given the increasing prevalence of HTP use among young people, the limited research on its effects on quality of life and autonomic status, and the scarcity of data on its consequences, our study aims to compare the quality of life and autonomic regulation in young individuals who use HTPs and their non-smoking peers. While the results we obtain may reflect only short-term effects, they will, in our opinion, contribute to a better understanding of the potential risks associated with HTP use and highlight the need for further, longer-term research.

AIM

To assess the impact of heated tobacco products on quality of life and autonomic nervous system function in young adults using SF-36 and Wayne questionnaires, with consideration of gender-specific differences.

MATERIALS AND METHODS

The study design was case-control, with no randomization procedures applied. The duration of HTP use at the time of the study was up to 5 years, corresponding to short-term exposure.

Inclusion criteria for the main observation group were as follows: systematic (daily) use of alternative forms of smoking in the form of HTPs for up to 5 years, age between 18 and 30 years, normosthenic body type, a state of somatic health at the time of participation in the study, and signed informed consent to participate in the current research.

The control group included 26 individuals who met the following inclusion criteria: absence of active or passive exposure to any form of tobacco, age between 18 and 30 years, normosthenic body type, a state of somatic health at the time of participation in the study, and signed informed consent to participate in the current research program.

Exclusion criteria for both groups were as follows: age under 18 or over 30 years, presence of comorbid chronic diseases, signs of acute infectious processes or exacerbation of chronic infections at the time of participation, professional athletes, individuals with asthenic or hypersthenic body types, and refusal to participate in the study for any reason. General characteristics of the study groups: the average age of men ($n = 40$) in the observation group was 24.8 (3.8) years, and for women ($n = 26$), it was 23.8 (2.7) years. In the control group, the average age of men ($n = 16$) was 24.7 (4.5) years, and for women ($n = 10$), it was 24.0 (2.6) years. This indicates the comparability of the groups in terms of age and gender ($p = 0.877$).

In accordance with the aim of this study, the validated SF-36 questionnaire («The 36-Item Short Form Health Survey») was used to assess the two main components – physical and mental – of the integral QoL evaluation in healthy young individuals who use HTPs compared to healthy young individuals who have never smoked. Additionally, a detailed analysis of the components of self-assessed QoL was conducted across the structural domains and scales of the SF-36 questionnaire. This approach allowed us to identify different levels of disturbances contributing to the reduction of respondents' overall QoL index.

To evaluate the state of the ANS, the standard validated Wayne questionnaire was used, providing a comprehensive assessment of the predominant regulatory type of the ANS – sympathetic or parasympathetic. The first part of the questionnaire, «Subjective assessment of autonomic status by the patient,» was completed by the participants themselves and consisted of 11 questions. Respondents selected their answers («Yes» or «No») by underlining or circling the appropriate response for each question. Each symptom scored between 1 and 10 points for positive responses. A total score of 15 or below was considered normal, while a score of 16 or higher indicated autonomic dysfunction. The second part, «Subjective assessment of autonomic status by the physician,» was completed by the researcher and included 13 questions with «Yes» or «No» responses, each assigned specific points. A total score above 25 indicated autonomic dysfunction.

Statistical analysis of the results was performed using MS Excel and SPSS v.25. Normality of data distribution was assessed using the Kolmogorov-Smirnov test. Since 95% of the data followed a normal distribution, parametric statistical methods were employed. Mean values are presented as M (SD). Correlations were evaluated using Pearson's test for quantitative variables and χ^2 for categorical variables. The critical significance level for hypothesis testing was set at 0.05.

RESULTS

The analysis of various aspects of respondents' QoL was conducted across all scales of the SF-36 questionnaire. This allowed us to identify significant differences in the

components of the integral «quality of life» indicator across all spheres of life. These differences reflected how healthy young HTP users perceived their health status, both in terms of the physical health component (PCS) and the mental health component (MCS), compared to their counterparts who had never smoked.

