Physical Activity and Body Composition Profile of Infertile and Fertile Women

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Abstract

Background: Identification of body mass and physical activity status in women might be helpful for improving their reproductive health. The current research aimed to analyze and compare the body mass index (BMI) and physical activity level (PAL) in fertile and infertile women.

Methods: This descriptive-analytical research was conducted on 150 infertile women who referred to therapeutic *centers* of Shahrekord to treat infertility and 150 fertile women using field study method. *In this regard, the participants filled in a physical activity questionnaire.* Their height and weight were measured using Seca stadiometer and digital scale based on standard methods, and subsequently, BMI was calculated and the values were compared. The chi square test was utilized to analyze the data and the significance level was considered P<0.05.

Results: The physical activity score of infertile women was estimated to be low in this study which indicates very low PAL in these subjects. The physical activity score of fertile women was estimated to be medium. Significant differences were found in total physical activity between women with and without experience with infertility (P=0.02). The overall prevalence of underweight, normal weight, overweight, and obesity in infertile subjects were 8.7%, 26.7%, 34.7%, and 30%, respectively. The prevalence of underweight, normal weight, overweight, and obesity in fertile subjects were 29.8%, 40.4%, 17.2%, and 11.3%, respectively. The frequency of overweight and obesity was reported to be significantly higher in infertile subjects (P=0.001).

Conclusion: The results from this study emphasize the importance of body composition and creation of interest among women to do exercise and gain normal weight and keep it off to achieve healthy fertility.

Keywords: Body mass index, Infertility, Physical activity, Women

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1. Introduction

Infertility is believed to be a multifactorial disease triggered by genetic and environmental factors which is accompanied by socio-economic, psychological, and physical challenges (1). According to the World Health Organization (WHO), infertility is one of the global public health problems capable of threatening the personal balance and marital and social relationships (2). Considering the growth and development of human societies and the lifestyle of men and women, there is a possibility that infertility increases in the coming years. The results of some recent studies have indicated that the real incidence of infertility has increased under the influence of various factors, and the fertility rate has significantly decreased (3). Physical activity and exercise (both aerobic and anaerobic) are regarded as health promotion behaviors, and physical *inactivity* and *sedentary* behavior and inattention to body composition may increase the risk of diseases such as hypertension, insulin resistance, higher blood lipids (*triglycerides* and *cholesterol*), cardiovascular diseases,

and infertility (4). In particular, physical activity has an equivocal effect on fertility. In men, moderate exercise training has been found to be positively associated with sperm parameters (5). In women, moderate physical activity increased fecundity indices and live birth rates, regardless of body weight (6). However, intensive physical activity has been identified to be correlated with lower semen quality in men (7) and decreased fertility in women (8). Even though the relationship between sedentary behaviors and decreased semen quality and male fertility is well understood (4, 5) in women it has received less attention.

Obesity is associated with both physical inactivity and sedentary behavior (9). Being overweight and obese is known to impact the fertility of couples (10). Previous studies have shown that a BMI over 25 kg/m2 was directly correlated to infertility in females (11). Obesity is believed to disrupt ovarian action by decreasing sex hormone-binding globulin, increasing insulin resistance, and elevating free androgens. Insulin resistance and consequent hyperandrogenism

has been implicated in polycystic ovarian syndrome (PCOS), which may represent an extreme endpoint of a more prevalent asymptomatic endocrine imbalance underlying ovulatory infertility (12). PCOS is one of the most common hormonal disorders in women of reproductive age which may result into infertility. The link between PCOS and obesity is complicated. What is clear is that women affected by obesity have a greater risk for PCOS (13). As BMI is considered as an important factor in females' fertility or infertility, researchers believe that fertility is dependent upon diet and exercise (10, 11). It has been widely approved that being too skinny or too fat can make it difficult for women to get pregnant such that the ovaries do not work well and the ovulation process will be affected if one's adipose tissue mass is low (less than 10%). On the other hand, obesity and inactivity also affect the ovulation and menstrual cycle through hormonal balance disruption (14).

