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Physical Exercise Impact on Hormonal Homeostasis Among Group of Women

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Abstract

Menstrual patterns can be an indicator of hormone homeostasis and the overall health status of women. This research aims to demonstrate the role of physical exercise in hormonal regulation among females and thus how exercising can solve or reduce menstruation cycle problems. This study is an observational, cross-sectional study. We used the data obtained from a questionnaire about the effect of physical exercise on women's hormonal homeostasis. Collected data was analyzed to get descriptive statistics. We found no significant relationship between an irregular menstrual cycle and physical exercise. There was no significant relation between irregular menstrual cycles and physical exercise.

Keywords: *Hormonal Homeostasis, Physical Exercise, Menstrual Cycle, Menstruation.*

1. Introduction

The endocrine system is involved in many regulatory roles in the human body such as growth and development, reproduction, metabolism, hydration, cardiovascular regulation, immune responses, and stress reactivity. Hormones are the chemical messages produced from different glands of the endocrine system. One of the most an important part of the endocrine system is the hypothalamus which is responsible for menstruation cycle regulation in the female endocrine system [1].

Many females experience menstrual cycle abnormalities such as metrorrhagia (irregular menstruation), dysmenorrhea (painful menstruation), menorrhagia (excessive bleeding), amenorrhea (absence of menstruation), and oligomenorrhea [2]. Several research studies found that physical exercise has a role in hormonal homeostasis. The endocrine response to exercise occurs over multiple phases and the amount depends on the volume and intensity of the workout[3]

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This research aims to demonstrate the role of physical exercise in the hormonal regulation among females and thus how exercising can solve or reduce the menstruation cycle problems. The menstrual pattern can be an indicator of hormone homeostasis and the overall health status of women. Many underlying conditions can present as abnormal changes in the woman's menstrual cycle such as amenorrhea which is the absence of menses. Amenorrhea can be classified as primary or secondary Amenorrhea. Evaluation should considered if menstruation has not occurred by 15 years old of age. Oligomenorrhea is the lack of menstruation for longer than 35 days in adults[4]

In addition to painful cramps of the uterine called dysmenorrhea and is most common in women under the age of 25. Dysmenorrhea can be classified as primary or secondary dysmenorrhea [5]. Estradiol also appears to offer muscle protection while under stress from exercise, Exercise may have positive effects because estrogen acts as an antioxidant, reducing oxidative damage, and a membrane stabilizer by slipping into phospholipids in the cell membrane, and an estrogen receptor substrate, affecting downstream gene regulation and other targets, though the precise mechanisms are unclear[6] More research has been done on the long-term effects of exercise and training on hormone levels in females, particularly when there is less energy available. The Triad is a combination of lower energy availability, menstrual irregularity (luteal phase abnormalities, anovulation, oligomenorrhea, and hypothalamic amenorrhea), and poor bone health (decreased BMD and increased risk of fracture), as briefly noted above[7]. Both the hormones testosterone and estrogen play an roles in neuromuscular adaption to exercise and some evidence supports the increase of testosterone and estradiol with exercise. Multiple studies have found an acute increase in estradiol immediately after exercise [14]. More work is needed to clarify the relationship among the energy availability and exercise effects on the HPG axis. Estrogen is a steroid hormone secreted by the ovaries in women. Estrogen performs many functions in the human body. In women, examining estrogen concentration is a proper description of the menstrual cycle. Acute elevation of estrogen following resistance training is reported, especially when women are in hypocaloric state [15].The objective of this research is to explore the effect of physical exercise on women's menstrual cycle homeostasis.

We intend to study the impact of physical activity on the menstrual cycle to better understand how physical activity affects the control of female reproductive hormones. We aim to help reduce difficulties resulting from hormone imbalance as a means of raising female consciousness about the need for exercise.

2. Materials and Methods

This study is an observational, cross-sectional study. We used the data obtained from a questionnaire about the effect of physical exercise on women's hormonal homeostasis (Appendix 1). Participants of this study are a group of females of age 15 or above in a fitness center (Pro Fitness GYM). The study was conducted from September 2022 to November 2022. The minimum size of the sample was determined as 50 women or more. The study was conducted in the Qassim region, Al Rass city.

Inclusion criteria:

-Female participants.

-15 years or above participants

-agreed to participate

Exclusion criteria:

-male participants.

-under 15 years old participants.

-declined to participate.

Data collection:

Data were collected by the questionnaire that was created in google form using MCQ questions then they were answered directly by the participants onsite. The questionnaire was in the Arabic language.

Ethical considerations:

Ethical approval for this study was obtained from the Department Research Review Committee at the College of Applied Medical Sciences at Qassim University. Informed consent was given to the participants before they filled out the questionnaire. All the data collected in this study was kept confidential and used for research purposes only.