According to our data (Table 1), healthy young HTP users demonstrated a significantly lower PCS score compared to the control group (56.0 (5.12) points vs. 58.2 (3.56) points, $p = 0.047$). This decline, based on self-assessment by the participants, was primarily attributed to a significant reduction in the «Role-Physical» (RP) scale ($p = 0.024$) compared to the control group (Table 1). According to the SF-36 evaluation criteria, this

indicates that physical health issues were a major factor in the perceived maladaptation of young HTP users. Their subjective assessment highlighted limitations in daily activities and reduced physical tolerance for performing professional duties and routine tasks, as compared to their peers who had never smoked.

Regarding the mental health component (MCS) of QoL among healthy young individuals in the primary group, the score was significantly lower compared to the control group (47.3 (8.35) points vs. 52.9 (6.65) points, $p = 0.003$). The decline in MCS was linked to changes in three of the four domains within this component: decreased QoL in «Vitality» (VT) ($p < 0.001$), «Social Functioning» (SF) ($p = 0.041$), and «Mental Health» (MH) ($p < 0.001$) (Table 1).

Table 1

Comparison of Quality of Life Indicators (SF-36) between the Group of HTP Users and the Control Group

№	Quality of Life Indicators (scores)	HTP Users (n = 66)	Control Group (n = 26)	p-value
Physical Component Summary				
1	Physical Functioning (PF)	95.3 (6.67)	97.3 (3.80)	0.154
2	Role-Physical Functioning (RP)	86.4 (25.64)	98.1 (6.79)	0.024*
3	Bodily Pain (BP)	83.7 (21.09)	87.9 (17.08)	0.369
4	General Health (GH)	78.1 (12.18)	79.9 (20.36)	0.603
Mental Component Summary				
5	Vitality (VT)	60.6 (16.54)	75.0 (12.49)	< 0.001*
6	Social Functioning (SF)	84.5 (16.79)	91.6 (7.59)	0.041*
7	Role-Emotional (RE)	74.8 (31.02)	79.5 (25.13)	0.489
8	Mental Health (MH)	66.2 (15.82)	78.2 (12.76)	< 0.001*

* Statistically significant difference.

According to the self-assessment of young users of HTPs on the «VT» indicator, which reflects the sense of energy sufficiency in the body, i.e., strength and energy, significantly lower scores were observed among healthy young HTP users (Table 1). This indicates that, based on their subjective assessment of quality of life, these individuals experienced reduced energy levels and vitality compared to healthy young individuals who had never smoked.

A significant decline in SF was also observed among participants in the primary study group (Table 1). According to the methodology of standardized evaluation, this deterioration was attributed to reduced social activity and communication. This finding not only reflects the

diminished role of young HTP users in social life but also underscores the importance of this domain of life for the respondents themselves, which, by definition, points to social maladaptation.

Our findings regarding the lower scores for the MH component (Table 1) highlight the presence of higher levels of anxiety and a decline in overall emotional well-being among healthy young HTP users compared to the control group.

A comparative analysis of self-assessed scores across the SF-36 questionnaire scales between healthy young individuals in the primary group and the control group, stratified by gender, revealed significant gender differences (Table 2).

Table 2

Comparative Analysis of Self-assessed Scores Across SF-36 Questionnaire Scales Among Healthy Young Individuals in the Primary and Control Groups by Gender

Indicator	Men		Women		p-value
	HTP Users	Control Group	HTP Users	Control Group	
MCS (Mental Component Summary)	50.5 (7.08)	55.5 (5.77)	42.5 (7.93)	51.3 (6.84)	$p_1 = 0.045$ $p_2 < 0.001$
MH (Mental Health)	72.6 (13.75)	85.6 (9.08)	56.3 (13.71)	73.5 (12.72)	$p_1 = 0.007$ $p_2 < 0.001$
VT (Vitality)	65.5 (16.94)	78.0 (11.83)	53.1 (12.89)	73.1 (12.89)	$p_1 = 0.033$ $p_2 < 0.001$
RP (Role-Physical Functioning)	-	-	75.0 (34.64)	96.9 (8.54)	$p_1 > 0.05$ $p_2 = 0.018$

Note: p_1 : Statistical significance of differences between men.

p_2 : Statistical significance of differences between women.

