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Editorial Office
Address: Trakya Üniversitesi Tıp Fakültesi
22030 Edirne, Türkiye
Phone: +90 (284) 235 76 53
E-mail: tmsj@trakya.edu.tr

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Turkish Medical Student Journal (TMSJ) is the first scientific journal in Turkey to be run by medical students and to publish works of medical students only. In that respect, TMSJ encourages and enables all students of medicine to conduct research and to publish their valuable research in all branches of medicine.

Turkish Medical Student Journal publishes researches, interesting case reports and reviews regarding all fields of medicine. The primary aim of the journal is to publish original articles with high scientific and ethical quality and serve as a good example of medical publications for those who plan to build a career in medicine. TMSJ believes that quality of publication will contribute to the progress of medical sciences as well as encourage medical students to think critically and share their hypotheses and research results internationally.

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CONTENTS

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Editorial

MENTAL HEALTH IN ACADEMIA

Concerns about mental health in the academic community have been growing in recent years. It is no surprise that mental health concerns are very common among university populations, including undergraduate, graduate students, and faculty staff. Studies that investigate mental health problems in academia show that subjects suffer from depression, anxiety, insomnia, and suicidal thoughts. Since talking about mental health is still considered a stigma, we can say the problem is much bigger than we think. These past two years with the COVID-19 pandemic have also caused a surge in these mental health problems. Distant education, offline classes, social distancing rules, and other pandemic measures have affected the level of anxiety and depression that the students and staff experience. Unfortunately, it seems that we are in the midst of an extensive mental health crisis. Although marginalized groups and minorities can be more vulnerable, anyone can experience these issues throughout academia.

Today, university students face challenges, unlike any other generation that came before them. The education costs are rapidly rising, and the competition for a limited quota is tough. The pandemic also poses a big uncertainty in terms of the economic, political, and social climate. The students are not only responsible for managing their academic programs, but also have to take care of their well-being amid all their responsibilities. Financial difficulties can also be a huge burden for the students and aggravate their mental health issues. Unfortunately, many students do not have job security after graduation. Therefore, financial hardships and fear of future unemployment may contribute to mental health concerns such as anxiety. The phrase “publish or perish” draws attention to the importance of making as many publications as possible to increase the scientific reputation of researchers in academia. This idiom expresses the off-the-record pressure that academics are subjected to. Early signs and symptoms of mental health issues can easily be masked by the established cultures of academia, such as overworking, productivity, and perfectionism. Signs of emotional distress are often seen as weakness or deemed irrelevant. People with mental health issues can be cast aside from academic circles and can be seen as not suitable to be in an academic position. Furthermore, students and staff may put their well-being aside and push their limits for the sake of being productive.

Everyone in the academic community has a responsibility to protect the mental health of themselves and the people around them. We need to take action to abandon the toxic cultures and traditions that we have been taught as much as we can and create a healthier work environment for future generations. We must protect and nurture enthusiastic students who are just starting in academia. We should try to educate ourselves to recognize the early signs of emotional stress in advance.

Beliz Koçyiğit
Editor-in-Chief, Turkish Medical Student Journal
Trakya University School of Medicine, Edirne, TÜRKİYE

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REVIEW

HPV, HPV VACCINATION WORLDWIDE AND CURRENT STATUS OF HPV VACCINATION IN TURKEY: A LITERATURE REVIEW

Janset Özdemir[1], Mert Yücel[1], Sarper Kızılkaya[1], Gizem Yıldırım[2], Irmak İrem Özyiğit[1], Zerrin Yuluğkural[3]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]Başkent University School of Medicine, Ankara, TÜRKİYE
[3]Trakya University School of Medicine, Department of Infectious Diseases and Clinical Microbiology, Edirne, TÜRKİYE

ABSTRACT

Human papillomavirus is the most common sexually transmitted viral infection in the world. The infection can cause cancers of the anus, vulva, vagina, penis, and oropharynx. There are more than one hundred subtypes of human papillomavirus, of which thirteen are the high-risk types that may cause cancer. Human papillomavirus 16 and 18 are the main types that are noted as high-risk, causing cancer and neoplasia. Cervical cancer is the fourth most frequent cancer among women worldwide, yet it is preventable and treatable when diagnosed early. Almost all cervical cancer cases are linked to infection with high-risk human papillomavirus subtypes, which are extremely common. Cervical cancer occupies a large place in cancer screening, diagnosis, and treatment. It is critical to include the vaccine in national vaccination programs in order to increase herd immunity to human papillomavirus. The human papillomavirus vaccine should be made accessible to everyone, as well as screening tests for human papillomavirus-related diseases. The awareness of human papillomavirus vaccines in immunization programs by health authorities can significantly increase the acceptability of the vaccine in communities. As of May 2022, the human papillomavirus vaccine is not included in the national vaccination program in Turkey. In our study, we have compiled why the human papillomavirus vaccine should be included in the vaccination calendar in Turkey, within the scope of the latest research on this subject.

Keywords: Cervical cancer, vaccination, human papillomavirus, viral infection, public health

INTRODUCTION

Human papillomavirus (HPV) is a group of viruses that are common all over the world. There are more than one hundred subtypes of HPV, of which 13 are high-risk subtypes that can cause cancers of the epithelial mucosal surfaces (1). There is evidence that HPV causes cancers of the anus, vulva, vagina, penis, oropharynx, and cervix (2). Cervical cancers are the fourth most common type of cancer encountered in women worldwide (3). Two types of HPV (HPV16 and 18) are known to cause 70% of cervical cancers and pre-cancerous lesions (3).

Human papillomavirus is transmitted through sexual contact or mucosal contact with an infected area (1). Various methods such as condom use, avoidance of direct contact, testing, and vaccination can be used to prevent the spread of HPV and the risk of cancer (2). Most countries have included the HPV vaccine in their vaccination calendar in order to reduce the economic burden of HPV (4). In our study, we presented general information on HPV and its vaccination, and have compiled why the HPV vaccine should be included in the vaccination calendar in Turkey, within the scope of the latest research on this subject.

Address for Correspondence: Janset Özdemir, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: jansetozdemir2018@gmail.com
ORCID iDs of the authors: JÖ: 0000-0001-7774-5068; MY: 0000-0002-4853-1607; SK: 0000-0002-7868-1585; GY: 0000-0001-5942-2169; IİÖ: 0000-0003-2443-0155; ZY: 0000-0002-0813-0403.
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EPIDEMIOLOGY

Human papillomavirus related diseases are the most common sexually transmitted viral infections in the world. It is accepted that most sexually active people are infected with at least one type of HPV at some point in their lives (5-7). The peak prevalence of HPV among young women is at the ages of 20 to 24 (8). However, the prevalence of HPV remains steady among men in all age groups (9, 10). In addition to cervical, penile, anal, vaginal, vulvar, and oropharyngeal cancers, HPV is associated with respiratory papillomatosis and anogenital warts (7). According to a systematic review of thirty-two studies conducted around the world, the annual incidence of anogenital warts ranged from 160 to 289 cases per 100,000 (11). The infection is transmitted through close skin-to-skin contact, most commonly through sexual contact (7). It can be transmitted by skin-mucous contact to the genital areas of the infected area of the person, such as the penis or female external genitalia, or areas such as the mouth and anus (7). Moreover, autoinoculation can occur from one part of the body to another (12).

Eighty-four percent of new cervical cancer cases and 90% of mortalities occur in middle- and low-income countries (13). Almost all cervical cancer cases are linked to infection with high-risk HPV (3). According to the World Health Organization (WHO), cervical cancer was diagnosed in around 570,000 women worldwide in 2018 and about 311,000 women died from the disease (3, 14). While the incidence of cervical cancer is relatively high in Central and Eastern European countries, around 14.9 cases per 100,000, it is lower in Western European countries with 6.9 cases per 100,000 (15). Turkey, on the other hand, has an age-adjusted incidence, which is 4.3 per 100,000 and its mortality is 1.7 per 100,000 (16). In addition, HPV16 and HPV18 are responsible for 75.4% of HPV-positive invasive cervical cancer cases in Turkey (17).

CLINICAL PRESENTATION

Human papillomavirus, a non-enveloped capsid virus with double-stranded DNA, enters the human body through cracks in the epidermis (18). Chronic infection, local infection, or dysplasia are degenerative changes that occur before malignancy (19). Regardless of gender, HPV can cause conditions and diseases in humans (20). HPV exposure can cause benign warts and cancers, though having no evident disease is more common (21). The immune system can recognize HPV and cure HPV infection (7). Therefore, HPV does not lead to the aforementioned conditions every time (7). In some cases, HPV was cleared from the body within two years (22). However, in organ-transplant and immunosuppressed patients, HPV-related diseases present themselves more frequently (e.g., anal cancer ratio of HIV-infected men is greater than HIV-negative men) and more complex due to widespread clinical presentations, creating a much larger burden (7, 23).

HPV-associated Cancers

Human papillomavirus is known to cause two main types of cancer: mucosal and skin (24). HPV is as a risk factor for oropharyngeal, anal, penile, and cervical cancers (25, 26). Benign lesions are more frequent even though high-risk types can also be detected in the head area, such as squamous cell carcinoma being the most common cancer of the oral cavity (27). HPV causes cervical cancers more commonly, though penile cancer rates of 20-60% are not negligible (28).

Cervical cancer is the only one that was admitted to the routine screening among HPV-associated cancers (3, 29). Especially HPV16 and 18 variants have a strong relationship with cervical cancer (19, 22, 30). It is estimated that 96% of cervical cancers are due to HPV (24). After the initial HPV exposure, precancerous lesions followed by cervical invasion create cervical cancer (29). The primary risk factor for cervical cancer is the male partner's sexual behavior (29).

TREATMENT

There is no generally accepted treatment for symptomatic HPV infection, though clinical studies continue to overcome this gap (31). Gene-Eden-VIR/Novirin is among those studies and achieved decreased time for HPV clearance with no adverse effect in one of its clinical trials (31).

Genital warts tend to regress by themselves with or without treatment due to their benign nature (7). Treatment of genital warts includes topical medications (podofilox gel, imiquimod cream, sinecatechins ointment) and only avails presenting symptoms (7, 32). Cryotherapy is another method to deal with warts, but, for widespread cases, surgical approaches are recommended (7, 32).

Radiotherapy, chemotherapy, and surgical removal of the infected tissues/organs are alternatives to manage to treat HPV-related cancers (33). For cervical cancer, different outcomes can be obtained depending on cancer staging, and it is easier to achieve complete resolution in stage 1A, while palliative care is the only option in stage 4B (21, 32). The desire for fertility, size of the tumor, and age of the patient may also affect the treatment plan of cervical cancer (7). Cisplatin is the primary option for chemotherapy, and cetuximab-based treatment could be an alternative for it (21, 34).

Notably, there are studies on therapeutic vaccines aiming to target HPV proteins and create an immune response without needing any further surgeries (35). However, there are still obstacles ahead, and currently, there is no approved therapeutic vaccine in use (35). Targeting E6 and E7 oncoproteins is in development for anal cancer besides many other epithelial neoplasms (36). Also, for penile cancer, studies targeting the HPV pathway with T-cell therapy in addition to chemotherapy are ongoing (28).

PROPHYLACTIC VACCINATION

Vaccines came into use mainly in the 20th century, and their impact on public health and mortality reduction was enormous (37). In general, elimination studies are carried out with vaccines against fourteen main diseases worldwide (38). A standardized vaccination scheme that focused on child vaccination was established within the scope of the Expanded Programme on Immunization (EPI) implemented by WHO in 1977 (38). This scheme has been expanded for different diseases in accordance with endemic countries and developing technology (38). Countries also have immunization programs associated with EPI and these vary depending on regional and country policies. Moreover, the HPV vaccine is included in vaccination programs in some countries (38).

Human papillomavirus vaccines are used for recognizing the natural immunity toward L1 capsid protein and providing antibody protection (39). The vaccines include L1 major capsid proteins that resemble HPV particles (38). There are three licensed vaccines against disease-causing HPVs: divalent Cervarix (HPV16 and 18), a tetravalent Gardasil (HPV6, 11, 16, and 18), and a nine-valent Gardasil 9 (HPV6, 11, 16, 18, 31, 33, 45, 52, and 58) (38, 40). All three contain the two high-risk HPV subtypes (HPV16 and 18). Furthermore, Gardasil prevents infections of HPV6 and 11, which are responsible for 90% of genital warts, and Gardasil 9 inhibits five more HPV subtypes that are responsible for 10% to 20% of cervical cancers (40). HPV vaccines are projected to be a profitable option primarily to reduce the incidence of cervical cancer and anogenital HPV infections (41).

World Health Organization aims to vaccinate 90% of all girls by the age of 15 years, to screen 70% of women aged 35-45 years twice, to ensure that at least 90% of all precancerous lesions detected during screening are cured. Thus, it aims to reduce the age-specific incidence of cervical cancer to less than 4 per 100,000 women worldwide (42). American Cancer Society recommends HPV vaccinations to girls and boys aged 9-14 years and young male adults and suggests HPV vaccines for young female adults aged 14-26 years to be recommended by consulting with healthcare professionals and making a clinical decision after the risks are understood. WHO does not recommend HPV vaccination primarily to males and argues that priority should be given to females at risk of cervical cancer. However, the Centers for Disease Control and Prevention (CDC) suggest the Gardasil vaccine for young males (40). In addition, WHO does not recommend HPV vaccination during pregnancy, especially considering the risk of spontaneous abortion (43).

