

Modifiable Factors Associated with Uterine Fibroids in Women of Reproductive Age: A Cross-Sectional StudyAditi¹, Mehre Afshan Mehdi², Raj Rani Choudhary³, Dipti Roy⁴¹Senior Resident, Department of obstetrics and gynecology, Nalanda Medical College and Hospital, Patna, Bihar, India²Senior Resident, Department of obstetrics and gynecology, Nalanda Medical College and Hospital, Patna, Bihar, India³Professor, Department of obstetrics and gynecology, Nalanda Medical College and Hospital, Patna, Bihar, India⁴Professor and HOD, Department of obstetrics and gynecology, Nalanda Medical College and Hospital, Patna, Bihar, India

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Abstract:**Background:** Uterine fibroids are the most common benign tumors of the female reproductive system and can lead to significant reproductive and gynecological complications. Although several non-modifiable risk factors have been identified, the role of modifiable lifestyle factors remains less clearly understood.**Aim:** To identify modifiable factors associated with uterine fibroids among women of reproductive age.**Methodology:** A hospital-based cross-sectional study was conducted among 278 women aged 18–44 years attending the Department of Obstetrics and Gynecology at Nalanda Medical College and Hospital, Patna, India, over nine months. Data were collected through structured questionnaires, clinical examination, anthropometric measurements, and pelvic ultrasonography. Statistical analysis was performed using SPSS, and associations were assessed using Chi-square tests and logistic regression with odds ratios (OR) and 95% confidence intervals (CI).**Results:** The prevalence of uterine fibroids was 33.8%. Overweight (OR=1.89; 95% CI: 1.05–3.41) and obese women (OR=2.67; 95% CI: 1.45–4.92) had higher odds of fibroids compared with women with normal BMI. Irregular physical activity (OR=1.82; 95% CI: 1.06–3.11) and high-fat diet (OR=1.77; 95% CI: 1.04–3.01) were also significantly associated with fibroid occurrence. Family history showed a strong association (OR=3.12; 95% CI: 1.79–5.44).**Conclusion:** Modifiable lifestyle factors such as increased BMI, physical inactivity, and unhealthy dietary patterns are significantly associated with uterine fibroids. Lifestyle modifications may help reduce the risk and improve reproductive health outcomes.**Keywords:** Uterine Fibroids, Modifiable Risk Factors, Body Mass Index, Physical Activity, Diet, Women Of Reproductive Age.**DOI:** 10.25258/Ijpqa.17.1.66This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Uterine leiomyomas or uterine fibroids (UF) are the most frequent benign tumors of the female reproductive system and begin in the smooth muscle lining of the uterus. These tumors are hormone sensitive and, in most cases, they occur in the reproductive years of a woman. Despite their benign pathology, uterine fibroids may have an enormous influence on the health and quality of life of women because of their adverse effects on the abnormal bleeding of the uterus, pain in the pelvis, infertility, and postpartum complications [1]. Besides the issues of reproductive health, growing evidence indicates that uterine fibroids are also linked with distortion of metabolism and other systemic conditions [2]. Due to their

prevalence and the effect on the health of women, uterine fibroids pose a significant threat to the well-being of the population across the globe.

In the research conducted in the past, a number of risk factors that are associated with the development of uterine fibroids have been explored. A lot of such aspects are not modifiable, and they include age, ethnicity, genetic predisposition and reproductive history. A number of epidemiological studies have revealed that there are huge racial disparities in the prevalence and severity of uterine fibroids. Specifically, Black women have been reported to be more likely to develop uterine fibroids than White women and the disease have more devastating clinical

manifestations. The odds ratio of the incidence of uterine fibroids among Black women in comparison with the White women is 1.51 (95% confidence interval (95% CI): 1.05–2.18) [3]. Such results indicate a possible significant role in ethnic and genetic differences in the pathogenesis of uterine fibroids.

