Physical Activity and Menstrual Pain

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Abstract: Menstrual pain, or dysmenorrhea, is a common condition that negatively impacts the daily lives and overall health of women of reproductive age. Regular physical activity may help alleviate menstrual discomfort by promoting endorphin release and reducing muscle tension. This study explores the relationship between varying levels of physical activity and menstrual pain among women. A total of 176 female participants, aged 18 to 30, with regular menstrual cycles (21–35 days ± 7 days) and no history of abortion or childbirth, were included. The severity of menstrual pain was assessed using the Visual Analogue Scale (VAS), while physical activity levels were evaluated through the International Physical Activity Questionnaire (IPAQ). Results indicated that participants with lower physical activity levels experienced higher VAS pain scores and longer durations of pain than those with higher activity levels, demonstrating decreased pain intensity and painful days as physical activity increased.

Keywords: Menstrual pain, primary dysmenorrhoea , physical activity

1. Introduction

The menstrual cycle is a complicated, regular biological process that runs through the pubertal years of a woman up to her reproductive age. This cycle, influenced by changes in the levels of hormones such as estrogen and progesterone in different phases, directly influences physiological and mental states [1]. Considerable changes in the level of hormones occur throughout the menstrual cycle, especially during the follicular and luteal phases, manifesting in changing heart rate, blood flow, and muscle contractions [2]. Changes in hormone levels bring not only physiological but also psychological effects; many women experience such negative symptoms as mood swings, stress, anxiety, and irritability within the menstrual cycle [3]. Among the most common symptoms of this period, menstrual pain has the medical term dysmenorrhea and forms a natural barrier for women in everyday activities [4]. Dysmenorrhea constitutes one of the very prevalent health problems among young and reproductive-aged women [5]. Primary dysmenorrhea is marked by severe cramping pain in the lower abdomen that occurs without any underlying pathological condition [6]. At the same time, studies show that dysmenorrhea is present in 50% to 90% of young women and more strongly during the first years following immediately after menarche [7]; the pain peaks during the first and second day of menstruation [8]. This causes absenteeism from work or school because the aching is sometimes intense enough to limit activity, force withdrawal from social life, and reduce the quality of life [9]. Research findings relating to how dysmenorrhea influences life activities have ascertained that a large number of women are made to experience reduced work productivity as a result of dysmenorrhea, which has contributed to labour loss [10]. Dysmenorrhea has made an impact, deteriorating the quality of life since it affects the emotional and social lives of women [11]. In this perspective, the dysmenorrhea factor in public health is significant; there is an overriding need to have effective strategy plans laid out for managing this condition [12].

In recent years, there has been growing interest in the potential pain-relieving effects of exercise on dysmenorrhea [13]. Regular physical activities could reduce pain with increased release of beta-endorphins, a natural painkiller [14]. Beta-endorphins are neurotransmitters in the brain that decrease pain sensation and promote overall relaxation [15]. This biochemical exercise effect is considered a significant mechanism that helps reduce the severity of dysmenorrhea [16]. In addition, exercise was said to help ease menstrual aches, at least partially, by reducing muscle tension and increasing blood flow [17]. The available research points to a positive correlation between physical activity and the above condition: physical activity tends to reduce uterine contractions due to the regularization of prostaglandin levels, thereby decreasing pain intensity [18]. Prostaglandin is a product promoting uterine contractions during menstruation, and a high level of this product causes an increased perception of pain [5]. Physical activity reduces pain by lowering such levels [4]. However, full details of how exercises can affect dysmenorrhea require further research. Mild and moderate physical activity may benefit dysmenorrhea, but high levels of exercise might negatively affect specific individuals [19]. More so, it is also said that the exercise duration is also efficient; for instance, a suggestion like doing exercises before menstruation increases blood flow and avoids accumulation of prostaglandins, thus delaying pain onset [9]. Similarly, if exercises are performed during menstruation, prostaglandins and other chemicals can be easily washed out. Hence, it reduces the period of pain taken to remain in the body [20]. This study investigated the role of physical activity in managing dysmenorrhea, focusing on the potential of exercise as a natural pain reliever. The findings could play a significant role in improving dysmenorrhea management and enhancing women's health outcomes. More specifically, the contributions being averred from regular physical activities to reduce dysmenorrhea are being evaluated as one aspect of non-drug treatment. These findings recommend that further studies be done to compare the forms of exercise most effective for dysmenorrhea and their longitudinal outcomes [21].

2. Materials and Methods

2.1 Participant

The sample size was determined using the G*Power software and was based on detecting statistically significant differences in the prevalence of moderate-to-severe dysmenorrhea between groups. According to "A Study on the Prevalence of Dysmenorrhoea and Its Relationship with Physical Activity among Young Adults" [22], and in line with previous studies, where moderate and high-intensity pain afflicted 23% with dysmenorrhea and 7% without, the analyses indicated that at least 86 participants per group would be needed to achieve a power of 0.80 with a 95% confidence level. After the selection criteria had been applied, the study's final sample contained 176 females aged 18–30 years. After applying the inclusion and exclusion criteria, data were collected from female participants who had a regular menstrual cycle in the range of 21–35 days with a variability of ±7 days [23], had never experienced childbirth or abortion, and gave informed consent to participate [24, 25]. Later, complete information on the study's purpose and importance was provided to each participant, and informed consent was obtained in writing. Ethical principles mentioned in the revised form of the Helsinki Declaration 2013 were followed.

