Original Article

Associations between uterine fibroids and lifestyles including diet, physical activity and stress: a case-control study in China

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This study was conducted to investigate the associations between uterine fibroids and lifestyles including diet, physical activity and stress from October 2009 to April 2011 in China. This case-control study composed of 73 women with uterine fibroids and 210 women without fibroids. Uterine fibroid cases were confirmed by ultrasound diagnosis or hysterectomy surgery. Information on women's dietary habits, physical activity and stress status were collected with a validated self-administered questionnaire. A logistic regression model was used to estimate the odds ratios (OR) after controlling for age, gravidity and parity. We found that vegetable and fruit intakes and occupational intensity played positive effects on uterine fibroids. For premenopausal women, vegetable and fruit intakes (OR = 0.5; 95% CI: 0.3, 0.9) and occupational intensity (OR = 0.2; 95% CI: 0.1, 0.6) significantly decreased the risk of fibroids; conversely, BMI significantly increased the risk (OR = 1.2; 95% CI: 1.0, 1.4). However, the associations for postmenopausal women were not significant. Our findings suggested protective roles for vegetable and fruit intakes and occupational intensity on uterine fibroids, and supported the hypothesis that high BMI only increased the risk of uterine fibroids in premenopausal women.

Key Words: uterine fibroid, diet, physical activity, stress, risk factors

INTRODUCTION

Uterine fibroids are common noncancerous tumors that usually develop among reproductive-aged women.[1] The incidence is about 30% to 70% according to different diagnostic methods.[2,3] Uterine fibroids represent the principal cause for hysterectomies, and lead to specific symptoms including heavy menstrual bleeding, pelvic pressure, infertility and pregnancy loss.[1,4,5] Because the economic burden due to fibroids has been increasing, these benign tumors are a significant health concern in women.

The pathogenesis of uterine fibroids is not well understood, but lifestyle factors including diet, physical activity and mental status have a potential effect on fibroids' growth and development.[3,6,7] Previous studies have shown that a diet rich in vegetables, fruit, dairy and soya food might have a positive effect on fibroids; conversely, a substantial consumption of red meat might increase the risk of fibroids.[8-13] Regular physical activity was negatively associated with the diagnosis of these tumors.[14] Wyshak *et al* [15] suggested that college athletes had a 40% lower prevalence of fibroids compared with non-athletes. Stress also has been found to affect women's estrogen and progesterone levels, which are both important in fibroid development.[16] Women who felt stress caused from racial discrimination were more likely to have fibroids.[17]

Thus far, the associations between lifestyle components and uterine fibroids have been individually established by previous studies. It is believed that stress can lead to a tendency to consume a high-fat diet, sweets and salty food. Conversely, poor diet and sedentary lifestyle are associated with negative physical and mental health. To confirm these associations, we examined the combined association of diet, physical activity and stress with fibroids in a case-control study conducted in China.

MATERIALS ANDMETHODS

Study population

This case-control study was conducted between October

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2009 and April 2011 in the International Medical Center of the People's Liberation Army General Hospital (PLAGH) in Beijing. The study subjects were recruited from a regular medical health checkup program for the early detection and treatment of gynecological diseases. Women who completely finished a physical examination and a self-administered questionnaire including demographic characteristics, reproductive histories, smoking and drinking habits, diet, exercise and stress status, were recruited to the study. We excluded subjects who were pregnant or breast feeding, who were younger than 18 years old, with a diagnosis or suspicion of malignant disease, with acute internal or infectious disease, or undergoing hormonal therapy. After exclusion, 73 cases and 210 controls were recruited in the study. This study was approved by PLAGH and participants gave informed consents.

Outcome assessment

Uterine fibroid cases were confirmed by ultrasound diagnosis or hysterectomies. Medical records were obtained for women who had undergone hysterectomies due to uterine fibroids. Ultrasounds have high sensitivity (99%) and specificity (91%) compared with histological diagnosis.[18] Self-reports of "no fibroids" were not accepted because undiagnosed fibroids are common.[19]

Exposure assessment

Diet was assessed with a validated short-form food frequency questionnaire (FFQ).[20] The participants were asked how many days per week on average they consumed each of the food items listed in the last year before study. The FFQ consisted of 10 sections: 1) cereals, 2) soy and soya products, 3) meat, 4) fish, 5) diary food, 6) eggs, 7) vegetables and fruits, 8) desserts, 9) fried food, and 10) salty food. For each item, the answer was artificially classified into four frequency categories: never/less than one day per week, one or two days per week, three to five days per week and everyday or more. Frequency of food intake was classified into low, intermediate, or high groups, in which low was never/less than one day per week, intermediate was one or two days per week, and high was more than three days per week.