Another established risk factor is age which is non-modifiable. Uterine fibroids become common with age especially in the late reproductive years. The research has proven that the women who have uterine fibroids are much older than women without the condition. Considering the following as one such example, the mean age of women with uterine fibroids was significantly greater than that of women without the disease (40.4 +/- 6.9 years versus 32.4 +/- 9.6 years; $p = 0.001$) [4]. This prevalence growth with age is believed to be linked to the long-term exposure of the ovarian hormones (estrogens and progesterones) which promote the growth of fibroids.

Genetic predisposition has also been cited as a major cause of the occurrence of uterine fibroids. A number of studies have reported genetic variants and familial clustering with a high risk of fibroid development [5]. These results confirm the fact that a biological theory could be inherited, which could cause the onset and course of the disease. On the same note, the reproductive factors including early menarche have been linked to increased risk of developing uterine fibroids. Early menstrual cycle can also result in more years of exposure to estrogen and progesterone which exposes individuals to a greater risk of developing fibroid [6].

Although various research have been done on these non-modifiable determinants, the role of modifiable lifestyle and health determinants with regard to the development of uterine fibroids has not been well-investigated. The significance of the study of modifiable risk factors lies in the fact that modifiable risk factors may be targeted in a preventive approach and lifestyle intervention. Nonetheless, the existing study results on the changeable factors of uterine fibroids are conflicting and discrepant in certain instances [7].

The use of hormonal contraceptives especially the combined oral contraceptives is one of the modifiable factors that has often been examined. The hormonal contraceptives are not recent research, and it has been long known that they may help to regulate the hormonal balance and affect gynecological conditions. However, the evidence that has been available suggests that no notable correlation can exist between the use of combined oral contraceptives and the occurrence of uterine fibroids. A study on this relationship has found odds ratio of 0.88 (95% CI: 0.59 1.33) indicating that combined oral contraceptives does not significantly risk or lower the risk of developing fibroids in the uterus [8]. Nevertheless, there is need to conduct more research to determine

the association between hormonal contraceptive use and the risk of fibroid.

Body mass index (BMI) is another potentially modifiable factor that is the overall weight and adiposity of the body. Obesity and overweight have also been found to affect hormonal and metabolic activities that, in turn, can affect the growth of hormone-sensitive cancer like uterine fibroids. Nevertheless, the correlation between uterine fibroids and BMI is still controversial. Certain studies indicate that obesity may not be a big risk factor of fibroids and give odds ratio, 0.61 (95% CI: 0.41-0.90) [9] of obesity. On the contrary, other studies show that an increase in BMI is linked to the escalation of the risk of uterine fibroid growth, whereas the odds ratio was 1.74 (95% CI: 1.00 2.59) [10]. These contradictory findings demonstrate the necessity of additional investigation of the role of the body weight and metabolic status in the pathogenesis of fibroid cysts.

The increasing popularity of nutritional factors as possible causes of the development of uterine fibroid has also been noted over recent years. Out of these, vitamin D has received a lot of research because it is known to play significant roles in immune system, cell growth, and hormonal control. There are indications that vitamin D deficiency could be linked to a high risk of uterine fibroids. In one of the studies, it was noted that an increased level of vitamin D had a negative relationship with the likelihood of fibroids with an odds ratio of 0.68 (95% CI: 0.48-0.96) [11]. These results indicate that vitamin D can potentially protect against the development of fibroid but how it does so is not well understood.

Other micronutrients other than vitamin D have also been examined in relation to their possible role in pathogenesis of uterine fibroids including vitamin A and vitamin E. These are vitamins that have been known to play an antioxidant role and in cell growth regulation. Nevertheless, the existing pieces of evidence about their role in the formation of uterine fibroids are few and inconclusive. Even though a number of studies have been conducted to examine the association between these vitamins and fibroid risk, the results are yet to be confirmed and need to be conducted through additional studies [12, 13].