According to our data (Table 2), healthy young men who used HTP products, as well as healthy young women who used HTP, had significantly lower scores for the overall MCS (on average, 5 points lower in men and 10 points lower in women). Additionally, their scores for the scales «MH» (on average, 13 points lower in men and 17 points lower in women) and «VT» (on average, 13 points lower in men and 20 points lower in women) were lower compared to healthy young peers who never smoked. This suggests a more pronounced deterioration in QoL among female HTP users.

Furthermore, young women who used HTP had significantly lower (on average, 20 points lower) scores on the «RP» scale ($p = 0.018$) compared to women who never smoked (Table 2). No significant gender differences were found for the average levels of evaluation for other scales in our study.

A comparative analysis of the mean scores for the components of quality of life that showed significant differences in the group of healthy young HTP users, based on gender, is presented in Figure 1.

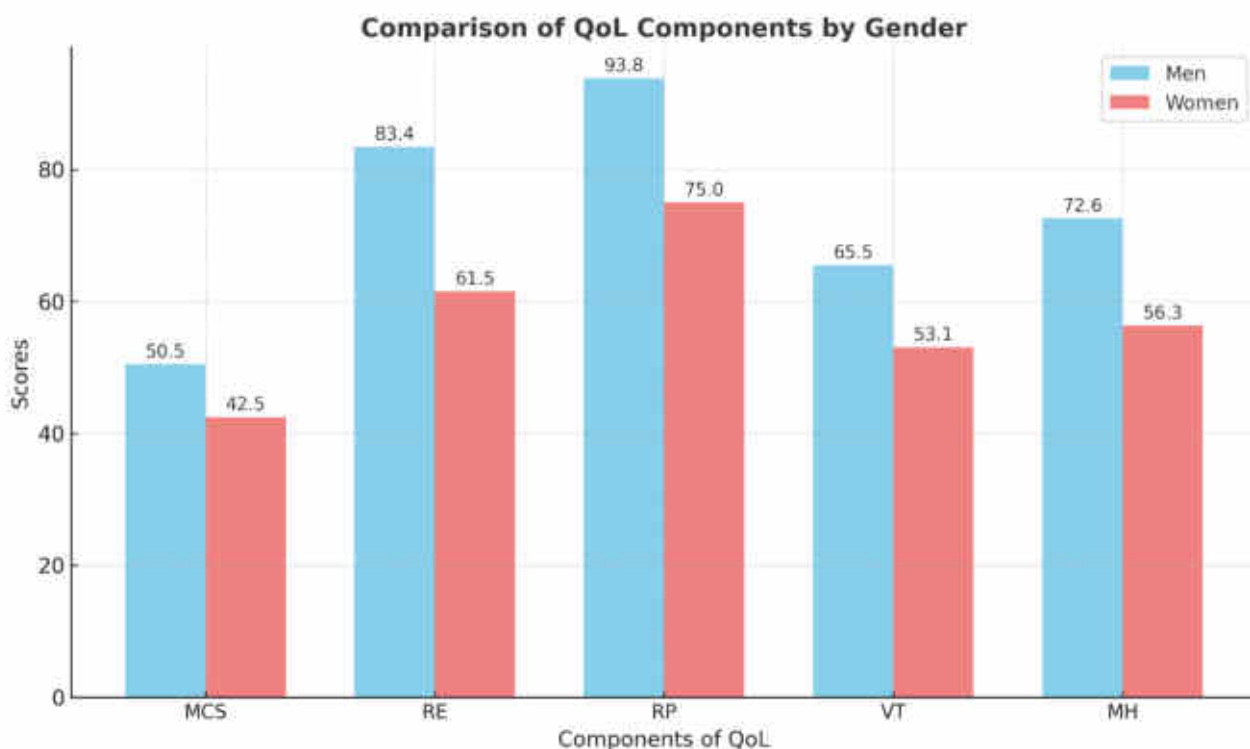


Figure 1. Comparison of the mean self-assessment scores for the components of quality of life in the group of healthy young HTP users, based on gender.