Women were asked by a short Chinese version of the International Physical Activity Questionnaire for their occupational and non-occupational physical activity level throughout their lifetime.[21] Data on intensity, frequency, and duration were partially obtained in each of these two categories. The occupational intensity was estimated by the participants as low, intermediate, or high according to the hours per day spent in sitting, standing or character of working, with definitions and examples provided for the study participants. Vehicles used to get to work were represented with three options (walking or riding, driving, and bus) to better explain the activity level at work. The frequency and duration of non-occupational activities were based on the time of week and hours per time that activity was performed. We defined activity frequency as low (less than one time per week), intermediate (one or two times per week) and high (more than three times per week); and activity duration as low (less than 30 min per week), intermediate (30 to 120 min per week), or high (more than 120 min per week). In addition, "vigorous activity" was defined as low, moderate and heavy by the type of exercise; and household chore activity corresponding to never, sometimes and always was defined as low, moderate and heavy, respectively.

A single-item question was used to assess perceived stress: "Did you feel stressful originating from work and life within past 12 months?". The response choices consisted of a five-point scale (i.e. none, mildly, moderately, severely and very severely), and perceived stress was categorized as a three-level variable: low daily stress (i.e., none or mild levels), moderate stress and high stress (i.e., severe and very severe levels combined). Respondents were also asked to evaluate their stress-related emotions as follows: "Did you feel depressed within past 12 months?" and "Did you feel anxious within past 12 months?". The response choices were none, sometimes and always, and both variables were categorized as low, intermediate and high based on the result distribution.

We also collected information on subjects' sociodemographic characteristics, education, occupation, medical history, age at menarche, parity, age at each birth, menopausal status, marital status, smoking, drinking, body height and body weight. BMI was calculated as weight (kg) divided by height squared (m^2).

Statistical analysis

The characteristics of the study subjects were compared using the chi-square test. Odds ratios (ORs) of uterine fibroids, and the corresponding 95% confidence intervals (CI) for an increment of each variable were estimated using an unconditional logistic regression model. The *p*-values for trend were calculated using the Mantel-Haenszel χ^2 test for trend. Because menopause status was significantly different in our population, a separate analysis was performed for the two subgroups in a multiple logistic regression model to estimate the adjusted ORs of fibroids associated with variations in diet, physical activity and BMI, which was controlled for age, gravidity and parity. The change of each variable was included as a continuous variable. All statistical analyses were performed using SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA), and the level of significance adopted was $p<0.05$, all *p*-values are two-sided.

RESULTS

Of the total study subjects (n=283), 94.0% (n=266) were of Han ethnicity and, 6.0% (n=17) were of other ethnicity, including Mongolian (n=10), Manchu (n=5), Hui (n=1) and Korean (n=1). The study population had a high education level: more than a high school diploma (54.1%), high school diplomas (29.3%) and less than a high school diploma (16.6%). The majority were married (95.8%) and from northern China (93.6%). The differences in ethnicity, education, marital status or location between women with fibroids or without fibroids were not significant.

Table 1 shows selected demographic characteristics between cases (n=73) and the controls (n=210). The two groups did not differ significantly by BMI, age at menarche, gravidity, parity, age at first birth, age at last birth, or smoking and alcohol status. Women with fibroids were significantly older ($p<0.05$) and more frequently post-