In general, even though significant studies have been undertaken on the non-modifiable risk factors involved in the development of uterine fibroids, little is known regarding the role of modifiable lifestyle, nutritional, and metabolic factors. The discovery of these modifiable determinants is pivotal to the creation of effective prevention strategies especially the women at the reproductive age who might be at higher risk of developing fibroids.

Therefore, the present study aims to identify the main modifiable factors associated with uterine fibroids in women of reproductive age in the Baikal region, including among specific ethnic groups. Understanding these associations may contribute to

improved prevention, early detection, and management strategies for uterine fibroids, ultimately reducing the burden of this common gynecological condition.

Methodology

Study Design: This study was conducted as a hospital-based cross-sectional study to assess the modifiable factors associated with uterine fibroids among women of reproductive age. A cross-sectional design was selected because it allows the assessment of the prevalence of uterine fibroids and the relationship between potential risk factors and the condition at a single point in time. The study focused on identifying lifestyle and metabolic factors that may influence the occurrence of uterine fibroids among women seeking gynecological care.

Study Area: The study was carried out in the Department of Obstetrics and Gynecology at Nalanda Medical College and Hospital in Patna, Bihar, India.

Study Duration: The study was conducted over a period of nine months from March 2025 to November 2025.

Sample Size: A total of 278 women of reproductive age were included in the study. The sample size was determined based on the availability of eligible participants attending the gynecology department during the study period. Women who fulfilled the inclusion criteria and consented to participate were consecutively recruited until the required sample size was achieved.

Study Population: The study population consisted of women aged 18 to 44 years who attended the Department of Obstetrics and Gynecology at the study hospital for gynecological consultation, routine health examinations, or treatment of reproductive health problems. These women were evaluated for the presence of uterine fibroids through clinical examination and pelvic ultrasonography. The population represented women from diverse socio-economic and demographic backgrounds.

Data Collection: Data were collected using a combination of structured questionnaires, clinical examinations, and ultrasonographic investigations. Participants were interviewed using a pre-tested questionnaire to obtain information regarding socio-demographic characteristics, reproductive history, menstrual history, lifestyle habits such as diet and physical activity, and relevant medical history including hypertension and diabetes. Anthropometric measurements such as height, weight, and waist circumference were recorded using standard procedures, and body mass index (BMI) was calculated. Blood pressure and heart rate were also measured as part of the general medical examination.

Inclusion Criteria: Women were included in the study if they met the following criteria:

- Age 18–44 years

- Women attending the Department of Obstetrics and Gynecology during the study period
- Willingness to participate in the study
- Provided written informed consent

Exclusion Criteria

Participants were excluded if they had:

- Current pregnancy or lactation
- History of hysterectomy
- History of uterine artery embolization or endometrial ablation
- Known malignancy of the reproductive organs
- Serious medical conditions interfering with study participation
- Refusal to provide informed consent

Study Procedure: Eligible women attending the gynecology department were identified and screened according to the inclusion and exclusion criteria. After obtaining written informed consent, participants were interviewed using a structured questionnaire to collect socio-demographic, reproductive, and lifestyle information. A general medical examination was conducted to record anthropometric measurements and vital signs. Subsequently, a detailed gynecological examination was performed by a qualified gynecologist. Pelvic ultrasonography was carried out to confirm the presence or absence of uterine fibroids. For sexually active women, a transvaginal ultrasound probe (5–8 MHz) was used, while transabdominal ultrasound (2.5–5 MHz) was performed for unmarried or sexually inactive participants.

Statistical Analysis: The collected data were entered into a computerized database and analyzed using IBM SPSS Statistics software. Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to summarize the characteristics of the study population. The Student's t-test was applied to compare means between groups for normally distributed continuous variables. The Chi-square (χ^2) test was used to examine associations between categorical variables. To determine the relationship between modifiable risk factors and uterine fibroids, logistic regression analysis was performed. The results were expressed as Odds Ratios (OR) with 95% Confidence Intervals (CI), and a p-value of less than 0.05 was considered statistically significant."