2.2 Data Collection Tools

Data were collected using a structured "Personal Information Form" about the demographic and health characteristics of the participants, including items about age, age at menarche, smoking status, history of chronic disease, and current medications. The International Physical Activity Questionnaire (IPAQ) assessed physical activity levels. This tool provided data on three levels of physical activity: low-intensity activity, to which a

metabolic equivalent of 3.3 METs was assigned; moderate-intensity activity, to which 4.0 METs was assigned; and high-intensity activity, to which 8.0 METs was assigned. For each participant, the total weekly physical activity volume was calculated using the following formula:

Total physical activity (PA), (MET-min/week) - (walking minutes × walking days × 3.3 METs) + (moderate PA minutes × moderate PA days × 4.0 METs) + (intense PA minutes × intense PA days × 8.0 METs) The total of the PA scores allowed for the approximation of the participants' MVPA. [26]To quantify menstrual pain, the 10-cm VAS scale ranged from 0, marked as no discomfort, to 10, marked as the most terrible pain ever imagined [27, 28].

2.3 Statistical Analysis

In the current study, all statistical analyses were performed using IBM SPSS Statistics for Windows, Version 20. According to the variable type, data are represented as mean, standard deviation, median, minimum, maximum, percentage, and frequency. Continuous variables regarding normality were evaluated using Shapiro-Wilk and Kolmogorov-Smirnov tests in addition to Q-Q plots and values of skewness and kurtosis. In comparisons across two independent groups, an Independent Samples t-test was used for normally distributed data; otherwise, when the distribution of data did not comply with the normality assumption in all other cases, the Mann-Whitney U test was conducted. The Pearson Chi-square test for categorical data was performed when the expected frequency exceeded 5 cases. When the number ranges between 3 and 5, the Chi-square Yates correction test was conducted, while Fisher's test was adopted for values below 3. The Fisher-Freeman-Halton test was adopted to ensure statistical efficiency for all 2x2 categorical comparisons where the expected frequency of one or more cells is less than 5. For all analyses, the level of statistical significance was set at $p < 0.05$, representing a 5% risk of Type I error in hypothesis testing.

3. Results

The VAS pain scale scores of the participants with low PA levels were 8,00±1,00, pain duration (days) was 3,00±1,00, menarche age was 12,00±1,00, age was 22,00±3,00, height was 166,00±7,00, weight was 55,00±9,00, BMI was 20,26±3,53. The VAS pain scale scores of the participants with moderate PA levels were 6,00±1,00, pain duration (days) was 2,00±1,00, menarche age was 13,00±1,00, age was 23,00±3,00, height was 165,00±7,00, weight was 55,00±7,00, BMI was 20,38±2,60. The VAS pain scale scores of the participants with high PA levels were 3.00±1.00, pain duration (days) was 2.00±1.00; menarche age was 13.00±1.00, age was 23.00±3.00, height was 165.00±6.00, weight was 58.00±9.00, BMI was 21.31±3.53

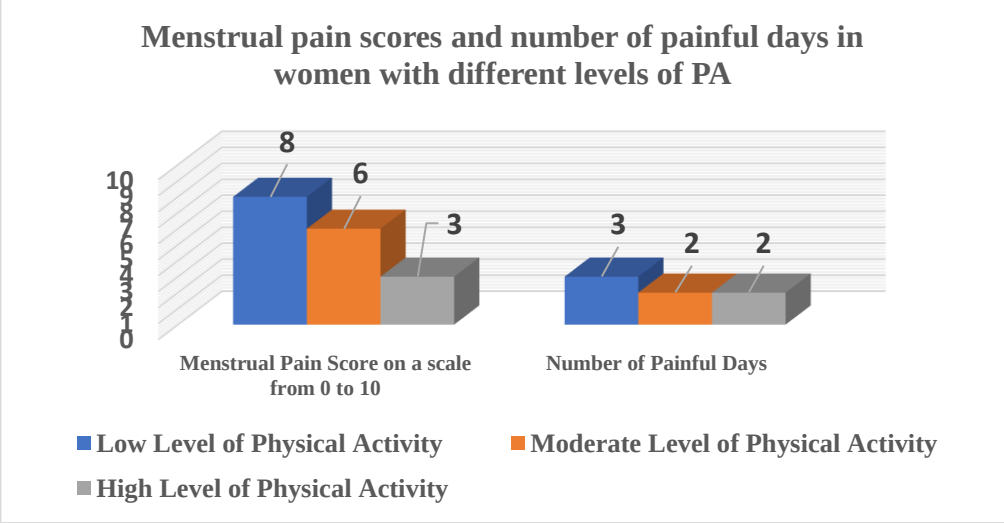
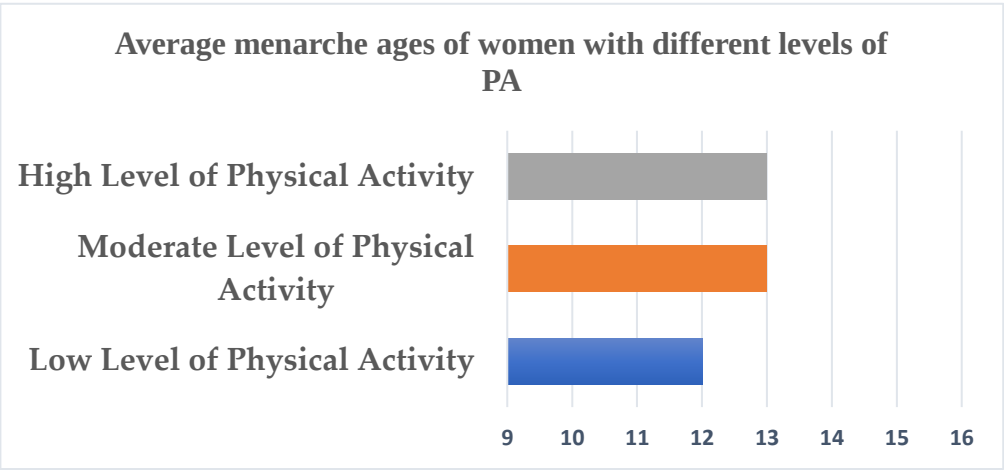


