Effect of exercise, body mass index, and waist to hip ratio on female fertility

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Abstract

Introduction: Infertility is a common problem among many couples. Exercise and weight loss seem to be among the effective factors on fertility. Therefore, the aim of this study was to investigate the effect of exercise, body mass index (BMI), and waist to hip ratio (WHR) with female fertility.
Materials and methods: This cross-sectional study was conducted on the data collected from Shahedieh Cohort. In this research, 1445 women (717 infertile and 728 fertile) were selected using the multi-stage cluster sampling method. Data on exercise, BMI, and WHR were compared between the infertile and fertile female groups. Independent t-test and logistic regression were used to analyze the data.
Results: A significant difference was found between the two study groups regarding BMI, WHR, and exercise levels ($P < 0.05$). The results of regression test showed that pysical activity had a significant effect on fertility ($P < 0.01$), but BMI and WHR had no significant effect on it ($P = 0.38$ and 0.35, respectively).
Conclusion: Based on the findings, it seems that exercise, regardless of changes in BMI and WHR, can increase fertility.

Keywords: Exercise, Body mass index, Waist to hip ratio, Fertility, Women

Introduction

Infertility is a common problem among many men and women. Based on the recent studies, approximately 15% of the couples in the childbearing age are faced with this problem (1). Infertility is defined as being unable to conceive after one year of trying (2). Reproductive disorders may be due to hereditary and some modifiable acquired factors, which can be considered as a treatment method (3). Life style is one of the factors that affect all aspects of human life, including health status and fertility. In fact, lifestyle includes the daily life pattern of individuals, including factors such as diet, exercise and physical activity, smoking, rest rate, stress management, as well as access to and use of health services (4).

Overweight and obesity, as effective factors on a couple's fertility, are among the most common problems associated with lack of exercise and physical activity. In this regard, some studies indicated that body mass index

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(BMI) higher than 25 could cause problems in male fertility (5). Obesity is also associated with decreased semen quality, decreased sperm concentration and motility, and damage to sperm DNA (6, 7).

Physically active women enjoy the benefits of disease prevention and experience less weight gain during pregnancy. These conditions are associated with a reduced risk of gestational diabetes and postpartum depression (8).

Recent studies showed that the rate of physical activity and exercise has declined in women (8). Dobson et al. reported that only 18% of people aged 18-23 and 31-36 years had adequate levels of physical activity. As they noted, the rate of overweight and obesity has also increased from 21% to 45% in women (9). This is important because reproductive problems, including infertility, are more common among overweight and obese women. Given the increasing number of overweight and obese women (10,11) as well as the increasing number of women in need of fertility treatment, the impact of exercise and weight loss should be investigated on fertility problems.

Infertility can cause many economic, social, and psychological problems for couples. Although new technologies have solved some problems related to fertility, such methods impose a high economic cost on families and their success is relatively low in some cases (12). Therefore, it seems necessary to find more economically viable methods to deal with infertility. In addition, the literature showed that exercise could improve the males' fertility and reduce obesity and its related diseases. Given that the effect of exercise and obesity on female fertility is not well understood, the present study aimed to investigate the effect of exercise, BMI, and WHR on fertility in women.

Materials and methods

The present study was conducted on the data collected for Shahedieh Cohort study, which is a part of the large PERSIAN (Prospective Epidemiological Research Studies in Iran) cohort study over 35-70 years old people (13). In Shahedieh Cohort study, approximately 10,000 men and women over 35 years of age living in Yazd City were studied. Although the method of PERSIAN cohort study was fully published in other research (13,14), a summary of the applied method is reported here. In brief, the participants were selected using multistage cluster sampling method. After completing the consent forms, the participants' demographic, anthropometric, lifestyle, level of exercise (walking and various sports hours per day), and fertility status information was recorded. To conduct the present study, 1445 women (717 infertile and 728 fertile) were selected (Table 1). Inclusion criteria were having 35 to 70 years of age, having Iranian nationality, not having a Comorbidity affecting fertility (such as cancer), not smoking, and not drinking alcohol. Exclusion criteria included unwillingness to cooperate in completing the questionnaire and consumption of drugs prescribed for fertility. To examine the differences between groups of data, independent t-test was run and to investigate the effect of independent variables (exercise, BMI, and WHR) on dependent (fertility) variable, logistic regression test was used by SPSS software version 18. Significance level of all tests was set at $P = 0.05$.

Results

The Age, anthropometric characteristics and level of exercise of the subjects are presented in Table 1. As shown in Table 2, a significant difference was found between the two study groups regarding mean BMI, waist circumference, hip circumference, WHR, walking, and exercise ($P < 0.05$).

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Furthermore, the results of logistic regression test indicated that exercise had a significant effect on fertility ($p < 0.01$), but BMI or WHR had no significant effect on fertility ($P = 0.38$ and $P = 0.35$, respectively) (Table 3).

Table 1. Anthropometric characteristics and exercise rate of the subjects under study.