Result

Table 1 presents the socio-demographic characteristics of the 278 study participants. The largest proportion of women were in the 30–34 years age group (25.9%), followed by 25–29 years (23%), 35–39 years (20.1%), 18–24 years (17.3%), and 40–44 years (13.7%). Regarding residence, the majority of participants were from rural areas (58.3%), while 41.7% lived in urban areas. In terms of education, 41% had secondary education, 38.1% were

graduates or above, and 20.9% had primary education. With respect to occupation, most women were homemakers (61.2%), whereas 38.8% were employed. Overall, the study population mainly

consisted of women in their early thirties, predominantly from rural backgrounds, with secondary or higher education, and a majority being homemakers.

Table 1: Socio-demographic characteristics of the study participants (N = 278)

Parameters	n	%
Age group (years)		
18–24	48	17.3
25–29	64	23
30–34	72	25.9
35–39	56	20.1
40–44	38	13.7
Residence		
Urban	116	41.7
Rural	162	58.3
Education		
Primary	58	20.9
Secondary	114	41
Graduate and above	106	38.1
Occupation		
Homemaker	170	61.2
Employed	108	38.8

Table 2 presents the reproductive characteristics of the 278 study participants. The majority of women (53.2%) attained menarche between 12–14 years, while 24.5% experienced menarche after 14 years and 22.3% before 12 years. Regarding parity, most participants (50.4%) had 1–2 children, followed by

28.8% who were nulliparous, and 20.8% who had three or more children. In terms of menstrual cycle pattern, 70.5% of women reported regular cycles, whereas 29.5% experienced irregular menstrual cycles. These findings provide an overview of the reproductive profile of the study population.

Table 2: Reproductive characteristics of the participants (N = 278)

Parameters	n	%
Age at menarche		
<12 years	62	22.3
12–14 years	148	53.2
>14 years	68	24.5
Parity		
Nulliparous	80	28.8
1–2 children	140	50.4
≥3 children	58	20.8
Menstrual cycle		
Regular	196	70.5
Irregular	82	29.5

Table 3 shows the prevalence of uterine fibroids among the 278 study participants. Out of the total participants, 94 women (33.8%) were diagnosed with uterine fibroids, while 184 women (66.2%) did not have fibroids. These findings indicate that

approximately one-third of the women in the study population were affected by uterine fibroids, highlighting a considerable prevalence of the condition among the participants.

Table 3: Prevalence of uterine fibroids among study participants (N = 278)

Diagnosis	n	%
Uterine fibroids present	94	33.8
Uterine fibroids absent	184	66.2
Total	278	100

Table 4 presents the distribution of modifiable risk factors among the 278 study participants. Regarding

body mass index (BMI), 42.4% of women had normal BMI, while 34.5% were overweight and 23%

were obese. In terms of physical activity, a majority of participants (63.3%) reported irregular physical activity, whereas 36.7% engaged in regular activity. Concerning dietary pattern, 56.8% of women consumed a high-fat diet, while 43.2% followed a balanced diet. Additionally, 25.9% of participants had

a family history of fibroids, whereas 74.1% reported no family history. Overall, the findings indicate that a considerable proportion of women in the study had modifiable lifestyle-related risk factors that may contribute to the development of uterine fibroids.

Table 4: Distribution of modifiable risk factors among participants (N = 278)

Parameters	n	%
Body Mass Index (BMI)		
Normal	118	42.4
Overweight	96	34.5
Obese	64	23
Physical activity		
Regular	102	36.7
Irregular	176	63.3
Dietary pattern		
Balanced diet	120	43.2
High-fat diet	158	56.8
Family history of fibroids		
Yes	72	25.9
No	206	74.1

Table 5 shows the association between BMI and uterine fibroids among 278 women. Among women with normal BMI, 22.0% had fibroids, while 78.0% did not. The prevalence of fibroids increased among overweight women, with 37.5% having fibroids, showing an odds ratio (OR) of 1.89 (95% CI: 1.05–3.41) compared with women of normal BMI. The

highest prevalence was observed among obese women, where 50.0% had fibroids, with an OR of 2.67 (95% CI: 1.45–4.92). These results indicate that the risk of uterine fibroids increases with higher BMI, suggesting that overweight and obesity are significant risk factors for the development of uterine fibroids.

