A Cross-Sectional Study of Clinical, Laboratory and Imaging Characteristics of Women with Uterine Fibroid

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Abstract:

Background: Uterine fibroids (UFs) are the most common pelvic tumors among women at reproductive age, affecting women's quality of life even their confidence with its symptoms. We designed a study to investigate the clinical, laboratory, and imaging characteristics of women with UF.

Methods: This cross-sectional study was performed from January 2023 to December 2023 in Obstetrics and Gynaecology Department of Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar. We included all women with UF referring to the Obstetrics and Gynecology department of JLNMCH. Based on a checklist, a research team interviewed the patients to investigate clinical characteristics. Also, we explored laboratory and transvaginal sonography (TVS) findings of all patients.

Results: The mean age of 439 studied patients was 44.47±8.80 years (range: 23-81). The most prevalent underlying disease was hypertension (17.1%), followed by thyroid diseases (15.7%) and diabetes mellitus (13.7%). The patients mainly complained of AUB (abnormal menstrual bleeding) (60.0%) and abdominal pain (23.7%). The mean NLR (neutrophil to lymphocyte ratio) and the mean PLR (platelet to lymphocyte ratio) were significantly higher than the normal upper limit (P<0.001). The largest diameter of UF was 49.89±47.92 mm. Most fibroids were located anteriorly (43.1%). The multivariate linear regression model revealed that age (β=-0.931, 95%CI= (-1.657, -0.204), P=0.012) and number of fibroid (β=22.418, 95%CI= (16.360, 28.476), P<0.001) could predict the size of fibroid.

Conclusion: Our results showed that NLR and PLR were increased in UF patients. It seems that patient's age and number of fibroids may be the predictive factors for UF's size.

Keywords: Abnormal Uterine Bleeding, Hypertension, Neutrophil, Leiomyoma, Lymphocyte, Ultrasonography.

Introduction

Uterine fibroids (UFs, uterine myoma, leiomyoma) are the most common pelvic tumors, originating from smooth muscle of uterine [1]. UFs affect more than 70% of women at their reproductive age worldwide [2]. Due to their hormonally-responsive nature, they are extremely rare before menarche, and usually regress after menopause [3]. 25-50% of patients complain from aboard spectrum of manifestations including abnormal uterine bleeding, pelvic pain, pressure, urinary frequency, and infertility.

However, the literature has reported many factors playing a role in the progression of UF, for instance, nulliparity, early menarche, and polymenorrreha, family history of UFs, obesity, age (peak incidence at 40-50), hypertension, and diabetes [4]. The size, number, and location of the UF are options that should be considered for the severity of the symptoms and choosing the treatment [5]. Moreover, the patient's age and her desire for the preservation of fertility are also important. So, with a sensitivity of 90-99% for transvaginal sonography (TVS), it is a good and low-cost imaging technique for UF diagnosis [6].

Symptomatic UFs may be treated medically, surgically, or with a combination of both [7]. UF may cause infertility depending on the location in the uterus in 2-3% of women. For example, submucosal and intramural fibroid altering the endometrial cavity are associated with lower pregnancy rates

[8]. This study aimed to determine the clinical, laboratory, and imaging characteristics of an Iranian woman with uterine UF.

Material and Methods

This cross-sectional study was performed between January 2023 to December 2023 in Department of Obstetrics and Gynaecology, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar. The inclusion criteria were: Women referring to the Obstetrics and Gynecology Clinic of Imam Hossein Hospital, at least 18 years old, diagnosis of UF by the pathology of the tissue specimens obtained through surgery. The exclusion criteria included patients who had an acute event during the study, patients with incomplete clinical testing information in their follow-up data; and patients diagnosed with pregnancy or fatal diseases, such as cancer, based on their pathology results.

In this study, data collection was done based on the census method. Based on a checklist the research team interviewed eligible patients to investigate age, body mass index (BMI), gravidity, parity, menopausal status, past medical history, and symptoms. Besides, the following laboratory tests were taken from all patients: complete blood count (CBC), Iron profile, and lipid profile. Blood samples were analyzed by the Laboratory of JLNMCH.

All patients underwent TVS by an expert radiologist. For the ultrasound assistant, we considered uterine size, endometrial thickness, and characteristics of observed fibroid (number, size, location, and FIGO classification). The UF was resected by different surgical procedures: total abdominal hysterectomy (TAH), myomectomy, and total vaginal hysterectomy (TVH). Finally, myoma was diagnosed by pathology.

