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Association of body mass index & android obesity with uterine leiomyoma among premenopausal women: A case–control study

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Abstract

Uterine leiomyomas (ULs) or uterine fibroids are the primary genital tumors in women of reproductive age. Obesity and increased visceral fat, and the production of inflammatory mediators might be risk factors for ULs. This study aimed to assess the correlation between ULs and body fat distribution among Iranian women. This case-control study involved 280 women of reproductive age with ULs and without myoma in 2020. They referred to three women's clinics in Shiraz (Shahid Faghihi, Zeinabieh, and Motahhari clinics). The sample size for each group consisted of at least 140 subjects selected via consumptive sampling methods. A gynecologist pre-diagnosed ULs based on the findings of vaginal ultrasound. We recorded and compared both groups' demographic information, fertility and ULs histories, body mass index (BMI), and android obesity. We used chi-square and t-tests to analyze the data. Most patients with ULs (64 people, 45.7%) were 41-50 years old. Most of them (126, 90%) were housewives, and the level of education of most patients (74 people, 52.9%) was under high school diploma. The mean BMI in women with myoma was 26.05±5.32 and 25.81 ±4.38 in women without myoma. There was no significant difference in the mean scores of BMI between the two groups, but the Android fat obesity was higher in patients with ULs. Few studies have attempted to identify specific risk factors for this tumor. Preventing weight gain and obesity and lifestyle modification can prevent Uterine leiomyoma.

Keywords: gynecology, premenopausal, uterine leiomyoma, women, body mass index, android obesity

1. Introduction

Uterine leiomyomas (ULs), or uterine fibroids, of the most common myometrial muscle cell tumors of benign pelvic origin (1), are benign steroid monoclonal tumors that stimulate the smooth muscle (myometrium) of the uterus (2). It is estimated that up to 77% (25-77%) of all women suffer from ULs during their life, and 15-30% suffer from significant symptoms (3-5). ULs are a common cause of menstrual irregularities, pelvic discomfort, menorrhagia, dysmenorrhea, anemia, recurrent pregnancy loss, preterm labor, incontinence, and infertility (4). Ekin et al. (2014) reported that the frequency of genital symptoms, urinary incontinence, including stress urinary incontinence, urgency and frequency of urination, and painful intercourse were higher in women with ULs. Women with ULs greater than 5 cm had more urinary incontinence than other women during physical activity and travel (6).

These seemingly benign tumors can be associated with abnormalities in preterm labor and infertility and recurrent miscarriages. The prevalence of abortion in such women is also twice as high as in other myoma-free pregnancies (7, 8). ULs are also the most common significant cause of uterine resection, which causes several complications for the patient (5, 9). The exact causes of ULs remain unknown, but two hypotheses propose genetics and hormones to be the cause (10, 11). Risk factors for ULs' development are obesity, reproductive factors such as nulliparity, young age in the first pregnancy, premature menarche, menstrual cycle length of more than 30 days and bleeding duration of more than six days, diabetes, and hypertension (12-16). A case-control study by Giri et al. (2017) (539 cases and 794 controls) entitled "African genetic ancestry interacts with body mass index to modify risk for uterine fibroids." reported that race, especially African race, and obesity are important risk factors for ULs and create suitable conditions for ULs growth (17). Obesity decreases the 2-hydroxylation of estrone to catechol estrogens and an increase in 16-alpha-hydroxylation of

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positively associated with uterine fibroids. Women with high BMI and waist-to-thigh ratio had the most significant uterine fibroids risk. Also, women with a body fat percentage of higher than 30% were comparatively prone to uterine fibroids, and uterine fibroids could be associated with overweight and central obesity (5), which is consistent with some of the findings of the present study. In a study by Tak et al., the WC and body fat were significantly greater in the ULs group. These outcomes are consistent with previous reports showing a positive correlation between obesity and the occurrence of ULs (15). In another study, visceral fat area (VFA), BMI, WC, body fat percentage, waist-to-height ratio, and waist-to-pelvic ratio were positively associated with uterine fibroids (30). Boclin et al. (2015) examined the association between adult weight gain and uterine myomas among Brazilian women. The results showed no significant relationship in the presence of uterine myomas among people with weight gain (31). Their results were inconsistent with our study. This difference might be due to the study population and the racial differences between Iran and Brazil. They studied 1560 Brazilian women whose weight gain had been continuously studied.

Studies show that the estrone to estradiol conversion in uterine fibroids is significantly lesser than the normal muscle tissue, and the estrogen receptors' concentration in fibroids is obviously greater than in peripheral muscle tissue. Thus, the pathogenesis of uterine fibroids might be related to the level of sex hormones (32). Obesity can lead to metabolic disorders, leading to local tissues creating an unusually great estrogen environment. This mechanism contains the following: 1) Androstenedione secreted through the adrenal glands could be converted to estrone via aromatase in adipose tissue, and plasma estrone levels increase with increased adipose tissue, hence causing a continuous effect of estrogen. 2) Obesity causes a periodic lack of regulation of progesterone; therefore, the endometrium is over-stimulated in an environment where no progesterone has an estrogen antagonist (33, 34). Uterine fibroids may develop in an abnormal environment with high estrogen. Therefore, obesity can be a risk factor for uterine fibroids.

Evidence shows that the levels of SHBG are lower in women with central obesity, and they have altered estrogen metabolism and hyperinsulinemia that are anticipated to stimulate the growth of UL (14, 23). However, a clear link between obesity and UL is connected to the hormonal effects associated with obesity. For instance, obesity increases with increased circulating adrenal androgens to estrones conversion due to adipose tissue accumulation (15). In addition, hepatic SHBR production is reduced, leading to more unrestricted physiologically active estrogen (35), which can cause a comparatively hyperestrogenic state. Previous studies have shown increased levels of estrogen and adipokines due to extreme fat accumulation and raised systemic inflammatory cytokines levels that may raise the tumorigenesis risk (36, 37).

Considering the above issues, it can be concluded that various factors are involved in the development of fibroids, and its true etiology remains unknown but understanding the risk factors associated with fibroids can be effective in providing preventive measures in the development of the disease. Preventing weight gain during fertility and lifestyle modification can be one of the preventative measures.

In conclusion, there was no significant difference in the mean scores of BMI between the case and control groups, but the Android fat index was higher in patients with myoma. Preventing weight gain during the reproductive period and improving lifestyle can be one of the preventive ways. Providing nutritional tips, changing diets, and exercising are essential steps to preventing uterine fibroids.

One of the study's limitations was that it was conducted during the COVID-19 pandemic in hospitals and public centers. As a result, a series of protocols were observed during the presence of participants, and completing the questionnaires, including maintaining the physical distance, necessitated a longer time than stated in the proposal. Furthermore, because only Iranian women participated in the study, our findings could not be generalized to other ethnicities or geographies.

Conflict of interest

All authors have no financial or personal conflict of interest.

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Authors' contributions

MA and ZK prepared the first draft of the manuscript, and MA &SA made critical revisions to the paper and responded to the reviewers. FN helped the Surge Articles and Clinical Research.

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