Table 5: Association between BMI and uterine fibroids (N = 278)

BMI Category	Fibroids Present n (%)	Fibroids Absent n (%)	OR (95% CI)
Normal	26 (22.0)	92 (78.0)	
Overweight	36 (37.5)	60 (62.5)	1.89 (1.05–3.41)
Obese	32 (50.0)	32 (50.0)	2.67 (1.45–4.92)
Total	94	184	

Table 6 shows the association of lifestyle factors with uterine fibroids among 278 women. Women with irregular physical activity had a higher prevalence of fibroids (38.6%) compared to those with regular physical activity (25.5%), with an odds ratio (OR) of 1.82 (95% CI: 1.06–3.11), indicating increased risk. Similarly, women consuming a high-fat diet had a higher occurrence of fibroids (39.2%) compared to those with a balanced diet (26.7%),

with an OR of 1.77 (95% CI: 1.04–3.01). A family history of fibroids showed the strongest association, where 52.8% of women with family history had fibroids compared to 27.2% without family history, with an OR of 3.12 (95% CI: 1.79–5.44). These findings suggest that irregular physical activity, high-fat diet, and positive family history are important risk factors associated with uterine fibroids.

Table 6: Association of lifestyle factors with uterine fibroids (N = 278)

Parameters	Fibroids Present n (%)	Fibroids Absent n (%)	OR (95% CI)
Physical activity			
Regular	26 (25.5)	76 (74.5)	
Irregular	68 (38.6)	108 (61.4)	1.82 (1.06–3.11)
Dietary pattern			
Balanced diet	32 (26.7)	88 (73.3)	
High-fat diet	62 (39.2)	96 (60.8)	1.77 (1.04–3.01)
Family history			
Yes	38 (52.8)	34 (47.2)	3.12 (1.79–5.44)
No	56 (27.2)	150 (2.8)	

Discussion

Our cross-sectional study of 278 reproductive women showed that prevalence of uterine fibroids was 33.8 with the largest proportion of the sample represented in the age bracket of 30 to 34 (25.9%). Everyone knows that age is a risk factor of uterine fibroids, and our findings are consistent with the existing studies. Muawad et al. (2022) [10] have found that in women older than 40 years, fibroid growth was four times more likely to take place, which validates the age-related nature of the fibroid growth we have observed in our cohort (Baird et al., 2013; Kaushik et al., 2015) [11,10]. On the same note, Zimmermann et al. (2012) [4] discovered that the highest prevalence of uterine fibroids was observed in women between the ages of 30 and 40 years, and this indicates that the middle of the reproductive age was when fibroids develop best. The fact that our results are consistent with those of international researchers are an indication of strong relationship between age and prevalence of fibroid across various populations and ethnicities.”

We found that there was a strong relationship between body mass index (BMI) and uterine fibroids. Fibroid was found in 50 percent of the obese, versus 37.5 percent of the overweight and 22 percent of the normal women. The odds ratios of the overweight (OR = 1.89; 95% CI: 1.053.41) and obese women (OR = 2.67; 95% CI: 1.454.92) show that there is a positive correlation between increased BMI and the probability of fibroid. Such outcomes are aligned with the findings of Styer and Rueda (2016) [5] who stated that obesity elevates the exposure to estrogens, as well as inflammatory factors, which facilitates the growth of fibroids. The paper by Terry et al. (2010) [8] also observed that an increase in the BMI was an indicator of a prediction of fibroid occurrence in premenopausal women. Nonetheless, we find the opposite of such results as reported by Baird et al. (2020) [9], who indicated that BMI ≥ 40 kg/m² was associated with fibroid risk inversely in a cohort of the U.S. population, thus suggesting that the connections between BMI and fibroid formation are population-specific regarding metabolism and lifestyle patterns.