	Fertile	Infertile
Age (year)	46.8±7	45.4±8
Height (cm)	156.64±6	156.41±6
Weight (kg)	71.27±11	73±13
BMI (kg/m^2)	29.05±4	29.82±5
Waist circumstance (cm)	96.47±10	98.1±12
Hip circumstance (cm)	104.82±8	106.37±10
WHR	0.92	0.93
Exercise (Hours per day)	3.91±35	2.51±21

Table 2. Results of independent t-test to examine the differences between means of the measured variables of the subjects under study.

	t	df	P
Age (year)	-2.969	1443	0.48
Height (cm)	-0.725	1443	0.14
Weight (kg)	2.58	1443	0.052
BMI (kg/m2)	2.981	1443	0.029*
Waist circumstance (cm)	2.728	1443	0.019*
Hip circumstance (cm)	3.106	1443	0.00*
WHR	-19.319	1443	0.038
Exercise (Hours per day)	-9.249	1443	0.00*

* indicates a significant difference between groups. BMI, Body Mass Index; WHR, Waist-to Hip Ratio.

Table 3. Results of logistic regression test to examine the factors that affect fertility.

	B	S.E.	P	OR
Exercise	3.21	0.28	0.00*	2.91
BMI	-0/01	0.01	0.38	0.99
WHR	0.83	0.89	0.35	0.83

* indicates a significant difference between groups. BMI, Body Mass Index; WHR, Waist-to-Hip Ratio.

Discussion

Infertility, defined as the failure to conceive after one year of trying, causes many economic, social, and psychological problems, especially in women. Although new laboratory methods have been developed to deal with infertility, the cost of such treatments is very high and their success rate is relatively low in some cases. In this regard, lifestyle changes, weight loss, and especially increased physical activity and exercise seem highly effective in reducing infertility. Therefore, the present study was conducted to investigate the effect of exercise, BMI, and WHR on female fertility.

Based on the results, a significant difference was observed between fertile and infertile women regarding exercise ($P < 0.01$). Furthermore, exercise had a significant effect on women's fertility ($P < 0.01$). Consistent with our findings, Hakimi and Cameron conducted a review study over the effect of exercise on ovulation and reported that exercise was beneficial for most women and could improve ovulation and fertility in women with ovulation disorders (15). Hajizadeh Maleki and Tartibian concluded

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that strength and aerobic exercises have a positive effect on male fertility (16). Mirghafourv et al. also studied infertile couples and noted that lifestyle, especially the level of physical activity, was not at a good level in infertile couples (17).

However, Gudmundsdottir et al. cited that intense exercise could increase the risk of female infertility, which is in contrary with our findings (18). Warren et al. also reported that intense exercise could impair women's fertility by causing hypothalamic disorders that result in impaired secretion of hormones affecting fertility (19).

The discrepancy between our findings and the studies by Gudmundsdottir et al. and Warren et al. may be related to the intensity of the exercise activities. They studied participants with intense exercise, but we found that the intensity of physical activity was almost moderate to low in our participants.

In most common fertility treatments, clomiphene ovulation stimulants (that stimulate the pituitary gland to secrete gonadotropins) or gonadotropins are prescribed. It seems that exercise and physical activity affect fertility through the same mechanism (15, 20). Furthermore, previous studies reported that exercise had the potential to recycle the GnRH cycle, resulting in spontaneous ovulation (21). Other studies also examined the possible mechanisms for the effect of exercise on fertility. Hakimi et al. investigated this issue from a neuro-endocrine perspective and showed that exercise helped resume ovulation in women by readjusting the hypothalamic-pituitary-gonadal axis (15, 20). Some studies also showed that improvement of sensitivity to insulin could be resulted from effective exercise in female fertility (22).

The results also indicated a significant difference between fertile and infertile women regarding BMI and WHR rates ($P < 0.05$). However, BMI and WHR had no significant effect on fertility ($P < 0.05$).

Considering that BMI and high body weight are associated with primary infertility (24,23), researchers examine obese and overweight women in this area. Similarly, some studies reported that weight loss in overweight and obese women is an effective way to improve fertility and pregnancy (26,25).

Although weight loss appears to play a role in improving fertility, Harrison et al. reported that physical activity in women was effective in restoring fertility, even though it did not reduce weigh significantly (15). These results were in the same line with the present research findings. Surkha et al. also suggested that physical activity improved ovarian reserve markers, regardless of body weight change (27). In the same way, Bast et al. reported that increased chance of fertility, improved ovulation, and normal menstrual cycle due to exercise were not associated with weight loss (28). A review of the literature shows that exercise may have a positive effect on fertility without leading to weight loss. Thus, weight loss can be considered as a mediator between the association of physical activity with reproductive health. However, comparing the individual effects of physical activity and weight loss on fertility is difficult

One of the limitations of our study was lack of control over the mental and psychological stress of the participants. Given that stress and stress hormones can have negative effects on female fertility, we suggest the future researchers to control the participants' stress levels. Moreover, diet, as an effective factor on fertility, was not controlled in the present study. Therefore, better conclusions can be achieved by implementing exercise programs with controlled diet in the future studies to investigate the relationship of exercise and obesity with fertility.

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Conclusion

the findingsof this study showed that the amount of exercise of the two groups is different and exercise could improve fertility. Also, it was seen that there is a significant difference between BMI and WHR of the two groups, But none of them have a significant effect on fertility. In general, it seems that exercise can have a positive effect on fertility, regardless of weight or body composition changes.

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Ethical approval

All stages of the present study were approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences in Yazd (Ethics Code: IR.SSU.SPH.REC.1397.161).

Conflicts of interest

The authors declare that they have no conflict of interest.

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