Table 1. Characteristics of study subjects according to uterine fibroid status

Characteristic	Case (n=73)		Control (n=210)	
	N	%	N	%
Age, years*				
<35	0	0	9	4.3
35-45	12	16.4	56	26.7
45-55	41	56.2	93	44.3
>55	20	27.4	52	24.8
BMI, kg/m^2 †				
<18.5	1	1.4	5	2.4
18.5-23.9	36	49.3	117	55.7
24.0-27.9	31	42.5	73	34.8
≥28	5	6.8	15	7.1
Age at menarche, years				
≤14	47	65.3	128	61.0
15-16	10	13.9	26	12.4
≥17	15	20.8	56	26.7
Gravidity‡				
≤1 pregnancy	8	11.0	19	9.5
2 pregnancies	15	20.5	45	22.4
3 or more pregnancies	50	68.5	137	68.2
Parity				
≤1 live birth	41	56.2	105	52.5
2 live births	20	27.4	62	31.0
≥3 live births	12	16.4	33	16.5
Age at first birth, years‡				
<25	45	64.3	119	58.3
25-30	25	35.7	79	38.7
≥30	0	0	6	2.9
Age at last birth, years‡				
<25	23	33.3	57	30.6
25-30	35	50.7	91	48.9
≥30	11	15.9	38	20.4
Menopausal status **				
premenopausal	32	43.8	132	62.9
postmenopausal	41	56.2	78	37.1
Smoking habits				
never	70	95.9	195	92.9
ever	3	4.1	15	7.1
Alcohol habits*				
never	44	60.4	139	66.5
ever	29	39.6	70	33.5

†Abbreviations: BMI, body mass index
‡Number does not sum to total because of missing data.
*p<0.05, **p<0.01

menopausal (p<0.01) compared with the control women.

The average weekly frequencies of the consumption of selected food groups and the corresponding ORs are reported in Table 2. The consumption of cereals, soya products, meat, fish, dairy food, eggs, desserts, fried and salty food was not significantly associated with fibroids. Vegetable and fruit intakes were significantly inversely associated with fibroid risk, and the OR in the high intake group was 0.4 (95% CI: 0.2, 0.9).

Table 3 presents the physical activity and stress status in cases and controls and their corresponding ORs. There was no significant difference with respect to the vehicle, activity frequency, vigorous activity and chores. Occupational intensity was inversely related to fibroids, and OR was 0.6 (95% CI: 0.4, 1.1). Non-occupational physical activity time per week was marginally associated with fibroids (p=0.05). No association was found between fibroids and stress, depression or feelings of anxiety.

Because all of the variables were considered individually, some of the statistically significant associations may not really exist. All of the risk factors that were highly significantly associated with fibroids and other traditional variables were simultaneously included in a multiple logistic regression equation to allow for a mutual confounding effect. Vegetable and fruit intakes (OR = 0.6; 95% CI: 0.4, 0.9) and occupational intensity (OR = 0.5; 95% CI: 0.3, 0.9) had positive effects on fibroids for the total study population. After stratification into premenopausal and postmenopausal groups, vegetable and fruit intakes (OR = 0.5; 95% CI: 0.3, 0.9) and occupational intensity (OR = 0.2; 95% CI: 0.1, 0.6) significantly decreased the risk of fibroids; Conversely, BMI significantly increased the risk (OR = 1.2; 95% CI: 1.0, 1.4) for premenopausal women. However, the associations in the postmenopausal group were not significant.

DISCUSSION

We observed protective effects of vegetable and fruit in-

Table 2. Risk of fibroids prevalence by across selected food groups

Food group	Consumption Frequency†	Case		Control		Odds ratios	95% confidence interval
		n	%	n	%		
Cereals	Low	9	12.3	10	4.8	1.0	
	Intermediate	5	6.8	28	13.3	0.2	0.1, 0.7
	High	59	80.8	172	81.9	0.4	0.1, 1.0
	p for trend					0.26	
Soy	Low	11	15.1	28	13.3	1.0	
	Intermediate	14	19.2	53	25.2	0.7	0.3, 1.7
	High	48	65.8	129	61.4	0.9	0.4, 2.1
	p for trend					0.79	
Meat	Low	9	12.3	13	6.2	1.0	
	Intermediate	22	30.1	64	30.5	0.5	0.2, 1.3
	High	42	57.5	133	63.5	0.5	0.2, 1.1
	p for trend					0.17	
Fish	Low	18	24.7	48	22.9	1.0	
	Intermediate	22	30.1	79	37.6	0.7	0.4, 1.5
	High	33	45.2	83	39.5	1.1	0.5, 2.1
	p for trend					0.72	
Dairy food	Low	19	26.0	60	28.6	1.0	
	Intermediate	17	23.3	51	24.3	1.1	0.5, 2.2
	High	37	50.7	99	47.1	1.2	0.6, 2.2
	p for trend					0.60	
Eggs	Low	7	9.6	27	12.9	1.0	
	Intermediate	14	19.2	51	24.3	1.1	0.4, 2.9
	High	52	71.2	132	62.9	1.5	0.6, 3.7
	p for trend					0.22	
Vegetables and Fruits	Low	13	17.8	19	9.0	1.0	
	Intermediate	12	16.4	27	12.9	0.7	0.2, 1.7
	High	48	65.8	164	78.1	0.4	0.2, 0.9
	p for trend					0.02*	
Desserts	Low	35	47.9	84	40.0	1.0	
	Intermediate	18	24.7	66	31.4	0.7	0.3, 1.3
	High	20	27.4	60	28.6	0.8	0.4, 1.5
	p for trend					0.42	
Fried food	Low	41	56.2	106	50.6	1.0	
	Intermediate	16	21.9	57	27.1	0.7	0.4, 1.4
	High	16	21.9	47	22.4	0.9	0.5, 1.7
	p for trend					0.58	
Salty food	Low	38	52.1	111	52.9	1.0	
	Intermediate	15	20.5	45	21.4	1.0	0.5, 1.9
	High	20	27.4	54	25.7	1.1	0.6, 2.0
	p for trend					0.83	