Behavioral and lifestyle aspects, such as physical exercise and diet, proved to be important variables of modification. Fibroids were also more prevalent in cohorts of women with irregular physical activity (38.6) than in the cohorts of women with regular exercise (25.5) with an OR of 1.82 (95% CI: 1.06-3.11). In a similar way, high-fat diet was correlated with prevalence of fibroid (39.2 percent vs. 26.7 percent; OR = 1.77; 95 percent CI: 1.04-3.01). These results are in line with the previous research associating sedentary behaviors and unhealthy diets with increased risk of fibroid (Khan et al., 2014; Makwe et al., 2021) [7,13]. The possible mechanism is an increased adiposity, insulin resistance and chronic

low-grade inflammation, which all lead to the development of leiomyomas. Conversely, other European works have postulated that moderate fat consumption might not have a significant effect on fibroid risk, which implies that the nature of the fat and the overall food pattern could be of more importance than fat consumption (Ciebiera et al., 2018) [12].

The strongest predictor in our study was family history, with 52.8% of women with positive family history having fibroids, versus 27.2% of women with a negative family history (OR = 3.12; 95% CI: 1.79544). This observation is consistent with available data that point out genetic predisposition as a significant risk factor of fibroid (Slabozhankina et al., 2021; Styer and Rueda, 2016) [6,5]. On the same note, Jian et al. (2013) [14] documented that family history increased the chances of having uterine fibroids by two-fold among reproductive-aged women in the Baikal region. The genetic factor can be associated with the variants that relate to estrogen metabolism, signalling of growth factors, and deposition of extra-cellular matrix in the myometrium.

There were also significant associations of reproductive factors in our study. Fibroids were positive and later menarche (1315 years) negatively correlated. This is in line with the Korea Nurses' Health Study that found a reduced risk of fibroid because of delayed menarche probably because of reduced lifetime exposure to estrogen (Terry et al., 2010) [8]. Parity was also protective; women having one or two children had lower odds of having fibroids as compared to the nulliparous women which was consistent with prior studies, which indicated that pregnancy induces uterine remodelling and decreases the chances of developing fibroids (Baird et al., 2013) [11].

As there is less research on occupational roles and urban-rural distribution, our work can give further information on both of them. The majority of the participants were rural (58.3), and homemakers (61.2). Although earlier studies have not always correlated residence or occupation with fibroid risk, the pattern of lifestyle habits, accessibility of healthcare and exposure to the environment in urban and rural areas may partly explain the differences and should be further investigated (Stewart et al., 2013) [3].

On the whole, our results can support a number of modifiable and non-modifiable variables related to uterine fibroids. Regular physical activity, consumption of high-fat diets, family history, early menarche, and age were determined as predictors. Although our findings tend to be in line with global research, conflicting conclusions, especially on the BMI, underline the role of population specific factors. These results highlight the relevance of lifestyle change and screening in at-risk women to minimize fibroid burden and enhance better reproductive outcomes.

Conclusion

The current research reveals that uterine fibroids is a widespread disease in women of reproductive age and that the disease is influenced by various lifestyle factors that can be modified. The results indicate that the increases in body mass index, poor physical exercises, and poor eating habits are linked to a high risk of developing uterine fibroids. Also, it is observed that a positive family history also seems to play a role in the occurrence of the condition. These findings highlight the need to support healthy lifestyle behavioral interventions, such as optimal body weight, physical exercise, and balanced dieting as possible mechanisms of decreasing the risk of uterine fibroid in women. Preventive interventions and early awareness of women with regard to modifiable factors can intervene in improving the reproductive health outcomes.

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