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Factors Affecting Cardiovascular Risk Awareness for Extreme Sports: Rafting Case

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Abstract

Purpose: *It is important to be aware of cardiovascular risk awareness in rafters to prevent sudden deaths. For this reason, this study aims to determine the factors affecting the cardiovascular risk awareness of rafters participating in rafting activities, which is considered an extreme sport.*

Material and methods: *The sample of the study consists of 1323 (n=651 female and n=672 male) volunteer rafters between the ages of 18 and 70 (31±10.43), who participated in rafting activities in Antalya Köprülü Canyon in June, July, and August 2023. The Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) Scale was used to measure the cardiovascular risk awareness of rafters.*

Results*: Statistical analysis revealed that the data differed by a small effect size (eta squared) significantly based on the variables of whether the rafters themselves (η^2=0.0237) or a family member had a chronic disease (η^2=0.0147), smoking (η^2=0.0072), following healthy diet recommendations (η^2=0.0283), and regularly doing exercises (η^2=0.0087) ($p<0.05$).*

Conclusions*: In accordance with the findings derived in the study, it was concluded that the above-mentioned variables affect cardiovascular risk awareness. Therefore, rafters can be protected from sudden deaths caused by cardiovascular issues by not smoking, following a healthy diet, and exercising.*

Key words: *Cardiovascular risk awareness, Extreme sport, Rafting*

INTRODUCTION

Cardiovascular illnesses, encompassing conditions such as coronary artery disease, atherosclerosis, hypertension, and heart failure, represent the predominant causes of mortality and morbidity in both industrialized and developing nations. Cardiovascular disease is a predominant global health issue. The World Health Organization indicates that the predominant cause of mortality is cardiovascular disease (CVD) [1]. Numerous symptoms and consequences associated with cardiovascular illnesses diminish patients' quality of life and hinder their productivity during middle age and early old age. The medical, surgical, and interventional management of cardiovascular illnesses exerts a significant economic burden on all nations and jeopardizes the sustainability of healthcare systems [2].

Gender, advanced age, family history of coronary artery disease, smoking, hypertension, dyslipidemia, elevated cholesterol levels, obesity, sedentary lifestyle, inadequate nutrition, excessive alcohol intake, psychosocial factors, and diabetes are recognized as both modifiable and non-modifiable risk determinants of cardiovascular diseases [3-4].

Khot et al. [5] posited that controlling cardiovascular risk factors can reduce morbidity and mortality risk by 80-90%. They also identified a significant correlation between cardiovascular risk awareness (CRA) and positive behaviors, including body weight management, nutrition, physical activity, and stress management. For this reason, measuring CRA levels in individuals, especially those in high-risk groups, is essential for enhancing awareness [6-7]. Low levels of CRA in individuals may hinder disease prevention and control [8].

Athletes are at an elevated risk for the development of cardiovascular diseases. The occurrence of sudden death among athletes due to cardiovascular diseases during training or competitions is a common phenomenon. The prevention of sudden death in athletes can be achieved through the identification of underlying cardiovascular conditions during pre-participation screenings. Athletes diagnosed with cardiovascular diseases exhibit an increased risk of sudden cardiac death relative to non-athlete individuals with similar conditions [9]. Corrado et al. [10] found that athletes face a 2.5-fold increased risk of sudden death relative to non-athletes. Harmon et al. [11] reported that 79 out of 514 athlete death cases in the United States were attributed to cardiovascular diseases. Holst et al. [12] reported that the incidence of sudden death among athletes aged 12-35 due to cardiovascular diseases was 1 in 82.645 in Denmark. A

study conducted in Denmark observed an increase in the number of athletes experiencing sudden death with advancing age [13].

Structural anomalies in the cardiovascular system are often identified as a cause of sudden death in young athletes under thirty-five years of age. Coronary artery disease is identified as the predominant cause of sudden death among athletes over the age of thirty [14]. Ventricular fibrillation is frequently cited as a primary cause of fatalities among athletes. A non-penetrating blow to the chest of athletes during the electrical excitability period of the ventricles may induce ventricular arrhythmia, potentially leading to sudden death or syncope secondary to polymorphic ventricular tachycardia linked to stress or emotion. Additionally, excessive vagotonin resulting from the abrupt cessation of exercise can cause asystolic syncope. Approximately 53% of athletes experiencing syncope have exercise-induced ventricular tachycardia, while 25% exhibit Wolf Parkinson White syndrome in their resting electrocardiography. Recent years have seen performance-enhancing substances, frequently utilized by professional athletes, implicated in instances of sudden athlete deaths [15-16,48,49].