Data analysis was performed using IBM® SPSS® Statistics version 23.0 Chicago, USA.

Data were described as frequency, percentage, mean, standard deviation, mean difference, and 95% confidence interval (CI). Laboratory tests were compared with assumed values using the One-sample t-test. Multivariate linear regression (Backward method) was used to investigate which variable could predict the size of fibroid. The following variables were entered into the regression model: age, BMI, past medical history (hypertension, dyslipidemia, and thyroid diseases), laboratory tests (WBC, hemoglobin, Platelet count, and NL ratio), and imaging findings (size of the uterus and the frequency of fibroid). In this study, the $P<0.05$ was considered statistically significant.

Results

The mean age of 439 included patients was 44.47±8.80 years (range: 23-81). Regarding menopausal status, most participants were premenopausal women (67.9%), and the others were postmenopausal women (32.1%). The most prevalent underlying disease was hypertension (17.1%), followed by thyroid diseases (15.7%), diabetes mellitus (13.7%), and anemia (11.0%). The patients mainly complained of abnormal menstrual bleeding (60.0%), abdominal pain (23.7%), intermenstrual bleeding (13.2%), dysmenorrhea (9.1%), dyspareunia (6.2%), stress incontinency (6.2%), and post-coitus bleeding (6.0%). Table 1 depicts the demographic and medical history of the patients.

Table 1: Demographic and medical history of the patients (n=439)

Variables	Values
Age (years)	44.47±8.80
Body mass index(kg/m^2)	
• <25	127(29.0)
• 25-30	156(35.5)
• >30	156(35.5)
Gravidity	
• Nulligravid	98(22.3)
• Unigravid	43(9.8)
• Multigravid	298(67.9)
Parity	
• Nullipara	110(25.0)
• Unipara	50(11.4)
• Multipara	279(63.6)
Menopausal status	
• Premenopausal women	298(67.9)
• Postmenopausal women	141(32.1)
Past medical history	
• Hypertension	75(17.1)
• Thyroid diseases	69(15.7)
• Diabetes mellitus	60(13.7)
• Anemia	48(11.0)

• Cardiovascular diseases	25(5.7)
• Dyslipidemia	20(4.6)
• Malignancy[*]	10(2.3)
• Polycystic ovary syndrome	2(0.5)
Symptoms	
• Abnormal menstrual bleeding	262(60.0)
• Abdominal pain	104(23.7)
• Intermenstrual bleeding	58(13.2)
• Dysmenorrhea	40(9.1)
• Dyspareunia	27(6.2)
• Stress incontinency	27(6.2)
• Post-coitus bleeding	26(6.0)
• Urinary incontinency	13(3.0)

As shown in Table 2, we compared laboratory findings to assumed values. The mean NL ratio was 8.20±9.01, which was significantly higher than the normal upper limit (3.0) with MD=5.20, 95% CI= (4.32, 6.07), and P<0.001. The mean PL ratio was 218.66±162.13, which was significantly higher than the normal upper limit (175.0) with MD=43.66, 95% CI= (27.82, 59.50), and P<0.001. Nevertheless, other laboratory tests were either within the normal range or did not significantly differ from the assumed values.

Table 2: Laboratory findings of the patients (n=439)

Variables	Normal range	Values	Assumed value	Mean difference (95%CI)	P-value
White blood cells ($10^3/\mu L$)	4000–10,500	9.79±4.16	10.5	-0.070(-1.10, -0.30)	0.001
NL ratio	1-3.6	8.20±9.01	3.0	5.20(4.32,6.07)	<0.001
Hemoglobin (mg/dL)	12-15	11.42±7.04	12.0	-0.57(-1.24,0.10)	0.097
Plateletcount ($10^3/\mu L$)	155,000- 350,000	260.19±80.80	350.0	-89.80(-97.60,-81.99)	<0.001
PL ratio	40-175	218.66±162.13	175.0	43.66(27.82, 59.50)	<0.001
Serumiron (μg/dL)	60-170	53.32±31.80	60.0	-6.67(-14.31,0.96)	0.086
Ferritin(ng/mL)	12-150	29.70±50.80	12.0	17.70(6.60,28.79)	0.002
TIBC (μg/dL)	240 -450	347.58±125.29	450.0	-102.41(-132.51,-72.31)	<0.001
Triglyceride(mg/dL)	<150	135.05±56.16	150.0	-14.94(-28.43,-1.45)	0.030
Cholesterol(mg/dL)	<200	181.68±49.68	200.0	-18.31(-30.72,-5.90)	0.004
HDL(mg/dL)	>50	47.08±12.31	50.0	-2.91(-6.41,0.58)	0.101
LDL(mg/dL)	<100	102.38±43.85	100.0	2.38(-10.20,14.98)	0.705