According to our data (Figure 1), healthy young men who used HTP had significantly higher self-assessment scores on the SF-36 questionnaire for the overall «MCS» indicator (on average, 8 points higher), as well as for the following scales: «RE» (on average, 22 points higher), «RP» (on average, 18 points higher), «VT» (on average, 12 points higher), and «MH» (on average, 16 points higher). This indicates a significantly higher level of quality of life in these components among male HTP users compared to female HTP users (Figure 1).

For other scales of the SF-36 questionnaire, we did not find a significant difference in the mean levels of QoL indicators in the respondents of the main observation group based on gender. It is also worth noting that, according to our data, a significant gender difference in healthy young individuals who never smoked was found only for the «MH» scale (women: 73.5 (12.72) vs. men: 85.6 (9.08); $p = 0.015$).

To determine the significance of the effect of HTP usage duration on the reduction of QoL indicators, we performed a correlation analysis between the length of HTP use and the self-assessment results of the SF-36 questionnaire, both among men and women in the main group.

The analysis of the data presented in Table 3 revealed that with the increasing duration of HTP use, social functioning in young healthy men worsens. However, in women, the increase in HTP use duration leads to a decline in QoL through various components, including reduced role-emotional functioning, a heightened subjective sense of worsening general health, and increased intensity of bodily pain. This, in turn, results in a deterioration in two key aspects – physical and mental health components – affecting the overall QoL indicator.

Table 3

Correlational Relationships between the Duration of HTP Use in Young Healthy Individuals and the Self-Assessment Scores on the SF-36 Scales based on Gender of the Respondents

Indicator	Men of main group (r; p)	Women of main group (r; p)
SF (Social Functioning)	-0.52; < 0.001	*
RE (Role-Emotional Functioning)	*	-0.65; < 0.001
BP (Bodily Pain Intensity)	*	0.59; 0.002
GH (General Health)	*	-0.41; 0.036
MCS (Mental Health Component)	*	-0.52; 0.007
PCS (Physical Health Component)	*	-0.44; 0.023

No significant correlation.

Another significant risk factor for the reduction in QoL among young healthy individuals using HTP was the observed patterns of autonomic regulation, prompting the search for correlational relationships between these components.

Thus, young healthy individuals who use HTP demonstrate lower self-assessed physical and mental health scores on the SF-36 questionnaire compared to those who have never smoked. According to our data, HTP users find it harder to cope with daily tasks ($p = 0.024$) and maintain social activity ($p = 0.041$), partly due to a sense of lacking life force ($p < 0.001$) and heightened anxiety ($p < 0.001$) compared to non-smokers.

It should be noted that male HTP users ($p > 0.05$), unlike female HTP users ($p = 0.018$), did not report any issues with performing daily activities at the time of the study. Male HTP users had significantly higher self-assessment results compared to female HTP users in the following scales: «MH», «RE», «RP» and «VT.»

In line with the objectives of the current study and our obtained data, it was also demonstrated that the decline in QoL among young healthy HTP users is correlated with the results obtained in these individuals using the Wayne questionnaire. The correlational matrices of interrelationships differ depending on the gender of the respondents, as clearly summarized in Figure 2.