The popularity of extreme sports, including rafting, diving, surfing, bungee jumping, and mountaineering, is steadily rising among adventure enthusiasts. Extreme sports, often engaged in by individuals seeking adrenaline, necessitate high levels of physical fitness and considerable willpower. Extreme sports, while highly exhilarating, present significant risks including injury, disability, and mortality [17].

Rafting, a highly favored extreme sport, has risks including injuries from impact, strain and overexertion, musculoskeletal diseases, panic attacks, and drowning. Participation in rafting activities poses significant risks for those with cardiovascular problems and pregnant women, including those in their first trimester [18]. An accidental collision between rafters with an oar or a rafter falling from the boat may result in injuries including bruises, muscle tears, sprains, fractures, contusions, and the potential risk of drowning [19]. The rafter's inadequate advantage from the 30-minute pre-activity training and suboptimal fitness exacerbate the previously indicated hazards. Certain rafters may get infectious infections following rafting activities due to exposure to contaminated water [20]. The intense exhilaration, fear, and panic associated with these hazards, combined with the significant effort needed to navigate between boulders and obstacles while maneuvering the raft with an oar in a high-flow stream, may increase the likelihood of a heart attack and sudden death. To mitigate the aforementioned risks, it is crucial for rafters to understand the determinants of CRA. Additionally, rafting is favored over other extreme sports because of its collaborative character, the absence of necessary technical expertise, its appropriateness for all age demographics, and its execution in natural environments. The research was carried out in Köprülü Canyon, Antalya, a notable destination both in Türkiye and globally. Köprülü Canyon is acknowledged as one of the most renowned and often traversed rafting destinations in Türkiye. The natural landscape, imbued with historical and cultural significance, offers a path appropriate for both novice and seasoned rafters, features convenient accessibility, and possesses a robust tourism infrastructure, rendering it very appealing. In the summer months, the canyon attracts considerable attention from both local and international tourists, with around seven thousand individuals rafting each day. The study was undertaken using rafting as a sample example, under the assumption that the findings would be relevant to a broader audience. This study tries to elucidate the parameters influencing the CRA of rafters. The findings presented herein are deemed to facilitate safe participation in rafting and other extreme sports, promote a healthy lifestyle, and enhance social well-being.

MATERIAL AND METHODS

Procedure

This study is designed as an analytical cross-sectional study.

Participants

The study sample comprises 1.323 volunteer rafters (651 female and 672 male), aged 18 to 70 years (mean age 31±10.43), who engaged in rafting activities in June, July, and August 2023 at Antalya Köprülü Canyon, a prominent tourist attraction in Türkiye.

Inclusion criteria

- Volunteering to participate in the study
- Aged between 18 and 70
- Having engaged in rafting at least once
- Having psychological well-being

Exclusion criteria

- Physical constraints that inhibit participation in rafting
- Pregnancy among female participants
- Substance addiction

Data collection tools

The cardiovascular disease risk factors knowledge level (CARRF-KL) scale

(CARRF-KL) Scale, which was adapted to Turkish and confirmed for its validity and reliability in Turkish by Arıkan et al. [21]. The internal consistency coefficient (Cronhbach alpha) of CARRF-KL was determined to be 0.768. CARRF-KL consists of 28 items. The first 4 items in the scale address the characteristics, protective measures and age factor associated with cardiovascular diseases; 15 items (items #5, 6, 9-12, 14, 18-20, 23-25, 27, 28) relate to the risk factors and 9 items (items #7, 8, 13, 15, 16, 17, 21, 22, 26) focus on the outcomes of alterations in risk behaviors. The scale items are presented to the participants as a full sentence, containing true or false statements, and the participants are expected to answer these statements as "Yes", "No" or "I don't know". Participants are awarded 1 point for each "correct answer", and no score is recorded for "I don't know" and "wrong" answers. The highest score achievable on the scale is is 28, and items 11-12-16-17-24-26 are reverse coded. No score is recorded for participants who reply these items as "It's true" are given 0 points; whereas "1" point is recorded for those who answered these items as "It's false" and those who answered other items as "It's true".

Statistical analysis

The data collected with the surveys administered via face-to-face interview technique were subsequently analyzed using the SPSS 26.0 package program, at 95% confidence interval and 0.05 significance level. Given that the number of observations exceeded 70, the Kolmogorov-Smirnov Test was employed to assess the normality of the data distribution. The data were found to be normally distributed, and the assumptions for parametric tests were satisfied; hence, parametric tests were employed in the statistical analyses. The significance of the difference between the means of two independent groups in terms of a continuous variable specified by measurement was determined with the Independent Samples t-test. The significance of the difference between the means of three or more independent groups was tested with One Way ANOVA, which is one of the Independent K Sample Tests. It was found that the variances were homogeneously distributed in the multiple comparisons between groups conducted in order to determine which groups the difference between three or more independent groups is concentrated in, Tukey HSD Test (a Post-Hoc Test) was used. The effect size was computed using the following formula to interpret the magnitude of the differences obtained from the statistical analyses [22].