Data analysis plan:

Collected data were entered in Microsoft Excel and then analyzed to get descriptive statistics. The result was interpreted in Microsoft Word in the form of tables and graphs. To determine the effect of exercise on the menstrual cycle, the ANOVA test has been done, the null hypothesis refers to that no significant differences in the menstrual cycle due todoing exercise. To check the relation between an irregular menstrual cycle before starting exercising and a menstrual cycle that becomes regular after doing exercise, a chi-square test has been done.

3. Results

This study was carried out to explore the effect of physical exercise on women's menstrual cycle homeostasis. A total of 160 participants were involved in this study.

All the participants were females. Most of the responders were between the age of 20-29.

Most of the participants were single. (Table1)

Table (2) shows the rate of exercise frequency per week reported by participants. 38.1% of participants exercise 6 times per week, 30% of participants exercise 5 times per week, 17.5% of participants exercise 4 times per week, 6.9% of participants exercise 3 times per week, 3.1% of participants exercise 7 times per week, 2.5% of participants exercise twice a week. Only 1.9% of participants exercise once a week. 55.6% of participants exercise more than one hour in a day, 34.4% of participants exercise for one hour in a day and 10% of participants exercise for less than one hour per day. 35.6% of participants have been exercising for more than one year, 30% of participants started exercising between the interval months to 11 months, 20% of participants have been exercising for less than a month and 14.4% of participants have been exercising for one year. No significant difference in the menstrual cycle related to time in doing exercise in a day, where the p.value of F test 0.780 is greater than 0.05, which means that time in doing exercise in a day effect on menstrual cycle with a percent 0.3% indicated in the figure(1) No significant difference in the menstrual cycle is to time of start exercising, where the p.value of F test 0.622 greater than 0.05, which mean that time of start exercising effect on the menstrual cycle with percent 1.12% as indicated in figure(2)

Table (3) indicates that there was a significant difference in menstrual cycle related to number of times doing exercise per week, where the p. Value of F test 0.036 is less than 0.05, which means that the number of times in doing exercise per week effect menstrual cycle with percent 8.4% as indicated in figure (3)

Table 4 represented the participant’s descriptions of their menstrual cycle pain. 53.8% of participants have moderate menstrual cycle pain, 20% of participants suffer from severe menstrual cycle pain, 19.4% of participants have mild menstrual cycle pain.

Only 6.9% of participants have no pain in their menstrual cycle. 56.9% of participants have noticed an improvement in their menstrual cycle pain after starting exercise, but 28.1% of participants have not noticed any improvement in their menstrual cycle pain. 15% of participants have no pain in their menstrual cycle already.

Table (5) indicate that No significant relation between irregular menstrual cycle before start exercising and the menstrual cycle becomes regular after doing exercise, where the p. Value of Pearson Chi-Square test 0.264 greater than 0.05

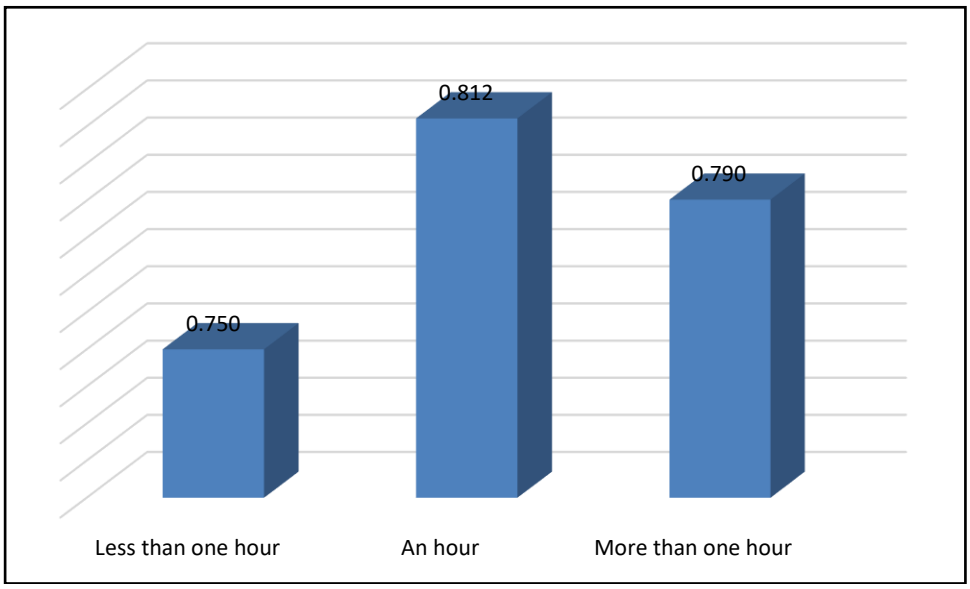

Figure 1: Association between period of exercise per day and menstrual cycle regulation