Global Policies

Human papillomavirus infection constitutes approximately 2% of the total cancer burden in more developed countries and almost 7% in less developed countries (38). Different policies are followed regarding HPV vaccination around the world. HPV vaccines for girls are on the vaccination schedule in forty-five countries, mostly in Europe (38). These HPV vaccines on the vaccination schedule are covered by various insurance systems of the countries (38). Besides, there are licensed HPV vaccines in more than a hundred countries (40). The thirty countries that are a part of the European Economic Area all had the HPV vaccination introduced in their national vaccination programs, except for Romania where it was introduced in 2008 but discontinued after low rates of public acceptance (44, 45). Three HPV vaccines have been licensed in Europe: bivalent, quadrivalent, and nonavalent, publicly known and marketed as Cervarix, Gardasil 4 or Silgard, and Gardasil 9, respectively (46). Poland is the sole country in the European Union that requires full out-of-pocket payment for HPV vaccination (45). In Slovakia, the amount of required payment varies between the types of licensed HPV vaccines (45). In other countries, vaccination is provided free of charge (44). In the United States of America, the Vaccines for Children program funded by the federal government is the main way for children who otherwise do not have access to vaccines, to receive HPV vaccination (47). Although the program provides vaccines at no cost, it only covers children under 18 years of age who are uninsured, Medicaid-eligible, a program that provides health coverage to low-income American citizens, or American Indian/Alaska Native (47, 48). Even though the vaccination can be started at the age of 9 years, the CDC recommended age is 11-12 years (47). The nonavalent vaccine (Gardasil 9) is the only HPV vaccine currently authorized by the federal United States government (49). In Latin America where 64,000 new cases of cervical cancer and 26,000 deaths from it were reported each year, nine countries remain to have introduced the HPV vaccine as of December 2016 (Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Guatemala, Martinique, Nicaragua, and Venezuela) (50). China has no HPV vaccination program (51). Bivalent HPV (Cervarix), quadrivalent HPV (Gardasil), and nonavalent HPV (Gardasil 9) are all licensed in China, but they are reported to be expensive and in limited supply (51). In India, similar to China, despite the recommendation by the National Technical Advisory Group on Immunization an HPV vaccination program has not been implemented as of 2018 (52). As of June 2019, nine Sub-Saharan African countries have included HPV vaccination in their National Immunization Programs: Botswana, Lesotho, Rwanda, Sao Tome and Principe, Senegal, Seychelles, South Africa, Uganda, Mauritius, and twenty-two additional countries have HPV vaccine demonstration projects in motion (53). Both of these statistics are in a prime position to increase considerably as international organizations such as the Global Alliance for Vaccines and Immunization and the Program for Appropriate Technology in Health, along with the WHO and United Nations Children's Fund, have generated substantial momentum around HPV vaccination in Sub-Saharan African countries (54).

Global Awareness and Acceptability

Even though its effectiveness is debated, increasing the knowledge of HPV is suggested as one of the methods to improve HPV vaccine uptake (55). Awareness and acceptability of HPV vaccination have been major factors in the success of

individual countries' vaccination programs, one example of this being the Romanian HPV vaccination program falling out due to a low level of public acceptance (44). A major part of the public perception of HPV vaccination is the view of parents (55). Parents of adolescents who had no intention of having their children vaccinated in a 12-month window expressed their reasoning as their child not being at a proper age for vaccination while closely associating it with the age of sexual activity (56).

The emergence of social media and the transition of a new generation into adulthood has shown the potential to positively affect awareness of HPV (57, 58). Although social media creates a more comfortable environment for sharing knowledge on HPV and enables the general public to engage with more information, social media can be used to spread negative content as well (58). Positive content on social media about HPV and HPV vaccination was reported to be associated with greater vaccine coverage, and the negative content on it had adverse effects on its public perception (58). With these in mind, it is important to note that positive content about HPV was able to reach larger audiences compared to its negative counterpart (57, 58).

Evaluation of the Current Status of Turkey

World Health Organization recommends nationwide screening of cervical cancer in all countries (38). According to the national cancer screening standards in Turkey; every woman between 30 to 65 years of age should be screened with HPV-DNA and Pap smear test every five years (38). Screenings are carried out free of charge at Cancer Early Diagnosis, Screening and Training Centers, Family Health Centers, Community Health Centers, and Healthy Life Centers (38). WHO recommends the administration of two doses of vaccination to girls, 6-12 months apart, before sexual intercourse (between 9-14 years of age) (38). However, HPV vaccines are not included in any vaccination program in Turkey. There are two main interventions in the country's policies in the fight against cervical cancer in general (59). First of which screening tests are developed for early diagnosis as a secondary prevention tool, and secondly, vaccination is developed to prevent long-term infection of the agent, which is a primary prevention tool, and its transformation into cancer (59). The decisive factor in including HPV in the vaccination program is whether it is cost-effective. The main argument for cost-effectiveness is the years of life gained by preventing deaths (38). There are not many studies conducted on the cost-effectiveness of the HPV vaccine in Turkey. However, according to Sözmen et al. (60), it was seen that administering two doses of vaccine alone is cost-effective, while vaccination without expanding the current screening program is less so. Additionally, a cost-effectiveness study found that HPV vaccines are very cost-effective to administer in the general population (38). Furthermore, in various survey studies conducted in Turkey, the level of awareness of certain groups about HPV infection, screening, and vaccines was investigated. The general public's knowledge about HPV vaccines was less than their knowledge about cervical cancer and screening, and the most conscious group was found to be health personnel. The group with the least awareness about HPV infection and vaccines is adolescent girls. The results are shown in Table 1 (61-67). In different questionnaires, physicians and students were asked about HPV vaccination-related questions, such as awareness about HPV vaccination, thoughts about their fees, and HPV vaccines being included in the national immunization program was investigated. In general, the results of the surveys with the most supportive responses from students (medical, midwifery, etc.) and physicians are shown in Table 2 where only about 7% of midwifery students are aware of the fact that vaccination may prevent cervical cancer (68-76). Moreover, according to a survey study conducted by Adıgüzel et al. (70), the most common reason for the low HPV vaccination rate in Turkey was that HPV vaccines were not included in the national vaccination program.

It is important to include the HPV vaccine in national vaccination programs to increase herd immunity to HPV (77, 78). This will not only help to eliminate socio-economic inequalities in access to vaccines but also reduce the prevalence of HPV-related diseases. Thus, it will contribute to more efficient use of resources in the health system (77). Early diagnosis of cervical cancer is of great importance for effective treatment (79).

Table 1: A review of several studies conducted in Turkey that examined the general knowledge on HPV.

Study, year	Population	Number of participants	Heard about pap smear (%)	Heard about cervical cancer (%)	Heard about HPV (%)	Heard about HPV vaccination (%)
Pınar et al. (61), 2010	Patients admitted to OB/GYN	471	78.8	92.6	N/A	57.7
Ozan et al. (62), 2011	Patients admitted to OB/GYN	336	51.8	86.6	33.6	44.6
Çetin et al. (63), 2014	Adolescent girls	501	N/A	34.2	22.2	11.7
Görkem et al. (64), 2015	Health personnel in the university hospital	192	97.9	89.1	91.7	85.4
Adıgüzel et al. (65), 2016	Patients admitted to OB/GYN	426	N/A	55.4	39.4	33.1
Kürtüncü et al. (66), 2018	Mothers of 10-15-year-old daughters	100	88	91	53	67
Çelik (67), 2018	Parents of children aged 9-18 years	1000	N/A	64.8	26.9	20.7

HPV: Human papillomavirus, OB/GYN: Obstetrics and gynecology, N/A: Not available

Table 2: The opinions of students and physicians on HPV vaccination-related questions.

Study, year	Population	Number of participants	HPV vaccination prevents cervical cancer (%)	HPV vaccination is expensive (%)	Would recommend HPV vaccination to their patients/ relatives (%)	HPV vaccination should be in the national vaccination program (%)	HPV vaccination is also in use for males (%)
Yıldırım et al. (68), 2009	Pediatricians	438	76.9	76.9*	91.1	N/A	77.4
Çeşmeci et al. (69), 2015	Intern doctors	208	67.3	41.8*	N/A	82.7	90.4
Adıgüzel et al. (70), 2018	Pediatricians	90	N/A	17.8*	38.9	N/A	45.6
Kızılca Çakaloz et al. (71), 2018	Midwifery students	257	6.6	N/A	78.4	85.2	N/A
Aydın (72), 2019	Family physicians	247	57.9	24.7*	35.2	51	42.5
Başlı et al. (73), 2019	Nursing, midwifery, nutrition-dietetics students	287	N/A	9.8*	N/A	87.1	49.1
Erdem et al. (74), 2020	Medical students	85	100	93	98	94	98
Emre et al. (75), 2020	Medical students	780	N/A	25.9*	74.2	69	79.7
Taşar et al. (76), 2021	Pediatricians	98	N/A	7.1*	60.2	N/A	84.7

HPV: Human papillomavirus, N/A: Not available
*The reason for not recommending/getting HPV vaccination is that the patients/participants could not afford it due to the price of the vaccine.
**The percentages indicate/show the group of participants who agrees with the given statements.

Early diagnosis of HPV-positive individuals by popularizing screening tests may alleviate the problems associated with HPV-related diseases, but it is clear that it is not a sufficient strategy alone for the formation of herd immunity.

According to a statement made by the Turkish Medical Association in 2019, in cancer screening programs in Turkey, it is seen that the resources and labor spent are not used appropriately, as there are data losses and monitoring problems (80). In another statement by the Turkish Medical Association in October 2021, it was requested that HPV vaccines be added to the national vaccination program free of charge, in addition to national screening, to prevent avoidable diseases and deaths (81). As the spread of the vaccine will reduce HPV-related diseases, it may create an opportunity for more efficient resources and workforce management (82). However, data losses and monitoring problems are a concern for future research and public health. To prevent future cases and reduce the prevalence of HPV-related diseases, the HPV vaccines should be made accessible to everyone, as well as screening tests.

Studies conducted with different populations in different regions of Turkey reveal that participants' awareness of HPV, cervical cancer, and HPV vaccines is not at a sufficient level, and the prevalence of HPV is similar to other studies in the literature (83-85). A study conducted in Denmark revealed that although there is free access to the vaccine, vaccination rates are affected by the socioeconomic and educational levels of the families (86). This indicates that free access to the vaccine is not a sufficient factor on its own, thus it is also important to work on raising social awareness. As of May 2022, the HPV vaccine is not included in the national vaccination program in Turkey and it is not a vaccine that can be accessed by everyone due to its cost. Although there are requests from time to time to increase awareness of HPV and to include HPV in the national vaccination program with the support of non-governmental organizations and social media campaigns, there has been no development in this direction yet.

CONCLUSION

Due to its carcinogenic types, HPV occupies a large place in cancer screening, diagnosis, and treatment and creates a demand for prevention methods worldwide (25). The wide spectrum of genital cancers, various clinical presentations, the possibility of malignancy, and the vaccine still not being available to the entire population make it an important issue to deal with, especially in low-income countries (21, 35).

In conclusion, the inclusion of HPV vaccines in vaccination programs by health authorities and policies can encourage community acceptance of HPV vaccines. Especially, the participation of countries that do not have HPV vaccines in their national vaccination programs will be an important initiative in terms of protecting public health. In this context, the inclusion of the HPV vaccine in the national vaccination program of Turkey will contribute to the protection of public health with more efficient resource management.

