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Research Article

DID THE BURNOUT LEVELS OF THE NURSES AFFECT THEIR PROFESSIONAL COMMITMENT DURING THE COVID-19 PANDEMIC PROCESS?

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Abstract: *This descriptive, cross-sectional, and correlational study investigated the effect of burnout on nurses' professional commitment during the COVID-19 pandemic. Nurses have been experiencing high levels of burnout since the onset of the COVID-19 pandemic. However, we know little about how burnout affects their professional commitment. The study was conducted between March 2021 and April 2021. The sample consisted of 671 nurses. Participation was voluntary. Data were collected online using a personal information form, the Maslach Burnout Inventory (MBI), and the Nursing Professional Commitment Scale (NPCS). The data were analyzed using the Statistical Package for Social Sciences (SPSS) at a significance level of 0.05. Half of the participants stated that the pandemic adversely affected their professional commitment (51.4%). More than a quarter of the participants noted that they considered quitting (36.4%). Participants had a mean MBI and NPCS score of 2.43±0.52 (above average) and 2.07±0.76 (average), respectively. Their MBI and NPCS scores were negatively correlated (r=-0.428; p=0.001). Burnout explained 18% of the total variance of professional commitment (p=0.000; R^2: 0.182). Nurses experience high levels of emotional exhaustion and depersonalization during the pandemic, resulting in reduced professional commitment. There is also a positive correlation between personal accomplishment and professional commitment.*

Keywords*: COVID-19, nurse, professional commitment, pandemic, burnout*

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1. Introduction

The novel coronavirus disease 2019 (COVID-19) that broke out in Wuhan/China at the end of 2019 has taken hold of the whole world. As of July 2022, it has affected approximately 562,672,324 people and killed 7,049,376 people [1]. Considering the speed, size, mortality, and morbidity rates of the pandemic, we can state that it has taken a tremendous toll on healthcare professionals [2-6].

Nurses are at high risk of exposure to COVID-19 patients because they are frontline healthcare professionals working tirelessly since the onset of the pandemic [7-11]. For various reasons, they have been under much stress since the pandemic. First, they must deal with more and more COVID cases, resulting in an increased workload. Second, they must work under tremendous pressure with inadequate protective equipment at their disposal. Third, they have been away from their families during this challenging time. Fourth, they have been worried about infecting their loved ones [12-21]. The pandemic has also taken an emotional toll on nurses for various reasons. First, they have been fighting against the coronavirus for a long time. Second, they are in constant contact with COVID-19 patients. Third, the pandemic was imbued with uncertainties. Consequently, they have been dealing with compassion fatigue [22,23], despair [24], stress [25], and even suicidal thoughts more than other healthcare

professionals [3,26-28]. The International Council of Nurses also states that the pandemic was an urgent matter that needs to be resolved because it is likely to cause nurses to experience serious health problems in the long term [29].

Research shows that nurses have been experiencing reduced levels of commitment and increased levels of burnout, resulting in a high rate of turnover since the pandemic began [17,30-38]. However, these researchers have focused on the psychological effects of the pandemic on nurses' work environment but have not determined its effect on professional commitment. Given the global nurse shortage, we think that we should take steps to improve nurses' professional commitment to keep them in the profession [18,39-41]. Therefore, this study aimed to determine whether burnout affected nurses' professional commitment during the COVID-19 pandemic. We think that our results will help authorities develop strategies to keep nurses in the profession.

2. Methods

2.1. Aim and Design

This descriptive, cross-sectional, and correlational study investigated the effect of burnout on nurses' professional commitment during the COVID-19 pandemic.

2.2. Population and Sample

The study population consisted of all nurses in Turkey. The sample consisted of 671 nurses recruited using simple random sampling. Participation was voluntary.

2.3. Data Collection Tools

The data were collected online using a personal information form, the Maslach Burnout Inventory (MBI), and the Nursing Professional Commitment Scale (NPCS).

Personal Information Form

This form prepared by the researchers, consists of 17 questions to determine the personal and professional characteristics of nurses and their situation during the pandemic process.

Nursing Professional Commitment Scale

The Nursing Professional Commitment Scale (NPCS) was developed by Lu et al. [42] and adapted into Turkish by Çetinkaya et al. [43]. The instrument consists of 26 items rated on a four-point Likert-type scale. The total score ranges from 26 to 104, with higher scores indicating higher levels of professional commitment [43]. The scale has three subscales: willingness to try (nine items; total score 13-52), maintaining membership (eight items; total score 8-32), and (3) belief in goals and values (six items; total score 5-20). Nine items (14, 15, 16, 17, 18, 19, 20, 21, and 25) are reverse scored. The original scale has a Cronbach's alpha of .94 [42]. The Turkish version has a Cronbach's alpha of .90 [43]. In the present study, the scale had a Cronbach's alpha of .92, while the "willingness to make an effort," "maintaining membership," and "belief in goals and values" subscales had a Cronbach's alpha of .88, .85, and .70, respectively.

Maslach Burnout Inventory

The Maslach Burnout Inventory (MBI) was developed by Maslach and Jackson [44] and adapted into Turkish by Ergin [45]. The instrument consists of 22 items rated on a five-point Likert-type scale. It has three subscales emotional exhaustion (nine items), personal accomplishment (eight items), and depersonalization (five items). The subscales are independent of each other, and therefore, there is no total score. The items (4, 7, 9, 12, 17, 18, 19, and 21) of the "personal accomplishment" subscale are

reverse scored. Higher scores on "emotional exhaustion" and "depersonalization" and low scores on "personal accomplishment" indicate high levels of burnout. The Turkish version has a Cronbach's alpha of .93 [45]. In the present study, the total scale had a Cronbach's alpha of .78, while the "emotional exhaustion," "personal accomplishment," and "depersonalization" subscales had a Cronbach's alpha of .90, .71, and .79, respectively.

2.4. Data Collection

The study was conducted between March 2021 and April 2021. The data were collected online due to the pandemic. Nurses were invited to participate in the study through a link to the online survey sent to their groups on social media platforms.

2.5. Data Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) at significance levels of 0.01 and 0.05. "Professional commitment" was the dependent variable, while "burnout" was the independent variable. Frequency and percentage were used for descriptive statistics. Normality was tested using skewness and kurtosis values. The data were analyzed using the student's t-test, Pearson's correlation coefficient, and linear regression.

2.6. Ethical Consideration

The study was approved by the Health Sciences Non-Interventional Research Ethics Committee of Bandırma Onyedi Eylül University (Date: 12.03.2021 & No: 2021-14). Nurses were informed about the research purpose and procedure. Informed consent was obtained from those who agreed to participate in the study.

3. Results

Most participants were women (n=581; 86.6%). More than half the participants were younger than 35 (n= 358; 53.4%) married (n= 422; 62.9%) and had bachelor's degrees (n= 450; 67.1%). Almost half the participants worked for tertiary healthcare institutions (n= 322; 48.0%). Half the participants worked in intensive care, operating rooms, or emergency departments (n= 339; 50.5%). More than half the participants were service nurses (n= 429; 63.9%). More than half the participants had more than 15 years of work experience (n= 444; 66.2%) and worked in shifts (n= 406; 60.5%). More than half the participants worked 161-200 hours a month (n= 349; 52.0%) caring for COVID patients (n=450; 67.1%). Those participants cared for 0 to 20 COVID patients every week (n=277; 61.5%). More than a quarter of the participants had tested positive for COVID-19 before (n=213; 31.7%). More than half the participants had family members or relatives who had tested positive for COVID-19 before (n= 474; 70.6%). Half the participants stated that the pandemic negatively affected their professional commitment (n=345; 51.4%). More than a quarter of the participants noted that they considered leaving the profession (n= 244; 36.4%). A quarter of the participants remarked that they sometimes thought about leaving the profession (n= 167; 24.9%) (Table 1.)

Table 1. Distribution of demographic characteristics of nurses participating in the study (N: 671)

Variables		N	%
Gender	Woman	581	86.6
Age	≤35	358	53.4
	41≥	174	25.9
Marital status	Married	422	62.9

Table 1. Continued

Variables		N	%
Educational background	Bachelor's degree	450	67.1
Type of health care worked	3. Step-by-step health care	322	48.0
Unit worked	Intensive Care/Operating Room/Emergency Room	339	50.5
Professional position	Service nurse	429	63.9
Years of work in the profession	>15 Years	444	66.2
How it works	Seizure (day and night)	406	60.5
Monthly working hours during the Covid-19 pandemic	161-200 hours	349	52.0
The status of caring for a Covid-19 patient in the unit you work in	Yes	450	67.1
Average weekly number of Covid-19 patients cared for	0-20 patients	277	61.5
Contracting Covid-19 disease	Yes	213	31.7
Covid-19 infection from family or relatives	Yes	474	70.6
The negative impact of the pandemic process on the commitment to the nursing profession	Yes	345	51.4
Thinking about leaving the profession during the pandemic	Yes	244	36.4
	Sometimes	167	24.9

Participants had a mean MBI mean total score of 53.43±0.52. They had a mean MBI "emotional exhaustion," "personal accomplishment," and "depersonalization" subscale score of 22.95±0.95, 24.08±0.63, and 6.4±0.97, respectively. They had a mean total NPCS score of 53.69±0.76. They had mean NPCS "willingness to make an effort," "maintaining membership," and "belief in goals and values" subscale scores of 24.31±0.84, 16.88±0.98, and 12.5±0.73, respectively (Table 2).

Table 2. Distribution of nurses' mean scores from MBI and NPCS

Scales	Subdimensions	Min-Max (Median)	M±SD
Maslach Burnout Scale	Emotional exhaustion	0-4 (2.67)	22.95±0.95
	Personal success	0.38-4 (3)	24.08±0.63
	Depersonalization	0-4 (1)	6.4±0.97
	Total	1.18-4 (2.41)	53.43±0.52
Nursing Commitment Scale	Willingness to make an effort	0-4 (1.85)	24.31±0.84
	Maintaining professional membership	0-4 (2)	16.88±0.98
	Belief in goals values	0-4 (2713.60)	12.5±0.73
	Total	0.08-3.92 (2.04)	53.69±0.76

M: Mean, SD: Standart Deviation, Min: Minimum, Max: Maximum.

Based on the Pearson correlation results (see Table 3), participants' MBI "emotional exhaustion" subscale scores were negatively correlated with their NPCS total (r=-0.605; p=0.001) and "willingness to make an effort" (r=-0.531; p=0.001) "maintaining membership" (r=-0.643; p=0.001), and "belief in goals and values" subscale scores (r=-0.297; p=0.001). Their MBI "personal accomplishment" subscale scores were positively correlated with their NPCS total (r=0.456; p=0.001) and "willingness to make an effort" (r=0.447; p=0.001), "maintaining membership" (r=0.351; p=0.001), and "belief in goals and values" (r=0.371; p=0.001) subscale scores. Their MBI "depersonalization" subscale scores were negatively correlated with their NPCS total (r=-0.416; p=0.001) and "willingness to make an effort" (r=-0.353; p=0.001), "belief in goals and values" (r=-0.288; p=0.001), and "maintaining membership" (r=-0.421; p=0.001) subscale scores. Their MBI total score was negatively correlated with their NPCS total

score (r=-0.428; p=0.001) and "maintaining membership" (r=-0.506; p=0.001) and "belief in goals and values" (r=-0.181; p=0.001) subscale scores.

Table 3. Correlation between MBI and NPCS scores

MBI subscales / NPCS subscales	**Emotional exhaustion**		**Personal accomplishment**		**Depersonalization**		**MBI Total**	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**
Willingness to make an effort	-0.531	**0.001***	0.447	**0.001***	-0.353	**0.001***	-0.351	**0.001***
Maintaining membership	-0.643	**0.001***	0.351	**0.001***	-0.421	**0.001***	-0.506	**0.001***
Belief in goals and values	-0.297	**0.001***	0.371	**0.001***	-0.288	**0.001***	-0.181	**0.001***
NPCS Total	-0.605	**0.001***	0.456	**0.001***	-0.416	**0.001***	-0.428	**0.001***

Pearson Correlation Analysis, r= Pearson Correlation, *p≤ 0.001

The regression analysis showed that burnout explained 18% of the total variance of professional commitment (R=.428, R^2=.182 p<0.001). The t-test showed that burnout, especially emotional exhaustion, and personal accomplishment, significantly predicted professional commitment (p=0.001). Emotional exhaustion, personal accomplishment, and depersonalization explained 45% of the total variance of professional commitment (R=.673, R^2=.450 p<0.001). The t-test results showed that emotional exhaustion and personal accomplishment predicted professional commitment significantly (p=0.001), whereas depersonalization did not (p=0.649) (Table 4).

Table 4. Linear regression analysis results from MBI and NPCS

Variable	**B**	**S.E.**	**β**	**t**	**P**
Constant	3.588	0.127		28.259	.001**
Burnout	-0.626	0.051	-0.428	-12.263	.001**
R=.428 $F_{(1.670)}$=150.373 p=0.000			R^2=.182		
Constant	1.990	0.142		13.992	.001**
Emotional exhaustion	-0.419	0.029	-0.526	-14.480	.001**
Personal accomplishment	0.374	0.037	0.311	10.093	.001**
Depersonalization	0.013	0.029	0.017	0.455	0.649
R=.673 $F_{(3.670)}$=183.902 p=0.000			R^2=.450		

Simple Linear Regression Analysis, Student's t-test, β= Beta, **p≤ 0.001

4. Discussion

The COVID-19 pandemic has caused economic and social problems all over the world. It has taken a great toll on healthcare professionals, especially nurses. Some nurses have left the profession, while others have considered quitting because they have faced numerous risks and problems since the onset of the pandemic.

Our participants had an above-average burnout level. They mostly suffered from emotional exhaustion. However, the results indicate that nurses are in the first burnout stage. In other words, 0they

have low depersonalization levels and high personal accomplishment levels, which is a pleasing result. These results suggest that nurses experience depersonalization regarding their patients and profession. They also feel high levels of personal accomplishment because they have been fighting against the pandemic for a long time even though they cannot meet their needs and have a low quality of life and poor psychological resilience [17,18,46,47].

Our participants had high burnout levels as reported in other studies [4,6,9,11,12, 31,35,48-52]. Research shows that nurses suffer from anxiety, depression, hopelessness, post-traumatic stress disorder, insomnia, fear of COVID-19, and suicidal thoughts [10,53-64]. Moreover, nurses working in high-risk units (intensive care units) or with COVID-19 patients are more likely to suffer from high levels of burnout [58, 64, 65].

Research shows that one in two nurses experiences burnout. Moreover, nurses are much more likely to experience burnout and depression than other healthcare professionals [59,66]. Especially young nurses experience emotional burnout due to long working hours [66,67]. Nurses caring for COVID-19 patients experience more burnout due to increased workload, emotional and psychological pressures, and short and unproductive breaks [31,37,63].

Our participants had a low professional commitment, especially regarding “willingness to make an effort” and “maintaining membership.” They had a moderate professional commitment regarding "belief in goals and values." In addition, more than half of our participants stated that the pandemic negatively affected their professional commitment. One-third of our participants noted that they considered leaving the profession. One-fourth remarked that they sometimes considered leaving the profession. This is probably because nurses experience burnout due to conditions during the pandemic. There were significant correlations between all subscales of burnout and professional commitment, suggesting that burnout significantly affects professional commitment. Burnout negatively affected the "willingness to make an effort" and "maintaining membership" subscales the most. This is a concerning result for the future of nursing because it suggests that more and more nurses are likely to leave the profession. However, our participants had a moderate level of professional commitment regarding "belief in goals and values," which is promising.

Most participants were young and married. They had been working in shifts in intensive care or emergency departments of advanced hospitals since the onset of the pandemic. They stated that they worked long hours caring for COVID-19 patients. Although most participants had never tested positive for COVID-19, they had family members and relatives who had. Therefore, it is no surprise that they experience burnout affecting their professional commitment. Nurses who do not work directly with COVID patients have higher occupational satisfaction than those who do. Nurses who care for COVID patients experience more emotional burnout and consider leaving the profession more frequently than other nurses [41,64,68,69]. In addition, working conditions during the pandemic negatively affect the professional commitment of healthcare professionals [20]. Cengiz et al. [8] also reported that nurses had been considering leaving the profession since the pandemic began. All these results indicate that it is of paramount significance to take the necessary steps to help nurses experience less burnout and develop professional commitment.

4.1. Strengths and Limitations

This study had two limitations. First, the data were collected online due to the pandemic, which posed a challenge in accessing nurses. Second, the results are sample-specific, and therefore, cannot be generalized to all nurses.

5. Conclusion

Nurses have been experiencing high levels of burnout since the pandemic began. They suffer particularly from emotional burnout. However, they have low levels of depersonalization and high levels of personal accomplishment. Nurses have low professional commitment. They are unwilling to make an effort and consider leaving the profession. However, they have firm beliefs in professional goals and values. Burnout negatively affects their professional commitment.

Hospital administrators, executive nurses, and policymakers should develop strategies to discourage nurses from leaving the profession. They should also take initiatives to increase nurses' professional commitment and reduce their burnout levels so as not to suffer from nurse shortages in times of crisis. Hospitals should provide nurses with better working conditions and safer working environments. They should also create an emotionally supportive organizational climate and design interventions to help nurses develop psychological resilience.

Ethical statement

The study was approved by the Health Sciences Non-Interventional Research Ethics Committee of Bandırma Onyedi Eylül University (Date: 12.03.2021 & No: 2021-14).

Acknowledgment

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Conflict of interest

The authors declare that there is no conflict of interest.

Authors' Contributions

S. A.: Conceptualization, Methodology, Formal analysis, Writing- Original draft preparation.
F. T.: Conceptualization, Methodology, Resources, Writing, Investigation.
All authors read and approved the final manuscript.

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Research Article

AWARENESS AND PARTICIPATION OF UNIVERSITY EMPLOYEES IN CANCER SCREENING PROGRAMS

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Abstract: *This study was planned to determine the awareness and participation of university employees in cancer screening programs. The sample of the descriptive cross-sectional study consisted of 223 university employees. An information form prepared in line with the literature was used for data collection to determine the demographic information of the participants, the perceived cancer risk of individuals, and their knowledge and participation in cancer screening programs. Frequency, percentage and chi-square test were used in the data analysis and evaluation process. The significance level was accepted as p<0.05. 60.5% of the participants were male and 39% of the participants had an average age between 30-39 years. 79.8% of the participants had heard about cancer screening programs, but only 15.2% had participated in screening programs. It was found that 34.7% of the participants had clinical breast examination and pap smear tests, and 19.6% had mammography. There is no statistically significant difference between age, marital status, educational status, cadre type, smoking and alcohol use status of university employees, and participation in cancer screening programs (p>0.05). Participation rates of female university employees in cancer screening programs were significantly higher than male employees (p<0.05). There was a significant positive correlation between having a history of cancer in a first-degree relative and participation in screening (p<0.05). When the participants' perceived risk and participation rates in cancer screening programs were compared, no significant difference was found between perceived risk and participation rates (p>0.05). Although the rate of knowledge of cancer screening programs among university employees participating in the study was high, the rate of participation in screening was low. To implement screening programs effectively, initiatives to support and strengthen the participation of individuals in the programs are recommended.*

Keywords*: Cancer, screening programs, early diagnosis*

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1. Introduction

Cancer is the second leading cause of death in the world after cardiovascular diseases. In 2020, approximately 10 million deaths in the world will be caused by cancer. In addition, one out of every six deaths in the world and one out of every five people in our country lose their lives due to cancer [1]. The physical, psychological, material, and moral discomforts brought by cancer increase the burden of the disease on the individual and society day by day. Therefore, cancer continues to be an important health problem [2].