Table 1: Characteristics of participants:

question	answer	frequency
Education level	Middle school	1
	High school	18
	University	137
	Postgraduate	4
	No education	0
Age	15-19	19
	20-29	85
	30-39	45
	40-49	8
	50 or older	3
Social status	married	49
	single	110
Total	160	

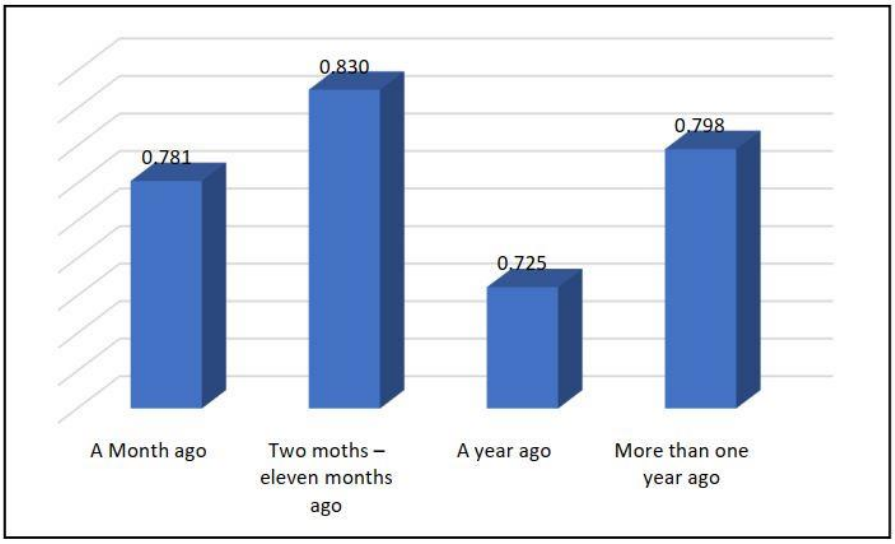

Figure (2): Association between times of starting exercise and menstrual cycle regulation.

Table 2. Exercise onset and frequency of included participants.

	Parameter	Frequency
Times of exercise per week	Once a week	1.90%
	Twice a week	2.50%
	3 times per week	6.90%
	4 times per week	17.50%
	5 times per week	30%
	6 times per week	38.10%
	7 times per week	3.10%
The duration of exercise per day	less than an hour	10%
	An hour	34.40%
	More than an hour	55.60%
The onset of exercise	A month ago,	20%
	From month to twelve months	30%
	A year ago,	14.40%
	More than one year ago	35.60%

Table 3: Number of times of doing exercise per week

	N	Mean	Std. Deviation	R^2	F	Sig.
Once a week	**3**	**0.889**	**0.192**	**0.084**	**2.324**	**0.036**
Twice a week	**4**	**0.292**	**0.344**			
3 times per week	**11**	**0.879**	**0.225**			
4 times per week	**28**	**0.798**	**0.319**			
5 times per week	**48**	**0.792**	**0.297**			
6 times per week	**61**	**0.790**	**0.336**			
7 times per week	**5**	**1.000**	**0.000**			
Total	**160**	**0.794**	**0.316**			

Table 4: Relation of menstrual pain to exercise.

	Parameter	**Frequency**
Description of Menstrual pain	**Mild**	**19.40%**
	Moderate	**53.80%**
	Severe	**20%**
	No pain	**6.90%**
Improvement of the period pain after starting the exercise	**Yes**	**56.90%**
	No	**28.10%**
	No pain from the beginning	**15%**

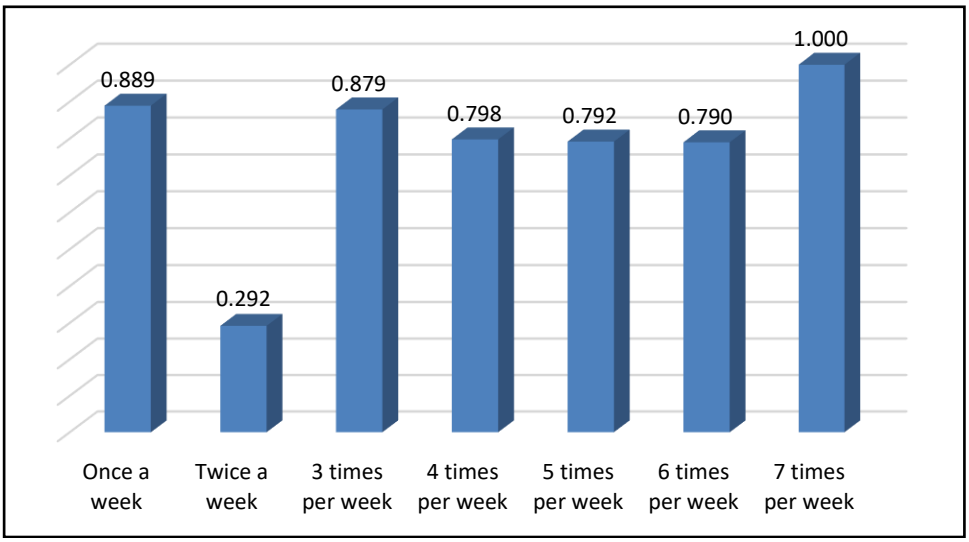

Figure 3: Association between number of times of doing exercise per week and menstrual cycle regulation