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REFERENCES

1. Ahmed HG, Bensumaidea SH, Alshammari FD et al. Prevalence of human papillomavirus subtypes 16 and 18 among Yemeni patients with cervical cancer. Asian Pac J Cancer Prev 2017;18:1543-8. [Crossref]
2. Centers for Disease Control and Prevention (CDC). Genital HPV infection – Fact Sheet (cited 2022 January 14). Available from: URL: https://www.cdc.gov/std/hpv/stdfact-hpv.htm. [Crossref]
3. World Health Organization (WHO). Human papillomavirus (HPV) and cervical cancer (cited 2022 January 14). Available from: URL: https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer. [Crossref]
4. Wigle J, Coast E, Watson-Jones D. Human papillomavirus (HPV) vaccine implementation in low and middle-income countries (LMICs): health system experiences and prospects. Vaccine 2013;31:3811-7. [Crossref]
5. Manini I, Montomoli E. Epidemiology and prevention of human papillomavirus. Ann Ig 2018;30(4 Supple 1):28-32. [Crossref]
6. Handler MZ, Handler NS, Majewski S et al. Human papillomavirus vaccine trials and tribulations: clinical perspectives. J Am Acad Dermatol 2015;73:743-56. [Crossref]
7. Dunne EF, Park IU. HPV and HPV-associated diseases. Infect Dis Clin North Am 2013;27:765-78. [Crossref]
8. Hariri S, Unger ER, Sternberg M et al. Prevalence of genital human papillomavirus among females in the United States, the National Health And Nutrition Examination Survey, 2003-2006. J Infect Dis 2011;204:566-73. [Crossref]
9. Chin-Hong PV, Vittinghoff E, Cranston RD et al. Age-Specific prevalence of anal human papillomavirus infection in HIV-negative sexually active men who have sex with men: the EXPLORE study. J Infect Dis 2004;190:2070-6. [Crossref]
10. Giuliano AR, Lu B, Nielson CM et al. Age-specific prevalence, incidence, and duration of human papillomavirus infections in a cohort of 290 US men. J Infect Dis 2008;198:827-35. [Crossref]
11. Patel H, Wagner M, Singhal P et al. Systematic review of the incidence and prevalence of genital warts. BMC Infect Dis 2013;13:39. [Crossref]
12. Centers for Disease Control and Prevention (CDC). Human Papillomavirus (cited 2022 January 14). Available from: URL: https://www.cdc.gov/vaccines/pubs/pinkbook/hpv.html. [Crossref]
13. Hull R, Mbele M, Makhafola T et al. Cervical cancer in low and middle-income countries. Oncol Lett 2020;20:2058-74. [Crossref]
14. World Health Organization (WHO). Cervical cancer (cited 2022 January 14). Available from: URL: https://www.who.int/health-topics/cervical-cancer#tab=tab_1. [Crossref]
15. Kesic V, Poljak M, Rogovskaya S. Cervical cancer burden and prevention activities in Europe. Cancer Epidemiol Biomarkers Prev 2012;21:1423-33. [Crossref]
16. Öztürker C, Sönmez G. Endometrium ve serviks kanserlerinde görüntüleme. Trd Sem 2015;3:1-11. [Crossref]
17. Usubütün A, Alemany L, Küçükali T et al. Human papillomavirus types in invasive cervical cancer specimens from Turkey. Int J Gynecol Pathol 2009;28:541-8. [Crossref]
18. Sapp M, Bienkowska-Haba M. Viral entry mechanisms: human papillomavirus and a long journey from extracellular matrix to the nucleus. FEBS J 2009;276:7206-16. [Crossref]
19. Pal A, Kundu R. Human papillomavirus E6 and E7: The cervical cancer hallmarks and targets for therapy. Front Microbiol 2020;10:3116. [Crossref]
20. Nweke MC, Okolo CA, Daous Y et al. Challenges of human papillomavirus infection and associated diseases in low-resource countries. Arch Pathol Lab Med 2018;142:696-9. [Crossref]
21. Schiffman M, Doorbar J, Wentzensen N et al. Carcinogenic human papillomavirus infection. Nat Rev Dis Primers 2016;2:16086. [Crossref]
22. Dong Z, Hu R, Du Y et al. Immunodiagnosis and immunotherapeutics based on human papillomavirus for HPV-induced cancers. Front Immunol 2021;11:586796. [Crossref]
23. Tschandl P, Rosendahl C, Kittler H. Cutaneous human papillomavirus infection: manifestations and diagnosis. Curr Probl Dermatol 2014;45:92-7. [Crossref]
24. Brianti P, De Flammineis E, Mercuri SR. Review of HPV-related diseases and cancers. New Microbiol 2017;40:80-5. [Crossref]
25. Hutter JN, Decker CF. Human papillomavirus infection. Dis Mon 2016;62:294-300. [Crossref]
26. Burd EM, Dean CL. Human papillomavirus. Microbiol Spectr 2016;4. [Crossref]
27. Candotto V, Lauritano D, Nardone M et al. HPV infection in the oral cavity: epidemiology, clinical manifestations and relationship with oral cancer. Oral Implantol (Rome) 2017;10:209-20. [Crossref]
28. Johnston MJ, Nigam R. Recent advances in the management of penile cancer. F1000Res (serial online) 2019 April (cited 2022 January 20):8:(9 screens) Available from: URL: https://f1000research.com/articles/8-558/v1. [Crossref]
29. Chelimo C, Wouldes TA, Cameron LD et al. Risk factors for and prevention of human papillomaviruses (HPV), genital warts and cervical cancer. J Infect 2013;66:207-17. [Crossref]
30. Oumeslakht L, Ababou M, Badaoui B et al. Worldwide genetic variations in high-risk human papillomaviruses capsid L1 gene and their impact on vaccine efficiency. Gene 2021;782:145533. [Crossref]
31. Polansky H, Itzkovitz E, Javaherian A. Human papillomavirus (HPV): systemic treatment with Gene-Eden-VIR/Novirin safely and effectively clears virus. Drug Des Devel Ther 2017;11:575-83. [Crossref]
32. Ufuk İ, Muhammed A, Nilay I. Human papilloma virus (hpv) current treatment and protection procedure. Journal of Health Sciences 2017;26:189-92. [Crossref]
33. Fundakowski CE, Lango M. Considerations in surgical versus non-surgical management of HPV positive oropharyngeal cancer. Cancers Head Neck 2016;1:6. [Crossref]
34. Kofler B, Laban S, Busch CJ et al. New treatment strategies for HPV-positive head and neck cancer. Eur Arch Otorhinolaryngol 2014;271:1861-7. [Crossref]
35. Crosbie EJ, Einstein MH, Franceschi S et al. Human papillomavirus and cervical cancer. Lancet 2013;382:889-99. [Crossref]
36. Symer MM, Yeo HL. Recent advances in the management of anal cancer. F1000Res 2018;7:F1000 Faculty Rev-1572. [Crossref]
37. Plotkin S, Orenstein W, Offit P, Edwards K. Plotkin's Vaccines. 7th ed. Elsevier. 2018.p.1-15. [Crossref]
38. Şahin ÇE. HPV aşısının ulusal aşı programına eklenmesi açısından maliyet-etkililiğinin değerlendirilmesi. İstanbul: İstanbul Univ. 2021. [Crossref]
39. Murray PR, Rosenthal KS, Pfaller MA. Medical Microbiology. 8th ed. Canada: Elsevier Inc; 2016.p.414. [Crossref]
40. Brooks GF. Ise Jawetz, Melnick and Adelberg's Medical Microbiology. 26th ed. The McGraw-Hill; 2013.p.647. [Crossref]
41. Bonde U, Joergensen JS, Lamont RF et al. Is HPV vaccination in pregnancy safe? Hum Vaccin Immunother 2016;12:1960-4. [Crossref]
42. Arbyn M, Weiderpass E, Bruni L et al. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. Lancet Glob Health 2020;8:191-203. [Crossref]
43. Forman D, de Martel C, Lacey CJ et al. Global burden of human papillomavirus and related diseases. Vaccine 2012;30(Suppl 5):12-23. [Crossref]
44. Nguyen-Huu NH, Thilly N, Derrough T et al. Human papillomavirus vaccination coverage, policies, and practical implementation across Europe. Vaccine 2020;38:1315-31. [Crossref]

45. Craciun C, Baban A. "Who will take the blame?": understanding the reasons why Romanian mothers decline HPV vaccination for their daughters. Vaccine 2012;30:6789-93. [Crossref]
46. Publications Office of the European Union. European guidelines for quality assurance in cervical cancer screening Second edition – Supplements. (Serial Online) 2015 Aug (cited 2022 January 14) Available from: URL: https://op.europa.eu/en/publication-detail/-/publication/a41a4c40-0626-4556- af5b-2619dd1d5ddc. [Crossref]
47. Centers for Disease Control and Prevention (CDC). Vaccines for Children Program (VFC) (cited 2022 January 14). Available from: URL: https://www.cdc.gov/vaccines/programs/vfc/index.html. [Crossref]
48. Medicaid. Program History. (Serial Online) (Cited 2022 January 14) Available from: URL: https://www.medicaid.gov/medicaid/index.html. [Crossref]
49. Hirth J. Disparities in HPV vaccination rates and HPV prevalence in the United States: a review of the literature. Hum Vaccin Immunother 2019;15:146-55. [Crossref]
50. Luciani S, Bruni L, Agurto I et al. HPV vaccine implementation and monitoring in Latin America. Salud Publica Mex 2018;60:683-92. [Crossref]
51. Zou Z, Fairley CK, Ong JJ et al. Domestic HPV vaccine price and economic returns for cervical cancer prevention in China: a cost-effectiveness analysis. Lancet Glob Health 2020;8:1335-44. [Crossref]
52. Das M. Cervical cancer vaccine controversy in India. Lancet Oncol 2018;19:e84. [Crossref]
53. Bruni L, Albero G, Serrano B et al. Human Papillomavirus and Related Diseases in the World. Summary Report 17 June 2019. Barcelona (Spain) ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre): 2019 Jun. [Crossref]
54. Deignan C, Swartz A, Cooper S et al. Stakeholders' understandings of human papillomavirus (HPV) vaccination in Sub-Saharan Africa: a rapid qualitative systematic review. Vaccines (Basel) 2021;9:496. [Crossref]
55. Jacobson RM, Agunwamba AA, St Sauver JL et al. The most effective and promising population health strategies to advance human papillomavirus vaccination. Expert Rev Vaccines 2016;15:257-69. [Crossref]
56. Darden PM, Thompson DM, Roberts JR et al. Reasons for not vaccinating adolescents: National Immunization Survey of Teens, 2008-2010. Pediatrics 2013;131:645-51. [Crossref]
57. Cocchio S, Bertoncello C, Baldovin T et al. Awareness of HPV and drivers of HPV vaccine uptake among university students: a quantitative, cross-sectional study. Health Soc Care Community 2020;28:1514-24. [Crossref]
58. Ortiz RR, Smith A, Coyne-Beasley T. A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination. Hum Vaccin Immunother 2019;15:1465-75. [Crossref]
59. Yöntem M, Gümüş A, Abalı R et al. Human papilloma virüs (HPV) varlığının cinsel aktif kadınlarda moleküler metodlarla değerlendirilmesi. Academic Platform Journal of Engineering and Science 2019;7:217-21. [Crossref]
60. Sözmen K, Tözün M, Baydur H et al. Türkiye'de serviks kanseri taramasının yaygınlaştırılmasının ve insan papilloma virüs aşısı'nın uygulanmasının maliyet etkililiğinin değerlendirilmesi. In: Eskiocak M, İrgil E, Kurt AÖ, Nahcivan N, Etiler N, editors. 17. Ulusal Halk Sağlığı Kongresi. Proceedings of the 17. Ulusal Halk Sağlığı Kongresi; Oct 20-24; Edirne, Türkiye; 2014.p.503-4. [Crossref]
61. Pınar G, Topuz Ş, An Ş et al. Başkent Üniversitesi Ankara Hastanesi kadın hastalıkları ve doğum polikliniğine başvuran kadınların HPV aşısı ve serviks kanseri ile ilgili bilgi düzeyleri. Türk Jinekolojik Onkoloji Dergisi 2010;1:11-8. [Crossref]
62. Ozan H, Çetinkaya Demir B, Atik Y et al. Kadın hastalıkları ve doğum polikliniğine başvuran hastaların human papilloma virüs ve hpv aşısı hakkındaki bilgi düzeylerinin belirlenmesi. Uludağ Üniversitesi Tıp Fakültesi Dergisi 2011;37:145-8. [Crossref]
63. Çetin O, Verit FF, Keskin S et al. Knowledge levels of adolescent girls about human papilloma virus and its vaccine. Turk Arch Pediatr 2014;49:142-7. [Crossref]
64. Görkem Ü, Toğrul C, İnal HA et al. Knowledge and attitudes of allied health personnel in university hospital related to Human Papilloma Virus and the vaccine. Turk Hij Den Biyol Derg 2015;72:303-10. [Crossref]
65. Adıgüzel FI, Adıgüzel C, Seyfettinoğlu S et al. HPV awareness and HPV vaccine acceptance among women who apply to the gynecology outpatient clinics at a tertiary referral hospital in the south Mediterranean region of Turkey. Med J Bakirkoy 2016;12:136-9. [Crossref]
66. Kürtüncü M, Arslan N, Alkan I et al. Knowledge, attitude and behaviors of the mothers of 10-15 year old daughters regarding cervical cancer and HPV vaccine. Journal of Human Sciences 2018;15(2):1072-85. [Crossref]
67. Çelik P. Hpv aşısı hakkında ailelerin bilgi, tutum ve davranışlarının değerlendirilmesi. Ankara: Ankara Yıldırım Beyazıt Üniv. 2018. [Crossref]
68. Yıldırım M, Düzovalı Ö, Kanık A et al. Knowledge and Attitudes of The Pediatricians in Turkey Regarding Human Papillomavirus (HPV) Vaccine. J Pediatr Inf 2009;3:62-8. [Crossref]
69. Çeşmeci Y, Köylü B, Sulaiman J et al. HPV infection and hpv vaccine through the eyes of interns. The Turkish Journal of Gynecologic Oncology 2015;3:85-92. [Crossref]
70. Adıgüzel A, Akgül S, Düzçeker Y et al. Çocuk hekimlerinin human papilloma virus aşıları hakkındaki bilgi ve eğilimleri. Çocuk Sağlığı Hastalıkları Dergisi 2018;61:53-8. [Crossref]
71. Kızılca Çakaloz D, Öztürk G, Çoban A et al. Determination of the Knowledge and Opinions of Midwifery Students about Cervical Cancer and Human Papilloma Virus Vaccination. Journal of Adnan Menderes University Health Sciences Faculty 2018;2:55-64. [Crossref]
72. Aydın B. HPV aşısı hakkında aile hekimlerinin bilgi düzeyleri, tutum ve davranışlarının değerlendirilmesi. Ankara: Ankara Yıldırım Beyazıt Üniv. 2019. [Crossref]
73. Başlı M, Aksu H, Toptaş B. Knowledge and views about human papilloma virus and hpv vaccine of school of health high students who studyıng at a unıversity. Journal of Ankara Health Sciences 2019;1:1-17. [Crossref]
74. Erdem HA, Işıkgöz Taşbakan M, Şanlıdağ G et al. Aşı oluyoruz, peki gerçekten biliyor muyuz?: HPV aşısı olan tıp fakültesi öğrencilerinin HPV infeksiyonu ve aşısı ile ilgili bilgilerinin değerlendirilmesi. FLORA 2020;25:62-8. [Crossref]
75. Emre N, Özşahin A, Edirne T. Pamukkale University Medical Faculty Students' Knowledge Level of Human Papilloma Virus Infection and Vaccine. Euras J Fam Med 2020;9:42-50. [Crossref]
76. Taşar S, Bal Yüksel E, Sağcan D et al. Knowledge and Attitudes of Pediatricians towards The Human Papilloma Virus Vaccines. Forbes J Med 2021;2:19-24. [Crossref]
77. Castle PE, Maza M. Prophylactic HPV vaccination: past, present, and future. Epidemiol Infect 2016;144:449-68. [Crossref]
78. Spinner C, Ding L, Bernstein DI et al. Human papillomavirus vaccine effectiveness and herd protection in young women. Pediatrics 2019;143:e20181902. [Crossref]
79. Centers for Disease Control and Prevention (CDC). Cancers Caused by HPV (cited 2022 January 14). Available from: URL: https://www.cdc.gov/hpv/parents/cancer.html. [Crossref]
80. Türk Tabipleri Birliği (TTB). Kanser taramalarında sorunlar giderilemiyor (cited 2022 January 14). Available from: URL: https://www.ttb.org.tr/haber_goster.php?Guid=6b8bfdaa-6295-11e9-994d-fcf6dd719ec4. [Crossref]
81. Türk Tabipleri Birliği (TTB). TTB, HPV Aşılarının Ulusal Aşı Takvimine Eklenmesini İstedi (cited 2022 January 14). Available from: URL: https://www.ttb.org.tr/haber_goster.php?Guid=d44ec376-30ac-11ec-a1a7-c5959a4589e2. [Crossref]
82. Ankara Tabip Odası. HPV aşısıyla binlerce kadının hayatı kurtulabilir (cited 2022 January 14). Available from: URL: https://ato.org.tr/news/show/1008. [Crossref]
83. Aynaci G, Guksu Z. Awareness of HPV and HPV vaccination in undergraduate students in the North West region of Turkey: near future outlook. J Infect Dev Ctries 2019;13:516-25. [Crossref]
84. Sahin HG, Kolusari A, Guducuoglu H. Prevalence of high risk human papillomavirus (HPV) infection and abnormal cervical cytology and knowledge about HPV vaccine in Eastern Turkey. Eur J Gynaecol Oncol 2017;38:241-4. [Crossref]
85. Özdemir S, Akkaya R, Karaşahin KE. Analysis of community-based studies related with knowledge, awareness, attitude, and behaviors towards HPV and HPV vaccine published in Turkey: a systematic review. J Turk Ger Gynecol Assoc 2020;21:111-23. [Crossref]
86. Slåttelid Schreiber SM, Juul KE, Dehlendorff C et al. Socioeconomic predictors of human papillomavirus vaccination among girls in the Danish childhood immunization program. J Adolesc Health 2015;56:402-7. [Crossref]