Figure 1. Menstrual pain scores and number of painful days in women with different levels of PA

Figure 1 shows the VAS pain score and the number of painful days of the participants with different PA levels. The VAS pain score of the participants with LLPA levels was 8, the VAS pain score of the participants with moderate PA levels was 6, and the VAS pain score of the participants with HLPA levels was 3. During menstruation, the number of painful days in participants with LLPA levels was 3, the number of painful days in participants with MLPA levels was 2, and the number of painful days in participants with HLPA levels was 2. The VAS pain score and the number of painful days were higher in participants with a LLPA compared to participants with a HLPA.



Figures 2. Average menarche ages of women with different levels of PA

Figure 2 shows the age at which participants experienced menarche, categorized by their different levels of PA. Participants who engage in low levels of PA have menarche at an early age compared to participants who engage in high levels of PA.

Table 1. The effect of smoking and non-smoking status of participants with different PA levels on VAS pain score

Categories			$\bar{X}$ ± SD	Med (Min-Max)	P
LLPA	**Smoking Status**	**Yes**	8,00 ± 1,00	8,00 (7,00-10,00)	0,059^{Z*}
		No	7,00 ±2,00	7,00 (3,00- 10,00)	
MLPA		**Yes**	6,00 ±1,00	6,00 (3,00-8,00)	0,009^{Z*}
		No	5,00 ±1,00	5,00 (2,00-7,00)	
HLPA		**Yes**	4,00 ±1,00	4,00 (2,00-6,00)	0,219^{Z*}
		No	3,00 ±1,00	3,00 (0,00-6,00)	

Z: Mann-Whitney U Test; SD: Standard deviation: *: Statistical significant p<0,05.

When the data are analyzed in the context of Table 1, significant changes are present in VAS pain scores in conditions of smoking and not smoking in participants with low, medium, and high levels of PA.

Table 2. The Effect of smoking status on pain duration (days) of participants with different PA levels

Categories			$\bar{X}$ ± SD	Med (Min-Max)	P
LLPA	**Smoking Status**	**Yes**	3,00±0,00	3,00 (2,00-4,00)	0,013 ^{Z*}
		No	3,00±1,00	3,00 (1,00-4,00)	
MLPA		**Yes**	3,00±1,00	3,00 (1,00-4,00)	0,411 ^{Z*}
		No	2,00±1,00	2,00 (1,00-4,00)	
HLPA		**Yes**	1,00±1,00	1,00 (1,00-3,00)	0,181 ^{Z*}
		No	2,00±1,00	2,00 (1,00-3,00)	

Z: Mann-Whitney U Test; SD: Standard deviation: *: Statistical significant p<0,05.

When Table 2 is considered, the differences in the duration (in days) of pain felt during menstruation conditions between conditions with smoking and no smoking were also significant among participants with low, medium, and high PA levels.

Table 3. Investigation of predisposition to primary dysmenorrhoea in participants with different PA levels

Categories		LLPA		MLPA		HPA		P
		N	**N%**	**N**	**N%**	**N**	**N%**	
Dysmenorrhoea	**Mild**	2	4,50%	7	10,40%	61	92,40%	<0,001 χ^{2*}
	Moderate	2	4,50%	39	58,20%	5	7,60%	
	Severe	40	90,90%	21	31,30%	0	0,00%	

chi-square: χ^2= Pearson Chi-Square Test; *:Statistical significant p<0,05.

When Table 3 is analyzed, in the predisposition to primary dysmenorrhoea of participants with different PA levels—considering high and low levels of menstrual pain—high-level menstrual pain is associated with a low PA level, while on the contrary, low-level menstrual pain is associated with a high one. In the classification according to the severity of menstrual pain, significant differences were obtained in all levels of PA.

Table 4. The effect of smoking and non-smoking status of the participants on VAS pain score

Categories		Menstrual Pain Score		P
		$\bar{X}$ ± SD	Med (Min-Max)	
Smoking Status	Yes	7,00 ± 2,00	7,00 (2,00-10,00)	<0,001 Z*
	No	4,00 ± 2,00	4,00 (0,00-10,00)	

Z: Mann-Whitney U Test; SD: Standard deviation: *:Statistical significant p<0,05.

When Table 4 was assessed, it was noted that the VAS pain scores of the participants who smoked were higher compared to the ones who did not smoke, regardless of their level of PA.