Table 5: Effect of exercise on the regularity of menstruation

		Was your menstrual cycle regular before you start exercising?		Total	Pearson Chi-Square	Asymptotic Significance (2-sided)
		No	Yes			
if the answer was no, did your menstrual cycle become regular	No	15	2	17	1.245	0.264
	Yes	40	13	53		
Total		55	15	70		

4. Discussion

Menstrual problems were found to be very common among females which have been linked to factors including marital status, fitness level, degree of physical activity, and intensity of workouts. This study was conducted to explore the effect of physical exercise on women's menstrual cycle homeostasis. Many researchers have noted a connection between activity and Menstruation disorders, although their focus has been on professional athletes [8]. Our study showed that most of the women who participated have a regular menstrual cycle. However, minor participants have abnormal menstrual cycle pattern. To be more specific, about two thirds of the participants menstrual cycle was regular before starting exercise whereas only one third of the participants menstrual cycle was irregular before starting exercise. About three fourth of participants noticed that their menstrual cycle became regular after starting exercise. As a result, we could conclude that menstrual regulation occurred in a proportion of women after doing the exercise,

A study of hormonal change after resistance exercise also found an increase in testosterone [9]. Studies have also shown an increase in testosterone with endurance exercise. Multiple studies have found an acute increase in estradiol immediately after exercise [10]. A study reported no significant change in estradiol level after 16 weeks of training[11].

Peinado et al., have found that physical exercise tends to increase the risk of menstrual cycle abnormalities in women who do not participate in competitive sports [8]. We found a significant difference in the menstrual cycle related to the number of times in doing exercise per week. However, there was no significant difference in menstrual cycle related to the period of exercise per day. We agree with Peinado et., who found that a statistically significant correlation between the number of hours per week spent exercising and the prevalence of menstruation problems. One study reported reductions in leptin concentrations following resistance exercise [11]. Meta-analysis study was done suggested that exercise for about 45 to 60 minutes, three times per week regardless of intensity may provide a significant reduction of menstrual pain[12][16]. Given the overall health benefits of exercise, women may consider using exercise to manage menstrual pain [13][17]. Our study showed that more than half of participants have noticed an improvement in their menstrual cycle pain after starting exercise. We found that there is no significant relation between irregular menstrual the cycle before starting exercising and the menstrual cycle become regular after doing exercise. So, there is no clear role of exercise and menstrual cycle regulation. As a result, medical professionals should be educated about the link between exercise and menstruation problems. Women who walk large distances or for extended periods of time, or whose work demand a high degree of physical activity, should also be aware that these factors might contribute to menstrual cycle abnormalities. By narrowing down on a potential reason, individuals can alleviate some of the stress and concern that their menstrual issue has brought them. If they know what causes their menstruation issue, they can take steps to enhance their mental health by reducing stress and worry.

The relatively small sample size is one of the study's primary limitations. Scientific evidence seemed insufficient to determine if the prevalence of physical activity in our study group was reflective of the frequency among women in the general population. This study's strengths include using exclusion criteria and multivariate analysis to account for a wide range of potential confounders, using a single examiner, and highly accurate instruments to reduce classification bias.

5. Conclusions

This study showed a significant association between menstrual cycle regulation and the number of times doing exercise per week. We found that the number of times of exercise per week effect on menstrual cycle with percent 8.4%.

On the other hand, there was no significant difference in the menstrual cycle related to period of exercise per day and no significant difference in the menstrual cycle related to the time of start exercising. We found no significant association between an irregular menstrual cycle before starting to exercise and a menstrual cycle becoming regular after doing exercise. It could have been a different result if we had more time to collect the data but due to a shortage of time, the number of participants with irregular menstrual cycles was limited.

Funding: This study has not received any fund locally or internationally.

Institutional Review Board Statement: Ethical approval for this study was obtained from the Department Research Review Committee at the College of Applied Medical Sciences at Qassim University. Informed consent was given to the participants before they filled out the questionnaire. All the data collected in this study was kept confidential and used for research purposes only.

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Conflicts of Interest: The authors report there are no competing interests to declare.

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