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ORIGINAL ARTICLE

EFFECTS OF THE COVID-19 PANDEMIC ON THE DEMOGRAPHIC OF ONCOLOGICAL PATIENTS AND THE USE OF PET/CT UTILIZATION

Ceren Yüksel[1], Berkin Ersoy[2], Elif Cengiz[1], Eylül Şenödeyici[1], Gizem Yıldırım[3], Dengiz Koray Şahintürk[1], Mustafa Alperen Koşucu[1], Fatma Selin Soyluoğlu[4]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]University of Hamburg School of Medicine, Hamburg, GERMANY
[3]Başkent University School of Medicine, Ankara, TÜRKİYE
[4]Trakya University School of Medicine, Department of Nuclear Medicine, Edirne, TÜRKİYE

ABSTRACT

Aims: Although the coronavirus disease-2019 (COVID-19) pandemic has created various health problems in many people, it has also caused disruptions in the clinical management of patients with existing cancerous diseases. This retrospective cohort study aims to observe the impact of the COVID-19 pandemic on positron emission tomography/computed tomography (PET/CT) utilization, which has an important role in the diagnosis, staging, and follow-up of cancer patients.

Methods: The data of 6,053 patients who have undergone PET/CT imaging from 2019 to 2021 at the Nuclear Medicine Department of Trakya University School of Medicine was analyzed. To examine the situation before and after COVID-19 pandemic, we compared the data of 6-month periods from March 11 to September 8, from 2019 to 2021, starting from March 11, 2020, when the first case was seen in Turkey. Patients' age, type of cancer, and date of the PET/CT scans were recorded.

Results: The mean ages of the patients admitted in 2019, 2020, and 2021 were 61.93±13.09, 61.16±13.29, and 61.57±13.78 years, respectively. Bronchus and lung cancer were the most common cancer type regardless of year or age group, with an average of 29.37%. The second and the third most common types of cancer were breast cancer with 9.60% and prostate cancer with 8.31%, respectively. When compared with April 2019, PET/CT scan numbers declined in April 2020. We observed a negative correlation between the number of PET/CT scans and the number of COVID-19 cases from week one through week five.

Conclusion: The COVID-19 outbreak had an important effect on PET-CT scans performed at Trakya University School of Medicine.

Keywords: COVID-19, PET-CT scan, pandemic

INTRODUCTION

Ever since the World Health Organization declared the spread of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) a pandemic, many countries imposed new restrictions against its spread (1). Clinical management of coronavirus disease-2019 (COVID-19) at hospitals offers various medical treatments and supportive care options such as mechanical ventilatory support, supplemental oxygen, etc. (2). The number of non-COVID-19 patients coming to hospitals for urgent needs has decreased significantly, as healthcare resources are predominantly reserved for the demands of COVID-19 patients and outpatients had a fear of contracting the virus from hospitals (3). Medical imaging centers and radiology departments have also been negatively impacted by public policies prioritizing COVID-19 patients, with

Address for Correspondence: Ceren Yüksel, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: crnyuksel2@gmail.com
ORCID iDs of the authors: CY: 0000-0003-2456-7282; BE: 0000-0001-7111-648X; EC: 0000-0002-5902-2904; EŞ: 0000-0002-4132-1594; GY: 0000-0001-5942-2169; DKŞ: 0000-0001-9865-0930; MAK: 0000-0002-2381-5099; FSS: 0000-0003-4473-7138.
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many seeing declines in medical imaging case volumes (4).

Cancer, medically known as a malignant neoplasm, is either the first or second cause of death before reaching the age of 70 in majority of countries (5). Early diagnosis of the disease vastly increases the chance of effective treatment, and various screening tests can be used (6). Positron emission tomography/computed tomography (PET/CT) is a screening test introduced in the first decade of the 21st century and gaining popularity among researchers working on oncology (7). PET can detect tissue metabolism disorders, and CT shows changes in structures (8). This imaging technique is currently the most popular because of its advantages. PET/CT is highly effective in detecting metabolically active malignancies due to its increased specificity and sensitivity (9).

This retrospective cohort study aims to observe the impact of the COVID-19 pandemic on PET/CT use by investigating the relationship between PET/CT imaging volume and weekly COVID-19 cases.

MATERIAL AND METHODS

This retrospective cohort study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: TÜTF-BAEK 2022/02).

Patients who underwent PET/CT imaging at the department of nuclear medicine of Trakya University School of Medicine, between March 2019-August 2021 were retrospectively evaluated. Patients who underwent F-18 fluorodeoxyglucose PET/CT and 68-Ga labeled prostate-specific membrane antigen PET/CT imaging for oncological diagnosis, staging, restaging, or treatment response, and whose demographic data could be obtained, were included in the study.

Data was analyzed for 6-month periods from March 11 to September 8, for the years 2019, 2020, and 2021. The weekly variance in the number of PET/CT scans in correlation to confirmed COVID-19 cases in Turkey was investigated. The data regarding patient demographics were classified by age and the type of malignancy. The mean age of the patients was calculated to investigate the effects of the COVID-19 pandemic on patients admitted to the hospital for PET/CT scans.

Statistical Analysis

The statistical analysis was performed using IBM SPSS version 27.0 (SPSS Inc., Chicago, IL, USA). Microsoft Excel (version 16.50) and Graph Prism (GraphPad Prism version 8.0.0 for Windows, GraphPad Software, San Diego, California USA) were also used in the statistical analysis of our study. Simple linear regression was used to evaluate the relationship between weekly COVID-19 cases and the weekly number of procedures. The Mann-Whitney U test was used to determine the difference in the number of performed PET/CT scans from 2019 to 2021. The data of patients aged 65 years and older were evaluated separately, in order to get a better sense of the effects of the COVID-19 pandemic on high-risk age groups. The test was utilized to see if there were any associations between the 6-month periods from March 11 to September 8, from 2019 to 2021, especially after the first confirmed case of COVID-19 was declared in Turkey in March 2020. A p-value of <0.05 was considered to be statistically significant.

RESULTS

In this retrospective study, 6,053 patients were included. Malignant neoplasm of bronchus and lung was the most common diagnosis in 2019, 2020, and 2021 with a total percentage of 29.37%. The top ten most common causes of referrals were, in descending order: bronchus and lung cancer, breast cancer, prostate cancer, specified and unspecified types of non-Hodgkin lymphoma, disseminated malignant neoplasms, colon cancer, laryngeal cancer, rectal cancer, stomach cancer, multiple myeloma, and malignant plasma cell neoplasms, respectively. The percentage of each diagnosis by year is shown in Table 1.

The mean ages of the patients admitted in 2019, 2020, and 2021 were 61.93±13.09, 61.16±13.29, and 61.57±13.78 years, respectively. The mean age of all three years was 61.56±13.39 years. The number of admissions by age intervals (<18, 18-65, >65 years) was also analyzed, and the only statistically significant decrease was observed in the number of patients aged over 65 years in the first year of the pandemic compared to the previous year (p=0.008). The number of patients over 65 years was 942, 821, and 957 in 2019, 2020, and 2021, respectively.

Table 1: The percentages of ten most common cancer types.

	2019 (%)	2020 (%)	2021 (%)	Total (%)
Bronchus and lung cancer	30.82	31.32	26.25	29.37
Prostate cancer	8.27	6.55	10.00	8.31
Non-Hodgkin lymphoma	7.89	7.74	7.28	7.63
Breast cancer	7.50	11.48	12.13	9.60
Disseminated malignant neoplasm	7.45	7.74	7.52	7.57
Colon cancer	4.74	3.90	3.40	4.01
Laryngeal cancer	3.05	2.81	3.15	3.01
Rectal cancer	2.81	3.06	2.52	2.46
Stomach cancer	2.66	2.23	1.65	2.18
Multiple myeloma and malignant plasma cell neoplasms	2.61	2.13	1.65	2.26

The age distribution of the patients was seen as follows: 1% of the patients were under 18 years, 44.9% of the patients were over 65 years, and the majority of the patients were between 18-65 years with a rate of 53.4%. The age data of 0.7% (42 patients) of the patients' could not be reached. Considering the most common diagnoses in patients aged under 18 years, between 18-65 years, and 65 years and over in 2019, 2020, and 2021, it can be said that bronchus and lung cancer is the most common cancer type regardless of age groups.

When each cancer group (ten most common types in 2019) was evaluated by years (Figure 1), it was seen that there was a decrease in the number of bronchus and lung cancer, non-Hodgkin lymphoma, prostate cancer, colon cancer, laryngeal cancer, and multiple myeloma cases. Only breast cancer and rectal cancer cases were increased in 2020.

The number of COVID-19 cases has increased until the 2nd week of April 2020 and reached the peak, while the number of patients undergoing PET/CT scanning has shown a statistically significant decrease (p=0.008). In the following weeks, it is seen that the number of cases started to decrease and the number of patients screened began to increase. After mid-June 2020, it can be said that both the number of cases and screening admissions remained stable on average. In general, there was a decrease in the number of scans at the beginning of the pandemic, and as the number of COVID-19 cases decreased, applications for PET/CT scans started to increase again (Figure 2). Neither in 2020 (p=0.390) nor 2021 (p=0.410) did this initial decline in the total number of PET/CT scans following the COVID-19 outbreak was statistically significant. However, the increase in the number of weekly COVID-19 cases resulted in a decline in procedures performed through 2020 (p=0.001).

DISCUSSION

Given the severity of the clinical consequences of COVID-19 for cancer patients, clinicians had to decide whether to continue or delay cancer screenings as planned to reduce the risk of infection, especially during the initial outbreak of the new SARS-CoV-2 (10). Compared to April 2019, we observed a significant decrease in the total number of PET/CT scans in April 2020, which may have occurred due to insufficient knowledge of the epidemiological and clinical features of the new disease. A slight decrease was observed in the number of PET/CT scans in April 2021 compared to 2019, but the numbers were still higher than in 2020 in the same period. This slight increase may have been due to extensive research on COVID-19, the development of vaccines against the virus, and the general public's adaptation to the pandemic, which provides healthcare professionals with information to combat the new disease. Despite the initial decrease in the total number of PET/CT scans following the COVID-19 pandemic, no significant reductions were detected in 2020 or 2021.

Older adults are at higher risk for adverse clinical outcomes of COVID-19 (11). After the first outbreak, in April 2020, a significant decrease was observed in the number of PET/CT scans of patients over the age of 65 compared to baseline. However, there was no significant decrease over the following year. Similarly, no significant change was observed in patients under the age of 18 and between the ages of 18-65.