Table 5. The effect of smoking and non-smoking status of the participants on pain duration (days)

Categories		Number of Painful Days		P
		$\bar{X}$ ± SD	Med (Min-Max)	
Smoking Status	Yes	3,00 ± 1,00	3,00 (1,00-4,00)	<0,001 Z*
	No	2,00 ± 1,00	2,00 (1,00-4,00)	

Z: Mann-Whitney U Test; SD: Standard deviation: *: Statistical significant p<0,05.

When Table 5 is analyzed, the number of painful days during menstruation is higher among smokers when compared with non-smokers, regardless of their PA levels.

4. Discussion

This study assessed menstrual pain levels in women with varying physical activity levels. Findings indicated that participants with lower physical activity levels reported higher VAS pain scores and experienced more painful days compared to those with higher physical activity levels. The results suggest higher physical activity levels are associated with reduced menstrual pain intensity and fewer painful days. The pain state includes a cycle of feeling pain, tension, and fear [29]. Therefore, women's menstrual pain can significantly lower their quality of life and daily functioning [30]. The major physiological factor contributing to primary dysmenorrhoea is increased prostaglandins in the menstrual fluid [31, 32]. Prostaglandins, especially PGF2a, reduce uterine blood flow by stimulating myometrial contractions and causing uterine hypoxia. This hypoxic state is the painful cramps that cause primary dysmenorrhoea [33-35]. Menstrual pain, which significantly affects the daily life of women, can be reduced by physical activity and exercise training [36]. Acute exercise in healthy people is known to lessen pain sensitivity and enhance pain thresholds [37, 38].

Menstrual pain is believed to be facilitated by uterine prostaglandins that induce myometrial contractions [35]. Physical activity alleviates stress [13, 39], possesses

antinociceptive characteristics [13, 40] and lowers prostaglandin F2α levels (the prostaglandin subtype most intimately linked to primary dysmenorrhea) [35] , which may reduce pain and thus reduce the overall amount of secreted prostaglandins [41]. Physical activity increases circulating levels of β-endorphins [42]. Physical activity is also known to improve sleep quality [43], reduce negative mood states such as stress [38] and may have general anti-inflammatory effects [36], all of which are important for effective pain management [44, 45].

It has been shown that exercise three or more times a week, lasting approximately 45- 60 minutes each time, can provide a clinically meaningful reduction of roughly 25 mm in menstrual pain intensity on a 100 mm VAS [41]. Bougault,Schiano-Lomoriello [30] reported that students with very high physical activity perceived menstrual symptoms less in the premenstrual week and menstrual week. Students showing low physical activity levels had a higher consumption of analgesic and anti-inflammatory medications. Randomized controlled trials indicate that 30 to 60 minutes of aerobic exercise, conducted 3 to 5 times weekly for 10 weeks, may effectively alleviate physical and psychological difficulties associated with menstruation [30, 41, 46]. The results of some studies do not agree that intense physical activity reduces perceived menstrual symptoms during menstruation and premenstrual weeks. Research involving adolescent girls revealed no change in the frequency or intensity of self-reported complaints between athletes and inactive individuals [30, 47]. At the same time, another study found increases in menstrual symptoms during the menstrual week [48]. Research in Greece revealed that female students with severe menstruation pain postponed physical activities more frequently (51%) than those with moderate (33.7%) and light pain (23.2%) [49].

According to Figure 2, those involved in low levels of physical exercise reached menarche at a younger age than those who participated in high levels of PA. Primary dysmenorrhoea is associated with an earlier menarche age [41, 50]. Studies suggest that smoking and physical activity may be precursors of painful menstrual periods [49, 51]. As a result of our study, as seen in Table 2, substantial differences were found in VAS pain scores in smoking and non-smoking conditions in participants with low, medium, and high PA levels. It was found that smokers had higher VAS scores in their physical activity groups. When the effect of the smoking status of participants with different PA levels on pain duration (days) was analyzed in Table 3, it was found that the duration of pain experienced during menstruation was lower in smokers than in non-smokers among people with high levels of PA. There are inconsistent results about smoking status in the literature. A research indicated that smokers experienced markedly reduced dysmenorrhoea compared to non-smokers [52]. Smoking and exercise did not affect menstrual pain status [49]. Previous research has shown that smoking behaviour has a higher risk of dysmenorrhea in women in more extended periods but a reduced risk in women who exercise consistently [45, 50]. Women who smoke experience early menopause, changes in hormone production, miscarriages due to pathological processes, and delayed fertilisation [53, 54]. Some studies have found that nicotine, the primary component of tobacco, causes vasoconstriction and may cause myometrial contraction due to hypoxia [53, 55]. However, vasoconstriction may reduce blood flow to the endometrium, causing dysmenorrhoea [53]. Studies have shown that nicotine may cause a decrease in blood flow to the endometrium, a condition frequently observed in women experiencing dysmenorrhoea [55, 56]. A meta-analysis study that evaluated the relationship between smoking status and dysmenorrhea included fourteen independent studies and found a significant positive relationship between the two [53]. Parazzini,Tozzi [57], examined the correlation between smoking duration and dysmenorrhoea, revealing that the risk of dysmenorrhoea escalated by 1.5 times in the unadjusted model for smoking durations ranging from 1 to 40 years. Furthermore, reports indicate a 3.4-fold increase in this risk in the unadjusted model for smoking durations ranging from 9 to 40 years. Research in Turkey showed that

smokers have a 1.6-fold greater incidence of dysmenorrhea in comparison to non-smokers. [58]. Carballo-Fazanes,Rico-Diaz [59], found that smokers performed less PA than non-smokers in their study. Other investigations have found a negative relationship between tobacco consumption and PA [60, 61]. In many studies, smoking is associated with an increase in premenstrual symptoms (PMS) [62, 63] an irregular menstrual cycle [64], other menstrual diseases, and miscarriage [64].