The most effective method to reduce deaths due to cancer is prevention and early detection. In addition to the primary prevention methods applied within the scope of cancer protection, secondary

prevention methods should also be applied [3]. With screening programs included in secondary prevention methods, cancer is detected at an early stage, reducing mortality rates and increasing the chance of treatment [4]. In our country, the "National Cancer Control Program" has been implemented since 2008; breast, cervical, and colorectal cancers are screened within the scope of this program [2]. For these screenings to be community-based, it is aimed to reach 70% of the population. Community-based cancer screening programs are carried out in all primary healthcare institutions and organizations [3].

Breast cancer is the most common cancer in women in our country and the world [5]. National screening programs recommend breast self-examination (BSE) once a month and clinical breast examination once a year from the age of 20, and mammography every two years after the age of 40. Mammography is thought to reduce mortality due to breast cancer, and BSE and clinical breast examination are thought to be guiding in the early detection of differences that may occur in the breast. As part of the cervical cancer screening program, women aged 30-65 are recommended to have a pap smear and HPV-DNA test every 5 years. It is especially important for sexually active women and women with multiple partners to participate in screening programs [2]. Colorectal cancers are the third most common cancer in both sexes and second only to lung cancer in mortality rates [5]. Therefore, early diagnosis of colorectal cancers is important and within the scope of screening programs, it is recommended that individuals aged 50-70 years should have fecal occult blood every two years and a colonoscopy every 10 years [2].

It is estimated that there will be more than 30 million cancer patients in 2040 and more than 16 million of these cases will be lost [5]. Therefore, the importance of early detection of cancer is increasing day by day. In cancer prevention, it is important to inform society about cancer screening programs, to increase social awareness and to accept screening programs [6]. However, the number of studies conducted on the level of knowledge, awareness, and compliance with screening programs throughout the country regarding cancer, whose incidence is increasing day by day and whose consequences affect the whole society, is limited. In studies conducted in the world and in our country, the number of participation in cancer screening programs is not sufficient [7-10]. Therefore, this study was planned to determine the awareness and participation of university employees in cancer screening programs.

2. Materials and Methods

2.1. Type of Research

It is a descriptive/cross-sectional study.

2.2. Place of Research

The research was conducted between June 2021 and March 2022 at a university in the Marmara region.

2.3. Study Population and Sample Selection

The population of the study consisted of 545 university employees working at a university between July 2021 and April 2022. Power analysis was performed to determine the sample size of the study. While calculating the power analysis, a 90% power ratio, 90% confidence limit, and 0.2 effect size were used. As a result of the calculation, the number of samples was found to be 210. The sample consisted of 223 individuals who agreed to participate in the study and met the inclusion criteria.

2.3.1 Inclusion Criteria

- Acceptance to participate in the research
- To be able to understand and communicate in Turkish

2.4. Data Collection Tools

A structured information form was used by the researchers in line with the literature [11-14]. The structured information form included questions about age, educational status, gender, smoking, alcohol use, presence of a family history of cancer, cancer risks perceived by individuals, and knowledge and participation in cancer screening programs.

2.5. Data Collection Method

Research data were collected online. The questionnaire form created in Google Form was sent to university employees by e-mail.

2.6. Data Evaluation

SPSS (Statistical Package for Social Sciences) for Windows 23 program was used for data analysis. Frequency, percentage, and chi-square tests were used to evaluate the data. The significance level was accepted as $p<0.05$.

2.7. Ethical Approach

The principle of volunteerism was prioritized in the study, and administrative and academic university staff who voluntarily agreed to participate were included in the study. Ethics committee permission (Ethics Committee Decision No:2021-37; Date: 23.5.2021) was obtained from the Ethics Committee of Bandirma Onyedi Eylül University and institutional permission was obtained from the higher education institution where the research was conducted.

3. Findings

A total of 223 university staff, of whom 60.5% (n=135) were male and 39.5% (n=88) were female, were included in the study. 39% (n=87) of the participants had an average age between 30-39 years, 67.7% (n=151) were married, 71.3% (n=159) were academic staff and 72.6% (n=162) had postgraduate education. Among the participants, 32.7% (n=73) smoked cigarettes and 21.1% (n=47) drank alcohol (Table 1).

Table 1. Sociodemographic Characteristics of University Employees (n=223)

Variables	n	%
Age		
20-29 years	36	16.1
30-39 years	87	39.0
40-49 years	69	30.9
50 years and older	31	13.9
Gender		
Woman	88	39.5
Male	135	60.5
Marital Status		
Married	151	67.7
Single	72	32.3
Education		
High School and Associate Degree	6	2.7
License	55	24.7
Postgraduate	162	72.6

Table 1 Continued.

Variables	n	%
Cadre Type		
Administrative	64	28.7
Academic	159	71.3
Cigarette Use		
Yes	73	32.7
No	150	67.3
Alcohol Use		
Yes	47	21.1
No	176	78.9

It was found that 30.5% (n=68) of the participants had a first-degree relative with cancer and 62.3% (n=139) considered themselves at medium risk of developing cancer. When hearing about and participating in cancer screening programs, 79.8% (n=178) of the participants heard about cancer screening programs, but only 15.2% (n=34) participated in screening programs. Of the participants, 86.1% (n=192) stated that breast cancer, 56.6% (n=124) colon cancer and 47.5% (n=106) cervical cancer were screened. Among university employees, 73.1% (n=163) stated that mammography, 67.2% (n=150) breast self-examination, 56% (n=125) colonoscopy and 49.3% (n=110) pap smear test were included in cancer screening programs. Among those who participated in the screening program, 34.7% (n=16) had clinical breast examination and pap smear test, and 19.6% (n=9) had mammography (Table 2).

Table 2. Opinions of University Employees about the Cancer Screening Program (n=223)

Variables	n	%
The Thought of Getting Cancer		
High Risk	54	24.2
Medium Risk	139	62.3
Low Risk	30	13.5
Presence of Cancer in the First-Degree Proximity		
Yes	68	30.5
No	155	69.5
Hearing about Cancer Screening Programs		
Yes	178	79.8
No	45	20.2
Participation in Cancer Screening Programs		
Yes	34	15.2
No	189	84.8
Knowledge of cancer screening programs*		
Breast cancer	192	86.1
Colorectal cancer	124	55.6
Cervical cancer	106	47.5
Knowledge of cancer screening tests*		
Breast self-examination	150	67.2
Clinical breast examination	145	65
Mammography	163	73.1
Pap smear	110	49.3
HPV-DNA	62	27.8
Colonoscopy	125	56
Occult blood in feces	81	36.3

Table 2. Continued

Variables	n	%
Participation in cancer screening programs (n=34)*		
Clinical Breast Examination	16	34.7
Mammography	9	19.6
Pap smear	16	34.7
HPV-DNA test	1	2.2
Fecal occult blood	2	4.4
Colonoscopy	2	4.4

* More than one answer was given.

When the sociodemographic characteristics of university employees and their participation rates in cancer screening programs were examined, there was no statistically significant difference between the participants' age, marital status, educational status, cadre type, smoking and alcohol use status and compliance with cancer screening programs ($p>0.05$). Among female university employees, 29.5% (n=26) participated in cancer screening programs. Participation rates of female employees in cancer screening programs were significantly higher than male employees ($p<0.05$). When the presence of cancer in the first-degree relatives of the participants and their participation rates in cancer screening programs were examined, it was determined that 23.5% (n=16) of the employees with a family history of cancer participated in screening programs. When the participants' participation in screening programs was compared with the presence of cancer in their first-degree relatives, it was found that those with a family history of cancer were significantly more likely to participate in screening programs ($p<0.05$).

Table 3. Participation in Screening Programs of University Employees According to Their Sociodemographic Characteristics, Presence of Cancer in the First Degree Relative and Thought of Getting Cancer (n=223)

Variables	Participation in the Screening Program			
	Yes (%)	No (%)	χ^2	p
Age				
20-29 years	2 (5.6%)	34 (94.4%)		
30-39 years	11 (12.6%)	76 (87.4%)	5.613	0.091
40-49 years	16 (23.2%)	53 (76.8%)		
50 years and older	5 (16.1%)	26 (83.9%)		
Gender				
Female	26 (29.5%)	62 (70.5%)	23.000	**0.001**
Male	8 (5.9%)	127 (94.1%)		
Marital Status				
Married	26 (17.2%)	125 (82.8%)	1.407	0.236
Single	8 (11.1%)	64 (88.9%)		
Education				
High School and Associate Degree	1 (16.7%)	5 (83.3%)		
License	25 (15.4%)	137 (84.6%)	0.035	0.983
Postgraduate	8 (14.5%)	47 (85.5%)		
Cadre Type				
Administrative	10 (15.6%)	54 (84.4%)	0.010	0.921
Academic	24 (15.1%)	135 (84.9%)		
Cigarette Use				
Yes	12 (16.4%)	61 (83.6%)	0.119	0.730
No	22 (14.7%)	128 (85.3%)		

Table 3. Continued

Variables	Participation in the Screening Program			
	Yes (%)	No (%)	χ^2	p
Alcohol Use				
Yes	7 (14.9%)	40 (85.1%)	0.006	0.940
No	27 (15.3%)	149 (84.7%)		
Presence of Cancer in the First-Degree Proximity				
Yes	16 (23.5%)	52 (76.5%)	5.194	**0.021**
No	18 (11.6%)	137 (88.4%)		
The Thought of Getting Cancer				
Low Risk	2 (6.7%)	28 (93.3%)		
Medium Risk	19 (13.7%)	120 (86.3%)	7.513	0.073
High Risk	13 (24.1%)	41 (75.9%)		

χ^2: Pearson chi-square test

When the perceived cancer risk of university employees and their participation in cancer screening programs were examined, it was found that 24.1% (n=13) of university employees with a high risk of developing cancer participated in cancer screening programs. When the rates of perceived risk and participation in cancer screening programs were compared, no significant difference was found between the rates of perceived risk and participation in screening ($p>0.05$). However, it was determined that the rates of participation in cancer screening programs increased as the perceived risk increased (Table 3).

4. Discussion

Cancer is an important health problem in our country and in the world with its disease burden, incidence, mortality and morbidity rates. Although the mortality rate is high, cancer incidence rates decrease with the measures to be taken. In addition, participation in cancer screening programs increases survival rates by allowing cancer to be detected at an early stage. Therefore, it is important for the community to know and participate in cancer screening programs [3]. In this study, it was found that 79.8% of university employees heard about cancer screening programs, but only 15.2% participated in cancer screening programs. Although the rate of university employees hearing about cancer screening programs is high, their participation rates are very low. Participation rates can be increased through cancer screening program trainings for university employees. In studies conducted in underdeveloped and developing countries in the literature, the rates of knowing about cancer screening programs vary between 47% and 56%, while the rates of participation in cancer screening programs vary between 5% and 26% [15-17]. In studies conducted in our country, while the rates of hearing about cancer screening programs vary between 86% and 72%; participation rates in screening programs vary between 39% and 13% [9,10,18]. Although the study results are similar to the literature, the low rate of participation in cancer screening programs is thought-provoking. However, the low rate of participation in screening programs can be explained by the fact that the cancer risks perceived by the participants and their average age are lower than the lower age limit for participation in cancer screening programs.

The majority of the university employees who participated in the study think that breast cancer is included in the national cancer screening program. However, about half of the participants stated that colon and cervical cancer are included in the screening programs. In Göl and Erkin's study, 55.6% stated that breast cancer, 39.9% cervical cancer and 25.5% colon cancer were included in national cancer screening programs [3]. In the study by Babaoğlu et al., 86.6% stated that breast cancer, 74.4% cervical cancer and 62.2% colon cancer were screened. However, although it is included in the screening

program for both genders, the number of people who know that colon cancer is included in the screening program is low. One of the most important factors affecting the rate of participation in the colorectal cancer screening program is positive family history. The low rate of participants having a family history of cancer may have reduced the awareness that colorectal cancers are included in the screening program.

While the rates of university employees knowing breast cancer screening tests are high, the rates of cervical and colorectal cancer screening tests are low. In a study conducted among nurses, 49.5% of nurses stated that mammography, 44.6% pap smear test, 16% fecal occult blood test and 11% colonoscopy were among cancer screening tests [18]. In another study, 57.5% mammography, 50.3% pap smear, 54.3% fecal occult blood test and 68.4% colonoscopy were among cancer screening tests. [19]. In studies conducted in underdeveloped and developing countries, 35.5% have heard of breast cancer screening tests [20], 45% colonoscopy, 24.2% fecal occult blood test [15], and 72% pap smear test [21]. The low awareness of colorectal cancer screening tests may be due to the late inclusion of colorectal cancers in national cancer screening programs. In addition, the fact that breast cancer is more common than colorectal cancer [5] is thought to increase the rate of participation in screening.

One of the important factors affecting participation in cancer screening tests is the ease of implementation of screening tests [2]. In the study, 54.3% of the participants participated in breast cancer screening tests, 36.9% in cervical cancer screening tests and only 8.8% in colon cancer screening tests. In a study conducted with patients over 35 years of age who applied to family medicine, 37.5% of the patients participated in breast cancer screening, 26.8% in cervical cancer screening and 25% in colon cancer screening [10]. Similar results were obtained in other studies conducted in our country [22-26]. In studies conducted in Saudi Arabia [27-29], the participation rates of participants in cervical cancer screening tests were found to be 26% [27,28] and 15.24% in colon cancer screening tests [29]. In the literature, participation rates in breast cancer screening tests vary between 30% and 42% [30,31]. Screening participation rates are high in developed countries [32-34]. In a study conducted in the UK, participation rates in breast, cervical and colorectal cancer screening tests were 88%, 74% and 67%, respectively [35]. Another reason for the low rates of participation in screening programs in this study may be that the study was conducted during the pandemic period. During the pandemic period, individuals' applications to health institutions and organizations to protect themselves from COVID-19 infection decreased; these reasons are thought to have reduced participation rates in cancer screening programs.

In our country, women can participate in all cancers included in cancer screening programs, while men can only participate in colorectal cancer screening programs [2]. For this reason, it is expected that the participation rates of women in cancer screening programs are high in studies conducted in our country [36-38]. Similar results were obtained in this study and the participation rates of women in cancer screening programs were significantly higher than men. Although similar results were obtained in cancer screening studies conducted in different countries [39-41], there are studies in which gender does not make a difference [15-29]. The most important reason for this is the differences seen in the cancer screening programs of countries.

Family history serves as a significant risk factor in cancer development, contributing to an estimated 5-10% of cancer cases. Family history is thought to be responsible for approximately 5-10% of cancer cases. Therefore, it is important for individuals with a family history of cancer to participate in cancer screening programs [42]. In this study, approximately a quarter of university employees with a positive family history participated in cancer screening programs and the rate of participation in screening programs was significantly higher compared to individuals without a family history of cancer. In a study conducted in nurses, 9.1% of nurses with a family history of cancer participated in cancer screening programs [18]. In the study conducted by Tekpınar et al., as the rates of cancer presence in the family increased, the rates of participation in cancer screening programs also increased [37]. In a

study examining participation in population-based cancer screening programs in China, 20.9% of individuals with a family history of cancer participated in screening programs [41]. In a study conducted in female university students, 11.1% of students with a family history of cancer were found to perform regular breast self-examination [43]. When the studies conducted were examined, it was observed that the participation rates of individuals with cancer in their first-degree relatives in cancer screening programs were low, and the non-participation of these individuals, especially in the risk group, in screening programs may lead to an increase in cancer incidence rates in the following years. Risky individuals with a positive family history should be identified by health care professionals and their participation in cancer screening programs should be ensured.

4.1. Limitations

The cross-sectional nature of the study and the fact that it was conducted at a university are among the limitations of the study. The fact that data was collected from the university employees through a voluntary online survey may have caused the staff who were interested in this issue to fill out the survey, so the sample may not represent all university employees. Moreover, the average age of the participants in the study was below 40 years and 60% of the sample was male. Therefore, the rate of adaptation to cancer screening programs is low.

5. Conclusion and Recommendations

Although the rate of knowledge of cancer screening programs among the university employees participating in the study was high, the rate of participation in screening was low. However, female and individuals with a family history of cancer were found to have high rates of participation in screening programs. Although the education levels of the participants were high, it was found that the individuals' knowledge of cancers and cancer screening tests in the National Cancer Screening Program was low.

In line with the results of the research; in order to implement screening programs effectively, the knowledge and awareness of individuals should be increased through health education by health care professionals in institutions and organizations where screening programs are carried out. In addition, to increase the awareness and participation of cancer screening programs, it is important to provide the necessary information through platforms such as national television resources and internet pages that the society can access.

Declaration of congress abstract:

This study was presented as an abstract at the 5th International Health Sciences Congress of the Association of Thrace Universities.

Ethical statement

Ethics committee permission was obtained from Bandırma Onyedi Eylül University Ethics Committee **(Ethics Committee No:2021-37; Date: 23.5.2021)** and institutional permission was obtained from the higher education institution where the study was conducted.

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Conflict of Interest

There are no conflicts of interest.

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Author's Contributions

Idea/Concept: GYD.; Design: GYD, BDG.; Supervision/Consulting: GYD, BDG.; Analysis and/or Interpretation: GYD.; Literature Search: GYD, BDG.; Writing the Article: GYD, BDG.; Critical Review: GYD, BDG.
All authors read and approved the final manuscript.

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Research Article

INVESTIGATION OF THE PREVALENCE OF FOREIGN BODY EXPOSURE TO THE EYES AND THE USE OF PROTECTIVE EQUIPMENT IN THE EMPLOYEES OF THE ÇALI INDUSTRIAL ZONE

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Abstract: *This study aims to determine the prevalence of foreign bodies in the eyes of people working in the Bursa Çalı Industrial Zone. A survey was conducted to evaluate ocular foreign body exposures in workers working in Çalı Industrial Zone. The demographic characteristics of the participants, presence of foreign body exposure to the eye, use of protective goggles, and medical leave of absence were questioned. A total of 400 participants, 351 male (87.8%) and 49 females (12.2%), were included in the study. The mean age of the participants was 36.92±10.27 years, and the average working time in the sector was 8.87±8.06 years. Of the 400 participants included in the study, 153 (38.3%) had a history of ocular foreign body exposure. While the most frequently exposed foreign body was metal burrs (83.7%), the most exposed workers were welders (85.5%). Those who reported that they constantly used protective goggles at work were 42.1%, and those who used them occasionally were 48.7%. Ocular foreign body exposure rates detected in that industrial zone were relatively high. Although the use of protective goggles is high, ocular injuries still suggest that personal protective equipment and its use should be more effective. Any eye trauma that is prevented will reduce suffering, hospital admission, loss of workforce/labor, and the burden on the health system and the economy.*

Keywords: *ocular injury, corneal foreign body prevalence, occupational accident, protective goggles*

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1. Introduction

Ocular trauma is a preventable public health problem worldwide [1]. Corneal foreign bodies are one of the leading causes of ocular trauma. Corneal foreign bodies cause symptoms such as eye pain, burning, stinging, and tearing. Depending on the penetration depth and localization of the foreign body, it may cause a decrease in visual acuity by creating a scar in the cornea. It can also cause severe problems such as keratitis and endophthalmitis [2]. The lifetime prevalence of ocular traumas is estimated to be 14.4% to 19.8% in the United States [3]. Epidemiological data on ocular traumas in our country were primarily obtained from patients admitted to emergency services. It has been observed that corneal foreign bodies are the most common cause of ocular trauma. It has been shown that foreign body traumas

in the eye occur most frequently in young adult males as work-related injuries and most frequently with metal burrs [4-7].