The COVID-19 pandemic has had different effects on the imaging of certain types of cancer. According to Table 1, among the ten most prevalent cancer types we looked at, the percentage of cases screened for six types of cancer (i.e., prostate cancer, colon cancer, stomach cancer, laryngeal cancer, non-Hodgkin lymphoma, and multiple myeloma and malignant plasma cell neoplasms) decreased while the percentage of other four types (i.e., bronchus and lung cancer, breast cancer, rectal cancer, and disseminated malignant neoplasm) increased. The highest decrease in the percentage of screened cases was observed in prostate cancer by 1.72% and the highest increase in the percentage of cases screened was observed in breast cancer by 3.98%. In parallel with our study, Kaufman et al. (12) also showed a decrease in new cases of same six cancer types during the COVID-19 pandemic period.

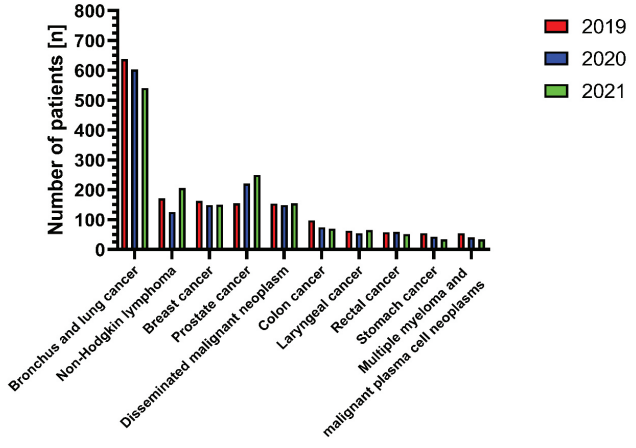

Figure 1: Number of patients regarding each of the most common ten cancer types in 2019, 2020, and 2021.

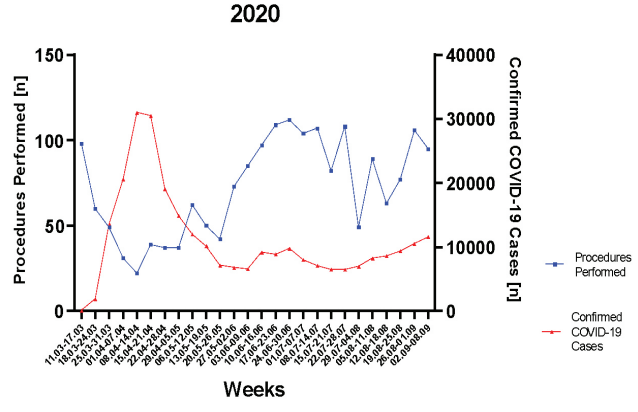

Figure 2: Number of PET/CT scan procedures performed and confirmed COVID-19 cases in Turkey between March 2020 and September 2020.
PET/CT: Positron emission tomography/computed tomography, COVID-19: Coronavirus disease-2019

It was estimated that the imaging volume for radiology applications would decrease by 50-70% in the first 3-4 months of the pandemic (13). Although our data show that PET/CT scans were not affected by this magnitude, the increase in the weekly number of COVID-19 cases still resulted in a decrease in procedures performed in 2020. On March 11, 2020, the first confirmed COVID-19 case was reported in Turkey. There was a significant decrease in the number of PET/CT scans from week one to week five, with a negative correlation as expected with the number of confirmed COVID-19 cases. The negative correlation between the transactions performed and the confirmed cases lasted for eight weeks. This instant volume loss can be interpreted as a result of the government-issued "stay at home" order for people aged 65 years and over on March 21, 2020. Another reason would be the anxiety of patients and their caregivers since even from the beginning of the outbreak, cancer patients were placed in high-risk groups which are most likely to die due to developing severe symptoms of COVID-19. However, one study showed that, among the five different imaging models, PET/CT scans were the least affected because oncological patients needed continuous and immediate treatment (14). Eleven weeks after the first confirmed case of COVID-19 patient in Turkey, improvement in imaging volume began to be seen, but it would be wrong to interpret this as a complete recovery, as after increasing for five weeks, the number of performed procedures showed irregular increases and decreases, regardless of the increasing number of COVID-19 cases. It would not be wrong to say that the public has adapted to the pandemic as time has passed and that the relaxation of social distancing regulations in the summer months of the year 2020 led to an increase in COVID-19 cases and a simultaneous increase in PET/CT scans.

A possible limitation of this study may be the small number of patients under 18 years of age and the lack of age-related data for 42 patients. Another limitation is that the analyzed data were obtained from only one hospital. Multicenter studies will provide a better understanding of the impact of the COVID-19 pandemic on nuclear medicine and radiology departments on a national or global scale.

CONCLUSION

The COVID-19 outbreak had a statistically significant effect on PET/CT scans, especially in the first weeks of the outbreak. Different cancer types were affected differently. There were no statistically significant changes in the number of scans performed on patients aged 18-65 years.

Ethics Committee Approval: This retrospective cohort study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: TÜTF-BAEK 2022/02).

Informed Consent: Informed consent was obtained from all of the subjects.

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REFERENCES

1. World Health Organization. Director-General's media briefing on COVID-19. (serial online) (cited 2022 January 25). Available from: URL: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. [Crossref]
2. Centers for Disease Control and Prevention (CDC). Treatments your healthcare provider might recommend if you are sick. (serial online) (cited 2022 January 25). Available from: URL: https://www.cdc.gov/coronavirus/2019-ncov/hcp/therapeutic-options.html. [Crossref]
3. Jeffery MM, D'Onofrio G, Paek H et al. Trends in emergency department visits and hospital admissions in health care systems in 5 states in the first months of the COVID-19 pandemic in the US. JAMA Intern Med 2020;180:1328-33. [Crossref]
4. Naidich JJ, Boltyenkov A, Wang JJ et al. Impact of the coronavirus disease 2019 (COVID-19) pandemic on imaging case volumes. J Am Coll Radiol 2020;17:865-72. [Crossref]
5. Sung H, Ferlay J, Siegel RL et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209-49. [Crossref]
6. Schiffman JD, Fisher PG, Gibbs P. Early detection of cancer: past, present, and future. Am Soc Clin Oncol Educ Book 2015;57-65. [Crossref]
7. Scarsbrook AF, Barrington SF. PET-CT in the UK: current status and future directions. Clin Radiol 2016;71:673-90. [Crossref]
8. National Health Service. Clinical commissioning policy statement: positron emission tomography-computed tomography (PET-CT) guidelines (all ages). (serial online) (cited 2022 February 15). Available from: URL: https://www.england.nhs.uk/commissioning/wp-content/uploads/sites/12/2015/10/b02psa-emssn-tomogrphy-guids-oct15.pdf. [Crossref]
9. Colleran GC, Kwatra N, Oberg L et al. How we read pediatric PET/CT: indications and strategies for image acquisition, interpretation and reporting. Cancer Imaging 2017;17:28. [Crossref]
10. Adin ME, Uezono H, Isufi E et al. Clinical PET/CT utilization during the COVID-19 pandemic: initial experience at Yale University. Nucl Med Commun 2021;42:1277-84. [Crossref]
11. Garg S, Kim L, Whitaker M et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus Disease 2019 - COVID-NET, 14 States, March 1-30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:458-64. [Crossref]
12. Kaufman HW, Chen Z, Niles J et al. Changes in the number of US patients with newly identified cancer before and during the coronavirus disease 2019 (COVID-19) pandemic. JAMA Netw Open 2020;3:e2017267. [Crossref]
13. Cavallo JJ, Forman HP. The economic impact of the COVID-19 pandemic on radiology practices. Radiology 2020;296:E141-4. [Crossref]
14. Norbash AM, Moore AV Jr, Recht MP et al. Early-stage radiology volume effects and considerations with the coronavirus disease 2019 (COVID-19) pandemic: adaptations, risks, and lessons learned. J Am Coll Radiol 2020;17:1086-95. [Crossref]

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ORIGINAL ARTICLE

COMPARISON OF ERGOGENIC SUBSTANCE USE AND PHYSICAL ACTIVITY LEVELS IN TRAKYA UNIVERSITY SCHOOL OF MEDICINE AND SCHOOL OF HEALTH SCIENCES STUDENTS

Görkem Şekerci[1], Övgü Güneş Varlık[1], Mert Akaltın[1], Nihayet Fırat[2], Necdet Süt[3], Selma Arzu Vardar[2]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]Trakya University School of Medicine, Department of Physiology, Edirne, TÜRKİYE
[3]Trakya University School of Medicine, Department of Biostatistics and Informatics, Edirne, TÜRKİYE

ABSTRACT

Aims: Ergogenic substances are nutritional supplements that are commonly used as enhancers of physical activity. The aim of this study is to examine the use of ergogenic substances and their relationship with physical activity levels in medical and health science students.

Methods: The short form of the International Physical Activity Questionnaire was applied to the students of Trakya University School of Medicine and School of Health Sciences, and a survey was used to collect data such as height, weight, gender, chronic disease, and ergogenic substance usage. The survey and questionnaire were conducted online based on voluntary participation. The Shapiro-Wilk, Mann-Whitney U, and Pearson's chi-squared and Fisher's exact tests were used to evaluate the results. A total of 196 students, of which 76 were male and 120 were female, participated in this study.

Results: Among the 196 students that participated in this study, the average body mass index of the students was 22.4 kg/m^2. Protein powder and vitamins were found as the most preferred ergogenic substances by the participants. The metabolic equivalent of task scores were calculated to determine the participants' level of physical activity. Of the participants, 32 (16.3%) were physically inactive, 134 (68.4%) were in the minimally active group, and 30 (15.3%) were in the physically active group. The mean metabolic equivalent of the task score of all participants was 1,765. The average metabolic equivalent of task score of those who used ergogenic substances was found to be significantly higher than the average score of the participants who did not use ergogenic substances.

Conclusion: The results of our study showed that physically active students in medical and health science schools may be more prone to using ergogenic substances than physically inactive students.

Keywords: Ergogenic substance, medical students, physical activity

INTRODUCTION

Ergogenic aids are defined as training techniques, biomechanical devices, nutritional support, and pharmacological support that improve training adaptation and exercise performance (1). Various nutritional supplements that are used for increasing the efficiency and the recovery period of an exercise are considered ergogenic substances (2). The use of ergogenic substances and dietary supplements as sports performance enhancers has increased in recent years (2). Vitamins, minerals, caffeine, protein powders, creatine, L-carnitine, carbohydrates, and amino acids are some of the most frequently used substances (3-5).

Restricted substances such as anabolic-androgenic steroids, beta-2 agonists, erythropoietin receptor agonists, or methods used by athletes before a competition to gain an unfair advantage by increasing performance, endurance, or speed are defined as doping (6). These substances might also be harmful

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Address for Correspondence: Mert Akaltın, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: mertakaltin7@gmail.com
ORCID iDs of the authors: GŞ: 0000-0001-8953-7143; ÖGV: 0000-0003-1075-9910; MA: 0000-0002-7847-4826; NF: 0000-0002-2331-1691; NS: 0000-0001-6678-482X; SAV: 0000-0002-1073-1718.
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since there is a risk they might cause health problems (6). Due to ergogenic substances being legal, athletes tend to use these with high-performance expectancy (6). The difference between these two terms is that doping creates an unfair advantage by increasing physical and/or psychological performance before the competition (6).

Due to the increase in the use of ergogenic substances in recent years, this study aims to reveal the prevalence and perspectives of ergogenic substance use among medical and health science students and to understand the relationship between the use of ergogenic substances and the physical activity levels.

MATERIAL AND METHODS

This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (protocol code: TUTF-BAEK 2020/187). This study was carried out online due to the coronavirus disease-2019 (COVID-19) pandemic between the dates 9 September 2020 to 14 October 2020, and 218 students from the Trakya University School of Medicine and School of Health Sciences participated voluntarily by filling out a 21-question survey regarding height, weight, gender, chronic disease information, ergogenic substance use, and the short form of the International Physical Activity Questionnaire-short form (IPAQ-SF) (Table 1). The answer options were added to the original IPAQ questionnaire, in order to make the score calculations easily. The data in the study was obtained from 196 participants since the data of the remaining 22 participants were found inadequate. The participants' body mass index (BMI) was calculated.

Participants who stated that they use ergogenic substances at least once were asked to answer questions about the type of substances they use, the reasons for their usage, the source of the information they received about ergogenic substances, the presence of side effects, whether they affected their sports performance, and how they obtained the substances. The results were evaluated overall with the total responses given by participants who stated that they weekly used ergogenic substances.

In addition to this questionnaire, IPAQ-SF was applied to the participants in order to determine their physical activity levels. The metabolic equivalent of task (MET) scores were calculated based on the answers given by the participants (7).

The standardized use of IPAQ is to determine the levels of exercise and sedentariness of an individual. IPAQ was developed to determine the physical activity levels of participants between the ages of 15 to 65, and the validity and reliability study of IPAQ in Turkey has already been carried out (7, 8). IPAQ has two forms of administration, long and short forms. The short form includes 7 questions about time spent sitting, walking, doing moderate and vigorous physical activities, while the long form of the questionnaire has 27 questions and categorizes activities into different aspects such as occupational, household, leisure, transport, etc. (8). In our study, the short form of the questionnaire was used for easier application.