Lifestyles and health-related behaviors vary across different societies and to the authors' knowledge no comprehensive studies have been conducted so far to compare the physical activity and BMI of fertile and infertile women in Shahrekord city; accordingly, the present study aimed to investigate and compare BMI and physical activity among fertile and infertile women of Shahrekord city.

2. Methods

This descriptive-comparative study was conducted from February 2019 to May 2019 using field study method in therapeutic centers of Shahrekord city. The research sample consisted of 150 infertile women (aged 20-40 years) who referred to therapeutic centers in Shahrekord city to treat their infertility caused by various factors, as well as 150 fertile women (aged 20-40 years) with a history of childbearing, who were selected using random sampling method. It is noteworthy that information about the study design, purposes, procedures, and benefits were presented at the beginning of the study and the subjects were asked to fill out the informed consent form before participation. The study protocol was approved by Arak University of Medical Sciences under the code IR.ARAKMU.REC.1398.213.

The data were collected by using *Baecke physical activity questionnaire*. It is an international standard questionnaire to assess PAL and is approved by scientific centers, including Iran University of Medical Sciences (15). This 16-item *questionnaire includes three* components with regard to occupational, sport, and leisure activities. *These items are scored* on a five-

point *Likert Scale* (1= lowest PAL and 5= highest PAL). Ultimately, the mean score obtained from the questionnaire completed by the subject is considered to be the participant's physical activity score. In order to collect anthropometric data, digital scale and Seca stadiometer were employed. *The women body weights* (in *kg* to the nearest 0.1 *kg*) *were measured using digital scale while* standing in *light clothing without shoes*. Additionally, Seca stadiometer was used to measure the subject's height (in *cm* to the nearest 0.1 *cm*) while the subject was *asked* to *stand* in the *anatomical position*. To be sure, the measurements were repeated twice and recorded by the researcher. To obtain BMI, the subject's weight in kg was divided to her height in m2. Generally, a BMI of less than 18.5 is considered as underweight, a BMI between 18.5 and 24.9 as normal, a BMI between 25 and 29.9 as overweight, and a BMI greater than 30 as obese (16). The collected data were primarily described using descriptive statistics, and then, the chi-square test and Mann Whitney test were used to perform a comparison between groups. Since the distribution of variables was tested, data were presented as mean and standard deviations (±SD) with median and interquartile range (IQR).The statistical calculations were performed with SPSS Version 22 software and the significance level was considered P<0.05.

3. Results

In this study, a total of 300 participants completed the physical activity questionnaire. The response rate was 100%. Demographic characteristics of the participants are represented in Table 1. The mean and median age of the subjects was 30.3±2.3 years and 30.1±1.8 years, respectively. No significant differences were found in age, marital status, education, own occupation, smoking, alcohol consumption and contraception use between women with and without experienced infertility (P>0.05). Most of the respondents were non-smokers (97.7%) and non-alcoholics (97.0%). The majorities of women had college education (65.7%) and were housewives (77.0%). Fertile women had a significantly lower age of marriage (P=0.01) compared to infertile women (Table 1).

The median PLA of the fertile and infertile women were 11.4 and 4.6, respectively. The median BMI of the fertile and infertile women were 24.4 and 30.7, respectively (Table 2). In the present work, the BMI was found to be greater in infertile women compared to fertile ones (P=0.01) and the PAL of fertile women was reported to be higher than their infertile counterparts (P=0.002).