In our country, there has not been any prevalence study conducted in the work field with a risk of foreign body exposure in the eye. The foreign body in the eye is a significant health problem that can affect the visual functions of the person, affecting the country's economy due to the burden it creates on the health system and the loss of workforce.

With a population of over 4 million, Bursa is 4'th largest city. According to industry statistics, it is Türkiye's largest automotive production center. There are approximately 230 companies with 6000-7000 employees in Bursa Çalı Industrial Zone. Production is carried out in different business branches, emphasizing the automotive sector [8].

This study aims to determine the prevalence of foreign bodies in the eyes of people working in the Bursa Çalı Industrial Zone and to evaluate the employee's awareness about occupational safety, time, and workforce loss due to corneal foreign body injuries.

2. Materials and Methods

Employees of companies operating in different branches of industry in the Bursa Çalı Industrial Zone were included in this prevalence study. The number of employees included in the survey was determined from approximately 10,000 employees in the Çalı Industrial Zone. When calculating the sample size, 400 was found as an adequate number of sample to conduct the study with an error level 5% for 80% power and 0.05 significance . Employees were allowed to participate voluntarily after explaining the study's purpose and method. An ophthalmology resident administered the questionnaires through a face-to-face interview between March 2022 and May 2022. The survey consisting of 29 questions in total, was answered by 400 employees anonymously. After the questions, including demographic characteristics (age, gender, education level) and working background (sector, job, and year in the industry) of the participants, the history of foreign body exposure in the eye was questioned. Participants who answered yes were asked to continue with the survey. The nature of the foreign body, the number of times it was exposed, the type and timing of treatment, the use of personal protective equipment, and the training background were questioned.

2.1. Statistical Analysis

Statistical analyzes were performed using IBM SPSS ver.28.0 program (IBM Corp. Published 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp.). The statistical significance level was accepted as $\alpha=0.05$. Participants' demographic data were examined using the Shapiro-Wilk test, which showed normal distribution. Results are presented as percentages and mean ± standard deviation values are given. Categorical variables were compared between groups using Pearson chi-square, Fisher exact and Fisher-Freeman-Halton tests. Bonferroni test, one of the multiple comparison tests, was used.

3. Results

A total of 400 voluntary, 351 male (87.8%) and 49 females (12.2%), were included in the study. The mean age of the participants was 36.92±10.27 years, and the average working time in the sector was 8.87±8.06 years. Of the 400 people in the study, 153 (38.3%) had a foreign ocular body exposure history. When the educational status was evaluated, the incidence of foreign bodies in the eye was statistically significantly higher in those who did not have formal education ($p<0.05$). As the level of education increases, the frequency of foreign bodies in the eye decreases.

According to the sector they work, the prevalence of foreign bodies in the eye was 80% in the construction workers and 36.1% in the manufacturing sector ($p<0.05$). The demographic data of the participants included in the study are shown in Table 1.

Table 1. Prevalence of Foreign Body Injuries in the Eye in the Workplace and sociodemographic factors

	History of Foreign Body Injury in the Eye						Statistics p
	Yes		No		Total		
	n	%	n	%	n	%	
Gender							
Male	140	39.9	211	60.1	351	100.0	$\chi^2=3.25$; $p>0.05$
Female	13	26.5	36	73.5	49	100.0	
Last school graduated							
Not graduated	18	100.0	0	0	8	100.0	
Primary school	36	50.0	36	50.0	72	100.0	
Middle school	31	47.7	34	52.3	65	100.0	$\chi^2=31.19$; $p>0.05$
High school	65	34.6	123	65.4	188	100.0	
University	11	18.0	50	82.0	61	100.0	
Working sector							
Construction sector	16	80.0	4	20.0	20	100.0	$\chi^2=15.54$; $p<0.05$
Manufacturing sector	137	36.1	243	63.9	380	100.0	
Job							
Welder	47	85.5	8	14.5	55	100.0	
Smelter/carpenter/iron joiner	4	66.7	2	33.3	6	100.0	
Grinding operation	14	58.3	10	41.7	24	100.0	
Other	53	38.1	86	61.9	139	100.0	$\chi^2=83.45$; $p<0.05$
Machining machine operator (lathe/mill/drill operator)	20	21.7	72	78.3	92	100.0	
Machine Operator (press, laser machine, plasma machine, sheet metal cutting machine, etc.)	15	17.9	69	82.1	84	100.0	

Considering the work, foreign body exposure to the eye was most common in welders (85.5%), casters/carpenters/iron joiners (66.7%), and grinding operators 58.3%, respectively. The most frequently exposed foreign body feature was metal burrs, with a rate of 83.7%.

At the time of the incident, 56.6% of those who had foreign object exposure to their eyes were wearing protective glasses. In 58.8% of the cases, the doctor intervened in the foreign body, and in %19.6 of them, the foreign body was removed by themselves. When questioned about how they removed the foreign body themselves, they stated that 11.8% were blown and rubbed, and 23.7% were removed with paper or napkins. The frequency of employees who received a medical leave of absence was 18.3%, and 64.3% received a one-day rest report. 0.7% of those exposed to foreign bodies were hospitalized. The frequency of those whose eye complaints continued after the event was 17.0%. The most common complaints were burning at 85.2% and blurring of vision at 11.1%. The frequency of those with visual loss is 3.7%. When questioned about protective goggles usage, 48.7% said they sometimes use them, while 42.1% said they use them constantly. The frequency of those who have never

used it is 9.2%. When questioned about the reason for not using it, 29.6% blamed fogging, 23.9% said it causes blurring in vision, and 21.1% mentioned that it slows down their work. The frequency of those who received training on personal protective equipment was 85%, and those who received first aid training was 74.5%. The frequency of those who answered "Yes" to whether they had any work accident other than this incident was 23.5%. The characteristics of those exposed to ocular foreign bodies are summarized in Table 2.

Table 2. Distribution of workers who have a foreign object in their eyes, according to their characteristics regarding the foreign body and how the incident occurred.

	n	***%***
What was the nature of the foreign body? (n=153)		
Metal burr	128	83.7
Dust	14	9.2
Wood	7	4.6
Other	3	2.0
Plastic	one	0.7
Were you wearing protective goggles when exposed to foreign body? (n=152)		
Yes	86	56.6
No	66	43.4
Who removed the foreign body? (n=153)		
Ophthalmologist	90	58.8
Myself	30	19.6
My colleague	19	12.4
Health officer/nurse	11th	7.2
Occupational physician	2	1.3
Physicians in other branches	one	0.7
How was the foreign body removed? (n=152)		
By blowing, rubbing	18	11.8
Paper or napkin	36	23.7
Needle tip		
Have you had a medical absence report? (n=153)		
Yes	28	18.3
No	125	81.7
Do you still have eye complaints? (n=153)		
Yes	26	17.0
No	127	83.0
If yes, please state your complaint (n=27)		
Burning-sting	23	85.2
Blurred vision	3	11.1
Vision loss	one	3.7

Table 2. Continued

	n	***%***
Do you constantly wear protective goggles during the process at work? (n=152)		
I do not use	14	9.2
I sometimes use	74	48.7
I always use	64	42.1
Why don't you use it? (n=71)		
It causes me to see blurry	17	23.9
It's misting	21	29.6
My work is slowing down	15	21.1
Other	18	25.4

4. Discussion

The annual incidence of patients admitted to hospital and emergency services diagnosed with ocular injury is 13-423/100.000 [9,10]. In the Helsinki Ocular Trauma Study, where hospital admissions were examined, the incidence of ocular trauma was found to be 88/100,000. They said that ocular traumas occur most frequently with superficial foreign bodies, in men between the ages of 17-45 and for work-related reasons [11]. In the survey by Glynn et al, the annual incidence was 980/100,000 in the whole population [12].They showed that more than half of the injuries were occupational accidents, and men were 5.5 times more exposed than women. Gordon conducted a phone interview survey of eye injuries in a population of all Canadians over the age of 18 years. They determined that the incidence of all eye injuries was 2090/100,000 per year. 35.5% of these injuries were work-related [13].

Ocular trauma data obtained based on hospital data give lower rates than general population studies. The fact that the annual incidences obtained by survey studies are higher than the studies conducted with hospital admissions indicates that there are ocular traumas that do not apply to the hospital. It supports that the most common eye trauma observed in all studies is an occupational accident, and men are more exposed to it. When we look at the lifetime ocular injury prevalence studies, it was found to be 14.4% in the Baltimore Eye Survey [14], 21.1% in Australia [15], and 19.8% in Beaver Dam [3]. In prevalence studies, it was determined that the most common injuries were in the workplace.

In the literature, the most common reason for hospital admissions due to ocular injuries is occupational accidents, and the leading cause of eye injuries is superficial foreign bodies. For this reason, in this study, in which we included the high-risk group, unlike the general population studies, we found a history of foreign body exposure to the eye in a part of their working life in 38.3% of the workers working in Çalı Industrial Zone. This rate was considerably higher than the data found in the literature. Our entire study population consists of workers in the industrial zone, and 87.8% of the participants are male. In a Canadian public health study, men aged 20 years and older had a 1.35 times greater risk than women, and Glynn et al reported that men are 5.5 times more likely to be exposed to ocular trauma than women [11, 12]. Foreign body exposure was observed in 40% of men and 25% of women included in this study. The fact that men work in risky jobs such as welding, joinery, and casting causes these results.

In the current study, 58.8% of those exposed to the foreign body were examined by a doctor, while others said that the foreign body was removed by themselves or their friends. Corneal perforation and foreign body penetration into the eye are risks when removing foreign bodies. In addition, careless handling when removing foreign bodies from the central cornea may result in decreased vision due to scarring. Even if a metallic foreign body is removed from the cornea, the rust ring remaining in the deep

stroma may result in scarring and corneal irregularity. Especially the rust ring located in the corneal center can cause visual complaints. Foreign bodies not removed within 24 hours cause reactive inflammation such as iritis. Foreign bodies in the deep corneal stroma may cause corneal endothelial cell damage and corneal thickening [14, 15]. For this reason, a specialist should remove corneal foreign bodies and prescribe proper medications.

Studies have stated that corneal injuries are more common in the construction and metal industries. A study examined hospital admissions from Türkiye and noted that 87% of the patients presenting with a corneal foreign body were metal cutting and welding workers [16]. Another study from Germany reported this rate as 73% [17]. Welders (85.5%), smelters/carpenters/iron joiners (66.7%), and grinding operators (58.3%) were the most exposed occupations in our study. 56.6% of workers with a foreign body in the eye said they used protective goggles during the injury. Especially 74.5% of the welders were using protective goggles during injury. In the study of Ozkurt et al, 43% of those exposed to foreign bodies wore protective goggles, and in the study of Kızıltaş et al, the rate was 49.1% [16, 18]. In the Australian prevalence study, 18% of those exposed to ocular injury at work were wearing protective goggles [19]. In the study reported from Germany, 6.9% of the employees exposed to trauma wore protective goggles [17]. We think that the different results observed in the literature and our study are due to the inadequate use of protective goggles, insufficient protection, and insufficient training. In the Çalı Industrial Zone where we conducted the research, training should be given to the welding, carpenter, iron, and joinery workers in the high-risk group, especially in the construction sector, and personal protective equipment should be reviewed and made more sheltered.

5. Conclusion

All new strategies to prevent ocular injury will significantly reduce the rates of ocular trauma we have identified. It is necessary to increase the frequency and effectiveness of employee training, to increase the use of protective equipment, and to make it more effective. Ocular injuries, especially the penetration of foreign bodies into the densely innervated corneal tissue, cause severe pain in people. With each preventable eye injury, the person will be prevented from suffering, and the decrease in hospital admissions and the prevention of loss of workforce will reduce the burden on the health system and the economy.

Ethical statement

The study was approved by the ethics committee of Health Sciences University, Bursa Yüksek İhtisas Training and Research Hospital. (Protocol number and date:2011-KAEK; 25 2022/02-02). The principles of the Declaration of Helsinki were adhered to throughout the study.

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Conflict of Interest

The authors report no conflict of interest.

Author’s contributions

H.G.U: Conceptualization, Methodology, Formal analysis, Writing - Original draft preparation.
L.Ö: Conceptualization, Methodology, Control/supervision, Review.
N. A.H: Methodology, Resources, Literature review.
D.D: Conceptualization, Methodology, Literature review.
Y:D: Data collection and processing, Methodology.

All authors read and approved the final manuscript.

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THE HIDDEN IMPACTS OF OCCUPATIONAL STRESS ON PATIENT SAFETY CULTURE

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Abstract: *Previous studies have shown that over 45% of healthcare workers exhibit symptoms of stress, but the impacts of occupational stress on PSC are not well understood. This study was to determine the relationship between occupational stress and PSC at Pham Ngoc Thach Hospital in 2022. A cross-sectional study was conducted on 390 hospital employees at Pham Ngoc Thach Hospital in November 2022. Data was collected using the Vietnamese version of the HSOPSC 2.0 tool (Cronbach's alpha 0.68-0.93) and the DASS-21-S. The results showed that 15% of hospital employees had mild to severe stress. The average PSC score was 3.13 with a standard deviation of 0.36 (5-point Likert scale). Higher occupational stress was associated with lower overall PSC. Specifically, occupational stress negatively impacted three domains of patient safety: teamwork, error communication, and hospital management support for patient safety. This study demonstrates that reducing healthcare worker stress could be an intervention to improve PSC. Hospitals should consider implementing workplace stress relief initiatives as an important factor in promoting PSC in healthcare, which can directly impact patient health and satisfaction.*

Keywords*: Occupational stress; Patient safety culture; Healthcare workers.*

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1. Introduction

According to the World Health Organization (WHO), the detrimental effects of unsafe patient care present a major global public health challenge, one that is escalating. It is recognized as one of the leading causes of death and disability worldwide [1]. In recent years, the concept of "patient safety" and related solutions have garnered increasing attention within healthcare facilities, particularly in Vietnam. Patient safety refers to the prevention of errors and adverse events during the provision of health care services. This includes measures to prevent medication errors (including overuse or insufficient use as per physician's prescription), infection control in hospitals, prevention of other errors in diagnosis or treatment, and improving communication between healthcare staff and between patients and staff [2].

Although there are various definitions of "patient safety culture" (PSC), broadly, PSC relates to attitudes, beliefs, perceptions, and values about the importance of patient safety and the commitment of healthcare organizations to improve it [1], [3]. PSC encompasses safe practices, processes, policies, and

behaviors of healthcare staff, as well as management's commitment to patient safety. PSC helps reduce medical errors, lower the rate of adverse events, and improve patient outcomes (reduce disease rates, medical incidents, healthcare costs, and improve patient satisfaction), enhancing the satisfaction of healthcare staff [3]–[5].

Some recent studies indicate that over 45% of healthcare staff experience stress, 25.8% exhibit symptoms of anxiety disorder, and 24.3% show symptoms of depression [6]–[8]. Some studies suggest that occupational stress among healthcare staff reduces PSC in healthcare facilities [6], [9]. Despite this, to the best of our understanding, there are limited studies in Vietnam exploring the relationship between occupational stress and PSC in hospitals. Pham Ngoc Thach Hospital is the largest respiratory hospital in Southern Vietnam. The hospital has over 900 healthcare staff serving more than 900 inpatient beds (with bed occupancy rate consistently over 90%) and nearly 1800 outpatient visits per day. Pham Ngoc Thach Hospital has conducted research related to PSC, but the relationship between stress and PSC has not been investigated. Investigating the relationship between occupational stress and PSC could assist managers in developing interventions aimed at reducing stress and improving PSC simultaneously, thereby delivering positive results for both healthcare staff and patients.

The objectives of this study are to determine the rate of occupational stress among healthcare staff at Pham Ngoc Thach Hospital in 2022; Determine the average score of patient safety culture at Pham Ngoc Thach Hospital in 2022; Identify the relationship between occupational stress and patient safety culture at Pham Ngoc Thach Hospital in 2022.

2. Materials and Methods

2.1. Setting

The study was conducted at Pham Ngoc Thach Hospital - the largest respiratory hospital in Southern Vietnam from September 2022 to March 2023

2.2. Study design

Cross-sectional study.

2.3. Participants, inclusion and exclusion criteria

The participants are hospital employees at Pham Ngoc Thach Hospital in Ho Chi Minh City in November 2022. The inclusion criteria for the study subjects were hospital employees who were working in the clinical departments, paraclinical departments, and outpatient departments of Pham Ngoc Thach Hospital at the time of the survey; The participant's seniority working at the hospital is 6 months or more. The exclusion criteria included those who were currently on maternity leave, long-term sick leave, long-term study or work trip, and those who did not agree to participate in the study.

2.4. Sampling size and sampling method:

The sample size was calculated using a formula to estimate a proportion, referenced from the study of Asefzadeh et al., which was 51.52% [6]. With a type I error probability (alpha) of 0.05 and an estimation error (d) of 0.05, the minimum required sample size was calculated to be 384 subjects. In reality, the study surveyed 390 subjects, selected randomly and systematically, who met all sampling criteria.

$$n \geqslant \frac{Z^2_{1-\alpha/2}(1-p)p}{d^2} \quad (1)$$

Data source and data tools: Data collection was conducted using an online questionnaire, self-filled with three parts: demographic characteristics of the study subjects involving 7 questions; a stress survey (DASS21-S) with 7 questions; and a survey on patient safety culture (Hospital survey on patient safety culture - HSOPSC) version 2.0 with 32 questions. The questionnaire consisted of 46 questions in total. The DASS-21 scale consists of 21 questions, including three component scales: Depression (DASS21-D), Anxiety (DASS21-A), and Stress (DASS21-S). It is a popular scale in stress, anxiety, and depression research with high reliability, Cronbach Alpha ranging from 0.761 to 0.906 [10], [11]. This study employed the Vietnamese version of the DASS21-S scale, with 7 questions to measure the stress level of healthcare workers. Each question included four short answer options, intended to reflect the severity level, and was scored from 0 (does not apply to me at all) to 3 (very much applies to me or most of the time). The Hospital Survey on PSC version 2.0 (HSOPSC 2.0) was published by the Agency for Healthcare Research and Quality (AHRQ) in the United States in 2019 [12]. The HSOPSC 2.0 toolkit consists of 10 safety areas, with 32 questions measured on a 5-point Likert scale: 1 is Strongly Disagree, 2 is Disagree, 3 is Neutral, 4 is Agree, and 5 is Strongly Agree. The Cronbach's Alpha value of the HSOPSC 2.0 scale was reported to range from 0.68 to 0.93 [13]. The ten patient safety areas in HSOPSC 2.0 include: 1. Teamwork (3 questions); 2. Staffing and workplace (4 questions); 3. Learning organization and continuous improvement (3 questions); 4. Response to errors (4 questions); 5. Supervision, management, or clinical leadership supports patient safety (3 questions); 6. Communication about errors (3 questions); 7. Open communication (4 questions); 8. Reporting patient safety events (2 questions); 9. Hospital management supports patient safety (3 questions); 10. Handoffs and information transitions (3 questions). The HSOPSC 2.0 toolkit was translated from the original English version to Vietnamese and then back-translated into English for comparison. Subsequently, a team of three medical experts reviewed it for linguistic and cultural appropriateness for Vietnam. The toolkit was revised until all three experts agreed before the survey was conducted. The Cronbach’s Alpha value in this study is 0.78.