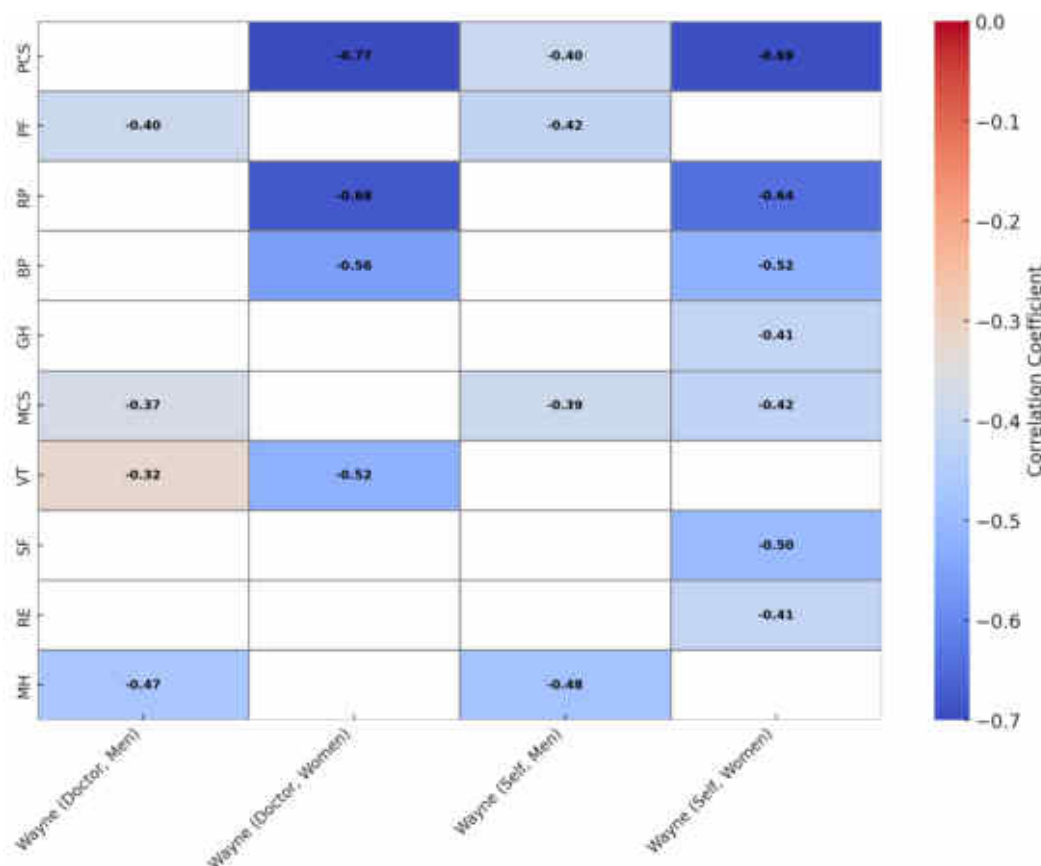


Figure 2. Correlation interactions between the self-assessment scores from the SF-36 questionnaire and the results of the Wayne questionnaire among healthy young individuals who use HTPs, stratified by gender.

In healthy young male HTP users (Figure 2), an increase in self-assessment according to the Wayne questionnaire, regardless of whether the rating falls within the normal range or reflects a risk or presence of autonomic dysfunction, was found to worsen quality of life through the deterioration of such QoL components as «PCS» ($p = 0.011$), «MCS» ($p = 0.012$), «PF» ($p = 0.008$), and «MH» ($p = 0.002$).

Furthermore, our data suggest that the higher the score on the Wayne questionnaire by the doctor (regardless of whether the score falls within the normal range or indicates a risk or presence of autonomic disorders), the lower the QoL scores for the following SF-36 scales: «MH» ($p = 0.018$), «PF» ($p = 0.045$), «VT» ($p = 0.043$), and «MH» ($p = 0.002$), which indicates a lower overall QoL for these individuals.