This study showed that more physically active people significantly reduce their VAS pain score and the number of days with pain compared to those who are inactive or less active. Physical activity can effectively protect women's general health and reduce menstrual pain, a difficulty in their lives.

5. Conclusions

This study evaluated the menstrual pain levels of women with different physical activity levels. It showed that participants with lower physical activity levels reported higher VAS pain scores and experienced more painful days compared to those with higher physical activity levels. As the physical activity level increases, the menstrual pain (VAS) score and the number of painful days decrease. Regular physical activity in women has significant potential as a non-pharmacological approach to reduce menstrual pain. The reducing effect of physical activity on menstrual pain is an effective approach in both dysmenorrhoea and general health parameters.

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Tjelesna aktivnost i menstrualni bolovi 426

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Sažetak 428

Menstrualna bol ili dismenoreja često je stanje koje negativno utječe na svakodnevni život i cjelokupno zdravlje žena reproduktivne dobi. Redovita tjelesna aktivnost može pomoći u ublažavanju menstrualnih tegoba poticanjem oslobađanja endorfina i smanjenjem napetosti mišića. Ova studija istražuje odnos između različitih razina tjelesne aktivnosti i menstrualnih bolova kod žena. U studiju je uključeno ukupno 176 sudionica u dobi od 18 do 30 godina s redovitim menstrualnim ciklusima (21–35 dana ± 7 dana) i bez povijesti pobačaja ili poroda. Težina menstrualnih bolova procijenjena je pomoću Vizualne analogne ljestvice (VAS), dok su razine tjelesne aktivnosti procijenjene putem Međunarodnog upitnika o tjelesnoj aktivnosti (IPAQ). Rezultati su pokazali da su sudionice s nižim razinama tjelesne aktivnosti iskusile više VAS rezultate boli i dulje trajanje boli od onih s višim razinama aktivnosti, što pokazuje smanjeni intenzitet boli i bolne dane kako se tjelesna aktivnost povećavala.

Ključne riječi: menstrualna bol, primarna dismenoreja, tjelesna aktivnost

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Uvod 440

Menstrualni ciklus je složen, redoviti biološki proces koji se odvija kroz pubertetsko razdoblje žene do njezine reproduktivne dobi. Ovaj ciklus, pod utjecajem promjena u razinama hormona poput estrogena i progesterona u različitim fazama, izravno utječe na fiziološka i mentalna stanja [1]. Značajne promjene u razini hormona događaju se tijekom cijelog menstrualnog ciklusa, posebno tijekom folikularne i lutealne faze, što se manifestira promjenama otkucaja srca, protoka krvi i mišićnih kontrakcija [2]. Promjene u razinama hormona donose ne samo fiziološke već i psihološke učinke; mnoge žene doživljavaju negativne simptome poput promjena raspoloženja, stresa, tjeskobe i razdražljivosti unutar menstrualnog ciklusa [3]. Među najčešćim simptomima ovog razdoblja, menstrualna bol ima medicinski naziv dismenoreja i predstavlja prirodnu barijeru za žene u svakodnevnim aktivnostima [4]. Dismenoreja predstavlja jedan od vrlo rasprostranjenih zdravstvenih problema među mladim ženama i ženama reproduktivne dobi [5]. Primarna dismenoreja obilježena je jakim grčevima u donjem dijelu trbuha koji se javljaju bez ikakvog temeljnog patološkog stanja [6]. Istovremeno, studije pokazuju da je dismenoreja prisutna kod 50% do 90% mladih žena, a jača tijekom prvih godina odmah nakon menarhe [7]; bol doseže vrhunac tijekom prvog i drugog dana menstruacije [8]. To uzrokuje izostajanje s posla ili škole jer je bol ponekad dovoljno intenzivna da ograniči aktivnost, prisili na povlačenje iz društvenog života i smanji kvalitetu života [9]. Istraživački nalazi koji se odnose na to kako dismenoreja utječe na životne aktivnosti utvrdili su da veliki broj žena ima smanjenu produktivnost rada kao posljedicu dismenoreje, što je doprinijelo gubitku rada [10]. Dismenoreja je imala utjecaj, pogoršavajući kvalitetu života jer utječe na emocionalni i društveni život žena [11]. U toj perspektivi, faktor dismenoreje u javnom zdravstvu je značajan; postoji prijeko potrebna izrada učinkovitih strateških planova za upravljanje ovim stanjem [12].