Abbreviations: OR, odd ratio; CI, confidence interval.
†low= never/less than one day per week; intermediate = one or two days per week; high = more than three days per week.
*$p<0.05$

takes and occupational intensity on uterine fibroids, and supported the hypothesis of an increased risk of fibroids with a high BMI in premenopausal women, which did not appear significant in postmenopausal women. Our findings were consistent with previous studies, in which low fibroid risk was associated with the intake of green vegetables,[8] regular exercise and low BMI.[14,22,23] Our study differed from these studies through stratification of women into pre- and post- menopausal groups. Fibroids usually shrink or disappear after menopause, indicating that most of the postmenopausal cases were of high severity or confirmed by hysterectomy. Their data measured at enrollment may show a prevalence-incidence bias with an underestimation of these risks.

Vegetables and fruits are good sources of dietary fibers, vitamins, minerals, antioxidants and phytochemicals.[24,25] In a previous study, a weak relationship was reported between fruit consumption and fibroids.[8] Additionally, the results of studies on the association between fruits and other hormone-responsive diseases were inconsistent.[26,27] Thus, we examined the effect of fruits and vegetables in combination, and found a strong link with fibroids. The protective effect of a high intake of vegetables and fruits could be related to fibers and other undetermined active constituent substances, such as phytoestrogens and lycopenes, through different mechanisms. Dietary fiber can influence sex hormone and bile acid metabolism mainly though partially interrupting enterohepatic circulation, altering intestinal metabolism and increasing the fecal excretion of these compounds.[26,28] Phytoestrogens, especially isoflavonoids and lignans, have moderate estrogen and anti-estrogen activity.[29,30] Several studies found that vegetarians had lower urinary levels of estriol

Table 3. Risk of fibroids prevalence by across selected physical activity and stress (odds ratios and 95% confidence intervals)

		Case		Control		Odds	95% confidence
		n[†]	%	n	%	ratios	interval
Occupational physical activity							
Occupational intensity[‡]	Low	44	62.0	101	49.3	1.0	
	Intermediate	27	38.0	97	47.3	0.6	0.4, 1.1
	High	0	0	7	3.4		
	p for trend					0.03*	
Vehicle	Walking or riding	19	26.4	67	33.3	1.0	
	Driving to work	40	55.6	110	54.7	1.3	0.7, 2.4
	Bus to work	13	18.1	24	11.9	1.9	0.8, 4.5
	p for trend					0.14	
Non-occupational physical activity							
Activity frequency[§]	Low	16	28.1	57	33.7	1.0	
	Intermediate	12	21.1	51	30.2	0.8	0.4, 1.9
	High	29	50.9	61	36.1	1.7	0.8, 3.4
	p for trend					0.11	
Activity time[¶]	Low	12	21.1	43	25.4	1.0	
	Intermediate	19	33.3	79	46.7	0.9	0.4, 1.9
	High	26	45.6	47	27.8	2.0	0.9, 4.4
	p for trend					0.05	
Vigorous Activity[††]	Low	44	74.6	134	78.4	1.0	
	Intermediate	8	13.6	20	11.7	1.2	0.5, 3.0
	High	7	11.9	17	9.9	1.3	0.5, 3.2
	p for trend					0.57	
Chore	Low	5	6.8	17	8.1	1.0	
	Intermediate	18	24.7	61	29.0	0.8	0.3, 2.2
	High	50	68.5	132	62.9	0.8	0.4, 1.4
	p for trend					0.43	
Stress							
Depression	Low	19	26.0	41	19.5	1.0	
	Intermediate	48	65.8	141	68.1	0.7	0.4, 1.4
	High	6	8.2	26	12.4	0.5	0.2, 1.4
	p for trend					0.16	
Anxiety	Low	18	24.7	39	18.6	1.0	
	Intermediate	48	65.8	139	66.2	0.7	0.4, 1.4
	High	7	9.6	32	15.2	0.5	0.2, 1.2
	p for trend					0.14	
Feeling stress	Low	40	54.8	96	45.7	1.0	
	Intermediate	18	24.7	58	27.6	0.7	0.4, 1.4
	High	15	20.5	56	26.7	0.6	0.3, 1.3
	p for trend					0.18	