For healthy young women who use HTPs, the correlation matrix of interactions between the Wayne questionnaire data (clinician's assessment) and the SF-36 questionnaire was structured as follows. A decrease in the scores for scales such as the «PCS» ($p < 0.001$), «RP» ($p < 0.001$), «VT» ($p = 0.006$), and «BP» ($p = 0.003$), which collectively reflect a deterioration in the QoL of these individuals, was influenced by an increase in the clinician's score on the Wayne questionnaire. This, in turn, could underlie the development of autonomic dysfunction.

Additionally, a higher self-assessment score of healthy young women who use HTPs on the Wayne questionnaire (irrespective of whether the score was within the normal range or indicated the risk or presence of autonomic dysfunction) contributed to lower scores in the following QoL domains: «PCS» ($p < 0.001$), «MCS» ($p = 0.012$), «RP» ($p < 0.001$), «SF» ($p = 0.009$), «BP» ($p = 0.007$), «GH» ($p = 0.036$), and «RE» ($p = 0.037$).

Further analysis of the correlation interactions between the identified autonomic dysfunction (a score exceeding 25 points on the clinician's assessment or more than 15 points on the patient's self-assessment, indicative of autonomic disorders) and the SF-36 domains in healthy young HTP users by gender revealed distinct correlation patterns that differed in their structural components.

For young male HTP users, the presence of autonomic dysfunction, as objectively assessed by a clinician, reduced their QoL in the following domains: «PCS» ($p = 0.045$), «MCS» ($p = 0.045$), and «MH» ($p = 0.01$).

In contrast, for female HTP users, clinician-assessed autonomic dysfunction (as per the Wayne questionnaire) negatively affected the QoL in the following domains: «PCS» ($p = 0.015$), «MCS» ($p = 0.015$), «MH» ($p = 0.013$), «VT» ($p = 0.016$), «BP» ($p = 0.047$), «SF» ($p = 0.021$), and «RP» ($p = 0.011$).

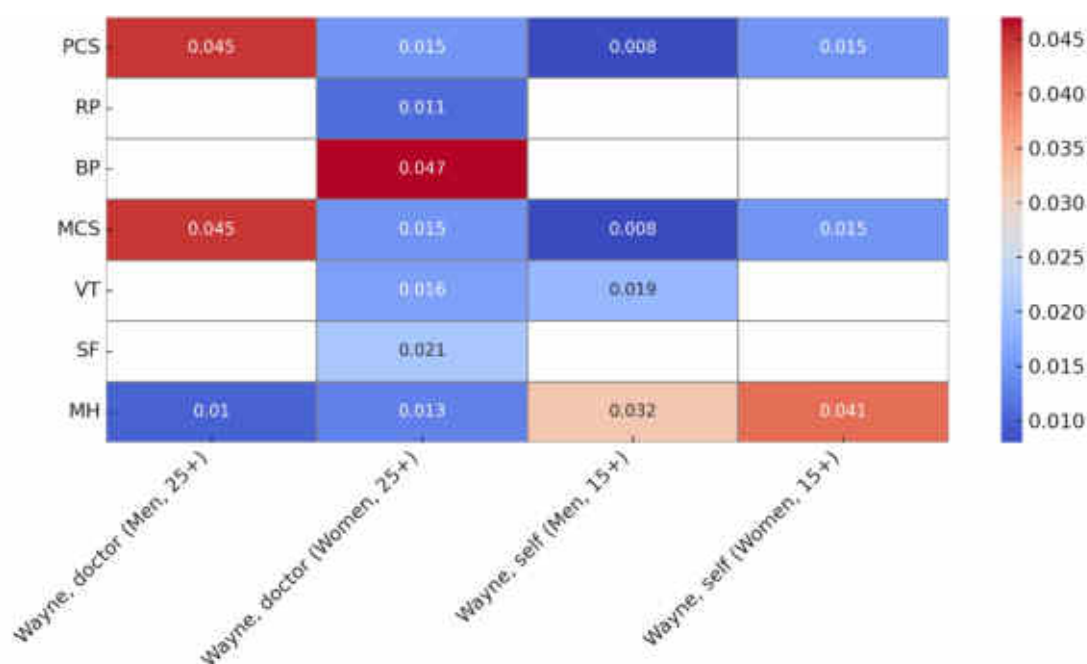


Figure 3. Associations between the presence of autonomic dysfunction, determined via the Wayne questionnaire, and SF-36 indicators in healthy young HTP users, stratified by gender (p-values presented for χ^2 tests). Color intensity reflects the level of significance (p-value): the closer to 0, the stronger the association.