Table 1: Demographic and Clinical Characteristics of the participants

Variables	Fertile women N (%)	Infertile women N (%)	P-value
Age			
20-25 yr.	25(16.7)	29(19.3)	0.19
26-30 yr.	60(40.0)	55(36.7)	
31-35 yr.	65(43.3)	66(44.0)	
Smoking			
Never	147(98.0)	146(97.4)	0.36
Former	1(0.6)	2(1.3)	
Current	2(1.4)	2(1.3)	
Alcohol use			
Never	146(97.4)	145(96.7)	0.41
Often	3(2.0)	4(2.7)	
Almost always	1(0.6)	1(0.6)	
Marital status			
Married	148(98.7)	147(98.0)	0.71
Divorced/widowed	2(1.3)	3(2.00)	
Education			
<12 yr.	30(20.0)	27(18.0)	0.67
12-16 yr.	98(65.4)	99(66.0)	
>16 yr.	22(14.6)	24(16.0)	
Age of marriage			
<18 yr.	40(26.6)	21(14.0)	0.01
18-35 yr.	106(70.7)	119(79.3)	
>35 yr.	4(2.7)	10(6.7)	
Occupation			
Employed	33(22.0)	36(24.0)	0.17
Housewife	117(78.0)	114(76.0)	
Contraception usage			
Yes	76(50.6)	78(52.0)	0.35
No	74(49.4)	72(48.0)	

Table 2: Comparison of anthropometric indices and PAL in subjects

	Physical activity level Mean±SD/median (IQR)	Body mass index Mean±SD/median (IQR))
Fertile women (n=150)	12.56±1.5, 11.4(3.1)	23.1±1.6, 24.4(3.8)
Infertile women (n=150)	5.87±1.1, 4.6(1.2)	29.8 ±2.1, 30.7(3.9)

According to the physical activity questionnaire guidelines, the infertile and fertile women had low and moderate PALs, respectively. According to the results (Table 3), 75% of infertile women had low scores of physical activity, implying that infertile women did no exercise or had low levels of physical activity. Moreover, 49% of fertile women had moderate physical activity scores.

The prevalence of underweight, normal weight, overweight, and obesity in infertile women were reported to be 8.7%, 26.7%, 34.7% and 30%, respectively. Additionally, the prevalence of underweight, normal weight, overweight, and obesity in fertile women were found to be 29.8%, 40.4%, 17.2%, and 11.3%, respectively. Considering the frequency results (Table. 3),

a subject's BMI was determined in four categories: underweight, normal weight, overweight, and obesity. As can be observed, 61 cases of the fertile subjects had normal weight, and only 17 cases of subjects were obese, whereas 52 cases of infertile women were overweight. The PAL in these individuals with various body compositions was different; the PAL in obese and overweight women was lower compared to that in underweight women and women with normal weight. The prevalence of obesity among women with moderate PAL was significantly higher than those with low PAL (P=0.01). It is noteworthy to mention that the activity levels were moderate in fertile women and their body composition was normal, but the activity levels were low in infertile women and most of the subjects were

Table 3: Physical activity and BMI status in the studied subjects

	Low	Moderate	High	Underweight	Normal weight	Overweight	Obese
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Fertile women	35(23.3)	74(49.0)	41(27.5)	45(29.8)	61(40.4)	26(17.2)	17(11.3)
Infertile women	113(75.3)	35(23.4)	2(1.3)	13(8.7)	40(26.7)	52(34.7)	45(30.0)

The physical activity levels in these individuals were considered to have the least score of 5 (low level) and the highest score of 15 (high level).

overweight. The difference between the two groups was statistically significant (P=0.02).

In order to compare PAL and BMI between the two groups, the chi-square test was used. According to the results, this comparison demonstrated that the PAL in fertile women is higher than that in infertile women (P=0.02). Additionally, the BMI in fertile women was lower than that of the infertile ones (P=0.001). Thus, it can be inferred that the null hypothesis was rejected in this study and there was a significant difference in two variables (PAL and BMI between the women with and without infertility).

4. Discussion

Our results showed that the PAL was low in women with infertility. Additionally, the prevalence of underweight was 8.7%, normal weight 26.7%, overweight 34.7%, and obesity 30% among infertile women. The prevalence of overweight was higher among these women, and the PAL in overweight and obese women was lower compared to that of the underweight women and women with normal weight. Yet in fertile women, the PAL score was reported to be moderate, and the overall prevalence of underweight, normal weight, overweight, and obesity were found to be 29.8%, 40.4%, 17.2%, and 11.3%, respectively. Infertility is one of the health problems in the field of reproduction, which affects several childbearing-aged couples across the world and cause irreparable psychological and physical trauma particularly to women up to the extent that it may lead to one's social isolation (17). Despite the widespread advancements of human knowledge, infertility is still one of the major health problems all around the world (18).