EtaSquared= $t^2 / t^2 + N1 + N2 - 2$

The obtained eta squared values were interpreted according to the criteria proposed by Cohen [23].

- 0.01 = small effect
- 0.06 = medium effect
- 0.14 = large effect

RESULTS

The table 1 presented that the CRA data differed small effect size (eta squared) significantly based on the variables of whether the rafters themselves (η^2=0.0237) or a family member had a chronic disease (η^2=0.0147), smoking (η^2=0.0072), and following healthy diet recommendations (η^2=0.0283) ($p<0.05$). However, no statistically significant difference is observed with regard to the CRA level of male and female rafters depending on the gender variable ($p>0.05$). (Table 1).

The results in the table 2 indicate that there is no statistically significant difference between the CRA levels of rafters based on their age group and body composition ($p>0.05$), however there is a small effect size (eta squared) significant difference based on regularly doing exercises variable (η^2=0.0283) ($p<0.05$). (Table 2)

Table 1. Independent Groups T-Test Results Regarding Cardiovascular Risk Awareness Level

Variables	Groups	n	$\bar{X}$	Sd±	S_{error}	T-test	
						t	p

Gender	Female	651	32.56	2.41	0.09	0.983	0.326
	Male	672	32.42	2.57	0.10		
Chronic diseases	Yes	114	32.61	2.33	0.06	-5.670	0.000*
	No	1209	31.24	3.58	0.33		
Having a family member with a chronic disease	Yes	187	32.61	2.27	0.06	-4.445	0.000*
	No	1136	31.74	3.48	0.25		
Smoking	Yes	414	32.18	2.84	0.14	-3.097	0.002*
	No	909	32.63	2.31	0.07		
Compliance with healthy diet recommendations	Yes	1087	32.69	2.18	0.06	6.202	0.000*
	No	236	31.59	3.48	0.22		

* at 0.05 significance level

Table 2. One - way Analysis Of Variance Results Regarding Cardiovascular Risk Awareness Level

Variables	Groups	n	X̄	Sd±	F	p	Change	Mean Difference (I - J)
Age Groups	1 18-29 years of age	728	32.53	2.41	2.220	0.109		
	2 30-42 years of age	385	32.59	2.55				
	3 43 years and older	210	32.16	2.66				
	4 Total	1323	32.49	2.49				
Regularly doing exercises	1 No	399	32.16	2.94	5.778	0.003*		
	2 1-2 times a week	815	32.60	2.27			1-2	-0.436
	3 Min 3 days a week	109	32.91	2.22			1-3	-0.748
	4 Total	1323	32.49	2.49				
Body composition	1 Underweight	29	33.17	1.10	2.199	0.086		
	2 Normal	604	32.56	2.38				
	3 Overweight	590	32.47	2.59				
	4 Obese	100	32.00	2.78				
	5 Total							

* at 0.05 significance level

DISCUSSION

This study, which aims to reveal the determinants affecting the CRA levels of rafters to aid in preventing health issues and sudden deaths related to rafting activities. The findings indicate that the CRA levels of female and male rafters are comparable and that gender is not a direct determinant of CRA. Instead, factors such as education, access to health care services, and lifestyle are significant determinants that influence improvements in CRA, surpassing the impact of gender. In studies supporting this one, Haidinger [24], Jingi and Noubiap [25] presented evidence indicating that CRA levels in both women and men are comparable. Other studies in the literature suggest that the awareness of CR differs between women and men [26-27-28-29-30]. These differences are considered to result from a range of human, societal, and methodological factors. The socio-cultural framework of a society, gender norms, and health attitudes can significantly impact CRA. In certain societies, women's access to healthcare facilities may be restricted, whilst in others, men may receive less encouragement to cultivate health knowledge. Factors such as education level, health literacy, and accessibility to healthcare services also play a significant role in explaining gender-based differences. Furthermore, the data collection tools used in studies, demographic characteristics of the sample groups such as age, education, and health history, as well as the research methods employed (sample size, data analysis techniques, scale types, etc.) may contribute to the different results obtained. Therefore, when evaluating gender-based differences in CRA levels, these results should not only be attributed to gender but also considered in the context of an individual's social environment, education level, health behaviors, and the methodological framework of the study.