The presence of autonomic dysfunction in young male HTP users, determined by self-assessment using the Wayne questionnaire, indicated a deterioration in the following QoL components: «PCS» ($p = 0.008$), «MCS» ($p = 0.008$), «VT» ($p = 0.019$), and «MH» ($p = 0.032$).

The correlation matrix of interactions between the presence of autonomic dysfunction in young female HTP users, diagnosed based on self-assessment using the Wayne questionnaire, confirmed the influence of autonomic disorders on

QoL indicators such as «PCS» ($p = 0.015$), «MCS» ($p = 0.015$), and «MH» ($p = 0.041$).

Thus, the generalization of the results of QoL assessment in healthy young individuals depending on their HTP smoking status allowed us to distinguish both general changes in QoL parameters of HTP smokers, regardless of gender, towards deterioration, identify gender-specific features of QoL deterioration in the HTP smoker cohort, and find correlations between SF-36 changes and autonomic features of the examined respondents according to the Wayne questionnaire.

DISCUSSION

The results of our study demonstrated the impact of electronic cigarettes on the health of young individuals, specifically the reduction in physical and mental components of quality of life, which aligns with the findings of other research. According to Gotts et al. (2019) and Ruszkiewicz et al. (2020), heated tobacco products negatively affect quality of life and the autonomic nervous system through various mechanisms. Aerosols produced by these devices contain fine particles, toxic metals, and chemical compounds that cause airway inflammation, impair lung function, and reduce overall physical endurance [10]. Additionally, Benowitz & Fraiman (2017) reported that nicotine, a component of heated tobacco products, significantly impacts the cardiovascular system by increasing heart rate and blood pressure, indicating heightened sympathetic nervous system activity. Chronic nicotine exposure decreases parasympathetic activity, consistent with our findings on the development of autonomic imbalance in young electronic cigarette users.

The research team led by Herman M. & Tarran R. (2020) demonstrated that long-term nicotine use provides temporary mood enhancement for smokers but also leads to dependence, emotional deterioration, anxiety, and depressive symptoms. Nicotine's impact on the brain's dopamine system may explain the reduction in the MCS of quality of life found in this study among HTP users. Moreover, cognitive function decline due to disrupted neurotransmitter regulation affects social interaction capabilities and overall subjective quality of life perception [11].

Our data also reveal gender-specific differences in the effects of HTP use among young individuals, which may be linked to biological, psychological, and social factors. Women exhibit higher sensitivity to hormonal changes induced by nicotine, which may exacerbate anxiety, depression, and social isolation. Women metabolize nicotine more rapidly, potentially explaining the more intense effects even with shorter use durations [12, 13]. Furthermore, the social stigma surrounding smoking among women can add emotional stress. Stigmatization of HTP use and awareness of nicotine dependence may induce additional stress, worsening emotional well-being and reducing vitality [14, 15].

Thus, summarizing our research findings and literature data underscores the adverse effects of HTP on quality of life and autonomic balance in young individuals. The gender-specific effects identified in this study highlight the need for the development of gender-sensitive preventive and therapeutic approaches to address QoL impairments and autonomic balance disturbances in these individuals.

CONCLUSIONS

1. The use of HTPs is associated with a significant reduction in the physical and mental components of quality of life, as confirmed by the SF-36 scales.
2. Women who use HTPs exhibit more pronounced deterioration in quality of life, particularly in the domains of mental health, vitality, and role-physical functioning.
3. With increasing duration of HTP use, social functioning declines in men, while women experience worsening emotional states, overall health status, and pain intensity.
4. The presence of autonomic disorders associated with HTP use significantly impacts the physical and mental health of young individuals, underscoring the importance of a gender-specific approach to addressing these changes.