Data Collection

The study employed an online, structured questionnaire in Vietnamese. The research team compiled a list of all employees in the clinical, paraclinical, and outpatient departments who met the study criteria, obtained from the hospital's human resources department. The initial list consisted of 810 healthcare workers, arranged in order according to their departments and names. This list was then randomly and systematically selected by the research team to obtain a sample list of 390 study subjects. The sample size for each department was proportional to the number of personnel in the department, meaning departments with more staff had more representatives in the study than those with fewer staff. Afterward, the research team sent the participation instructions, online survey link, and a list of study subjects divided by department to each department's email inbox. Department representatives forwarded the survey link to the selected healthcare workers' phone numbers.

Data analyses and interpretations

Google Forms was used to create the online survey tool, and data were analyzed using R software, version 4.3. The characteristics of the healthcare workers were reported with frequency and ratio for variables such as gender, job title, position, regular patient contact, and stress level. Quantitative variables (age, working hours, hospital working hours) were reported with mean, median, and interquartile range. The results of the survey were multiplied by two and added together. The DASS21-S scale scores ranged from 0 points to 42 points. The severity of the stress condition was analyzed according to the recommendations of Lovibond and colleagues: normal (0-14 points); mild (15-18 points); moderate (19-25 points); high (26-33 points) and severe (34 points or more).[14] Using a 5-point Likert scale for each question, the overall PSC score represents the average score of the ten PSC areas.

The score for each PSC area is calculated by averaging the scores of the questions within each area. The highest and lowest possible scores for the overall PSC, as well as for each area, are 5 and 1 points, respectively. To examine the relationship between PSC and occupational stress, the study employed an ordinal logistic regression model to test the relationship between the level of occupational stress (dependent variable) and the average overall and specific area PSC scores. A difference was considered statistically significant if the p-value was less than 0.05.

This study was approved by the Ethics Committee for Biomedical Research of Pham Ngoc Thach Hospital on March 30, 2023 (Decision No. 534/PNT-EC), and permission was granted for its implementation. The Ethics Committee for Biomedical Research of Pham Ngoc Thach Hospital is an organization affiliated with Pham Ngoc Thach Hospital, Vietnam. Our research also adheres to international ethical guidelines for biomedical research. Study participants have complete discretion to participate or leave the study at any time. Participants' rights were clearly informed before participating in the study.

3. Results and Discussion

Table 1 shows that the majority of the research subjects were female (68.2%) and nurses (56.1%). The most common age group in the study was from 30 to 40 years old, accounting for 44.9% of the research subjects. The average working time of the research subjects at Pham Ngoc Thach Hospital was 10.54 years, with a median of 9 years. The shortest tenure was less than 1 year, and the longest was 37 years. Regarding stress levels, there were 58 research subjects (15%) with stress levels ranging from mild to severe, of which there were 5 cases of severe stress, accounting for 1.3%.

Table 1. Characteristics of participants (n=390)

Characteristics		Freq	(%)
Gender			
	Male	124	31.8
	Female	266	68.2
Age *			38.03; 32; 28-39
Age group			
	Under 30 years old	122	31.3
	30 to 40 years old	175	44.9
	40 to 50 years old	49	12.6
	Over 50 years old	44	11.2
Job			
	Medical doctor	78	20.0
	Nurse	219	56.1
	Pharmacist	9	2.4
	Medical Technician/Paraclinical Specialist	49	12.5
	Others Bachelor	5	1.3
	Housekeeper	30	7.7

Table 2. Contined

Characteristics	Freq	(%)
Possition		
Head/ Deputy head	17	4.4
Chief nurse/chief technician	23	5.9
Payroll staff	222	56.9
Contract staff	128	32.8
Number of years working at the hospital (years) *	10.54; 9; 4-14	
Stress level		
Normal	332	85.1
Mild	24	6.2
Moderate	13	3.3
Severe	16	4.1
Extremly severe	5	1.3

* Mean; Median; interquartile range

Table 2 shows that the overall PSC score of all research subjects was 3.13, and the standard deviation was 0.36. There was a statistically significant difference between the stress level of healthcare workers and the PSC score in both univariate models (coefficient β: -0.25; 95% CI: -0.43; -0.07; p-value: 0.006) and multivariate models (coefficient β: -0.22; 95% CI: -0.41; -0.04; p-value: 0.017). Higher levels of stress were associated with a reduction in PSC. In addition, the stress of healthcare workers also negatively impacted the following three safety areas: teamwork, communication about errors, and hospital management supporting patient safety.

Table 2. The relationship between stress and PSC (n= 390)

Dimensions of PSC	Stress Level*					Mean PSC *	Univariate models		Multivariate models	
	Normal	Mild	Moderate	Severe	Extremely severe		Coefficient β (95% CI)	p-value	Coefficient β (95% CI)	p-value
1. Teamwork	3.38 (0.44)	3.29 (0.43)	3.24 (0.55)	3.11 (0.52)	2.57 (0.65)	3.35 (0.47)	-0.38 (-0.57; -0.19)	<0.001	-0.36 (-0.55; -0.17)	<0.001
2. Staffing and Work Pace	2.52 (0.53)	2.59 (0.53)	2.53 (0.45)	2.52 (0.49)	2.28 (0.65)	2.52 (0.52)	-0.05 (-0.23; -013)	0.590	-0.07 (-0.26; 0.11)	0.450
3. Organizational Learning - Continuous Improvement	3.21 (0.49)	3.14 (0.56)	3.14 (0.40)	3.04 (0.58)	2.71 (0.95)	3.19 (0.51)	-0.18 (-0.37; -0.01)	0.047	-0.16 (-0.36; 0.02)	0.082
4. Response to Error	2.48 (0.51)	2.45 (0.45)	2.61 (0.62)	2.57 (0.51)	2.17 (0.45)	2.48 (0.51)	0.04 (-0.14; 0.23)	0.628	0.05 (-0.13; 0.24)	0.582
5. Supervisor, Manager, or Clinical Leader Support for Patient Safety	3.21 (0.55)	3.15 (0.57)	3.15 (0.43)	3.14 (0.60)	3.14 (0.60)	3.20 (0.55)	-0.08 (-0.26; 0.09)	0.355	-0.10 (-0.28; 0.08)	0.269
6. Communication About Error	4.05 (0.88)	4.08 (0.73)	3.70 (0.66)	3.79 (0.79)	3.33 (1.62)	4.03 (0.88)	-0.26 (-0.44; -0.07)	0.005	-0.21 (-0.40; -0.03)	0.023
7. Communication Openness	3.24 (0.81)	3.36 (0.68)	3.00 (0.80)	3.35 (0.65)	2.42 (1.40)	3.24 (0.81)	-0.09 (-0.27; 0.08)	0.312	-0.10 (-0.28; 0.08)	0.275
8. Reporting Patient Safety Events	3.60 (1.17)	3.75 (1.01)	3.57 (1.07)	3.45 (1.13)	3.71 (1.49)	3.60 (1.16)	-0.03 (-0.20; 0.14)	0.751	0.01 (-0.17; 0.18)	0.957
9. Hospital Management Support for Patient Safety	3.25 (0.48)	3.04 (0.55)	2.96 (0.80)	2.82 (0.94)	2.23 (1.10)	3.19 (0.55)	-0.46 (-0.66; -0.26)	<0.001	-0.48 (-0.68; -0.28)	<0.001
10. Handoffs and Information Exchange	2.46 (0.62)	2.62 (0.57)	2.35 (0.78)	2.53 (0.73)	2.04 (1.14)	2.47 (0.63)	0.10 (-0.09; 0.277)	0.337	0.08 (-0.10; 0.27)	0.375
Total	3.14 (0.35)	3.15 (0.29)	3.02 (0.37)	3.03 (0.36)	2.66 (0.70)	3.13 (0.36)	-0.25 (-0.43; -0.07)	0.006	-0.22 (-0.41; -0.04)	0.017

Note: * Mean (SD)

Our cross-sectional study conducted on 390 healthcare workers directly involved in patient care at Pham Ngoc Thach Hospital, including nurses, doctors, and other specialties, revealed that 15% of the study participants experienced stress ranging from mild to severe, with 1.5% extremely severe stress.

Our research indicates a stress rate of 15% among healthcare staff at Pham Ngoc Thach Hospital. Conversely, a study by Vu Thi Cuc and colleagues using the same DASS-21 scale showed an over 80% stress rate among healthcare workers. This discrepancy can be attributed to Vu Thi Cuc et al.'s research being conducted in Ho Chi Minh City during the COVID-19 pandemic, whereas our study was conducted in November 2022, a period of relative pandemic stability in the city [14]. Despite differences in stress assessment tools (DASS-21-S and PSS-10), our study aligns reasonably with Bui Hong Cam et al.'s research conducted on 272 healthcare workers in Ho Chi Minh City's healthcare centers and local health stations in 2022, which also showed a stress rate of approximately 15% [15]. Our study also aligns with Oulyna Phannavong et al.'s research conducted on 161 healthcare workers at Xiangkhoang Provincial Hospital, Laos, in 2020, which reported a stress rate of 14.3% [16].

Our study also showed that "occupational stress" affected the overall PSC score, and four areas of patient safety: teamwork, learning organization and continuous improvement, communication about errors, and hospital management supporting patient safety. This finding is consistent with some previous studies. Two studies in Iran and one study in Turkey all suggested that occupational stress has a negative impact on PSC [6], [9], [17]. Conversely, several other studies found no correlation between stress and PSC [18]. The discrepancies could be due to differences in tools and research procedures. However, a recent systematic review supported the view of a negative relationship between occupational stress and PSC [19].

Occupational stress negatively affects "teamwork". In hospitals, patients are cared for by several healthcare workers (doctors, nurses, clinical nutritionists, clinical psychologists, etc.). Therefore, teamwork among these staff is a necessary requirement for patient care. However, when healthcare workers are stressed at work, they often reduce or eliminate some necessary communication steps with colleagues to save time for their tasks. Some studies have shown that job stress can lead to "burnout" and reduced communication [20]. Burnout can be understood as when healthcare workers become tired, lose emotion and work spirit, affecting concentration and work quality, which can impact teamwork ability. When staff no longer communicate and cooperate effectively with colleagues, it adversely impacts the efficacy of patient care processes and maintains patient safety [20]. The difference in the "teamwork" score still exists in both the univariate and multivariate models. Generally, stress reduces 0.36 to 0.38 points in the "teamwork" domain.

Occupational stress negatively impacts the facet of “continuous learning and improvement organization”. It may lead to a sense of work overload, causing employees to focus more on completing their tasks rather than self-learning or continuous improvement [21]. Consequently, as occupational stress increases, the PSC Score (PSCS) related to the domain of continuous learning and improvement organization significantly decreases. Specifically, the score decreases by 0.18 with a p-value of 0.047 in the univariate model. However, this difference is not observed in the multivariate model when adjusted for demographic characteristics of the study population. Thus, occupational stress does not alter the "continuous learning and improvement organization" factor.

Occupational stress negatively impacts "communication about errors", reducing the PSCS by 0.26 to 0.21. Occupational stress may affect healthcare workers' communication abilities in sharing error information, especially when they do not feel safe in their work environment. This impedes the timely detection and prevention of potential errors, resulting in undesirable consequences for patients [9]. A study by Zabin et al. indicated that occupational stress could affect healthcare workers' communication abilities in sharing information about errors and mistakes, particularly when they do not feel safe in their work environment [19]. This impedes the timely detection and prevention of potential errors, leading to undesired consequences for patients.

Occupational stress negatively impacts "hospital management support for patient safety hospital management support for patient safety". Many studies have shown that healthcare workers' occupational stress is associated with decreased job satisfaction, loss of focus, diminished ability to assess and resolve patient safety issues, reduced support for clinical leadership, and decreased collaboration among staff [22]. This could lead to clinical leaders failing to properly prioritize patient safety improvements, negatively impacting decision-making and actions towards improving patient safety.

Our study has some limitations as it was conducted in a specialized respiratory hospital rather than a general hospital. Therefore, some characteristics of work stress in a specialized hospital may differ from those in general hospitals, health centers, or community medical stations. Future research should consider conducting a survey in various hospitals, particularly general hospitals, diverse clinics/specialty clinics, health centers, and community medical stations. Due to research resource limitations and time constraints, we used a descriptive cross-sectional study design. We acknowledge that a cross-sectional design is not robust enough to conclude a causal relationship between occupational stress and PSCS. Therefore, we suggest future studies need to be conducted with a longitudinal or repeated measures design to clarify the causal relationship between occupational stress and PSCS.

4. Conclusion and Recommendations

Our study on 390 healthcare workers at Pham Ngoc Thach Hospital shows that 15% of healthcare workers experience mild to severe occupational stress. The average PSCS is 3.13. Occupational stress causes a decrease in PSCS. Three dimensions of PSC are affected by occupational stress: teamwork, communication about error, and hospital management support for patient safety. Hospitals should consider implementing solutions to reduce workplace stress as an important factor in promoting a PSC in healthcare. This may directly affect patient health and satisfaction.

Ethical statement

Ethics committee permission was obtained from the Ethics Committee for Biomedical Research of Pham Ngoc Thach Hospital (**Ethics Committee No: 534/PNT-EC; Date: 30.03.2023**), and institutional permission was obtained from the higher education institution where the study was conducted.

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Conflict of Interest

The authors must notify of any conflicts of interest.

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Author’s Contributions

M.N.T: Conceptualization, Methodology, Formal analysis, Writing (15%)
A.T.L.D: Conceptualization, Methodology, critical review (15%)
A.T.H.L: Literature review (10%)
L.T.L: Literature review, Investigation (10%)
N.T.T.D: Literature review, Investigation (10%)
N.T.B.N: Formal analysis Investigation (10%)
V.H.N.S: Formal analysis, supervise (10%)
T.H.V: Materials and resources (10%)

X.T.T.N: Conceptualization, Methodology, Writing. (10%)
All authors read and approved the final manuscript.

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Research Article

ELECTRODIAGNOSTIC STUDIES IN GERIATRIC PATIENTS

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Abstract: *In this study, we evaluated the neurophysiologic examinations of elderly patients admitted to our electroneuromyography (ENMG) laboratory to examine whether neuromuscular diseases vary with age as in many other diseases. ENMG examinations of 215 patients aged 65 years and older who applied to our ENMG laboratory in the last 3 years were retrospectively evaluated. Data of 79 males (36.7%) and 136 females (63.3%) with a mean age of 73.2±7.02 years were analyzed. The most common diagnoses in elderly patients were entrapment neuropathies (37.2%), followed by carpal tunnel syndrome. The other main pathologies were various peripheral nerve lesions (15.8%), polyneuropathy (14.9%) and radiculopathy (13%). Electrodiagnostic examinations were normal in 16.4% of the cases. In our patients over 65 years of age, the most common electrodiagnostic diagnosis of carpal tunnel syndrome was bilateral (74.6%). Diabetes mellitus was diagnosed in a significant proportion of patients with polyneuropathy. The rate of chemotherapy-induced polyneuropathy was also remarkable. Sciatic nerve damage was the most common peripheral nerve lesion. It is thought-provoking that these rates are still observed even though it is a well-known injection complication and despite all precautions taken. Early diagnosis of neuromuscular diseases and timely initiation of treatment are very important for prognosis. Electrodiagnostic examinations have a valuable role in the diagnosis and follow-up of these diseases. These diseases should not be ignored in the elderly population and the importance of early diagnosis and treatment should always be considered.*

Keywords: *Electroneuromyography, geriatrics, neuropathy*

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1. Introduction

Older age is a period of increased risk of many diseases and often presents additional challenges in diagnosis and treatment. As the proportion of elderly people in developed and developing societies increases due to developments in medicine, science and technology, and as the elderly age group brings with it special problems, the approach to the health problems of the elderly and the solution of these problems are gaining increasing importance in the medical world, and physicians are devoting an increasing amount of their time to their diagnosis and treatment. The spectrum of neuromuscular diseases seen in older ages also differs from the younger age group [1]. For example, the incidence of entrapment neuropathies, peripheral neuropathies and motor neuron diseases is reported to increase with age. Diseases such as diabetes mellitus (DM), cancer, etc., which have effects on the peripheral nervous system and muscles and whose frequency increases with age, are thought to contribute to this increase [2].

Electroneurophysiologic examinations have an important place in the diagnosis of various neuromuscular diseases and are frequently used for diagnosis in the elderly. Electrodiagnostic tests,

including nerve conduction studies and needle electromyography, is a method used to measure the electrical activity of the peripheral nervous system, which is considered an extension of neurological examination, and to evaluate neuropathies [3]. Electromyography (EMG) is detected in only a few patients with normal neurological examination. EMG also may reveal dysfunction of peripheral nerves or muscles [4, 5]. In this study, we aimed to evaluate the distribution of neuropathic diseases in the geriatric population by analyzing the results of nerve conduction studies and needle EMG in elderly individuals referred to our electroneuromyography (ENMG) laboratory.

2. Materials and Methods

2.1. Research Design and Participants

In this descriptive study, we retrospectively evaluated the electroneurophysiologic examinations and results of 215 patients aged 65 years and older who applied to the electroneurophysiology laboratory of our clinic between 2021 and 2024.

2.2. Data Collection

Data were collected by the researcher. Age, gender, neurologic examination findings, etiologic causes (traffic accident, work accident, gunshot or sharps injury, trauma) were recorded. All electrophysiologic examinations were performed using the Dantec Keypoint ENMG device and standard techniques. Normal values were based on age groups [6].

2.3. Statistical analysis

Data were processed using the Statistical Package for Social Sciences software (SPSS, Chicago, II) version 22.0 and the statistical significance level was set at 0.05.

2.4. Ethical considerations

Data collection was started with the permission of the Scientific Research and Ethical Committee of Inönü University (approval number 2024/6015). The study was carried out in accordance with the Helsinki Declaration.

3. Results

A total of 215 patients aged 65 years and older who applied to our electrophysiology laboratory in the last 3 years were included in the study. Electroneurophysiologic examinations performed in 79 male (36.7%) and 136 female (63.3%) patients with a mean age of 73.2±7.02 years were retrospectively analyzed.

The most common diagnosis was entrapment neuropathies in 80 cases, 67 of which had carpal tunnel syndrome (CTS). Nine cases had entrapment of the ulnar nerve at the elbow (cubital tunnel syndrome) (3 cases with CTS and 1 case with tarsal tunnel syndrome), while tarsal tunnel syndrome was diagnosed in 4 cases. Most of the cases with CTS (50 cases, 74.6%) had bilateral involvement, 10 cases had right-sided involvement and 7 had left-sided involvement, with a male/female ratio of 4.1. Of the 9 patients diagnosed with ulnar nerve neuropathy at the elbow, 5 had right, 3 had left and 1 had bilateral involvement.

34 patients had various peripheral nerve lesions (Figure 1). Peripheral nerve lesions varied according to etiology. 11 patients had sciatic nerve lesions and 8 of them developed after intramuscular injection in the hip region. The second most common brachial plexus lesion was due to traffic accident in 5 cases and cancer invasion in 4 cases. All other peripheral nerve lesions had a history of trauma (traffic accident, gunshot injury, etc.) (Figure 2).