[†] Number does not sum to total because of missing data.
[‡] low included clerical work ,driving, shop keeping, teaching, studying, housework, medical practice and occupations requiring a university education; intermediate included factory work plumbing, carpentry and farming; high included dock work, construction work and professional sport.
[§] low = less than one time per week; intermediate = one or two times per week; high =more than 3 times per week.
[¶] low = less than 30 minutes per week; intermediate = 30 to 120 minutes per week; high = more than 120 minutes per week.
[††] low included walking or sedentary, intermediate included swimming or indoor sports, high included running or ball games, etc.
*$p<0.05$

and total estrogens and higher plasma levels of sex hormone-binding globulin.[28,31] Lycopenes from the yellow, orange, and red colors in many fruits and vegetables, are associ-ated with a reduced risk of many cancer types due to their antioxidant properties and provitamin A activity.[32] One animal study confirmed that lycopene supplementation reduced the incidence of leiomyomas,[33] but its role was not confirmed in human studies.[9]

Soy food, the predominant source of phytoestrogens, was hypothesized to have an inverse relationship with fibroids, but we failed to find this association. A cross-sectional study found no association between intake of soy isoflavones and uterine fibroids.[11] It is possible that we collected information only on the frequency of intake, without an accurate estimation of each portion size. Consequently, a more quantitative study should be conducted to determine the association between soy food or isoflavonoids and fibroids.

Few studies have examined both occupational and recreational physical activity and uterine fibroids, our data evaluated the associations between physical activity at or not at work with uterine fibroids in detail. We found that

Table 4. Odds ratios and corresponding 95% confidence intervals for an increment of variables related to uterine fibroids

	Total		Premenopausal		Postmenopausal	
	OR (95%CI)†	*p*-value	OR (95%CI)†	*p*-value	OR (95%CI)†	*p*-value
Vegetable &Fruit	0.6 (0.4,0.9)	0.02*	0.5 (0.3,0.9)	0.01*	0.8 (0.4,1.6)	0.58
Occupational intensity	0.5 (0.3,0.9)	0.01*	0.2 (0.1,0.6)	0.003**	0.8 (0.3,1.6)	0.46
BMI	1.0 (0.9,1.2)	0.40	1.2 (1.0,1.4)	0.03*	0.9 (0.8,1.1)	0.40

† Derived from a multiple logistic regression equation adjusted for age, gravidity and parity.
*$p<0.05$
**$p<0.001$

the risk of fibroids significantly decreased among women who had moderate occupational intensity. Results from several studies suggest that higher levels of occupational physical activity may be associated with a reduction in risk of breast cancer.[34,35] Only two previous studies focused on the variable of recreational physical activity, suggesting a significantly inverse association with fibroids.[14,15] Baird *et al*[14] reported that women were more likely to have decreased risk of fibroids when they had at least four hours of vigorous physical activity per week. However, we observed a non-significant trend toward increased risk among women who were in the category of high non-occupational physical activity time, which might be explained by the observation that women with fibroid condition were more likely to exercise or seek other healthy lifestyles. Besides, the recreational exercise of women in China being substantially low relative to other countries,[36] might also explain why the same protective effect was not shown between non-occupational activity and uterine fibroids.