Perspectives for further research. A study on the long-term effects of alternative forms of tobacco smoking through cohort studies.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was approved by the Biomedical Ethics Commission of Dnipro State Medical University and was conducted in accordance with the principles of bioethics outlined in the Helsinki Declaration of Ethical Principles for Medical Research Involving Human Subjects (1975), as amended in 2000; the Universal Declaration on Bioethics and Human Rights (UNESCO); the Council of Europe Convention on Human Rights and Biomedicine (2007). All participants were fully informed about the research, and their written informed consent was obtained prior to the commencement of the study.

FUNDING AND CONFLICT OF INTEREST

All research was conducted at the authors' own expense, without any external funding. The authors declare that they have no conflicts of interest, financial or otherwise.

AUTHOR CONTRIBUTIONS

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Резюме

ВПЛИВ ВИКОРИСТАННЯ ЕЛЕКТРОННИХ СИГАРЕТ НА ЯКІСТЬ ЖИТТЯ ТА РОБОТУ ВЕГЕТАТИВНОЇ НЕРВОВОЇ СИСТЕМИ МОЛОДИХ ОСІБ

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Вступ. Глобальне зниження традиційного куріння тютюну супроводжується зростанням популярності тютюнових виробів для електричного нагрівання та електронних сигарет, які рекламуються як більш безпечні альтернативи. Незважаючи на їхню популярність серед молоді, особливо через агресивний маркетинг та привабливі смаки, ефекти для здоров'я залишаються недостатньо вивченими. Це дослідження зосереджено на короткостроковому впливі вживання тютюнових виробів для електричного нагрівання на якість життя та функціонування автономної нервової системи у здорових молодих людей з урахуванням гендерних відмінностей.

Мета. Оцінити вплив вживання тютюнових виробів для електричного нагрівання на якість життя та функціонування автономної нервової системи у здорових молодих людей за допомогою анкет SF-36 та Вейна, з акцентом на гендерні відмінності.

Матеріали та методи. Це дослідження випадок-контроль включало 92 учасників, поділених на дві групи: 66 користувачів курців та 26 осіб, які ніколи не курили. Критерії включення до основної групи включали щоденне використання цих пристроїв до п'яти років, соматичне здоров'я та індекс маси тіла в межах норми. Некурці не мали активного чи пасивного впливу тютюнових виробів. Якість життя оцінювалась за допомогою анкети SF-36, яка вимірює фізичні та психічні компоненти здоров'я через вісім підшкал.

Результати. Користувачі тютюнових виробів для електричного нагрівання продемонстрували значно нижчі показники якості життя порівняно з некурцями, зокрема за компонентами фізичного та психічного здоров'я. У жінок спостерігалось більш виражене зниження у рольовому фізичному функціонуванні, психічному здоров'ї, життєвій енергії та соціальному функціонуванні. Триваліший стаж використання тютюнових виробів для електричного нагрівання корелював зі зниженням соціального функціонування у чоловіків та більшим зниженням емоційного стану, загального здоров'я та інтенсивності болю у жінок. Дисфункція автономної нервової системи була пов'язана із зниженням якості життя в обох статей, хоча були виявлені гендерні відмінності у паттернах впливу.

Висновки. Використання тютюнових виробів для електричного нагрівання значно погіршує якість життя та функціонування автономної нервової системи у здорових молодих людей. Жінки більш вразливі до цих ефектів. Отримані результати підкреслюють необхідність гендерно-специфічних стратегій профілактики та подальших досліджень щодо довгострокових наслідків для здоров'я.

Ключові слова: тютюнові вироби для електричного нагрівання, психічне здоров'я, гендерні відмінності, профілактичні стратегії

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