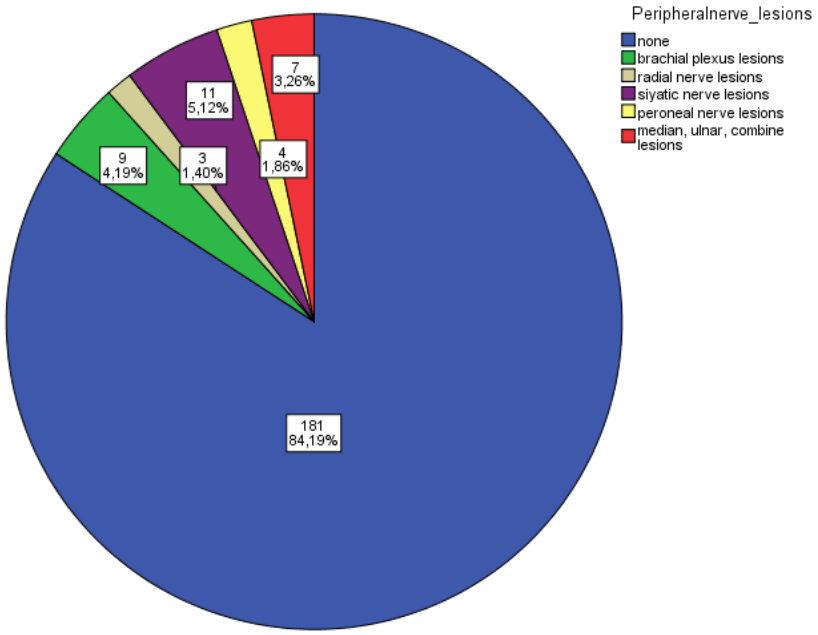

Figure 1. Peripheral nerve lesions frequency according to age

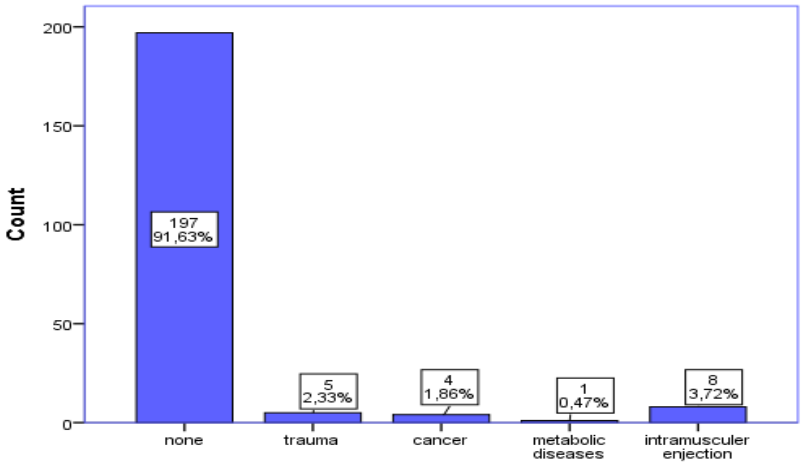

Figure 2. Etiology of peripheral nerve lesions

Polyneuropathy was diagnosed in 32 of all cases. Diabetes mellitus was present in 15 of these cases, paraneoplastic syndrome/chemotherapy-related side effects in 11 cases and severe vitamin B12 deficiency in 2 cases. Polyneuropathy was diagnosed in three patients who presented with clubfoot. Radiculopathy was found in 28 patients. Of these, 17 had lumbar radiculopathy and 2 had cervical radiculopathy (Table 1).

Table 1. Distribution of diagnoses according to ENMG results

Diagnosis	n (%)	M/F
Entrapment Neuropathies	80 (%37,2)	13/67
Carpal tunnel syndrome	67	12/55
Cubital tunnel syndrome	9	1/8
Tarsal tunnel syndrome	4	0/4
Peripheral Nerve Lesions	34 (%15,8)	27/7
Sciatic nerve lesion	11	4/7
Brachial plexus lesion	9	9/0
Radial nerve lesion	3	3/0
Peroneal nerve lesion	4	4/0
Median nerve lesion	7	7/0
Polyneuropathy	32 (%14,9)	9/23
Radiculopathy	28 (%13)	18/10
Normal Findings	44 (%20,5)	16/28

Enmg: Electroneuromyography, M: Male, F: Female.

4. Discussion

The characteristics of patients referred for electrodiagnostic examination may vary according to the characteristics of the laboratory, the referring departments and the physicians' knowledge of electrodiagnosis. Our electrodiagnosis laboratory, which operates within the Physical Medicine and Rehabilitation Clinic of our tertiary care hospital, which is a reference center, receives patient referrals from all departments, especially neurosurgery, orthopedics and plastic surgery departments.

A heterogeneous group of focal neuropathies is defined by entrapment neuropathies. These are the most common neuropathies [7]. Symptoms such as pain and paresthesia occur due to compression of the peripheral nerve [8]. In our study, we observed that the rate of CTS was higher than the other diagnoses in accordance with the literature. CTS is the most common entrapment neuropathy. It is a syndrome with a prevalence of 3% in the general population, 5-15% in industrialized societies, and more common in women than in men [9, 10]. In our study, the rate of CTS was found to be higher than other neuropathies (31.1%). CTS was bilateral in most of the cases. Various studies have reported that the rate of bilateral CTS is up to 85% clinically and 50% electrophysiologically [11]. The high rate we found in our study is a finding indicating that the bilateral incidence of CTS is significantly increased in the geriatric population.

Peripheral nerve lesions are a heterogeneous group of disorders that occur due to many different causes. Electrophysiological studies have an important role in patients with peripheral nerve injury [12]. In our study, we observed that peripheral nerve lesions due to traumatic causes were lower in elderly patients. Here, the excess of injection-related sciatic nerve lesions is a remarkable finding. In previous studies, more sciatic nerve damage was observed in men than in women in patients over 60 years of age [13]. Despite all the precautions taken and information given to healthcare personnel about injection-induced sciatic nerve neuropathy, this complication still occurs. This risk should be kept in mind when recommending and performing gluteal intramuscular injection in the elderly population, especially in patients with low body mass index [14]. In other peripheral nerve lesions (median, radial, ulnar, etc.) the diagnosis should be made as early as possible. Because the earlier the surgical treatment, the better the recovery and functional outcome [15].

Of the 215 elderly patients who underwent electrodiagnostic examinations, 43 (20%) were diagnosed with diabetes mellitus. Polyneuropathy was present in 28 of these patients. It is known that the prevalence of DM increases in the elderly and can reach up to 40% over the age of 65 [16]. More

frequent referral of these cases to electrodiagnostic laboratories will allow early diagnosis of this disease that can cause neuropathy.

The etiology of polyneuropathies is very heterogeneous. Diabetes mellitus, alcohol use, genetics, nutrition disorders, drug toxicity, autoimmunity, infection, malignancy, and older age are some examples [17, 18]. When we looked at the etiology of polyneuropathy patients in our study, we observed that 11 patients had chemotherapy-induced polyneuropathy. These patients had mostly lower extremity involvement and axonal damage findings in which sensory fibers were affected. It also involved mostly the lower extremities. Since sensory fibers are mainly affected by chemotherapy, complaints such as paresthesia, numbness and pain occur [19]. The patients in our study had similar findings in accordance with the literature.

5. Conclusion

In our study, we can say that the disease profile in geriatric patients referred to our electroneuromyography laboratory in our Physical Medicine and Rehabilitation clinic did not show a significant difference when all age groups were evaluated together and was consistent with the literature. Considering that neuropathies are more difficult to treat and have a worse prognosis in elderly patients, we would like to emphasize the importance of early electrodiagnostic studies for diagnosis.

Limitations of the study

The major limitation of our study is that it is a single-center study.

Ethical Statement

The study was carried out in accordance with the Helsinki Declaration and approved by the Scientific Research and Ethical Committee of Inönü University with the number 2024/6015.

Conflict of interest

No potential conflict of interest was reported by the author.

Authors' Contributions

S.A: Conceptualization, idea concept, literature review, data collection, data analysis, findings, writing up the original draft, critical review.

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Research Article

CIGARETTE USE, ADDICTION LEVELS, AND INFLUENTIAL FACTORS AMONG HEALTHCARE STUDENTS IN TÜRKİYE

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Abstract: *This study aims to determine cigarette use, addiction levels, and factors influencing cigarette use among university students. A descriptive-cross-sectional study design was employed, and the study procedure was administered to students enrolled in the Health Sciences Faculty (HSF) and Vocational School (VS) of a foundation university in the southern region of Türkiye during the 2022-2023 Academic Fall Semester. The sample of the study consisted of 802 students (255 from VS and 547 from HSF). Data collection was conducted using a 'Demographic Information Form' and the 'Fagerström Test for Nicotine Dependence (FTND).' It was found that 20.8% of the participating students were cigarette users, and 71.9% initiated cigarette use after the age of 16. Among cigarette users, 34.1% were classified as very mildly addicted, 35.9% as mildly to moderately addicted, and 30.0% as highly and very highly addicted. Considering the results obtained from the Binary Logistic Regression Analysis conducted in this study, being male, having a fragmented family, and having moderate or low academic performance were determined to be factors influencing students' cigarette use ($W = 60.659$, $p < 0.001$; $W = 6.076$, $p = 0.014$; $W = 10.397$, $p = 0.001$, respectively).*

Keywords: *Addiction, Effective Factors, Students, Cigarette, Smoking Addiction.*

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1. Introduction

Cigarettes, along with all tobacco products, poses a significant public health issue causing preventable morbidity and mortality [1]. The World Health Organization (WHO) defined smoking addiction as the regular use for at least one month and difficulty or inability to quit despite numerous harmful effects [2]. Nicotine is the most important substance in cigarettes leading to addiction. It easily crosses the blood-brain barrier, stimulates receptors, and activates the release of dopamine, providing a pleasurable sensation. The release of dopamine relaxes the individual, leading to addiction in approximately 50% of cigarette users [2,3]. This addiction is thought to play an important role in the difficulty of quitting smoking.

A study carried out in Türkiye revealed that individuals, who start smoking at an early age, tend to smoke more and experience a higher level of difficulty quitting [4]. In 2007, the Global Youth Tobacco Survey (GYTS) was conducted in Türkiye to assess smoking among 13-15-year-olds.

According to the results, tobacco and tobacco products use among students in this age group increased from 8.4% in 2009 to 10.4% in 2012. In 2017, it was found that 17.9% of students still used a tobacco or tobacco product, and 7.7% still smoked cigarettes [5]. A study carried out by Demirbağ and Tavacı (2012) reported that the initiation of smoking occurs before the age of 20, particularly during the high school years, not later during university [6]. In a study by Potuk Bilici, Özer, and Bozdemir (2023), 36% of the 1407 university students surveyed used tobacco and tobacco products, with 23.1% using cigarettes [7]. In a study carried out by Aydın, Eryiğit, and Nurdan (2022) on university students, it was found that 33.1% of students smoked, with 69.2% of smoking students falling in the 20-25 age range [8]. Studies with university students from diverse sample populations in Türkiye show smoking rates ranging from 25.6% to 29.1% [9–11].

It was observed that smoking addiction mostly begins between the ages of 15 and 19 years, and approximately. 50% of those who start smoking during adolescence continue for approximately 15-20 years [12]. In a study carried out by Duran and Gözeten (2017), it was determined that the prevalence of smoking behavior was higher among university students aged 21 and above [13]. Considering the Turkish Statistical Institute (TÜİK) 2022 data, the daily tobacco product usage rate for individuals aged 15 years and above is 15.5% for females and 41.3% for males [14]. Tobacco kills half of its users who do not quit. Over 8 million people worldwide die from diseases caused by tobacco use annually, and this number is estimated to double in the next eight years [2].

The initiation and habituation of cigarette use among university students involve various risk factors [15]. These risk factors include family, peer group, school life, and individual characteristics, as well as environmental and societal risk factors [11,15]. In a study carried out by Özcebe et al. (2014) among first-year university students, it was found that the prevalence of smoking was higher among those whose mothers were illiterate (23.0%), those living alone (37.7%), and those who perceived their spending money as insufficient (24.9%) (16). The same study identified that 28.6% of fourth-year students and 19.7% of first-year students were found to be smoking during the research [16]. Another study revealed that university students stated pleasure (12.2%), social environment (10.7%), curiosity (4.6%), and stress (4.3%) as reasons for smoking [8]. Some studies indicated that male university students used cigarettes at a higher rate than female students [13,17].

University students, due to their age, may fail to fully comprehend the potential harms of smoking addiction and can forget that serious effects may develop after a prolonged period [18]. Adolescents, representing an important stage in terms of initiating tobacco consumption, are potential consumers from the perspective of the tobacco industry. Therefore, investigating the tobacco consumption behavior of this group holds significant importance [19]. This study aims to determine the cigarette use, addiction levels, and factors influencing cigarette use among university students. Studies conducted with university students in Türkiye have examined the rates, reasons, and levels of cigarette use. Since the 1990s, the importance given to tobacco control policies globally has increased, thanks to efforts led by the World Bank (WB) and the World Health Organization (WHO), in order to mitigate the adverse health and economic impacts of tobacco consumption. The "Framework Convention on Tobacco Control (FCTC)" and the "MPOWER" policy package have played significant roles in this increase. In Türkiye, the implementation of Law No. 4207 in 1996 and the FCTC in 2004 brought a significant boost in tobacco control policies [19]. In Türkiye, the increase in tobacco use led to the establishment of the "National Tobacco Control Program" through the Prime Ministry's directive numbered 2006/29. This program involved decisions to ban and restrict smoking in enclosed spaces, certain modes of transportation, and open areas of educational institutions [20]. As a part of our research's significance, participating students were asked about their opinions on smoke-free zone practices implemented in Türkiye. Moreover, through various statistical analyses, factors influencing the addiction to cigarettes among student smokers were identified, and an analysis predicting the level of addiction was presented.

It is anticipated that planning new practices based on these factors will contribute to preventing the initiation and addiction of smoking in Türkiye, thereby reducing a significant public health issue.

2. Materials and Methods

2.1. Study Population

The universe of this descriptive-cross-sectional study consists of a total of 1460 students enrolled in the Health Sciences Faculty (Nursing: 442, Nutrition and Dietetics: 299, Physiotherapy and Rehabilitation: 259) and the Vocational School (Dialysis: 150, Anesthesia: 150, First Aid and Emergency Assistance: 160) during the 2022-2023 Fall Semester at a foundation university in the southern region of Türkiye. According to the power analysis, if the universe size is 1000 and the significance level (α) is set at 0.05, the sample size for calculating sample sizes with a margin of ±0.05 error ($p = 0.5$, $q = 0.5$) is 278. Similarly, for a universe size of 500, the calculated sample size, with the same parameters, is 217. In this study, it was aimed at reaching reach a minimum of 278 undergraduate and 217 associate degree students, totaling 495 participants. However, the study was completed with the participation of 802 students.

2.2. Data Collection Tools

In the study, the 'Introductory Information Form' and the 'Fagerström Test for Nicotine Dependency (FTND)' were used in data collection. The data collection process was conducted through face-to-face interviews carried out by the researchers. The application duration for the data collection forms ranged from 30 to 45 minutes.

Introductory Information Form: A total of 31 questions, including sociodemographic characteristics of university students, aspects related to cigarette usage (such as the age of initiation, duration of smoking, quantity of cigarettes smoked, desire or experience of quitting, etc.), the effectiveness of smoke-free zones in front of the buildings where they receive education, the adequacy of warnings, and opinions on expanding these areas, were included.

Fagerström Test for Nicotine Dependence (FTND): Fagerström initially developed the Fagerström Tolerance Test in 1978 to measure nicotine addiction. This test was revised in 1992 by Fagerström, Heatherton, and Kozlowski, leading to the development of the Fagerström Test for Nicotine Dependence [21]. The Fagerström Test for Nicotine Dependence consists of six questions, each receiving a different score. The assessment of this test categorizes nicotine addiction into five groups based on the total scores obtained: very low (0-2 points), low (3-4 points), moderate (5 points), high (6-7 points), and very high (8-10 points). In Türkiye, the validity and reliability of the Fagerström Test for Nicotine Dependence were tested by Uysal et al. in 2004, resulting in a Cronbach's alpha coefficient of 0.56 [22]. In the present study, the FTND Scale demonstrated a Cronbach's alpha reliability coefficient of $\alpha = 0.681$.

2.3. Statistical Analysis

Research data were analyzed using the Statistical Package for Social Sciences (SPSS) 25.0 program. Data on continuous variables were reported using mean (M), median, minimum-maximum values, interquartile range (IQR), and standard deviation (SD). For categorical variables, the data were presented as numbers (n) and percentages (%). The normality of the distribution of continuous dependent variables requires the Kolmogorov-Smirnov normality test to be nonsignificant ($p > 0.05$), skewness and kurtosis values calculated by dividing them by their standard errors to be within acceptable limits (within ±1 boundaries) and within ±1.96 boundaries, a bell curve to be in the histogram graph, points on the Normal Q-Q Plot graph to be near or on the 45-degree line, and arithmetic mean, mode,

and median to be equal or close to each other. Since the majority of continuous variables did not meet the above criteria for normal distribution, non-parametric tests were used as evidence of their deviation from normal distribution.

For variables with two groups, the Mann-Whitney U test was utilized, while the Kruskal-Wallis H test was used for three or more groups. Evaluations regarding the predictive relationships between variables were reported using Logistic Regression Analysis. A significance level of $p<0.05$ was considered for all conducted tests.

2.4. Ethical Statement

The necessary ethical approval was obtained by applying to the Institutional Review Board for Non-Interventional Research in Health Sciences of Hasan Kalyoncu University in southern Türkiye (Decision No: 2022/3; Decision Date: 01.01.2023). Moreover, written permission was obtained from the university administration. The research adhered to the principles of the Helsinki Declaration. Verbal consent was obtained from university students who voluntarily participated in the research.

3. Results

Distribution of students and their families by sociodemographic characteristics are shown in Table 1.

Table 1. Distribution of Students and Their Families by Sociodemographic Characteristics (n=802)

Variables	Mean ± SD	Min – Max
Age	24.58±2.18	21-48
Variables and Subgroups	**Number (n)**	**Percentage (%)**
Age groups		
≤ 23	247	30.8
24 years	201	25.0
25 years	177	22.1
26 ≤	177	22.1
Sex		
Female	589	73.4
Male	213	26.6
Department of graduation in high school		
Private or state high school	99	12.3
Technical\vocational high school	194	24.2
Anadolu or science high school	509	63.5
Department in university		
HSF	547	68.2
VS	255	31.8
Year		
1st	249	31.0
2nd	249	31.0
3rd	138	17.3
4th	166	20.7
Success in courses		
Good	426	53.1
Moderate	349	43.5
Low	27	3.4
Place of residence		
Rural	158	19.7
Urban	644	80.3

Table 1. Continued.

Variables and Subgroups	Number (n)	Percentage (%)
Cohabitating with		
Family	633	78.9
Relative/Friend/Dormitory/Alone at home	169	21.1
Chronic disease		
No	742	92.5
Yes	60	7.5
Family type		
Extended family	66	8.2
Nuclear family	699	87.2
Broken family	37	4.6
Father's educational level		
Undergraduate and higher	183	22.8
High school	233	29.1
Elementary school	352	43.9
Uneducated	34	4.2
Mother's educational level		
Undergraduate and higher	71	8.9
High school	203	25.3
Elementary school	437	54.5
Uneducated	91	11.3
Father's employment status		
Employed	753	93.9
Unemployed	49	6.1
Mother's employment status		
Employed	131	16.3
Unemployed	671	83.7
Family income level		
Income>Expenses	221	27.6
Income=Expenses	467	58.2
Income<Expenses	114	14.2
Scholarship		
No	628	78.3
Yes	174	21.7
Political view of family		
Democratic-egalitarian	745	92.9
Not democratic-egalitarian	57	7.1
Chronic disease in first-degree relatives		
No	595	74.2
Yes	207	25.8
Total	**802**	**100.0**

Mean: Mean, **SD:** Standard deviation, **Min:** Minimum value, **Max:** Maximum value **HSF:** Health Sciences Faculty, **VS:** Vocational School

The mean age of the students participating in the present study was 24.58±2.18 (min.-max.= 21-48), with 30.8% aged 23 years or younger. Moreover, 73.4% were female, 63.5% were graduates of Anadolu or science high schools, and 68.2% were currently enrolled in a health sciences faculty, with 62.0% attending their first and second years. It was found that 53.1% of students had a good academic performance, 80.3% lived in a city, and 78.9% resided with their families. Chronic illness was present in 7.5% of the students (Table 1).