Posljednjih godina raste interes za potencijalne učinke vježbanja na ublažavanje boli kod dismenoreje [13]. Redovita tjelesna aktivnost mogla bi smanjiti bol povećanim oslobađanjem beta-endorfina, prirodnog analgetika [14]. Beta-endorfini su neurotransmiteri u mozgu koji smanjuju osjet boli i potiču cjelokupno opuštanje [15]. Ovaj biokemijski učinak vježbanja smatra se značajnim mehanizmom koji pomaže u smanjenju težine dismenoreje [16]. Osim toga, navodi se da vježbanje pomaže ublažiti menstrualne bolove, barem djelomično, smanjenjem napetosti mišića i povećanjem protoka krvi [17]. Dostupna istraživanja ukazuju na pozitivnu korelaciju između tjelesne aktivnosti i gore

navedenog stanja: tjelesna aktivnost obično smanjuje kontrakcije maternice zbog regularizacije razine prostaglandina, čime se smanjuje intenzitet boli [18]. Prostaglandin je proizvod koji potiče kontrakcije maternice tijekom menstruacije, a visoka razina ovog proizvoda uzrokuje povećanu percepciju boli [5]. Tjelesna aktivnost smanjuje bol snižavanjem tih razina [4]. Međutim, potpuni detalji o tome kako tjelovježba može utjecati na dismenoreju zahtijevaju daljnja istraživanja. Blaga i umjerena tjelesna aktivnost može koristiti dismenoreji, ali visoka razina tjelovježbe može negativno utjecati na određene osobe [19]. Štoviše, također se kaže da je trajanje tjelovježbe također učinkovito; na primjer, prijedlog poput tjelovježbe prije menstruacije povećava protok krvi i sprječava nakupljanje prostaglandina, čime se odgađa početak boli [9]. Slično tome, ako se vježbe izvode tijekom menstruacije, prostaglandini i druge kemikalije mogu se lako isprati. Stoga se smanjuje vrijeme koje je potrebno da bol ostane u tijelu [20]. Ova studija istražila je ulogu tjelesne aktivnosti u liječenju dismenoreje, fokusirajući se na potencijal tjelovježbe kao prirodnog sredstva za ublažavanje boli. Nalazi bi mogli igrati značajnu ulogu u poboljšanju liječenja dismenoreje i poboljšanju zdravstvenih ishoda žena. Točnije, doprinosi koji se navode redovitom tjelesnom aktivnošću smanjenju dismenoreje procjenjuju se kao jedan aspekt liječenja bez lijekova. Ovi nalazi preporučuju provođenje daljnjih studija kako bi se usporedili oblici vježbanja koji su najučinkovitiji za dismenoreju i njihovi dugoročni ishodi [21].

2. Materijali i metode

2.1 Sudionik/ca

Veličina uzorka određena je pomoću G*Power softvera i temeljila se na otkrivanju statistički značajnih razlika u prevalenciji umjerene do teške dismenoreje između skupina. Prema "Studiji o prevalenciji dismenoreje i njezinoj povezanosti s tjelesnom aktivnošću među mladim odraslim osobama" [22], a u skladu s prethodnim studijama, gdje je umjerena i jaka bol pogađala 23% s dismenorejom i 7% bez nje, analize su pokazale da bi bilo potrebno najmanje 86 sudionika/ica po skupini kako bi se postigla snaga od 0,80 s razinom pouzdanosti od 95%. Nakon primjene kriterija odabira, konačni uzorak studije sadržavao je 176 žena u dobi od 18 do 30 godina. Nakon primjene kriterija uključivanja i isključivanja, podaci su prikupljeni od sudionica koje su imale redoviti menstrualni ciklus u rasponu od 21 do 35 dana s varijabilnosti od ±7 dana [23], nikada nisu iskusile porod ili pobačaj te su dale informirani pristanak za sudjelovanje [24, 25]. Kasnije su svakoj sudionici pružene potpune informacije o svrsi i važnosti studije, a informirani pristanak je dobiven u pisanom obliku. Slijeđeni su etički principi spomenuti u revidiranom obliku Helsinške deklaracije iz 2013. godine.

2.2 Alati za prikupljanje podataka

Podaci su prikupljeni pomoću strukturiranog „Obrasca za osobne podatke“ o demografskim i zdravstvenim karakteristikama sudionika, uključujući stavke o dobi, dobi menarhe, pušačkom statusu, povijesti kroničnih bolesti i trenutnim lijekovima. Međunarodni upitnik o tjelesnoj aktivnosti (IPAQ) procijenio je razinu tjelesne aktivnosti. Ovaj alat pružio je podatke o tri razine tjelesne aktivnosti: aktivnost niskog intenziteta, kojoj je dodijeljen metabolički ekvivalent od 3,3 MET-a; aktivnost umjerenog intenziteta, kojoj je dodijeljeno 4,0 MET-a; i aktivnost visokog intenziteta, kojoj je dodijeljeno 8,0 MET-a. Za svaku sudionicu, ukupni tjedni volumen tjelesne aktivnosti izračunat je pomoću sljedeće formule:

Ukupna tjelesna aktivnost (FA), (MET-min/tjedno) - (minute hodanja × dani hodanja × 3,3 MET-a) + (minute umjerene FA × dani umjerene FA × 4,0 MET-a) + (minute intenzivne FA × dani intenzivne FA × 8,0 MET-a) Zbroj FA rezultata

omogućio je aproksimaciju MVPA sudionica. [26]Za kvantificiranje menstrualne boli, VAS skala od 10 cm kretala se od 0, što je označeno kao bez nelagode, do 10, što je označeno kao najstrašnija bol ikad zamišljena [27, 28].