The MET score is an indicator of physical activity based on how long a person exercises per day, how many days per week, and the type of physical exercise (7, 8). The exercises are divided into three groups according to IPAQ: vigorous (e.g., weightlifting, aerobic exercise), moderate (e.g., tennis, speed cycling at normal speed, swimming), and low intensity (e.g., walking) (7, 8). There are MET coefficients for each category. The coefficient of vigorous-intensity activity was determined as 8 MET, the coefficient of moderate-intensity activity was determined as 4 MET, and the coefficient of low-intensity activity was determined as 3.3 MET (7, 8).

Participants were divided into 3 groups according to their MET scores. Participants with a MET score below 600 were considered physically inactive, those with a score between 600-3000 were considered minimally active, and those with a MET score above 3000 were considered physically active. The exercise times of the participants were taken at intervals (for example, 30-60 minutes), and the maximum and minimum MET scores of

Table 1: IPAQ-short form questions and options.

Questions	Options
1A. During the last 7 days, how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?	None, 1 day, 2 days, 3 days, 4 days and more
1B. How much time did you usually spend doing vigorous physical activities on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
2A. During the last 7 days, how many days did you do moderate physical activities like carrying light loads, cycling at a regular pace, or doubles tennis? (Do not include walking.)	None, 1 day, 2 days, 3 days, 4 days and more
2B. How much time did you usually spend doing moderate physical activities on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
3A. During the last 7 days, how many days did you walk for at least 10 minutes at a time?	None, 1 day, 2 days, 3 days, 4 days and more
3B. How much time did you usually spend walking on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
4. During the last 7 days, how much time did you spend sitting on a weekday?	Do not know/Not sure, 3-4 hours, 4-5 hours, 5-6 hours, 6-7 hours, 7-8 hours, 8 hours and more

IPAQ: International Physical Activity Questionnaire

the individuals were calculated according to the responses given to calculate the MET score.

Statistical Analysis

Minimum MET scores were used in the statistical analysis of the study with the aim of being more inclusive (7, 8). IBM SPSS version 28.0.1 was used for statistical analysis. The conformity of the quantitative data to the normal distribution was examined via IBM SPSS using the Shapiro-Wilk test. The mean BMI, standard deviation, 95% confidence interval, and median (minimum-maximum) values were calculated. The Mann-Whitney U test was used to compare the total MET score between the groups of ergogenic substance use. The Pearson's chi-squared and Fisher's exact tests were used to compare students' ergogenic substance use status according to physical activity categories. The value of $p<0.05$ was accepted as the cut-off value of statistical significance.

RESULTS

Gender distribution of 196 participants included in this study was found to be 76 and 120, for men and women, respectively. One hundred ninety one (97.4%) of the participants were between the ages of 18-24, while 5 (2.6%) were aged 25 years or above. The average BMI of the students participating in the study was 22.4±3.4 kg/m^2. The 95% confidence interval was found to be between 21.9 and 22.9 kg/m^2. The minimum BMI value was 16.8 kg/m^2 and the maximum BMI value was 32.4 kg/m^2. The BMI of the participants were classified according to the Obesity Diagnosis and Treatment 2019 Guidelines of the Turkish Endocrinology and Metabolism Society (9). Twenty one participants were in the underweight (BMI: <18.5 kg/cm^2) group, 131 participants were in the normal (BMI: 18.5-24.9 kg/cm^2) group and 41 participants were in the overweight (BMI: 25-29.9 kg/cm^2) group, 3 participants were in the slightly obese (BMI: 30-34.9 kg/cm^2) group. There were no participants with BMI above 35 kg/cm^2.

The number of participants who regularly use ergogenic substances was found to be 21 (10.7%). Nine (4.6%) participants stated that they used ergogenic substances at some point in their lives, but they do not use them regularly. It was determined that ergogenic substances are mostly used by the participants to increase their body muscle mass rapidly (Figure 1). There was a total of 175 participants who stated that they did not use ergogenic substances, of which 140 participants stated that they did not feel the need to use ergogenic substances. Thirty of the participants said that they found ergogenic substances to be unhealthy, and 2 of the participants said that they had read harmful information regarding these substances. Three participants who do not use ergogenic substances did not answer this question.

The distribution of ergogenic substance preferences is shown in Figure 2. There are participants who used different ergogenics at the same time. Our study determined that the 21 participants who used ergogenic substances regularly mainly preferred protein powder 11 (26%) and vitamins 11 (26%). Ten (45.5%) of our participants obtained ergogenic substances via the internet and 7 (31.8%) from pharmacies. It was also stated that ergogenic substances were supplied from supermarkets, sports facilities, or sports stores. Seventeen (81%) of the participants stated that they decided to use ergogenic substances by their preferences, and 4 (19%) stated that they started with the recommendation of a medically licensed professional.

When the sources of information participants received about ergogenic substances were questioned, it was found that among 21 participants who regularly use ergogenic substances, 12 (57.1%) received information through the internet, radio, television, or social media, 3 (14.3%) from a medical doctor, and 3 (14.3%) from a dietitian. In addition, 1 (4.8%) participant received information from a friend and 1 (4.8%) from articles while 1 (4.8%) did not receive any information.

The effects of ergogenic substances on exercise performance were questioned. Eighteen (85.7%) of the participants who used ergogenic substances stated that they had a significant positive or negative effect, and 3 (14.3%) stated that they were undecided. Eighteen (85.7%) of the 21 participants who used ergogenic substances stated that ergogenic substances had

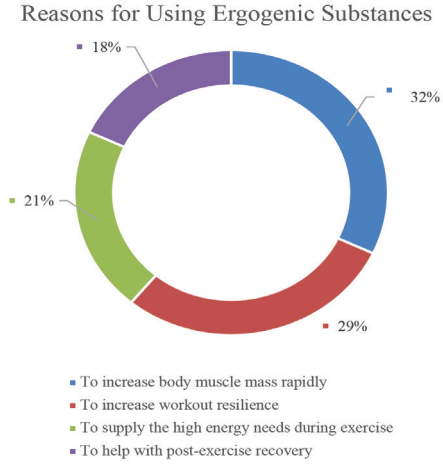

Figure 1: Reasons for taking ergogenic substances.

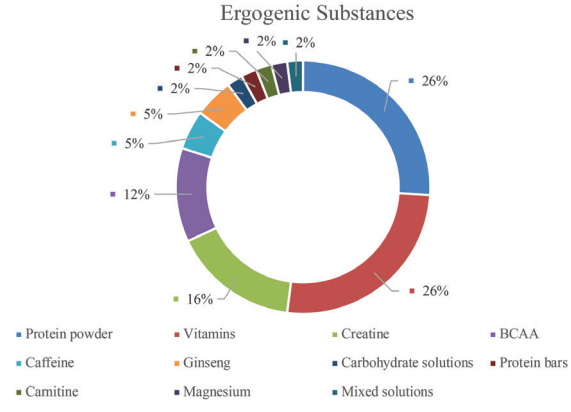

Figure 2: Preference of ergogenic substances among the participants.
BCCA: Branched-chain amino acids

a significant effect on their sports performance and a positive effect on their exercise performance.

In our study, out of the 21 participants who used ergogenic substances regularly, 8 (38.1%) participants stated that they did not cease the use of ergogenic substances, 6 (28.6%) participants stated that they stopped using them and this negatively affected their sports performance, 4 (19%) participants stated that they suspended the use, but their sports performance was not affected, 3 (14.3%) participants did not answer the question.

The presence of side effects of ergogenic substances was questioned among 21 participants who used them regularly, 16 (76.2%) stated that they did not observe any side effects, and 2 (9.5%) stated that they experienced side effects such as nausea, vomiting, and sleep problems, 3 (14.3%) of them did not answer the question.

According to their MET scores, 32 (16.3%) of the participants were in the physically inactive group, 134 (68.4%) were in the minimally physically active group, and 30 (15.3%) were in the physically active group. The mean MET score of all participants was determined as 1765.6.

The participants in the study were divided into two groups as those who used ergogenic substances and those who did not, and their physical activity levels were compared with the average MET score. The result of our study showed that the mean MET score of ergogenic substance users was found to be significantly higher than the mean score of non-users, as can be seen in Table 2 (p=0.004).

Physical activity categories were compared in accordance with ergogenic substance usage. It was found that there was a statistically significant difference in ergogenic substance use between the inactive, minimally active, and physically active groups (p=0.003) (Table 3). The data showed that ergogenic substance use was significantly higher in the physically active group than in the minimally active and inactive groups (p=0.029 and p=0.002, respectively). Although the use of ergogenic substances was higher in the minimally active group than in the inactive group, there was no statistically significant difference between the two groups (p=0.075).

DISCUSSION

Students at Trakya University School of Medicine and Health Sciences were evaluated regarding their physical activeness and ergogenic substance usage characteristics. According to the data in our study, it was observed that there was a significant relationship between the level of physical activity and the use of ergogenic substances.

Physical activity is defined as at least 150 minutes of moderate aerobic physical activity or at least 75 minutes of vigorous aerobic physical activity per week for individuals aged 18-64 years (10). Physical activity is protective against many diseases that increase the risk of mortality and morbidity (10). In terms of obesity assessment, the average BMI values of the participants were in the normal range. Considering that these students will work as healthcare professionals, this is a promising result. However, when the MET scores of the participants were calculated, it was determined that only 15.3% of the participants were physically active. This may be due to the fact that the survey was conducted during the COVID-19 pandemic and the participants were affected by the quarantine conditions between September 2020 - October 2020. It would be appropriate to expect a tendency toward a sedentary lifestyle in university students under quarantine conditions (11).

Some of the ergogenic substances, which are known to have hypertrophic effects on the muscles that delay fatigue mechanisms by acting directly on muscle fibers and therefore increase sports performance, are gaining popularity (12). This increase in popularity is not only seen among elite athletes and students studying in sports departments but also among amateur athletes and the general public (12). Therefore, studies investigating the use and effects of ergogenic substances on the general public and amateur athletes are essential.

In accordance with the aims of this study, the physical activity levels of the participants using ergogenic substances, calculated according to their MET scores, were found to be significantly higher than those who did not use ergogenic substances. The fact that the use of ergogenic substances is more preferred in the physically active group may indicate that the need for nutritional support increases as physical activity increases. This

Table 2: Comparison of MET total scores between groups formed according to ergogenic substance use.

Ergogenic substance use	N	Mean*	Median	Minimum	Maximum
User	21	2593±1486	2316	636	5592
Non-user	175	1666±1232	1356	0	9180

MET: Metabolic equivalent of task, *p=0.004

Table 3: Comparison of students' ergogenic substance use according to the physical activity categories.

Ergogenic substance use*	Physical activity categories			
	Physically inactive participants n (%)	Minimal active participants n (%)	Physically active participants n (%)	Total (n)
Users	0 (0.0)	13 (9.7)	8 (26.7)	21
Non-users	32 (100)	121 (90.3)	22 (73.3)	175
Total	32 (100)	134 (100)	30 (100)	196

*p=0.003

suggests that ergogenic substances are used for their intended use. However, it has been shown that ergogenic substances, which can be obtained without a prescription from easily accessible points such as the internet, pharmacies, grocery stores, or sports stores, may contain anabolic steroids, even if they are not specified on the label. This situation leads to the inadvertent anabolic steroid intake while using ergogenic substances. For this reason, athletes may be exposed to the undesirable effects of these substances such as addiction, hypertension, left ventricular hypertrophy, acute renal failure, impotence, decreased high-density lipoprotein cholesterol, etc. (13). Likewise, health sciences and medical students who are physically active may also be exposed to these effects. Therefore, it is important to examine the contents of ergogenic substances in detail before placing them on the market and to ensure that they are specified on their labels (14).

According to the findings of this study, it was determined that the most preferred ergogenic substances among the students studying at the School of Medicine and Health Sciences of Trakya University are vitamins and protein powders. In the results of similar studies, it has been shown that vitamins or protein powders were preferred most frequently (3, 15, 16).

Among the 21 participants who claimed to use ergogenic substances regularly, 18 of them stated that the substances had a significant positive effect on their exercise performance. The findings obtained in our study show a higher percentage of positive impressions than in previous similar studies (1, 16). Ergogenic substances may have positive biochemical or psychological effects on users, but these surprisingly high positive impressions perceived by the participants may stem from the placebo effect.

The increasing use and popularity of these substances may lead to misuse considering that they can be bought without medical supervision and prescription. The fact that the participants using ergogenic substances in this study mostly started to use them by their own decision differs from the data of similar studies that show that they often started with the recommendation of a sports trainer (1). The reason for this may be due to the fact that similar surveys are mostly applied to individuals who receive sports and athletics training under the guidance of a trainer, such as elite athletes or students at the schools of physical education and sports (1, 16). The scarcity of similar studies applied to students studying health-related majors has made it important to carry out studies focusing specifically on this group.

A limitation of the study could be that, as previously stated, the survey was conducted during the COVID-19 pandemic and the participants were affected by the quarantine conditions between September 2020 - October 2020. It would be appropriate to expect a tendency toward a sedentary lifestyle in university students under quarantine conditions.

CONCLUSION

In conclusion, it was determined that health sciences and medical students using ergogenic substances were more physically active. The fact that the participants often start to use ergogenic substances without professional advice shows that the relevant population should be more conscious about these nutritional supplements. The usage of protein powders and vitamins was found to be most prevalent than the other substances in the group, and new studies are yet to be conducted to determine their long-term benefits and harmful effects on health. In addition, increasing the level of awareness of the people who will work in the field of health sciences is also valuable in order to correctly guide society on the usage of these substances.