Furthermore, 87.2% of students lived in nuclear families, 43.9% had fathers, and 54.5% had mothers with education at the primary school level. Additionally, 93.9% of students' fathers were employed, and 83.7% of mothers were housewives. In terms of family income, 58.2% of students reported equal monthly income and expenses, while 78.3% did not receive any scholarships from institutions. The family's ideological perspective revealed that 92.9% held democratic and egalitarian views. It was determined that 25.8% of students' immediate family members had chronic illnesses (Table 1).

Ninety-two percent (92.0%) of students found the school-based SFA necessary, with 25.2% stating that the designated SFAs in school were not used for their intended purpose. Moreover, 55.5% of students believed that the warnings in the school's designated SFAs were insufficient, whereas 48.4% considered it appropriate to expand these areas. It was observed that 40.4% of students were undecided about the effectiveness of the school's SFA program in the stages of abstaining from or quitting smoking (Table 2).

Table 2. Distribution of Smokers' Characteristics and Students' Opinions on Smoke-Free Areas

Variables and Subgroups	Number (n)	Percentage (%)
Smoke-Free Areas (SFAs) are necessary		
Yes	738	92.0
No	64	8.0
Are SFAs in your university used for the intended purposes		
No	202	25.2
No opinion	283	35.3
Yes	317	39.5
Are SFAs in your university enough		
Yes	357	44.5
No	445	55.5
Should SFAs in your university be expanded		
No	98	12.2
No opinion	316	39.4
Yes	388	48.4
Are SFAs in your university effective in quitting smoking		
No	224	27.9
No opinion	324	40.4
Yes	254	31.7
Smoking status		
No	635	79.2
Yes	167	20.8
Age of starting smoking		
≤ 15 years	47	28.1
16 years ≤	120	71.9
Duration and amount of smoking		
0-5 years 10 pcs	58	34.7
0-5 years 20 pcs	62	37.1
6-10 years 10 pcs	10	6.0
6-10 years 20 pcs	37	22.2
Monthly expenditure on cigarettes		
< 150 TL	64	38.3
150 TL ≤	103	61.7
Desire to quit smoking		
Yes	75	44.9
No	92	55.1

Regarding smoking habits, 20.8% of students were identified as smokers, with 71.9% initiating smoking after the age of 16. Among smokers, 37.1% reported a smoking duration of 0-5 years, consuming an average of 20 cigarettes per day. Notably, 61.7% of smoking students spent 150 TL or more monthly on cigarettes, and 44.9% expressed a desire to quit smoking (Table 2).

When examining the levels of addiction among students based on their FTND scores, it was determined that 29.3% were mildly addicted, 6.6% were moderately addicted, and 17.4% were severely addicted. The mean FTND score was calculated to be 3.90±2.72 (min-max=0-10) (see Table 3).

Table 3. Fagestrom Nicotine Dependence Scores and Distribution of Smoker Students

Fagestrom Nicotine Dependence	Number (n)	Percentage (%)	Cumulative (%)
Fagestrom Score			
0	19	11.4	11.4
1	18	10.8	22.2
2	20	12.0	34.2
3	27	16.1	50.3
4	22	13.1	63.4
5	11	6.6	70.0
6	15	9.0	79.0
7	14	8.4	87.4
8	11	6.6	94.0
9	7	4.2	98.2
10	3	1.8	100.0
Level of Addiction			
0-2: Very mild addiction	57	34.1	34.1
3-4: Mild addiction	49	29.3	63.4
5: Moderate addiction	11	6.6	70.0
6-7: High level of addiction	29	17.4	87.4
8-10: Very high level of addiction	21	12.6	100.0

	Mean ± SD	Min-Max	Median (IQR: Q3-Q1)
Scale total	3.90±2.72	0-10	3 (6-2)

Mean: Mean, **SD:** Standard deviation, **Min.:** Minimum value, **Max.:** Maximum value
IQR: Interquartile range (Q3:quantile of 75%, Q1: quantile of 25%), **Median:** Quantile of 50%

A statistically significant difference was found between groups' mean rank in the FTND scale by gender ($Z = 3.943$, $p < 0.001$). A statistically significant difference was also observed between the groups' mean ranks on the FTND scale by academic performance ($\chi2(2) = 14.349$, $p < 0.001$). Students with low and medium academic performance had higher mean ranks and were more addicted to cigarettes in comparison to students with good academic performance ($p = 0.003$, $p = 0.018$, respectively). Similarly, a statistically significant difference was found between groups' mean ranks on the FTND scale by family income ($\chi2(2) = 6.765$, $p = 0.034$). Students whose family income exceeded their expenses had higher average ranks and were more addicted to cigarettes than students whose family income was equal to their expenses ($p=0.040$). Moreover, a statistically significant difference was found between groups' mean ranks on the FTND scale by family type ($\chi2(2) = 9.745$, $p = 0.008$). Students from broken families had higher mean ranks and were more addicted to cigarettes compared to those from nuclear families ($p=0.019$) (Table 4).

Table 4. Comparing the Sociodemographic Characteristics of Smoker Students with Fagerström Test for Nicotine Dependence Mean Ranks (n=167)

Characteristics	n	Mean Rank	Median (IQR)	Min-Max	Test	p	Post Hoc
Age groups							
≤ 23	42	85.32	3 (6-2)	0-9	3.818	0.282	-
24 years	41	83.55	3 (6-1)	0-10			
25 years	36	95.32	4 (5.5-3)	0-9			
26 ≤	48	74.74	3 (5.5-1)	0-10			
Sex							
Female[1]	76	67.96	2.50 (5-1)	0-9	**3.943**	**<0.001***	**2>1**
Male[2]	91	97.40	4 (7-3)	0-10			
Department in University							
HSF	100	83.61	3.5 (6-2)	0-10	0.128	0.898	-
VS	67	84.58	3 (7-1)	0-10			
Year							
1	41	88.33	4 (6-2)	0-10	0.755	0.860	-
2	58	83.64	3 (6-2)	0-10			
3	35	78.80	3 (6-1)	0-9			
4	33	84.77	4 (6-2)	0-10			
Success in courses							
Good[1]	63	68.47	3 (5-1)	0-9	**14.349**	**0.001****	**3-2>1**
Moderate[2]	92	90.10	4 (7-2)	0-10			
Low[3]	12	118.75	6 (7-4)	2-10			
Family income level							
Income>Expenses[1]	56	95.39	4 (7-2)	0-10	**6.765**	**0.034****	**1>2**
Income=Expenses [2]	91	75.21	3 (5-1)	0-9			
Income<Expenses [3]	20	92.10	4 (6-2.5)	0-9			
Family type							
Extended family[1]	12	104.38	4 (6.5-3.5)	2-8	**9.745**	**0.008****	**3>2**
Nuclear family[2]	140	78.98	3 (6-1)	0-10			
Broken family[3]	15	114.53	5 (9-3)	1-10			
Cohabitating with							
Family	128	84.96	4 (6-2)	0-10	-0.470	0.638	-
Relatives/Friends/Dormitory/Alone at home	39	80.83	3 (6-2)	0-9			
Chronic Disease							
No	156	83.43	3 (6-2)	0-10	0.581	0.561	-
Yes	11	92.14	5 (5-2)	0-9			
Chronic disease in first degree relatives							
No	136	86.21	4 (6-2)	0-10	-1.247	0.212	-
Yes	31	74.29	3 (6-1)	0-9			

Min: Minimum values, **Max.:** Maximum values, **n:** Number of individuals, **[1-2-3]:** Intergroup differences **IQR:** Interquartile range (Q3:quantile of 75%, Q1: quantile of 25%), **Median:** Quantile of 50% **Post Hoc:** Bonferroni method, **HSF:** Health Sciences Faculty, **VS:** Vocational School *****Mann Whitney U test (**Z**), ******Kruskal Wallis H test (χ^2)

Paired logistic regression analysis and the backward stepwise method were used in order to determine the factors influencing smoking among students participating in the present study. The variables included in the model in the first step were gender, family type, age, academic performance, family income status, cohabiting individuals, and the presence of chronic illness in first-degree relatives. These variables were included in the model based on a literature review, considering that they could influence students' smoking status. The backward stepwise method identified the variables contributing most to the model in the fifth step. Accordingly, it was observed that the model established in the fifth step was statistically significant (Model: $\chi2=110.290$, df=4, $p<0.001$). The result of the Hosmer-Lemeshow test indicated a good fit for the model ($\chi2=9.342$, df=5, $p=0.096$). The established model explained 12.8% of the variance in smoking status (Cox & Snell R^2) and 20.1% (Nagelkerke R^2), predicting smoking status with an accuracy of 81.7%. The variables of being male, having a broken family, and having moderate or low academic performance were found to be factors influencing students' smoking status (W=60.659, $p<0.001$; W=6.076, $p=0.014$; W=10.397, $p=0.001$, respectively). Thus, for each unit increase in smoking status, being male increased the odds by 4.4 times (95% CI: 3.055-6.476), belonging to a broken family increased the odds by 2.5 times (95% CI: 1.213-5.441), and having moderate or low academic performance increased the odds by 1.8 times (95% CI: 1.273-2.692) (Table 5).

Table 5. Factors Influencing Students' Smoking Status: Paired Logistic Regression Analysis

Variables Involved in the Model							**95% Confidence Intervals for OR**	
	B	**S.E.**	**Wald**	**df**	**p**	**OR**	**LL**	**UL**
Sex (1)	1.492	0.192	60.659	1	<0.001	4.448	3.055	6.476
Family type (1)	0.944	0.383	6.076	1	0.014	2.569	1.213	5.441
Success in courses at university (1)	0.616	0.191	10.397	1	0.001	1.851	1.273	2.692
Constant	-2.573	0.187	188.667	1	<0.001	0.076		

Model: $\chi^2=110.290$, df=4, $p<0.001$; **Hosmer-Lemeshow:** $\chi^2=9.342$, sd=5, $p=0.096$

Cox & Snell R^2: 0.128; **Negelkerke R^2:** 0.201

df: Degree of freedom, **OR:** Odds Ratio, **SE:** Standard error, **LL:** Lower limit, **UL:** Upper limit
Reference groups: Sex (Female); Family type (Extended-Nuclear); Success in courses at university (good)
Proxy variables: Family type: (0) extended-nuclear family, (1) broken family; Success in courses at university: (0) good, (1) moderate, low

Table 6. Factors Influencing Students' Smoking Status: Sequential Logistic Regression Analysis

Variables Involved in the Model				95% Confidence Intervals for Wald		Hypothesis test				95% Confidence Intervals for OR	
		B	S.E.	Lower	Upper	Wald Chi-square	df	p	OR	LL	UL
Threshold	[mild =.00]	-0.767	1.9006	-4.492	2.958	0.163	1	0.687	0.464	0.011	19.261
	[moderate =1.00]	-0.382	1.8999	-4.106	3.342	0.040	1	0.841	0.683	0.016	28.271
Age of starting smoking	[≤15 years =.00]	1.264	0.3797	0.520	2.009	**11.087**	**1**	**0.001**	**3.541**	1.682	7.454
	[16 years ≤ =1.00]	0[a]	.	.	.	.		.	1	.	.
Monthly expenditure on cigarette	[<150 TL =.00]	-1.650	0.4612	-2.553	-0.746	**12.795**	**1**	**<0.001**	**0.192**	0.078	0.474
	[150 TL ≤ =1.00]	0[a]	.	.	.	.		.	1	.	.
Family type	[Extended-nuclear =.00]	-0.443	0.6030	-1.624	0.739	0.538	1	0.463	0.642	0.197	2.095
	[Broken =1.00]	0[a]	.	.	.	.		.	1	.	.
Success in courses at the university	[Good =.00]	-0.789	0.3908	-1.555	-0.023	**4.076**	**1**	**0.043**	**0.454**	0.211	0.977
	[Moderate-low=1.00]	0a	.	.	.	.		.	1	.	.
Age		-0.023	0.0671	-0.154	0.109	0.114	1	0.736	0.978	0.857	1.115
(Scale)		1[b]									

Parallel Curves Test= χ^2=3.490, sd=6, p=0.745; **Model:** χ^2=43.344, sd=6, p<0.001; **Cox & Snell R^2**: 0.229; **Negelkerke R^2**: 0.282

df: degree of freedom, **OR:** Odds Ratio, **SE:** Standard error, **LL:** Lower limit, **UL:** Upper limit
Reference groups: Age of starting smoking (16 years ≤), Monthly expenditure on cigarette (150 TL≤), Family type (Broken family); Success in courses at university (moderate-low), age
Proxy variables: Addiction levels: (0) very mild-mild, (1) moderate, (2) high-very high level; Family type: (0) extended-nuclear family, (1) broken family; Success in courses at university: (0) good, (1) moderate-low

The regression model derived from the sequential regression analysis conducted to determine the effects of the age of initiation of smoking, monthly expenditure on cigarettes, family type, academic performance, and age variables on the levels of smoking addiction among students was found to be statistically significant ($\chi 2$=43.344, sd=6, p<0.001). Alongside the independent variables used in the analysis, it was observed that these variables explained 22.9% of the variance in students' levels of smoking addiction (Cox & Snell R2) and 28.2% (Negelkerke R^2). Considering the odds ratio (OR) values, students who initiated smoking at the age of 15 or younger exhibited smoking addiction levels 3.5 times higher than students who started smoking at 16 years or older. Additionally, it was determined that students with a monthly expenditure on cigarettes of 150 TL or less had lower levels of smoking addiction compared to those who spent more than 150 TL. Among smoking students, those with good academic performance had lower levels of smoking addiction compared to students with moderate to low academic performance (Table 6).

Table 7. Multiple Criteria Logistic Regression Analysis Classification for Predicting the Addiction Levels of Smoker Students

		Predicted				Accuracy Percentage
		Mild	Moderate	High	Total	
Addiction level	Mild	93	0	13	106	87.7
	Moderate	8	0	3	11	0.0
	High	26	0	24	50	48.0
General Percentage						70.1

Given the classification table, the constructed regression model accurately classified the mild addiction group at 87.7%, the moderate addiction group at 0.0%, and the severe addiction group at 48.0%. The overall accuracy percentage for classification was found to be 70.1% (Table 7).

4. Discussion

Among the students participating in the present study, it was determined that 20.8% used cigarettes, with 71.9% starting to smoke after the age of 16. Moreover, 37.1% of the participants had a smoking duration ranging from 0 to 5 years, consuming an average of 20 cigarettes per day. It was found that 61.7% of smoker students spent 150 TL or more monthly on cigarettes, and 44.9% expressed a desire to quit smoking (Table 2). The present study revealed that students who spent more than 150 TL monthly on cigarettes had addiction levels 5.20 times higher when compared to those spending less than 150 TL (Table 6). It is thought that students not facing financial difficulties allocate a more comfortable budget for smoking, resulting in higher cigarette consumption. According to the 2022 data from the Turkish Statistical Institute (TSI), the reasons for initiating tobacco product use in the 15-24 age group were distributed as follows: peer influence 34.4%, imitation 26.7%, curiosity 20.3%, personal problems 5.4%, no specific reason 5.9%, family issues 3.5%, and recreational purposes 3.7%. Examining the distribution of tobacco product use by age group, it was observed that the daily smoking rate increased from 16.4% in 2010 to 19.3% in 2022 among individuals aged 15-24 years [14]. In a previous study, it was noted that individuals who started smoking due to family use or imitation had higher FTND scores [23].

Decisions made in Türkiye in 1980, in line with the liberalizations in the tobacco sector in Türkiye, removed tobacco from the control of the state monopoly ("TEKEL") and positioned international tobacco companies in a decisive role. The entry of these companies into the Turkish market led to an increase in activities such as advertising and promotions, contributing to a rapid increase in

cigarette consumption. The first anti-tobacco law in Türkiye came into effect in 1996. This law prohibited tobacco use, as well as all forms of advertising and promotion, in public spaces such as health and education facilities, public transportation, etc. Additionally, it empowered television channels to broadcast informative programs about the harms of smoking and prohibited the sale of tobacco products to individuals under the age of 18 years. Despite the comprehensive nature of this law, its effect on reducing tobacco use did not reach a satisfactory level due to the inadequacy of its sanctions. In 2004, Türkiye became a party to the "WHO Framework Convention on Tobacco Control (FCTC)." Thanks to the harmonization efforts of the law enacted in 1996 and the FCTC, the "Law on the Prevention and Control of Harmful Effects of Tobacco Products" was put into effect in 2008. This new law expanded smoke-free areas and implemented a smoking ban in the accommodation and hospitality sectors. These areas were declared 100% smoke-free zones. With this law, Türkiye became the 5th country in Europe and the first in the Middle East and Central Asia to have smoke-free airspace. In Türkiye, there was a decrease in tobacco consumption during the period 2009-2011. However, from 2013 to 2018, there was a sharp increase in tobacco consumption, resembling the levels seen in the year 2000 [19]. According to the Global Youth Tobacco Survey (GYTS) conducted among students aged 13-15 years in 2017, it was determined that, despite not reaching the age of 18 years, 73.3% of the participating students could purchase cigarettes from informal sources [5]. It is thought that the majority of the students in the present study starting smoking after the age of 16 can be attributed to various reasons, and it is due to the ineffectiveness of many tobacco control measures implemented in Türkiye.

In the present study, based on the results of Sequential Logistic Regression Analysis conducted to identify factors influencing smoking addiction among students who smoke, it was determined that the level of smoking addiction in students who started smoking at the age of 15 and below is 3.5 times higher than that of those who started smoking at the age of 16 and above (Table 6). In the literature, the study carried out by Yakar and Pirinçci (2019) revealed that the age of starting to smoke increases the level of addiction, with individuals who start smoking before the age of 15 having higher levels of addiction [24]. The study carried out by Selçuk et al. (2018) revealed a higher level of addiction in students who start smoking at an early age, smoke more cigarettes, and are more encouraged to smoke [25]. Other studies also determined that individuals with higher scores of smoking addiction are more likely to start smoking due to curiosity, emulation, and peer influence [23,26]. It is well-known that smoking addiction leads to fatal diseases and preventing addiction results in a significant decrease in morbidity and mortality rates [27]. A study carried out by Babjakova et al. (2020) revealed that 55.6% of students had not received sufficient education about smoking addiction [28]. To overcome curiosity and interest in smoking and reduce smoking addiction, it is recommended to start providing informative and educational lessons about smoking addiction in preschool education institutions in Türkiye, in collaboration with children's families.

Examining the levels of addiction among students who smoke, it was determined that 29.3% were mildly addicted, 6.6% were moderately addicted, and 17.4% were severely addicted. The FTND score mean was found to be 3.90±2.72 (min.-max.=0-10) (Table 3). According to the FTND results in the study conducted by Kaya and Ergün (2020), it was found that "51.3% of the participating students were moderately addicted, and 26.9% had a high level of smoking addiction" [29]. In the study by Terzi et al. (2019), individuals in the group of smokers were found to have a higher level of addiction [30]. Additionally, in the present study, the analysis conducted to predict the levels of addiction among students who smoke correctly classified the excessive addiction group of students by 48.0%. The overall accuracy percentage for classification was found to be 70.1% (Table 7). In conclusion, it can be said that the model generally yielded good results. Particularly, multidisciplinary studies addressing students in the excessive addiction group in our research are considered necessary.