2.3 Statistička analiza

U ovoj studiji, sve statističke analize provedene su pomoću IBM SPSS Sta-tistics for Windows, verzija 20. Prema vrsti varijable, podaci su prikazani kao srednja vrijednost, standardna devijacija, medijan, minimum, maksimum, postotak i učestalost. Kontinuirane varijable u vezi s normalnošću procijenjene su pomoću Shapiro-Wilk i Kolmogorov-Smirnov testova, uz Q-Q dijagrame i vrijednosti asimetrije i kurtosis. U usporedbama između dvije neovisne skupine, za normalno distribuirane podatke korišten je t-test neovisnih uzoraka; inače, kada distribucija podataka nije bila u skladu s pretpostavkom normalnosti u svim ostalim slučajevima, proveden je Mann-Whitneyjev U test. Pearsonov hi-kvadrat test za kategoričke podatke proveden je kada je očekivana učestalost premašila 5 slučajeva. Kada se broj kretao između 3 i 5, proveden je hi-kvadrat Yates korekcijski test, dok je Fisherov test usvojen za vrijednosti ispod 3. Fisher-Freeman-Haltonov test usvojen je kako bi se osigurala statistička učinkovitost za sve 2x2 kategoričke usporedbe gdje je očekivana učestalost jedne ili više ćelija manja od 5. Za sve analize, razina statističke značajnosti postavljena je na $p < 0,05$, što predstavlja 5% rizika od pogreške tipa I u testiranju hipoteze.

Rezultati

VAS skala boli sudionika s niskim razinama FA bila je 8,00±1,00, trajanje boli (dani) bilo je 3,00±1,00, dob menarhe bila je 12,00±1,00, dob 22,00±3,00, visina 166,00±7,00, težina 55,00±9,00, BMI 20,26±3,53. VAS skala boli sudionika s umjerenim razinama FA bila je 6,00±1,00, trajanje boli (dani) bilo je 2,00±1,00, dob menarhe bila je 13,00±1,00, dob 23,00±3,00, visina 165,00±7,00, težina 55,00±7,00, BMI 20,38±2,60. Rezultati VAS ljestvice boli sudionika s visokim razinama FA bili su 3,00 ± 1,00, trajanje boli (dani) bilo je 2,00 ± 1,00; dob menarhe bila je 13,00 ± 1,00, dob 23,00 ± 3,00, visina 165,00 ± 6,00, težina 58,00 ± 9,00, a BMI 21,31 ± 3,53.

Rasprava

Ova studija procijenila je razinu menstrualne boli kod žena s različitim razinama tjelesne aktivnosti. Rezultati su pokazali da su sudionice s nižim razinama tjelesne aktivnosti prijavile više VAS rezultate boli i iskusile više bolnih dana u usporedbi s onima s višim razinama tjelesne aktivnosti. Rezultati sugeriraju da su više razine tjelesne aktivnosti povezane sa smanjenim intenzitetom menstrualne boli i manjim brojem bolnih dana. Stanje boli uključuje ciklus osjećaja boli, napetosti i straha [29]. Stoga, menstrualna bol kod žena može značajno smanjiti njihovu kvalitetu života i svakodnevno funkcioniranje [30]. Glavni fiziološki čimbenik koji doprinosi primarnoj dismenoreji su povećani prostaglandini u menstrualnoj tekućini [31, 32]. Prostaglandini, posebno PGF2a, smanjuju protok krvi u maternicu stimulirajući kontrakcije miometrija i uzrokujući hipoksiju maternice. Ovo hipoksično stanje su bolni grčevi koji uzrokuju primarnu dismenoreju [33-35]. Menstrualna bol, koja značajno utječe na svakodnevni život žena, može se smanjiti tjelesnom aktivnošću i vježbanjem [36]. Poznato je da akutna tjelovježba kod zdravih osoba smanjuje osjetljivost na bol i povećava prag boli [37, 38].

Vjeruje se da menstrualnu bol olakšavaju maternični prostaglandini koji potiču kontrakcije miometrija [35]. Tjelesna aktivnost ublažava stres [13, 39], posjeduje antinociceptivna svojstva [13, 40] i snižava razinu prostaglandina F2α

(podtip prostaglandina koji je najintimnije povezan s primarnom dismenorejom) [35], što može smanjiti bol i time smanjiti ukupnu količinu izlučenih prostaglandina [41]. Tjelesna aktivnost povećava razinu β-endorfina u cirkulaciji [42]. Poznato je i da tjelesna aktivnost poboljšava kvalitetu sna [43], smanjuje negativna stanja raspoloženja poput stresa [38] i može imati opće protuupalne učinke [36], a sve je to važno za učinkovito upravljanje boli [44, 45].

Pokazalo se da vježbanje tri ili više puta tjedno, u trajanju od otprilike 45-60 minuta svaki put, može pružiti klinički značajno smanjenje intenziteta menstrualne boli od otprilike 25 mm na VAS ljestvici od 100 mm [41]. Bougault, Schiano-Lomoriello [30] izvijestili su da su studentice s vrlo visokom tjelesnom aktivnošću manje percipirale menstrualne simptome u predmenstrualnom tjednu i menstrualnom tjednu. Studentice s niskom razinom tjelesne aktivnosti imale su veću konzumaciju analgetika i protuupalnih lijekova. Randomizirana kontrolirana ispitivanja pokazuju da 30 do 60 minuta aerobne vježbe, provođene 3 do 5 puta tjedno tijekom 10 tjedana, može učinkovito ublažiti fizičke i psihološke poteškoće povezane s menstruacijom [30, 41, 46]. Rezultati nekih studija ne slažu se da intenzivna tjelesna aktivnost smanjuje percipirane menstrualne simptome tijekom menstruacije i predmenstrualnih tjedana. Istraživanje koje je uključivalo adolescentkinje nije otkrilo promjenu u učestalosti ili intenzitetu samoprijavljenih pritužbi između sportašica i neaktivnih osoba [30, 47]. Istovremeno, druga studija je otkrila porast menstrualnih simptoma tijekom menstrualnog tjedna [48]. Istraživanje u Grčkoj otkrilo je da su studentice s jakim menstrualnim bolovima češće odgađale fizičke aktivnosti (51%) od onih s umjerenim (33,7%) i blagim bolovima (23,2%) [49].