Ethics Committee Approval: This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: TÜTF-BAEK 2020/187, date: 29.06.2020).

Informed Consent: Informed consent was obtained from all the subjects.

Conflict of Interest: The authors declared no conflict of interest.

Author Contributions: Concept: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Design: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Supervision: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Resources: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Materials: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Data collection and/or processing: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Analysis and/or Interpretation: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Literature Search: G.Ş., Ö.G.V., M.A., N.F., S.A.V., Writing Manuscript: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V., Critical Review: G.Ş., Ö.G.V., M.A., N.F., N.S., S.A.V.

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REFERENCES

1. Şirinyıldız F, Cesur G, Alkan A et al. Determination of using of ergogenic aids as food supplements and nutrition awareness of physical education and sport high school students. [Crossref]
2. Tekin KA, Kravitz L. The growing trend of ergogenic drugs and supplements. ACSM'S Health Fit J 2004;8:15-8. [Crossref]
3. Çağıran İH. Adnan Menderes Üniversitesi spor takımlarında yer alan öğrencilerin beslenme, ergojenik destek kullanım ve fiziksel aktivite durumları. Aydın: Adnan Menderes Üniv. 2018. [Crossref]
4. Fraczek B, Warzecha M, Tyrala F et al. Prevalence of the use of effective ergogenic aids among professional athletes. Rocz Panstw Zakl Hig 2016;67:271-8. [Crossref]
5. Porrini M, Del Bo` C. Ergogenic aids and supplements. Front Horm Res 2016;47:128-52. [Crossref]
6. Momaya A, Fawal M, Estes R. Performance-enhancing substances in sports: a review of the literature. Sports Med 2015;45:517-31. [Crossref]
7. Savcı S, Öztürk M, Arıkan H et al. Physical activity levels of university students. Arch Turk Soc Cardiol 2006;34:166-72. [Crossref]
8. Craig CL, Marshall AL, Sjöström M et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35:1381-95. [Crossref]
9. Turkish Journal of Endocrinology and Metabolism Editorial Board. Obezite tanı ve tedavi kılavuzu. 6th ed. Ankara:Turk J Endocrinol Metabol;2019. [Crossref]
10. Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. Curr Opin Cardiol 2017;32:541-56. [Crossref]
11. Bertrand L, Shaw KA, Ko J et al. The impact of the coronavirus disease 2019 (COVID-19) pandemic on university students' dietary intake, physical activity, and sedentary behaviour. Appl Physiol Nutr Metab 2021;46:265-72. [Crossref]
12. Karakuş M. Ergogenic aid in athletes. Turk J Sports Med 2014;49:155-67. [Crossref]
13. Albano GD, Amico F, Cocimano G et al. Adverse effects of anabolic-androgenic steroids: a literature review. Healthcare (Basel) 2021;9:97. [Crossref]
14. Cooper ER, McGrath KCY, Li X et al. Androgen bioassay for the detection of nonlabeled androgenic compounds in nutritional supplements. Int J Sport Nutr Exerc Metab 2018;28:10-8. [Crossref]
15. Solloway ME. Nutritional ergogenic aid use in male college students (bachelor thesis). Harrisonburg (VA): James Madison University. 2014. [Crossref]
16. Çetin E, Dölek BE, Orhan Ö. Determination of Gazi University physical education and sport department's students' knowledge and usage status of the ergogenic aids and doping. Spormetre J Phys Educ Sport 2008;6:129-32. [Crossref]

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CASE REPORT

CHALLENGES IN DIAGNOSING RENAL INFARCTION: A CASE REPORT

Enisa Mustavataj[1], Eda Shundo[1], Zeynep Turna[1], Ferdi Karagöz[2], Burak Günay[3], İlhan Kurultak[2]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]Trakya University School of Medicine, Department of Internal Medicine, Division of Nephrology, Edirne, TÜRKİYE
[3]Trakya University School of Medicine, Department of Radiology, Edirne, TÜRKİYE

ABSTRACT

We aimed to present a renal transplant recipient who did not undergo regular follow-up and therefore developed renal infarction. However, we aim to emphasize that post-transplantation lactate dehydrogenase levels should be carefully monitored. A 28-year-old male patient with chronic hypertension and a history of kidney transplantation was admitted to Trakya University School of Medicine, Department of Nephrology with the diagnosis of cellular renal transplantation rejection. Physical examination showed normal vital signs. No abnormality was detected in urinalysis, urine culture, and urine microscopic examination. Blood tests revealed increased creatinine and urea levels without a significant increase in lactate dehydrogenase levels at baseline. As an additional diagnostic tool, Doppler ultrasonography imaging was performed, which revealed normal renal parenchyma and anatomical features without any evidence of arterial stenosis. Electrocardiography and investigation of troponin levels were requested. Cardiological findings were normal and no intervention was required. Finally, a contrast-enhanced computed tomography scan of the abdomen and pelvis was performed with the suspicion of renal infarction. A sickle-shaped hypodense area was observed in the renal anteroposterior cortex, and a diagnosis of renal infarction was made. Renal infarction is a difficult disease to diagnose because of its non-specific symptoms. Careful monitoring of lactate dehydrogenase levels after transplantation is necessary, as elevated lactate dehydrogenase levels are very common in renal infarction cases and acute transplant rejection may be associated with subclinical vasculitis.

Keywords: Infarction, lactate dehydrogenase, creatinine, renal transplantation

INTRODUCTION

Renal infarction is a rare condition caused by impaired blood flow in the renal artery. It is an underdiagnosed phenomenon with unclear physiopathological features (1). Although not all patients have the same symptoms, abdominal pain, groin pain and hypertension are the most common symptoms (2). It mimics the pathological features of various diseases such as renal colic, pyelonephritis, and pulmonary embolism without specific clinical findings (3).

The most common cause of renal infarction is of cardioembolic origin, but it has been reported that most of the cases are idiopathic (4). A postmortem study performed in Los Angeles among patients aged from 4 months to 88 years revealed that the incidence of renal infarction was 1.4% (205 of 14,411), where only 2 of the 205 were diagnosed antemortem (5).

Delayed diagnosis of renal infarction may cause irreversible damage to the kidney tissue and increase the risk of mortality by triggering embolic events that can affect other organs (1). Contrast-enhanced computed tomography (CECT) is used for the diagnosis of renal infarction (3).

With this case report we aim to present a case of renal artery infarction having no specific clinical findings and mimicking the pathological features of various diseases. Along with that, we aim to emphasize that post-transplantation lactate dehydrogenase

Address for Correspondence: Zeynep Turna, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: xyzturna@gmail.com
ORCID iDs of the authors: EM: 0000-0001-7758-5359; ES: 0000-0002-2586-3887; ZT: 0000-0001-6868-5059; FK: 0000-0001-9656-6970; BG: 0000-0002-8462-7681; İK: 0000-0001-5607-13750.
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levels should be carefully monitored. Additionally, we would like to emphasize the importance of regular follow-ups.

CASE REPORT

A 28-year-old male patient with a history of chronic hypertension and a renal transplant was admitted to the the nephrology department of an external center with groin pain, burning during urination, and headache. The patient had not gone through regular follow-up after the renal transplant. While the physical examination was normal, laboratory tests revealed an increase in the creatinine level from 1.2 mg/dL to 2.8 mg/dL. Due to the increase in the creatinine level, a renal biopsy was performed, and the patient was diagnosed with cellular renal transplant rejection. Following the diagnosis, the patient was given 250 mg of intravenous pulse steroid, and the per oral (PO) tacrolimus dose was increased from 2 mg to 3.5 mg daily. The patient was admitted to the nephrology department of the Trakya University School of Medicine for further examination.

On physical examinations, the patient's vital signs were within the normal range. Urinalysis, urine culture, and urine microscopic examination revealed no abnormalities. A stool culture was requested because the patient had diarrhea. The blood tests revealed that the patient's creatinine (2.52 mg/dL) and urea (64 mg/dL) levels were increased. There was no significant increase in lactate dehydrogenase (LDH) level. As further diagnostic tools, ultrasonography and Doppler ultrasonography were performed, revealing normal renal parenchymal and anatomical features without any evidence regarding arterial stenosis. Electrocardiography and the investigation of troponin levels were requested after the patient expressed complaints such as chest pain and bounding pulse. Cardiological findings were normal, and no interventions were found necessary.

During hospitalization, the patient developed abdominal sensitivity, primarily at the right lower quadrant where the renal transplantation was performed. The blood tests were requested again. It revealed that the LDH level was increased to 361 U/L (Table 1). With the exacerbation of the patient's complaints, renal Doppler ultrasonography was performed with the suspicion of renal infarction.

The patient started a treatment dose of 0.4 mg of subcutaneous (SC) clexane twice daily, which allowed the patient's pain to subside. With the findings of renal Doppler ultrasonography, the possibility of renal arterial stenosis was ruled out. In addition, CECT scanning was required. The CECT scanning of the abdomen and pelvis showed that the pelvicalyceal system of the transplanted kidney was slightly prominent. At the renal anteroposterior cortex, a sickle-shaped hypodense area was observed, and the patient was diagnosed with renal infarction (Figure 1).

Table 1: Changes in the lactate dehydrogenase levels during the patient's hospitalization.

	Lactate dehydrogenase (U/L)
Reference range	0-247
Day of hospitalization (16.07.2021)	219
During hospitalization (12.08.2021)	361
Day of discharge (16.08.2021)	200

Moreover, minimal effusion was observed at the periphery of the transplanted kidney and pericardial area. Anti-cardiolipin antibodies, anti-b2-glycoprotein antibodies, protein C, protein S, and antithrombin 3 were requested to investigate whether there was another factor predisposing to infarct development. The antibody results were negative, so PO 5 mg of coumadin was included in the treatment in addition to the clexane the patient was receiving. During his stay in the hospital, urea levels changed between 90-100 mg/dL and creatinine levels 2.4-2.8 mg/dL. The patient was discharged with the recommendation of

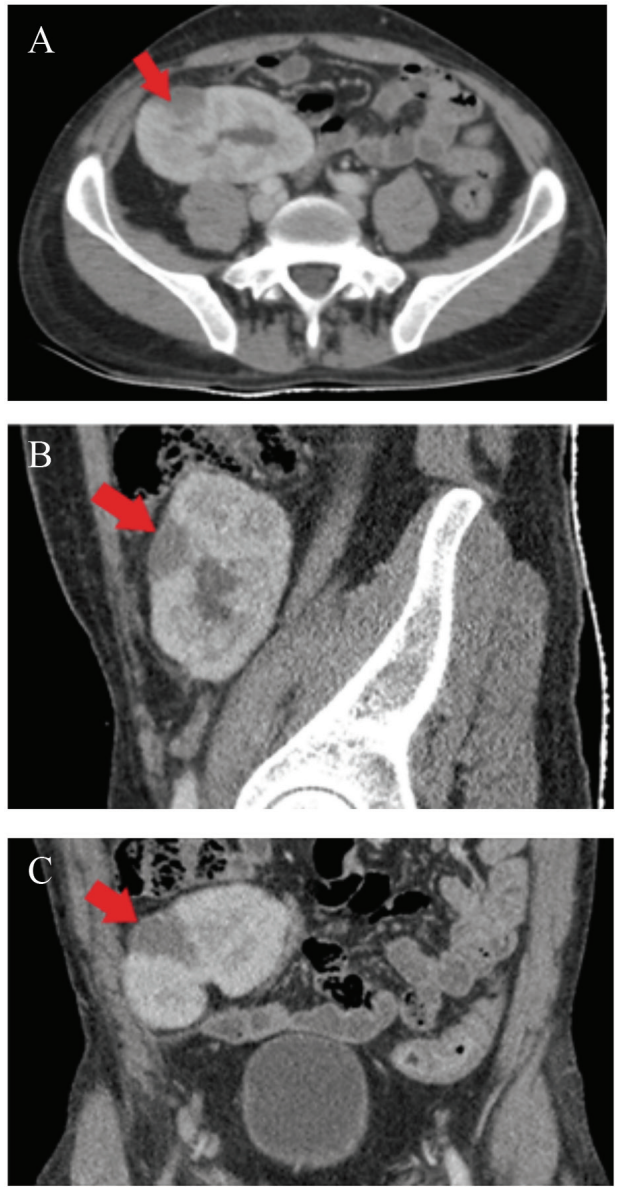

Figure 1: Contrast-enhanced computed tomography images reveal a sickle-shaped hypodense area at the renal anteroposterior cortex (red arrows). A: Axial plane, B: Sagittal plane, C: Coronal plane.

Table 2: Complete blood count and serum biochemistry.

	Reference range	Day of hospitalization (16.07.2021)	Day of discharge (16.08.2021)
Complete blood count			
White blood cells (10^9/L)	4.23-9.07	11.2	12.19
Red blood cells (10^{12}/L)	4.63-6.08	4.48	3.53
Hemoglobin (g/dL)	13.7-17.5	12.4	9.6
Hematocrit (%)	40.1-51.0	36.2	28.3
Serum biochemistry			
Urea (mg/dL)	17-43	64	91
Creatinine (mg/dL)	0.72-1.25	2.52	2.46

control after 1 week. Blood test results of the patient on the day of hospitalization and discharge are shown in Table 2. Moreover, the patient's discharge prescription was as follows: tacrolimus PO 8.5 mg, mycophenolate mofetil PO 500 mg twice daily, prednisolone PO 5 mg once three days, amlodipine PO 10 mg once a day, famotidine PO 40 mg once a day, clexane SC 0.4 mg twice a day.