In the present study, it was found that the rank average of groups of male students on the FTND scale is higher than that of female students, and they are more addicted to cigarettes compared to females ($p<0.05$) (Table 4). Considering the results of the Global Adult Tobacco Survey conducted in 2008, 2012, and 2016, men, individuals aged 25-44, and those living in urban areas had higher tobacco usage rates compared to women and individuals in other age groups [19]. In 2020, 36.7% of men and 7.8% of women globally smoked cigarettes [2]. According to the 2022 Turkish Statistical Institute datas, the rate of individuals aged 15 and above who use tobacco products daily increased from 28.0% in 2019 to 28.3% in 2022. This rate was determined to be 41.3% in males and 15.5% in females in 2022 [14]. According to the Global Youth Tobacco Survey 2017 datas, male students were found to use cigarettes at a higher rate than female students (9.9% and 5.3%, respectively) [5]. The present study revealed that students with low and moderate academic performance are 2.20 times more likely to be addicted to cigarettes when compared to students with good academic performance ($p<0.05$) (Table 6). Furthermore, the Paired Logistic Regression Analysis conducted in the present study identified being male, having a broken family, and having moderate or low academic performance as factors influencing students' smoking status (Table 5). Some studies in the literature indicated that there is a relationship between smoking addiction and age of starting smoking, duration of use, and quantity of use independent of gender [24,25]. In a study carried out by Babjakova et al. in 2020, it was reported that the prevalence of smoking addiction is higher in women than in men [28]. In a study carried out by Yalçın et al. in 2021, it was found that men have a higher prevalence of smoking addiction [31]. Additionally, other studies also reported that individuals with high academic achievement and low addiction scores are more knowledgeable about smoking addiction, and their quit rates are also higher [29,31,32]. In this context, it is considered important to expand the scope and content of education on cigarette addiction and provide it to all segments of society. Most smokers who are aware of the dangers of tobacco want to quit. Worldwide, counseling and medication were shown to more than double the chances of a smoker successfully quitting [2].

In this study, it was determined that students with a family income higher than expenses are more likely to be cigarette-dependent compared to students with an equal family income and expenses ($p<0.05$). Additionally, the present study found that students from broken families are more prone to smoking addiction than those from nuclear families ($p<0.05$) (Table 4). Studies consistently showed a higher prevalence of smoking among individuals with higher income levels and those with a history of adverse experiences [33,34]. In a study carried out by Ergin and İpek (2021), an increase in household income was associated with an increase in both cigarette and alcohol consumption [35]. It was reported in the literature that the influence of family pressure and peer environments contributes to an increase in cigarette and other substance use [36–38]. Factors such as divorce or a high number of individuals in the family, which may harm emotional bonds, can escalate substance use. It has been observed that divorced or broken family structures serve as significant predictors of alcohol and cigarette use among adolescents [39]. In contrast to our study's findings, Kaya and Ergün (2020) identified that students with low economic status and those living with their peers exhibit higher rates of cigarette use [29]. This suggests that the prevalence of cigarette use may vary depending on multiple factors. Some socioeconomic advantages are associated with increased access to and use of cigarettes, while socioeconomic disadvantages and negative family structures affect cigarette use in certain situations. Recognizing the complexity of these factors, it is important to create awareness across all segments of society and implement diverse initiatives and projects to reduce cigarette use and, consequently, smoking addiction.

5. Conclusions and Suggestions

In this study, the factors influencing cigarette use and addiction among university students were identified. Gender, academic performance, family income, and family structure were found to be effective variables in smoking addiction. Students who started smoking at an earlier age exhibited higher levels of smoking addiction when compared to those who started later in life. In light of these findings, it is recommended to plan and develop effective and innovative interventions in order to prevent the initiation and progression of cigarette use and addiction in Türkiye. Moreover, it is recommended that university students be provided with educational programs that teach the harms of smoking and the importance of addiction, fostering internalization and raising awareness.

Limitations of the study

Since the study was conducted in a single foundation university in the southern part of Türkiye, the results achieved here cannot be generalized to the entire specified population.

Acknowledgments

There is nothing to declare.

Ethical Statement

The necessary ethical approval was obtained by applying to the Institutional Review Board for Non-Interventional Research in Health Sciences of Hasan Kalyoncu University (Decision No: 2022/3; Decision Date: 01.01.2023). Moreover, written permission was obtained from the university administration. The research adhered to the principles of the Helsinki Declaration. Verbal consent was obtained from university students who voluntarily participated in the research.

Conflict of interest

There is nothing to declare.

Authors' contributions

S.A.: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. A.B.C.: Conceptualization, Data curation, Investigation, Methodology, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. Z.Ç.: Conceptualization, Investigation, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. E.D.: Data curation, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. M.Ö.Ç.: Data curation, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. S.P.: Data curation, Software, Writing - original draft, Writing - review & editing. S.A.: Data curation, Software, Writing - original draft, Writing - review & editing. All authors read and approved the final manuscript.

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Research Article

THE INTERACTION BETWEEN EXERCISE ADDICTION AND NUTRITIONAL LEVELS AMONG STUDENTS OF THE FACULTY OF HEALTH SCIENCES: A CROSS-SECTIONAL STUDY

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Abstract: *Physical exercise is a voluntary, planned, structured, continuous activity aimed at developing and improving body and physical fitness. While nutrition constitutes one dimension of healthy lifestyle behaviors, exercise and physical activity constitute the other dimension. We aimed to examine the relationship between healthy nutrition levels and exercise addiction levels of students studying at the faculty of health sciences. Our study was performed on 133 students studying at Sakarya University of Applied Sciences, Faculty of Health Sciences. The nutrition levels of the participants were assessed with the Nutrition Exercise Behavior Scale (NEBS) and exercise dependence levels were assessed with the Exercise Dependence Scale (EDS). The mean values of age and body mass index of the subjects were 21.83±4.21 and 18.13±3.09, respectively. There were statistically significant and weak correlations between participants' healthy eating habits and exercise dependence level (r=0.386 - p<0.001), Extreme Focus and Emotion Change (r=0.376 - p<0.001), Postponement of Individual-Social Needs and Conflict (r=0.285 - p=0.001), and Tolerance Development and Passion (r=0.295 - p=0.001). There was a positive correlation between exercise addiction levels and various factors, including healthy nutrition levels, extreme focus and emotion change related to exercise, postponement of individual-social needs leading to conflicts, and the development of tolerance and passion for exercise. Interestingly, as students' exercise levels increased, they tended to prioritize maintaining healthy nutrition habits. These findings highlight the intricate interplay between healthy behaviors, exercise habits, emotional responses, social dynamics, and addiction-like tendencies, underscoring the influence of individual differences and environmental factors in shaping exercise-related behaviors among health sciences students.*

Keywords: *healthy eating, exercise, university student, addiction*

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1. Introduction

Living a healthy life requires that the human body is free from any discomfort or disability that may affect or limit daily life. This is extremely important to improve the quality of life of individuals and to preserve their freedom to do the activities they want. Therefore, adopting a healthy lifestyle and staying away from diseases is one of the most important tasks for people. This is because being healthy means being at full capacity both physically and mentally. However, an unbalanced diet can also have negative effects on physical health. Not getting the nutrients the body needs can lead to lower energy levels and a feeling of inadequacy when doing daily tasks. Therefore, for a healthy life, it is important to exercise regularly, eat a balanced diet, and keep up with health check-ups. In this way, we can avoid

diseases that affect the body, improve the quality of life, and perform the desired activities in a healthy way [1]. People who exercise regularly to achieve a healthy physical and physiological state may have different body structures and physical characteristics than those who do not exercise. In people who exercise regularly, the heart and lungs respond faster to exercise. This immediate response stimulates the human system to increase blood pumping and improve the circulation of oxygen. This results in increased muscle strength and endurance, while the flexibility of the joints increases and the risk of injury decreases.[2]. Regular exercise also helps with weight control by increasing the burning of body fat. In addition, key conditions for being clinically healthy include regular participation in exercise, eating a proper and balanced diet, controlling weight, avoiding alcohol and drug use, regular self-care, avoiding stress, using relaxation techniques, and getting enough sleep. These healthy living habits improve overall health and help prevent illness [3].

Nutrition plays a pivotal role in determining individuals' overall health status. While it's largely shaped by personal choices, maintaining a healthy diet is crucial for a well-rounded lifestyle [4]. The rise of digitalization in the evolving global landscape has led to an increase in sedentary lifestyles [5]. Moreover, recent challenges, such as those posed by the pandemic, have triggered shifts in people's behaviors and attitudes towards nutrition. The undergraduate phase is particularly crucial in shaping one's lifestyle, whether it leans towards healthiness or unhealthiness[6]. During this period, stress levels tend to rise, external factors gain more influence, and there's a propensity to resort to fast food due to being away from family and developing irregular eating patterns[7].

Behavioral addiction, distinct from substance-related addiction, showcases addictive traits through activities such as gaming, internet use, or exercise [8]. Detection of behavioral addiction employs criteria akin to those for substance addiction, encompassing mood alterations, tolerance, attentional focus, withdrawal symptoms, relapse proclivity, and interpersonal conflicts [9]. Exercise addiction specifically denotes persistent engagement in exercise despite experiencing emotional disturbances upon cessation. Individuals may prioritize exercise over obligations, escalate exercise parameters indiscriminately, and experience a sense of incompleteness or frustration in its absence, even in compromised health states [10]. Addiction is a condition in which repetitive and compulsive behaviors can negatively affect daily life. This includes excessive exercise, and sometimes such behaviors can negatively affect people's work, education, or social life [11]. Research shows that the risk of depression can increase when exercise is excessive. Exercise is often recommended as an important part of a healthy lifestyle. However, the type, duration, and intensity of exercise can affect a person's physiology and metabolism. Therefore, it is important to understand the relationship between athletic performance, heavy exercise, and physiological changes [12, 13]. Exercise addiction, like other addictions, is a controversial topic. Some experts argue that withdrawal symptoms from lack of psychoactive substance should be among the symptoms of a true addiction, while exercise addiction can be difficult to diagnose. Exercise addiction often involves behaviors such as over-exercising, devoting excessive time to exercise, and exercising so intensely that it causes negative effects on physical health [10]. Some research suggests that this type of addiction may develop depending on personal factors such as personality traits, psychological factors, age and gender [14]. In summary, exercise addiction is often associated with excessive exercise habits that impair physical health and, in some cases, can lead to psychological problems. More research needs to be done on this topic and diagnostic criteria need to be clarified. It is also important to find the balance between the benefits of exercising with a healthy lifestyle and the harms of excessive exercise. Literature contains various studies to determine the healthy eating and physical exercise habits of university students [15-17]. It is important for students of the faculty of health sciences to receive education on health, to develop healthy lifestyle behaviors and therefore to determine their levels of exercise addiction and healthy nutrition behavior. Additionally, examining the relationship between healthy life parameters can show that those who are careful about

their health may not be careful about their health on the other hand. It is seen that there are limited studies on this subject in the literature and it is noteworthy that more studies on the subject are needed. For this reason, our study aimed to examine the relationship between healthy nutrition levels and exercise addiction levels of students studying at the faculty of health sciences. At the end of the study, we aim to provide new information to the literature on exercise addiction and eating habit change, which are increasingly widespread in today's societies, for students of the faculty of health sciences.

2. Materials and Methods

2.1. Research Type

A cross-sectional - correlational study type.

2.2. Population and Sample

This cross-sectional and descriptive study population consisted of students at Sakarya University of Applied Sciences, Faculty of Health Sciences in the 2023-2024 academic year. G-power 3.1 program was used to calculate the number of people included in the study. Taking the Extreme Focus and Emotional Shifts value, which is the subdivision of the exercise addiction scale in the reference article, it was found that it was sufficient to include 112 people in the study with an effect size of 0.347, 95% confidence interval and 0.05 margin of error. 133 students participated in the study conducted between October 25, 2023 and February 2024. Participants' demographic information (age, weight, height, body mass index) and incomes were recorded. Descriptive statistics for the research are given in Table 1.

Table 1. Evaluation parameters

Evaluation parameters	Mean±SD
Age (year)	21.83±4.21
Weight (kg)	60.20±11.76
Height (cm)	165.62±7.56
BMI (kg/m2)	18.13±3.09
Healthy eating exercise behaviour (14-70)	47.56±6.22
Unhealthy eating exercise behaviour (14-70)	41.43±5.63
Meal pattern (6-30)	20.48±3.75
Psychological/addictive eating behaviour (11-55)	33.72±7.20
Exercise Addiction level (17-85)	47.29±8.34
Extreme Focus and Emotion Change (7-35)	27.28±3.86
Postponement of Individual-Social Needs and Conflict (6-30)	13.17±3.12
Tolerance Development and Passion (4-20)	9.85±2.98

SD: Standard deviation

2.3. Data Collection Instruments

The levels of exercise dependence were assessed with the Exercise Dependence Scale (EDS) and the level of nutrition was assessed with the Nutrition Exercise Behavior Scale (NEBS).

2.3.1 Exercise Dependence Scale (EDS):

The validity and reliability study were conducted by Demir et al. in order to measure the exercise dependence of the participants. This measurement tool consists of a 5-point Likert-type scale. The sub-dimensions of the scale are; Postponement of Individual and Social Needs (8, 9, 10, 11, 12, 13), Conflict,

Overfocus and Emotion Change (1, 2, 3, 4, 5, 6, 7) and Tolerance Development and Passion (14, 15, 16, 17). The scale consists of 3 sub-dimensions and 17 questions [18].

2.3.2 Nutrition Exercise Behavior Scale (NEBS)

The NEBS is a five-point Likert-type scale comprising 45 items categorized into four sub-factors. Participants rate each item based on how well it describes them, with options ranging from "Completely defines me=5" to "Does not define me at all=1". However, specific items within the scale (7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 20, 22, 30, 31, 32, 34, 35, 36, 37, 38, 39, 42, 43) may present positive statements but signify negative behaviors, impacting the overall scoring. The scale's scoring is divided into sub-dimensions and evaluated based on the total scores obtained. The "Psychological/Addictive Eating Behavior" sub-factor ranges from 11 to 55, with higher scores indicating more pronounced psychological or dependent eating behaviors. The "Healthy Eating-Exercise Behavior" sub-factor spans from 14 to 70, with elevated scores representing positive engagement in healthy diet and exercise habits. Conversely, the "Unhealthy Diet-Exercise Behavior" sub-factor also ranges from 14 to 70 but signifies unhealthy diet and exercise patterns with higher scores indicating such behaviors. Lastly, the "Meal Pattern" sub-factor encompasses scores between 6 and 30, with higher scores reflecting better meal ordering habits [19].

2.4. Ethical statement:

The present study was conducted in accordance with research and publication ethics. Approval for this study was obtained from Sakarya University of Applied Sciences Ethics Committee on 19.10.2023 with the number E.102278.

2.5. Data Analysis

In this study, descriptive statistics were used to summarize both categorical and numerical variables. For categorical variables, frequencies were employed to describe the distribution of categories. Meanwhile, numerical variables were described using mean ± standard deviation values, providing insights into central tendency and dispersion. Correlations between variables were analyzed using the Spearman Correlation Test, with correlation coefficients interpreted based on predefined criteria: very weak correlation if < 0.2, weak correlation between 0.2 and 0.4, moderate correlation between 0.4 and 0.6, high correlation between 0.6 and 0.8, and very high correlation if > 0.8. The statistical software SPSS 27, developed by IBM Inc. in Chicago, IL, USA, was utilized for data analysis. These statistical methods and software ensure a robust analysis, facilitating a deeper understanding of the relationships and patterns within the data.

3. Results

Participants' mean age and body mass index (BMI) were 21.83±4.21 and 18.13±3.09, respectively. Table 1 shows the means and standard deviations of the parameters evaluated and analyzed for correlation. When the monthly income levels of the participants were evaluated, it was seen that 34 (25.6%) people had an income between 0-500 TL, 16 (12.0%) people had an income between 500-1000 TL, 52 (39.1%) people had an income between 1000-2000 TL, 16 (12.0%) people had an income between 2000-3000 TL, and 14 (10.5%) people had an income between 3000-5000 TL.

There were statistically significant and weak correlations between participants' healthy eating habits and exercise dependence level ($p<0.001$), Extreme Focus and Emotion Change ($p<0.001$), Postponement of Individual-Social Needs and Conflict ($p=0.001$), and Tolerance Development and Passion ($p=0.001$). When we looked at the correlation between the sub-parameters of the Nutrition

Exercise Behavior Scale and the parameters of the Exercise Dependence Scale, there was no significant correlation (see Table 2).

Table 2. Correlation of exercise and nutrition data

	Exercise Addiction level		**Extreme Focus and Emotion Change**		**Postponement of Individual-Social Needs and Conflict**		**Tolerance Development and Passion**	
	r	p	r	p	r	p	r	p
Healthy Eating Exercise Behavior	0.386	**<0.001***	0.376	**<0.001***	0.285	**0.001***	0.295	**0.001***
Unhealthy Eating Exercise Behavior	0.073	0.401	-0.150	0.085	0.038	0.666	-0.051	0.562
Meal Pattern	0.005	0.958	-0.021	0.807	0.048	0.583	-0.010	0.911
Psychological/Addictive Eating Behavior	0.008	0.927	-0.037	0.676	0.096	0.274	-0.031	0.726

r: Pearson Correlation, *p<0.001

4. Discussion

The aim of this study was to assess the prevalence of exercise and nutritional habits among university students enrolled in the Faculty of Health Sciences, as well as to examine the potential relationship between these habits. Analyzing participants' exercise addiction levels based on their self-perceptions revealed that those who perceived themselves as having high exercise addiction also scored high on the sub-dimensions and overall dimension of the EDS. Several factors and theories can elucidate these findings. Firstly, exercise addiction denotes a strong dedication to exercising, while perceived exercise addiction reflects individuals' awareness of their own addiction levels. This perception can intensify their commitment to exercise, prompting them to engage in more physical activity. In line with existing literature, Paksoy et al. noted that individuals who believed they were exercise addicts exhibited the highest scores in dimensions such as postponement of individual-social needs and conflict, as well as tolerance development and passion [20]. Similarly, Karabıyık et al. found that those who perceived themselves as exercise addicts scored highest across all dimensions of the exercise addiction scale, followed by those who were undecided and those who did not consider themselves exercise addicts [21]. Particularly among the younger generation, having a negative body image or idealizing a certain size can lead to excessive participation in exercise. According to a study, women's reasons for participating in sports are to keep fit, lose weight, relax, socialize and have fun, while men's reasons are to exercise, have fun, relax, lose weight and socialize [22].

There's a statistically significant but weak correlation between participants' healthy eating habits and their level of exercise dependence. This implies that while there is a relationship between these two variables, it's not a particularly strong one. It could suggest that having healthier eating habits doesn't strongly predict exercise dependence. Similarly, there's a significant but weak correlation between extreme focus and emotion change in relation to exercise habits. This could indicate that individuals who exhibit extreme focus on exercise may also experience more significant emotional changes related to their exercise routines. The correlation between postponement of individual-social needs and conflict is significant. This suggests that individuals who tend to postpone their individual or social needs due to exercise may also experience conflicts related to this behavior. The correlation between tolerance development and passion related to exercise is also significant. This could mean that individuals who develop a tolerance to exercise (possibly needing more exercise to achieve the same effects) may also have a stronger passion for exercise. The lack of significant correlation between the sub-parameters of the Nutrition Exercise Behavior Scale and the parameters of the exercise addiction scale is interesting.