Prema Slici 2, one koje su sudjelovale u niskim razinama tjelesne aktivnosti dosegle su menarhu u mlađoj dobi od onih koje su sudjelovale u visokim razinama tjelesne aktivnosti. Primarna dismenoreja povezana je s ranijom dobi menarhe [41, 50]. Studije sugeriraju da pušenje i tjelesna aktivnost mogu biti prekursori bolnih menstruacija [49, 51]. Kao rezultat naše studije, kao što je prikazano u Tablici 2, pronađene su značajne razlike u VAS rezultatima boli u uvjetima pušenja i nepušenja kod sudionica s niskim, srednjim i visokim razinama tjelesne aktivnosti. Utvrđeno je da su pušačice imale više VAS rezultate u svojim skupinama tjelesne aktivnosti. Kada je u Tablici 3 analiziran učinak pušačkog statusa sudionica s različitim razinama tjelesne aktivnosti na trajanje boli (dani), utvrđeno je da je trajanje boli tijekom menstruacije bilo kraće kod pušačica nego kod nepušačica među osobama s visokim razinama tjelesne aktivnosti. U literaturi postoje nedosljedni rezultati o pušačkom statusu. Istraživanje je pokazalo da su pušačice iskusile znatno smanjenu dismenoreju u usporedbi s nepušačicama [52]. Pušenje i tjelovježba nisu utjecali na status menstrualne boli [49]. Prethodna istraživanja pokazala su da pušenje ima veći rizik od dismenoreje kod žena u duljim razdobljima, ali smanjeni rizik kod žena koje redovito vježbaju [45, 50]. Žene koje puše doživljavaju ranu menopauzu, promjene u proizvodnji hormona, pobačaje zbog patoloških procesa i odgođenu oplodnju [53, 54]. Neke studije su otkrile da nikotin, primarni sastojak duhana, uzrokuje vazokonstrikciju i može uzrokovati kontrakciju miometrija zbog hipoksije [53, 55]. Međutim, vazokonstrikcija može smanjiti protok krvi u endometrij, uzrokujući dismenoreju [53]. Studije su pokazale da nikotin može uzrokovati smanjenje protoka krvi u endometrij, stanje koje se često opaža kod žena koje imaju dismenoreju [55, 56]. Meta-analiza koja je procijenila odnos između statusa pušenja i dismenoreje uključivala je četrnaest neovisnih studija i pronašla značajnu pozitivnu vezu između ta dva stanja [53].

Parazzini i Tozzi [57] ispitali su korelaciju između trajanja pušenja i dismenoreje, otkrivši da se rizik od dismenoreje povećao 1,5 puta u neprilagođenom modelu za trajanje pušenja u rasponu od 1 do 40 godina. Nadalje, izvješća ukazuju na 3,4 puta veće povećanje ovog rizika u neprilagođenom modelu za trajanje pušenja u rasponu od 9 do 40 godina. Istraživanje u Turskoj pokazalo je da pušači imaju 1,6 puta veću incidenciju dismenoreje u usporedbi s nepušačima. [58]. Carballo-Fazanes i Rico-Diaz [59] u svojoj su studiji otkrili da pušači imaju manje tjelesne aktivnosti (TA) od nepušača. Druga istraživanja pronašla su negativnu vezu između konzumacije duhana i TA [60, 61]. U

mnogim studijama pušenje je povezano s povećanjem predmenstrualnih simptoma (PMS) [62, 63], neredovitim menstrualnim ciklusom [64], drugim menstrualnim bolestima i pobačajem [64]. Ova je studija pokazala da fizički aktivnije osobe značajno smanjuju VAS ocjenu boli i broj dana s boli u usporedbi s onima koje su neaktivne ili manje aktivne. Tjelesna aktivnost može učinkovito zaštititi opće zdravlje žena i smanjiti menstrualne bolove, što im predstavlja poteškoću u životu.

Zaključci

Ova studija procijenila je razinu menstrualne boli kod žena s različitim razinama tjelesne aktivnosti. Pokazalo se da su sudionice s nižim razinama tjelesne aktivnosti prijavile više VAS rezultate boli i imale više bolnih dana u usporedbi s onima s višim razinama tjelesne aktivnosti. Kako se razina tjelesne aktivnosti povećava, smanjuje se VAS rezultat menstrualne boli i broj bolnih dana. Redovita tjelesna aktivnost kod žena ima značajan potencijal kao nefarmakološki pristup smanjenju menstrualne boli. Smanjenje učinka tjelesne aktivnosti na menstrualnu bol učinkovit je pristup i kod dismenoreje i kod općih zdravstvenih parametara.