BMI was shown to increase the risk of fibroids only in premenopausal women in our study. Prospective studies have presented that an increased BMI is significantly associated with the risk of uterine fibroids.[22,23,37] Obesity is associated with the development of fibroids most likely through increasing endogenous hormone levels, decreasing serum hormone-binding globulin, altering estrogen metabolism under premenopausal conditions, and changing myometrial cell signaling controls such as insulin receptors, insulin-like growth factors, and peroxisome proliferator-activated receptors.[38-41] However, we didn't observe the same association between BMI and fibroids in postmenopausal women. A prospective study has also reported that the positive effect of BMI appears to be restricted to premenopausal and perimenopausal women other than postmenopausal women.[42] It is likely that the increased BMI may be associated with a reduction, not only in estrogen levels, but also fibroid growth factors such as IGF-1 in postmenopausal women.

We also found no association between stress and uterine fibroids, which was inconsistent with Vines[16,43] and Wise,[17] who both supported a relationship between stress and uterine fibroids. Vines *et al* reported that chronic stress was inversely associated with fibroids. Black women with severe stress had a prevalence of fibroids that was 11% higher than those in the no or mild stress group, whereas white women with severe stress had a non-significantly higher prevalence.[43] We selected women who completed the questions, which might indicate the women of lower economic status were not represented in the study, and this result might explain the lack of a stress effect. It is conceivable that stress can cause fluctuations in hormonal levels; however, an exploration of the biological mechanisms underlying the association is still needed.

Our study had several strengths. First, we used ultrasound screening for fibroids, which enabled us to identify a large sample of subclinical fibroid cases. The high sensitivity and specificity of ultrasound can avoid misclassification bias between cases and controls. Second, to avoid the effect of selection bias, comparisons were performed between women who completely filled out questionnaires and those who did not, and there was no significant difference existed (data not shown). In addition, for the control group, we used exclusion criteria during enrollment of women admitted to the hospital for chronic conditions and for any disease that could have produced a long-term modification of diet, physical activity and mental health. Third, data were collected from women participating in a health checkup program. Our study was unlike other studies that had to identify cases through symptoms or the treatment of fibroids in a hospital. The associated risks may be related more to the occurrence of uterine fibroids rather than symptoms and treatments.

A limitation of our study was that we measured long-term dietary intakes using FFQs without a quantitative estimation of each frequency. Detailed information of physical activity variables, such as METs, was not defined in our results. However, compared with controls, women (including pre- and post- menopausal women) with fibroids reported a higher average occupational intensity, and the protective effect disappeared in the post-menopausal group. Thus, this association may be underestimated. The small number of subjects was another limitation because we had insufficient power to detect a small but significant association. We compared whether women with or without fibroids was associated with some chemical exposure, such as the petrochemicals industry, metal industry, and the coal and mining industry, which might induce stress. For three cases and two controls exposed to a chemical environment, the difference was not significant. More detailed information is needed.

In summary, vegetable and fruit intakes and occupational intensity had positive effects on uterine fibroids, and a high BMI increased the risk of fibroids in premenopausal women. Further research will be required to assess these possible mechanisms for uterine fibroid prevention and treatment.

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AUTHOR DISCLOSURES
We declare that there are no conflicts of interests.

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Original Article

Associations between uterine fibroids and lifestyles including diet, physical activity and stress: a case-control study in China

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子宫肌瘤与膳食、体力活动及压力等生活方式之间的关系：中国的病例对照研究

本研究于 2009 年 10 月至 2011 年 4 月期间在中国采用病例对照研究探讨子宫肌瘤与膳食、体力活动及压力等生活方式之间的关系。共纳入 73 名子宫肌瘤患者和 210 未患肌瘤的正常女性。子宫肌瘤病例经超声或行子宫切除术进行诊断。采用自填式问卷收集女性膳食习惯，体力活动和压力等方面的信息。在控制年龄，孕次和产次等混杂因素后，进行逻辑回归分析，并计算疾病风险比值(OR)。结果发现蔬菜水果的摄入与职业性体力活动是子宫肌瘤的保护因素。对于绝经前女性，蔬菜水果的摄入(OR= 0.5；95%CI：0.3，0.9)和职业性体力活动(OR =0.2；95%CI：0.1，0.6)能显着降低子宫肌瘤的风险；与之相反，BMI 显着增加子宫肌瘤的患病风险(OR = 1.2；95%CI：1.0，1.4)。这些关系在绝经后女性中没有统计学意义。研究表明在绝经前女性中，蔬菜水果的摄入和职业性体力活动是子宫肌瘤的保护因素，而高 BMI 是子宫肌瘤的危险因素。

关键词：子宫肌瘤、膳食、体力活动、压力、危险因素