We suggest that specific behaviors related to nutrition and exercise addiction may not be strongly linked or may be influenced by different factors. This could indicate that while healthy eating habits might be related to exercise habits in general, they may not directly correlate with addiction-like behaviors specifically related to exercise. Overall, our findings provide insights into the complex relationships between healthy behaviors, exercise habits, emotional responses, social dynamics, and addiction-like tendencies related to exercise. we suggests that these factors interact in nuanced ways and may be influenced by various individual differences and environmental factors. There are several studies in the literature on eating habits and exercise. When we examine these; Türkoğlu et al. discovered a significant variance in total healthy eating scores based on exercise participation, indicating higher healthy eating attitudes among active individuals. They also noted differences in the nutritional knowledge sub-dimension and feeling toward nutrition sub-dimension based on physical activity status. Conversely, no distinctions were found in the Nutrition Positivity and Malnutrition sub-dimensions [23, 24]. Furthermore, Arı and Çakır similarly found significant differences in healthy eating scores related to physical activity, especially due to regular physical activity, with higher scores observed among those engaging in activities 3-4 times a week. This positive difference was particularly evident in the positive nutrition sub-dimension. The researchers suggest that practicing regular physical activity alongside healthy nutrition likely contributed to these findings. It's noted that the level of physical activity plays a direct role in shaping healthy lifestyle behaviors, aligning with previous literature findings [25]. Overall, these results mirror findings from existing research, highlighting the intertwined relationship between physical activity levels, healthy nutrition attitudes, and overall lifestyle habits [26]. In general, we see that we obtained similar results with the literature.

5. Conclusion and Recommendation

As a result, although the exercise addiction levels of the Faculty of Health Sciences students are at a high level, it is seen that the students are sensitive about exercise addiction. Additionally, it was observed that there was a positive relationship between students' exercise addiction and healthy nutrition level, Extreme Focus and Emotion Change, Postponement of Individual-Social Needs and Conflict, Tolerance Development and Passion. Accordingly, it is seen that as the exercise level of students increases, more importance is given to healthy nutrition.

Generally, these findings provide insight into the complex relationships between healthy behaviors, exercise habits, emotional responses, social dynamics, and exercise-related addiction-like tendencies. It shows that these factors interact in subtle ways and may be influenced by a variety of individual differences and environmental factors.

Ethical Statement

The present study was conducted in accordance with research and publication ethics. Approval for this study was obtained from Sakarya University of Applied Sciences Ethics Committee on 19.10.2023 with the number E.102278.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Contribution

The author’s contribution to the study is equal.

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THE EFFECT OF NURSES' CHALLENGES TO STOPPING SMOKING ON NICOTINE DEPENDENCE

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Abstract: *This study was conducted to examine the effects of nurses' difficulties in quitting smoking and their socio-demographic characteristics on Nicotine addictions. A cross-sectional study was conducted between August and November 2022. The study reached 410 nurses. The Fagerström Test for Nicotine Dependence and the challenges to stopping smoking were used in the study. In the analysis of data; percentage, number, and linear regression techniques were used. It was determined that 30.3% of the nurses had high Nicotine Addiction. It was determined that the mean score of the Internal factors sub-dimension of the Nurses' challenges to stopping smoking was 28.89±8.06, the mean score of the Extrinsic Factors sub-dimension was 23.07±8.36, and the mean Nicotine Addiction scale score was 4.20±2.51. It was determined that the smoking nurse's age, perceived income level, smoking duration, and internal factors sub-dimension of the difficulties in quitting smoking had a 34% effect on the Nicotine addiction test. It was determined that the smoking addiction levels of the nurses who had difficulties in quitting smoking were higher. The Extrinsic Factors sub-dimension of the challenges to stopping smoking of nurses who smoked did not affect Nicotine Addiction status.*

Keywords: *Smoking, Fagerstrom Nicotine Addiction Test, stopping, challenges, nursing*

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1. Introduction

Smoking addiction is one of the preventable public health problems that ranks first among the causes of mortality and morbidity [1]. Smoking ranks first among the risk factors for deaths from lung cancer, Ischemic Heart Disease, Cerebrovascular Diseases, and Chronic Obstructive Pulmonary Disease. By quitting smoking, the risk of catching these diseases caused by smoking decreases, and this decrease is higher in those who quit smoking at an early age [2,3].
According to WHO statistics, smoking causes more than 8 million deaths per year worldwide [4]. According to TUIK's 2019 data, 54.5% of Turkey has never used cigarettes or similar products, while 28% of them use tobacco products every day [5].

The nicotine in the tobacco in cigarettes is an addictive substance. Although most of the smokers were not satisfied with this, they said that they continued to smoke due to nicotine addiction [6,7]. In addition to this addiction, one of the most important reasons for the continuation of smoking behavior and the failure of treatment attempts is the lack of desire to quit smoking [8,9]. It is not possible to force

a person to quit smoking without the desire to quit [1]. For this reason, determining the degree of addiction and difficulties in quitting smoking in those who want to quit are of great importance in terms of quitting success [10].

Determining the behaviors that are effective in starting and quitting smoking and identifying the obstacles to quitting smoking are the most important factors in the fight against smoking. Social Cognitive Theory examines the interactions between internal and external stimuli and creates a framework in which individuals can explain their difficulties in starting and quitting smoking. According to this theory, personal factors, behavioral and environmental factors are potential stimuli to promote smoking behavior [11,12].

In studies in the literature, it has been determined that many factors are effective in people's decision to quit smoking [13,14,15]. A systematic review of 65 studies also showed the existence of many factors that prevent smoking cessation. These factors are lifestyle and personal factors [eg, withdrawal symptoms, nicotine addiction], social [eg, access to resources], and cultural and economic factors [16].

Tobacco use by health workers; primarily threatens their own health, as well as causing significant weakness in the fight against tobacco addiction. Due to their location, healthcare professionals are in the closest position to patients to encourage smoking cessation and treat tobacco addiction [17]. The importance of health professionals setting an example and role model for society by not using tobacco is emphasized in Article 14 of WHO's Tobacco Control Convention. Health professionals who use tobacco will not only reduce the credibility of the fight against tobacco use but also shake their authority [4].

Efforts to be made so that nurses, who are an important and powerful resource for tobacco control, do not quit smoking will also contribute to the health of society.

Objective: This study was conducted to examine the effects of nurses' difficulties in quitting smoking and their socio-demographic characteristics on Nicotine addictions.

2. Materials and Methods

2.1. Type of Research

The cross-sectional study was carried out in a Hospital between August and November 2022.

2.2. Population and Sample of the Research

The population of the study consisted of 1000 nurses working in a hospital. The sample size of the study was calculated to represent the population, with a 95% confidence interval and a 3% margin of error, and it was calculated that a minimum of 410 people should be included in the research sample, and a total of 410 nurses were reached in the study.

Criteria for inclusion in the study

- Being open to communication.
- Participating in the study voluntarily

Criteria for Exclusion from the Study

- Individuals with communication difficulties.

2.3. Data Collection

Data were collected between August and November 2022. In order to collect the data, the survey Form, Fagerström Test for Nicotine Dependence and Challenges to Stopping Smoking Scale-21, created by the researcher, was used. The data were filled in by face-to-face interviews with the nurses in Malatya Training and Research Hospital. It took an average of 15-20 minutes to fill out a questionnaire.

2.4. Data Collection Tools

2.4.1 Introductory features form

It includes introductory features consisting of questions in total, including age, marital status, economic status, education level and unit of employment, how long they have worked, smoking status, etc. of the nurses included in the study.

2.4.2 Challenges to Stopping Smoking Scale-21

The scale was created in 2016 by Thomas et al. Challenges to Stopping Smoking Scale [CSS-21] was created to identify difficulties or problems related to quitting smoking [18]. The Turkish validity study of the scale was carried out by Gür [19]. The scale consists of two sub-dimensions. It consists of 9 items on the individual aspect of smoking cessation (eg, "Feeling lost without smoking") and 12 items on the social and environmental factors of quitting smoking (eg, "Fear of failing to quit smoking]. The first sub-dimension is called internal factors (items 1-9) and the second sub-dimension is called external factors (items 10-21). The four-point Likert-type scale consists of 21 items. The total score of the scale is not calculated. The score of each sub-dimension is calculated separately. Accordingly, a score between 9-36 can be obtained from the intrinsic factors and a score of 12-43 from the extrinsic factors. A higher score indicates higher difficulties in quitting smoking. The CSS-21 subscales were Cronbach alpha 0.86 and 0.82, respectively [19]. In our study, Cronbach's alpha was 0.86 to 0.84, respectively.

2.4.3 Fagerström Test for Nicotine Dependence

The scale was created by Fagerström in 1989 to determine the degree of physical dependence of individuals against cigarettes [20]. Uysal et al. conducted a Turkish validity study of the scale in 2004. The Cronbach Alpha coefficient of the scale was found to be 0.56. The scores that can be obtained from the scale are between 0-10. A high score indicates that cigarette addiction is high. On the scale, 0-2 points are considered as very mild, 3-4 points as mild, 5 points as moderate, 6-7 points as high and 8-10 points as very high addiction [21]. In this study, the Cronbach's alpha coefficient of the scale was calculated as 0.72.

2.5. Variables of the Study

Dependent variable: Fagerström Test for Nicotine Dependence
Independent variable: Challenges to Stopping Smoking Scale-21 and sociodemographic characteristics

2.6. Evaluation of Data

Data analysis [SPSS] was done with the 22.0 package program. The socio-demographic characteristics of the nurses are shown with numbers, mean, standard deviation, and percentage distribution values. Linear regression analysis was used to determine the effect of the Challenges to Stopping Smoking Scale-21 and sociodemographic characteristics on the Fagerström Test for Nicotine Dependence.

2.7. Ethical Principles of Research

Approval was obtained from the İnönü University Health Sciences Non-Interventional Clinical Research Ethics Committee to conduct the study (No= 2022/4221). Before starting the research, the purpose of conducting research was explained to the nurses, and verbal consent was obtained.

3. Results

In this section, the findings obtained from the research conducted to determine the effect of the difficulties of the nurses working in the hospital to quit smoking on nicotine addiction are presented. The descriptive characteristics of nurses are given in Table 1.

Table 1. Socio-demographic characteristics of the nurses

Introductory features	**n**	**%**
Gender		
Female	290	70.7
Male	120	29.3
Marital status		
Married	247	67.1
Single/Divorced	121	32.9
Child presence		
Yes	240	65.2
No	128	34.8
Educational status		
High school	42	11.4
University	293	79.6
Master's/PhD	33	9.0
Perceived income level		
Good	68	18.5
Middle	258	70.1
Bad	42	11.4
Perceived health level		
Good	179	48.6
Middle	176	47.8
Bad	13	3.6
Shift work		
All day long	127	34.5
Perpetual night	69	18.8
Shift change	172	46.7
Year of study		
1-3 years	78	21.2
4-6 years	15	4.1
7-9years	30	8.2
10-12 years	50	13.6
13-15 years and above	195	53.0
Clinic studied		
Policlinic	9	2.4
Services	177	48.1
Intensive care/reanimation	65	17.7
Operating room	5	1.4
Urgent	42	11.4
Other	70	19.0
Smoking status		
Yes	132	35.9
I was drinking	14	3.8
No	222	60.3
*** Thoughts to quit smoking**		
Yes	65	49.3
No	67	50.7
	X±SD	
Average age	37.09±9.61	
Smoking duration	16.47±1.54	

In the study, it was determined that 29.5% of the nurses had very mild, 28.0% mild, 12.1% moderate, 16.7% high, and 13.6% very high scores, and they generally had a score between 4.20 and mild-moderate.

Table 2 shows the item score averages of the scales used in the research.

Table 2. Scale score averages

Fagerström Test for Nicotine Dependence	**Points**	**Number**	**%**
So light	0-2 points	39	29.5
Light	3-4 points	37	28.0
Middle	5 points	16	12.1
High	6-7 points	22	16.7
Very high	8-10 points	18	13.6
Average ±sd	4.20±2.51		
Challenges to stopping smoking scale (CSS-21)			
Intrinsic Factors	28.89±8.06		
Extrinsic Factors	23.07±8.36		

Tablo 3. Explanation of Challenges to Stopping Smoking and Socio-Demographic Factors Affecting Fagerström Test for Nicotine Dependence with Regression Analysis (n=132)

Independent variables	**Unstandardized Coefficients**		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1.872	2.793		.670	.204
Age	-.087	.042	-.312	-2.063	**.041**
Gender	-.135	.0544	-.025	-.248	.804
Marital Status	.088	.351	.021	.251	.802
Child Status	.377	.659	.066	.573	.568
Level of education	-.131	.426	-.026	-.307	.759
Perceived income level	-.762	.337	-.188	-2.258	**.026**
Perceived health level	.657	.366	.153	1.795	.075
Working clinic	.013	.123	.008	.102	.919
Working in shifts	.317	.241	.115	1.320	.190
Smoking status	.045	.289	.027	.156	.876
Smoking duration	.114	.036	.436	3.148	**.002**
Thoughts to quit smoking	.462	.428	.091	1.078	.283
Instrinsic Factors	.087	.034	.281	2.601	**.011**
Extrinsic Factors	.001	.028	.004	.045	.964
	R=.583	R Square= .340	Adj R= .257	F=.4082	**p=.000**

The dependent variable: Fagerström Test for Nicotine Dependence

In Table 3, the difficulties of smoking cessation nurses (n=410) and the effect of socio-demographic characteristics on Nicotine addiction status were examined. The effect of characteristics based on qualitative data on Nicotine addiction status was determined and it was found as R=.583, R^2=.340, Ajd R=.257. It was determined that 34% of the total variance of the variables affecting the Nicotine Dependence Scale was explained by these variables, and the result was statistically significant ($p<0.05$). Age, perceived income level, duration of smoking, and internal factors sub-dimension of difficulties in quitting smoking were found to be effective on the Nicotine addiction test ($p<0.05$). It was determined that age and perceived income level had a negative (-.087,-.762) effect on the Nicotine addiction test, and the Nicotine addiction scores of the younger ones and nurses with low perceived income were higher.

It was determined that the duration of smoking and the difficulties of quitting smoking internal factors sub-dimension had a positive (.114, .087) effect on the Nicotine addiction test. According to this, it was determined that the nicotine addiction test scores of the nurses increased as the duration of smoking increased. In addition, it was determined that as the scores of the Internal factors sub-dimension of the nurses' Difficulty to Quit Smoking scale increased, their Nicotine addiction test scores increased.

It was found that gender, marital status, having a child, education level, perceived health level, clinic worked, working type, thought of quitting smoking, and the extrinsic factors sub-dimension of the scale of difficulties to quit smoking had no effect on the Nicotine addiction test ($p>0.05$) (Table 3).

4. Discussion

The findings obtained from this study, which was conducted to determine the effect of nurses' difficulties in quitting smoking, were discussed in line with the literature.

In the study, 35.9% of the nurses stated that they smoke. 45.5% of smokers stated that they were considering quitting smoking. In studies on nurses' smoking in our country, it has been determined that nurses smoke with a prevalence ranging between 30% and 52.8% [22- 28].

The international review found nurses' smoking rates at 25.8% in Northern Ireland and over 30% in Italy, Serbia and Spain [29]. In studies conducted around the world, the prevalence of smoking among healthcare workers was found to be between 21.7% and 65% [30-32].

In the study, it was shown that the mean score of the nicotine addiction scale of the nurses was between 4.20±2.51 and mild to moderate, and 30.3% of them had high nicotine addiction [high and very high]. In a study conducted with students of the Faculty of Medicine, 41.8% were found to have high nicotine addiction [33]. In the study of Sağlam et al. on healthcare workers, it was determined that 28.4% of them had high nicotine addiction [34]. In the Yiğitalp study, it was determined that the nicotine addiction scale score of nursing students was 4.7±2.8 and they had a high nicotine addiction of 35% [35].

In the study, it was determined that the smoking nurses [n=410] had a 34% effect on the Fagerstrom Nicotine addiction test for age, perceived income level, duration of smoking, and internal factors sub-dimension of difficulties in quitting smoking. In the study, it was determined that there was a negative relationship between the age of the nurses and Nicotine Addiction and that the younger ones used more cigarettes. In our study, it was determined that especially nurses in the 30-40 age group experienced higher nicotine addiction, and serious use decreased after the age of 40. In the study of Hassoy and Özvurmaz, it was determined that nurses aged 40 and over smoked significantly more than those under the age of 40 [27]. Our study is similar to the study of Üzer [25]. In their study with nurses working in the province of Muş, Sezgin, and Pirinççi reported that the rate of smoking is higher in nurses aged 31 and over [23]. It has been determined that more smoking patterns in women with higher education, such as nurses, disappear primarily in younger generations [36]. In the study of Sayan et al., it was observed that the rate of smoking increased as age increased and decreased after 34 years of age. This situation; It can be interpreted that as the number of years of smoking increases, the tendency to quit increases or the rate of starting smoking in this age generation is low [28]. In a study in the literature, the highest smoking age was found between the ages of 31-40 [37].

In the study, it was determined that there was a negative effect on the perceived economic level of nurses and nicotine addiction. It was determined that those with low economic level had higher nicotine addiction levels. In the study of Valencia et al. on patients, it was determined that all nicotine addictions were among poor and low-income individuals [38]. In the study of Maksimovic et al. on medical school students, it was determined that those with low family income had higher cigarette addiction [33].

In the study, it was determined that the smoking duration of the nurses had a positive effect on nicotine addiction. Accordingly, as the duration of smoking increases, nicotine addiction scores also increase.

In the study, the internal factors sub-dimension of the nurses' difficulties in quitting smoking positively affected nicotine addiction. Accordingly, it was determined that those who were forced to quit smoking due to internal factors had higher nicotine addiction scores.

Intrinsic factors sub-dimension of the scale determines the self-efficacy of the individual. The greater the internal difficulties experienced by the person, the lower their self-efficacy. The external factors sub-dimension covers the difficulties related to the external environment. At the same time, this scale is used to determine the difficulties experienced by individuals during their previous smoking cessation experiences. At the same time, the scale is suitable for detecting changes in difficulties over time and developing specific interventions [18]. A study conducted on smokers in Spain; stated that the most effective intervention to help smokers quit is a combination of medication and psychological support [54.6%], with willpower [37%] being the second-best treatment [40]. Maksimovic, in his study on medical students, stated that among the reasons that push students to become addicted to cigarettes, are affected by internal and external factors such as the habit of consuming coffee and alcohol, the thought of cigarettes in their spare time, the pressure of parents and their use [33].

5. Conclusion

In the study, it was determined that 30.3% of the nurses had high nicotine addiction. It was stated that 35.9% of the nurses were smokers and 45.5% of the smokers had the thought of quitting smoking. In the study, it was determined that the smoking nurses [n=410] had a 34% effect on the Fagerström Test for Nicotine Dependence for age, perceived income level, duration of smoking, and internal factors sub-dimension of difficulties in quitting smoking.

Ethical Statement

Approval was obtained from the İnonu University Health Sciences Non-Interventional Clinical Research Ethics Committee to conduct the study (No= 2022/4221).

Conflict of Interest

The authors declare that there is no conflict of interest.

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Author's Contribution

The author's contribution to the study is equal.

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