DISCUSSION

As in our patient, abdominal pain, inguinal pain, and hypertension are common findings in more than 50% of patients with renal infarction (1). Nausea, vomiting, and fever are among the less common symptoms (6). The aforementioned findings may also be present in pyelonephritis, renal colic, or pulmonary embolism (3). High LDH is one of the most important markers in the differential diagnosis of renal infarction (7). High creatinine is considered a marker of kidney damage (7).

Renal infarction is a difficult disease to diagnose because of its non-specific symptoms. Acute transplant rejection may be associated with subclinical vasculitis, which may be one of the causes of renal infarction (8). High LDH levels have been reported in 90.5% of renal infarction cases, therefore, we would like to emphasize that careful monitoring of post-transplant LDH levels is required (1). Renal artery infarction should be considered in every patient presenting with abdominal pain and renal dysfunction. As a result, CECT scanning should be requested for a more accurate evaluation of renal artery infarction (3).

Ethics Committee Approval: N/A

Informed Consent: Informed verbal consent was obtained from the patient.

Conflict of Interest: The authors declared no conflict of interest.

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REFERENCES

1. Bourgault M, Grimbert P, Verret C et al. Acute renal infarction: a case series. Clin J Am Soc Nephrol 2013;8:392-8. [Crossref]
2. Markabawi D, Singh-Gambhir H. Acute renal infarction: a diagnostic challenge. Am J Emerg Med 2018;36:1325.e1-2. [Crossref]
3. Antopolsky M, Simanovsky N, Stalnikowicz R et al. Renal infarction in the ED: 10-year experience and review of the literature. Am J Emerg Med 2012;30:1055-60. [Crossref]
4. Mesiano P, Rollino C, Beltrame G et al. Acute renal infarction: a single center experience. J Nephrol 2017;30:103-7. [Crossref]
5. Hoxie HJ, Coggin CB. Renal infarction. Statistical study of two hundred and five cases and detailed report of an unusual case. Arch Intern Med 1940;65:587-94. [Crossref]
6. Al-Shareef AS, Alwafi E, Alzailaie M et al. Idiopathic renal infarction: an important differential diagnosis of unexplained flank pain. Cureus 2021;13:e18206. [Crossref]
7. London IL, Hoffsten P, Perkoff GT et al. Renal infarction. Elevation of serum and urinary lactic dehydrogenase (LDH). Arch Intern Med 1968;121:87-90. [Crossref]
8. Nasr M, Sigdel T, Sarwal M. Advances in diagnostics for transplant rejection. Expert Rev Mol Diagn 2016;16:1121-32. [Crossref]

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CASE REPORT

CHRISOFIX CHEST ORTHOSIS TECHNIQUE FOR A RIB FRACTURE PATIENT

Sevde Bengisu Yartaşı[1], Ayşenur Çolakel[1], İlayda Guluf[1], Yekta Altemur Karamustafaoğlu[2]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]Trakya University School of Medicine, Department of Thoracic Surgery, Edirne, TÜRKİYE

ABSTRACT

Thoracic trauma, which is frequently encountered in the field of thoracic surgery, is of great importance with its mortality and morbidity rates and is usually observed as multiple body trauma. The treatment of rib fracture, one of the most common findings of thoracic trauma, is usually in the form of pain control. In addition to the classical pain control methods, there is also a treatment method with the Chrisofix® Chest Orthosis, which is not yet used commonly. In this case report, we aimed to present the treatment of multiple rib fractures with Chrisofix Chest Orthosis in a patient who was admitted to our hospital. A 47-year-old female patient was admitted to our hospital with blunt thorax trauma after an in-vehicle car accident. On the first examination, the patient was conscious, cooperative, and her general condition was fair. The radiologic evaluation revealed fractures on the anterolateral side of the 3rd, 4th, 5th, and 6th ribs, a sternum fracture, and a minimal pneumothorax. In addition to the routine pharmacologic pain treatment and care, the Chrisofix Chest Orthosis was used for the repair of the fractions. The patient was successfully treated and discharged after three days of hospitalization. In this case, we concluded that the Chrisofix Chest Orthosis can be used on patients with multiple rib fractures, as it minimizes the complications, significantly reduces pain, and shortens the healing process.

Keywords: Rib fracture, Chrisofix Chest Orthosis, trauma

INTRODUCTION

Thoracic traumas constitute one-third of all trauma emergencies (1). Trauma is one of the most important causes of death, and thoracic trauma is the reason for 20-25% of deaths related to traumas (2). Thoracic traumas may affect many organs and systems. For this reason, it is of great importance to be treated as soon as possible. Flail chest is seen in 5% of thoracic traumas, which are caused by at least two fractures of at least three ribs (3). Mechanical ventilators are used in the flail chest treatment of rib fractures. It destabilizes the chest wall and reduces respiratory volume, thus causing restrictive and obstructive respiratory distress, as well as unforeseeable effects on bronchial secretion. Poor pain management can lead to pulmonary complications as a result of decreased ventilation (4). Pain management is crucial in rib fractures in order to stop the progression of the trauma. In this context, methods such as intravenous analgesia (non-opioid analgesics, opioid analgesics, etc.), intercostal blockage, and patient-controlled analgesia are used (2). Chrisofix Chest Orthosis (CCO) is another method used for the treatment of rib fractures. In this case report, we aimed to assess the possible contribution of CCO to the treatment of traumatic rib fractures and in reducing the complications of a traumatized patient after an accident.

CASE REPORT

A 47-year-old female patient was admitted to the Trakya University School of Medicine Hospital with a blunt thorax trauma after an in-vehicle car accident. Tenderness was noticed on the affected side of the chest wall both on light and deep palpation. The patient was conscious, and cooperative, and her general condition was fair. The patient's first vital signs were normal (temperature: 36.4 °C, blood pressure: 126/80 mmHg,

Address for Correspondence: Sevde Bengisu Yartaşı, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: bbengisuyrts@gmail.com
ORCID iDs of the authors: SBY: 0000-0002-3334-3240; AÇ: 0000-0002-9879-7948; İG: 0000-0001-6964-3125; YAK: 0000-0002-5491-1219.
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pulse: 78 beats per minute, SpO_2: 98%). The radiologic evaluation revealed fractures on the anterolateral side of the 3rd, 4th, 5th, and 6th ribs, a sternum fracture, and a minimal pneumothorax (Figure 1). Examinations of other systems were normal. Her ribs were not displaced. Transdermal remifentanil 25 mg, oral paracetamol 500 mg 4x1, and N-acetylcysteine 600 mg were prescribed to the patient. The CCO was placed on the fracture region in order to reduce pain and paradoxical chest movements (Figure 2). The pain was significantly reduced compared to the first day [third-day visual analog score: 3, first-day visual analog score: 9 (In visual analog scale higher scores indicate worse pain)]. After three days of hospitalization, the patient was discharged in a healthy condition. An informed verbal consent form was obtained from the patient.

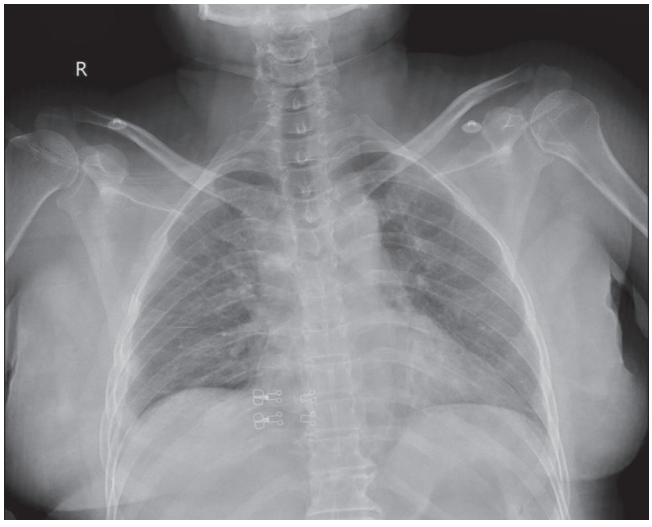

Figure 1: Posteroanterior chest radiography revealing 3rd, 4th, 5th, and 6th rib fractures on the right side on the day of the accident.

Figure 2: Chrisofix Chest Orthosis placement on the fracture region.

Application of CCO

According to the official instructions of CCO, the body hair has to be removed and the skin has to be cleaned. The splint needs to be adjusted to the chest so that the direction of the arrow follows the ribs. The splint should be applied to the fracture region. The splint has to bridge the fractured area. It can be fixed on the area by removing the cover sheet from the bottom of the foil and pressing adhesive foil edges to the skin. It is appropriate to apply CCO in multiple consecutive rib fractures of the anterior and lateral chest, consecutive upper 1-8 ribs, and more than three rib fractures.

Initially, the application of a CCO reduces pain by stabilizing the fracture site that can simultaneously increase vital capacity and reduce pain. It decreases the paradoxical thoracic movement, if present, and thus reduces the risk of late complications. Patients often try to manage their pain by applying pressure to the injured area using their hands, lying on their injured side, or by using belts. The innovation of CCO, the rib splint, mimics this pressure applied by the hand. CCO rib splint decreases the movements of the thereby decreasing the pain. Less pain helps the injured patient take adequately deep breaths to promote ventilation.

DISCUSSION

Rib fractures are the most common types of injuries to the thorax following blunt chest trauma, and they are identified in nearly 10% of all trauma patients (5). It can be caused by falls, traffic accidents, crush injuries, and coughing (6, 7). In this case, we reported a 47-year-old female patient with a total of 4 rib fractures on the right side caused by an in-vehicle car accident. The patient had a flail chest and minimal pneumothorax. A flail chest is defined as three or more consecutive rib fractures in two or more places identifiable by computer tomography and X-ray. Flail components result in paradoxical movement of the flail segment, making it move inward while the other parts of the thoracic cage during inspiration expand out. This limits lung expansion and leads to less effective ventilation (8). As the number of rib fractures increases, the higher rates of pneumonia, aspiration, pneumothorax, and duration of hospitalization may occur. Patients with flail chest and several rib fractures might require ventilator management, and intensive pain control to decrease the risk of further complications. However, none of these methods are adequate only by themselves for the treatment of rib fractures. Surgical rib fixation is a method for repairing rib fractures. Even though this method has been used for years, it may lead to rare but concerning postoperative complications. These surgical rib fixation related complications are emphysema, surgical site infection, persistent effusion, or

hematoma. Prolonged hospitalization, pneumonia, prolonged ventilation, or death are the general thoracic trauma-related complications. It is difficult to distinguish whether these complications are a result of the surgical fixation or the thoracic injury itself (9). Therefore, the CCO was designed as an alternative method. CCO is one of the therapeutic approaches to treat rib fractures besides these standard treatments. We applied CCO on the day of trauma. This application aims to shorten the duration of hospitalization, reduce analgesic usage, improve pain management and reduce the number of pulmonary complications (4). According to a meta-analysis, patients treated with CCO spend 2.2 days less in the hospital, compared to the control group (10). We concluded that CCO binding is beneficial in terms of a short duration of hospitalization, as we have observed in our patient who had six days of hospitalization and experienced reduced pain and analgesic consumption. The CCO method shows a lot of promise, yet it is an underused application that still needs to be worked on.

The usage of CCO in the management of rib fractures aims to improve the quality of life and the functional abilities of patients as soon as possible.

Ethics Committee Approval: N/A

Informed Consent: Verbal informed consent was obtained from the patient.

Conflict of Interest: The authors declared no conflict of interest.

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REFERENCES

1. Sarıtaş A, Kul C, Kandiş H et al. Traumatic bilateral pneumothorax: three case reports. Konuralp Medical Journal 2011;3:28-31. [Crossref]
2. Tekinbaş C, Eroğlu A, Kürkçüoğlu IC et al. Chest trauma: analysis of 592 cases. Ulus Travma Acil Cerrahi Derg 2003;9:275-80. [Crossref]
3. Çobanoğlu U. Chest trauma: analysis of 110 cases. Turk Thorac J 2006;7:162-9. [Crossref]
4. Lee Y, Lee SH, Kim C et al. Comparison of the effectiveness in pain reduction and pulmonary function between a rib splint constructed in the ER and a manufactured rib splint. Medicine (Baltimore) 2018;97:e10779. [Crossref]
5. Çiftçi H. Retrospective analysis of patients operated by flail chest. Euroasia Journal of Mathematics, Engineering, Natural & Medical Sciences 2020;7:112-8. [Crossref]
6. Sano A, Tashiro K, Fukuda T. Cough-induced rib fractures. Asian Cardiovasc Thorac Ann 2015;23:958-60. [Crossref]
7. Martin TJ, Eltorai AS, Dunn R et al. Clinical management of rib fractures and methods for prevention of pulmonary complications: a review. Injury 2019;50:1159-65. [Crossref]
8. Coary R, Skerritt C, Carey A et al. New horizons in rib fracture management in the older adult. Age Ageing 2020;49:161-7. [Crossref]
9. Senekjian L, Nirula R. Rib fracture fixation: indications and outcomes. Crit Care Clin 2017;33:153-65. [Crossref]
10. Mészáros T, Sárváry A, Petri A et al. Use of chest orthosis can significantly shorten the hospitalisation of rib fracture patients. 7th European Trauma Congress. Ljubljana, Slovenia; 2006.p.279-82. [Crossref]

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