Obesity and overweight have also been introduced as one of the major emergent health-related problems raised over the recent years throughout the world. These problems could lead to several health issues, for instance cardiovascular diseases, diabetes, asthma, arthritis, chronic pain, Alzheimer's, and infertility (19, 20). On the other hand, human health depends on the lifestyle or activities that are usually performed a daily

basis (21, 22). Consistent with the present study, several studies have reported that obesity and overweight are associated with an increased risk of infertility. The WHO (2008) reported the prevalence of overweight and obesity to be respectively 35% and 14% among infertile women (23). Ismailzadeh and colleagues found obesity incidence in women with infertility to be 4.8 times higher than that in healthy women (24). Other studies have reported that the frequency of overweight and obesity in infertile women is 2.2 times higher than in healthy women (25). As this study was conducted on 150 women with fertility and 150 women without fertility in Shahrekord, the highest frequency of infertility belonged to overweight (n=52) and obese women (n=30). This finding is inconsistent with a study in which body mass index was like between women with and without experienced infertility (26). A study done in the Netherlands on 500 women who referred to an infertility clinic indicated that the infertility rate was higher in women with a waist-hip ratio greater than 8% (27). In a study conducted in England on women of childbearing age, it was found that the ovarian disorders increased as BMI raised and the therapies for these women worked with difficulty (28). In a study by Milone and colleagues (2015) it was reported the weight loss in infertile women leads to the increased incidence of successful pregnancy. They suggest that the infertile obese women pay attention to weight loss (29). Indeed, this evidence highlights the importance of women body composition.

Considering the growth and development of human societies and changes in men's and women's lifestyle, infertility is likely to increase in the future (19). The results of recent studies indicate that the real incidence of infertility has been changing and increasing under the influence of various factors (1). Furthermore, the fertility rate has significantly reduced (3). In this research, the PAL was reported to be low in women with infertility. There are certain studies with the similar reported results (23-25). In a study conducted on 131 women treated for infertility, Kucuk and colleagues (2010) showed that the low to moderate intensity physical activity increases the likelihood of live birth and acceptance of conception (30). The study

conducted by Palomba and colleagues (2008) illustrated that the probability of pregnancy rate was 35% higher by doing physical activity (6).

Very few studies, however, have assessed the effect of physical activity on female infertility in the general population. Herein, the mean score of physical activity in women with infertility was reported to be low (about 75.3 % of women had low PAL). Moreover, the findings of this research showed that the PAL in overweight and obese women was far lower than that of the underweight women and women with normal weight. Meanwhile, the PAL was found to be moderate in 50% of fertile women. The results concerning association between PAL and fertility status are conflicting. While certain studies have reported that moderate exercise improves fertility (6), others have shown that exercising on a daily basis, to the level of exhaustion, could reduce fertility (8). There seems to be a threshold regarding the relationship between physical activity and fertility, which is more detrimental to reproductive health. As in several studies (6, 27-30), the physical activity and body composition factors have been reported to have significant effects on women infertility; therefore, informing people seems to be necessary to improve the women's society health and encourage the individuals to have an active life and the chance of healthy childbearing.

5. Conclusion

In brief, we found that women who were active on most days of the week had a lower risk of infertility compared with inactive women. As overweight and obesity can interfere with reproduction process in women, physical training might help improve the complex process of fertility in women. It is suggested that women use physical activity as a non-pharmacological therapy so that they could benefit from physical activity in order to resolve the infertility crisis.

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Ethical approval

The Ethics Review Board of Arak University of Medical Sciences approved the present study with the following number: IR.ARAKMU.REC.1398.213.

Conflicts of interest: None to declare.

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