This study demonstrated that rafters with chronic illnesses exhibit elevated CRA levels. It is determined that patients with chronic disorders exhibit elevated CRA levels due to their necessity to routinely undertake health assessments, consult specialists, and diligently monitor information regarding their conditions in both visual and written media. Indeed, several recent research have corroborated this conclusion [31-32-33].

The study additionally established that rafters with a family member suffering from a chronic illness exhibit elevated CRA levels. Genetic factors, familial communication, and individual experiences may lead to the elevation of CRA levels in the aforementioned individuals. Literature indicates that having a family member with a chronic illness elevates CRA levels [28-34-35-36-37-38].

The study concluded that non-smoking rafters and those adhering to healthy diet recommendations exhibited elevated CRA levels. Avoiding smoking and following healty diet recommendations may enhance individuals' health awareness. Such behaviors frequently result in more deliberate decisions focused on minimizing health risks and may enhance awareness of cardiovascular health. Avoiding smoking and maintaining a healthy diet can enhance overall health awareness and foster a positive belief in disease prevention. Non-smokers who adhere to a healty diet are typically regarded as more health-conscious. These individuals demonstrate proactive behaviors aimed at mitigating health risks and making informed decisions to maintain cardiovascular health. Avoiding smoking and adhering to a healthy diet enhance individuals' health awareness and their conviction in disease prevention.

Current studies in the literature support this argument [28-29-39-40]. Monsuez et al. [41] argued that women who smoke have low CRA levels. Jacobs et al. [44] argued that malnourished individuals have low CRA levels whereas Güneş et al. [30] argued that non-smoking individuals and those who follow a healty diet recommendations have a high CRA level.

It was observed that CRA levels of the rafters participating in this study are similar, regardless of their age, thereby it was concluded that age does not affect the CRA level. However, some studies revealed that CRA is higher in older age groups [28-31-37-43]. Okobi et al. [44] stated that young and middle-aged individuals have higher CRA levels compared to older individuals. The observed differences can be attributed to the increasing health-related experience, the more frequent occurrence of chronic diseases, and the heightened necessity for medical check-ups that individuals typically encounter with advancing age, all of which contribute to enhanced health awareness. Conversely, in certain individuals, increasing age may restrict CRA levels due to diminished access to information, limited technology utilization, and challenges in accessing health-related resources.

This study revealed that rafters who who engaged in workouts 1-2 days per week and at least 3 days per week exhibited higher CRA levels compared to those who did not do any exercise. The rafters exhibiting the highest CRA levels were those who engaged in workouts at least three days per week. Similar studies concluded that individuals with high levels of physical activity and those who regularly engage in exercise exhibit elevated CRA levels [40-41-45].

This study indicated that body composition does not affect CRA levels, however other research has associated normal Body Mass Index (BMI) values with elevated CRA levels [29-45-46]. Koniak-Griffin and Brecht [47] argued in their studies similar hereto that BMI values have no effect on CRA levels. This discrepancy may be associated with individuals' health perceptions, body image, and lifestyle. Individuals with a normal BMI frequently engage in preventive health behaviors, including healthy eating and regular physical activity, potentially improving their overall health awareness. Conversely, certain individuals with overweight or obesity may possess insufficient knowledge regarding cardiovascular risks or may struggle to convert this knowledge into practical behavior, potentially contributing to the noted inconsistency.

CONCLUSION

The study findings suggest that rafters who have a chronic disease themselves or have a family member with a chronic condition, as well as those who do not smoke, follow healthy diet recommendations, and engage in regular physical activity, may tend to have higher levels of cardiovascular risk awareness. It is anticipated that the likelihood of health problems related to cardiovascular risks may be relatively lower in the aforementioned rafters. The study results further indicated that gender, age and body composition do not have an effect on CRA levels and that CRA levels of rafters with different gender, age and body composition are similar. The study shows that healthy lifestyle habits such as not smoking, eating healthily, and regular exercise may positively influence cardiovascular risk awareness, but it can be said that further research is needed to explore this relationship.Therefore, it was suggested that rafters should be encouraged not to smoke, to follow a healthy diet and to exercise. It is important to provide trainings to rafters to improve their CRA levels regardless of the aforementioned personal characteristics. Such strategies are significant as they will prevent the rafters to develop cardiovascular diseases and even to face a sudden death. Further considering that rafters are members of society, the mentioned strategies are also important in terms of improving overall public health.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethics statement

The studies involving human participants were reviewed and approved by Uşak University Social and Human Sciences Scientific Research and Publication Ethics Committee (protocol no: 2023/112/05 and date of approval 17.05.2023). The patients/participants provided their written informed consent to participate in this study.

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