TVS revealed that the mean size of the uterus (largest diameter) was 101.36±39.15 mm, with an endometrial thickness of 8.86±6.41 mm. Furthermore, the mean frequency of observed fibroid was 1.94±0.92 (Minimum: 1, Maximum: 5) with the largest diameter of 49.89±47.92 mm. In terms of location, most fibroid were located anteriorly (43.1%), followed by the posterior segment (26.2%), fundus (21.64%), and lateral segment (9.1%).Regarding the surgical procedure, most patients underwent TAH (69.5%). However, others underwent myomectomy (30.0%) or TVH (0.5%). Additionally, pathology revealed that all specimens had fibroids. The multivariate linear regression model presents that age (β=-0.931, 95%CI= (-1.657, -0.204), P=0.012) and the number of fibroid (β=22.418, 95%CI= (16.360, 28.476), P<0.001) could predict the size of fibroid (Table 3).

Table 3: Multivariate linear regression model to predict the size of UF

Variables	Regression coefficient	95% Confidence interval	P-value
Constant	97.540	(44.988, 134.275)	<0.001
Age	-0.931	(-1.657,-0.204)	0.012
Body mass index	-1.153	(-2.349,0.043)	0.059
Platelet to lymphocyte ratio	0.020	(-0.013,0.052)	0.237
Number of UF	22.418	(16.360, 28.476)	<0.001

Discussion

It seems changes due to factors like inflammation, environmental factors or enzyme functional problems, etc., in the vascular structures of UF, can lead to higher pulse pressure in women who have UF [9].

Like other studies our result showed the companionship of hypertension and cardiovascular disease

in UF. Because of the risk of preeclampsia or pregnancy loss, this connection should be highly considered when the patient is willing to get pregnant [10]. Changing in the Sex hormones in UF, affect thyroid function and thyroid-stimulating hormone (TSH) regulation. It seems having UF may increase the risk of thyroids nodules [11].

But in our study, 2/3 of patients with thyroid disease showed hypothyroidism as the common thyroid dysfunction. The mechanism of this bilateral relationship needs to be clarified by more research. Interestingly, with diabetic and the BMI >25 kg/m^2 patients in our study group who underwent surgeries, studies still show diabetes as a protective factor for UF [12,13]. According to another study, this protection may be due to receiving diabetes medications such as metformin [14].

Following AUB, anemia is prevalent in UF patients. Anemia in these patients also affects the quality of hospitalization and the surgery process for treating UF [15]. Some studies have shown the types, sizes, and locations of UFs are associated with anemia [16,17]. Specific characteristics of UF, like its location and size, can cause heavy menstrual bleeding (HMB)[18]. Based on the FIGO classification, respectively intramural and subserosal UF with nearly 36 and 26% in our study confirmed that hospitalization of patients with UF is affected by the intramural type and AUB, which are independent factors for anemia too [15].

Based on some studies urine dysfunctions may be the symptom of having UF at the anterior location of the uterus. The size up to 5cm also may be the risk factor for the recurrence of the UF [19]. So, it was interesting that we found Along with stress incontinence as a symptom, about half of our patients had anteriorly located UFs with the largest diameter of 4.9cm. So, our result confirmed the previously mentioned study.

Neutrophil cells are present in the disease's acute or chronic inflammation phase, which can have pro-inflammatory effects. Lymphocytes are also present in chronic inflammation. According to prior studies, UF-related infertility is related to pro-inflammatory mediators. Studies have shown the NLR, as a prognostic indicator and a marker of the chronic inflammation process is connected to the size of UF [20-24].

Similar to the result of one study, we found that the NLR and PLR were higher in our study group [25]. Even as an indicator of cellular immune inflammation or as an important index for UF's predictive model, some studies showed a higher level of PLR can be used in differentiating between normal endometrial patients and those who have cancerous or benign endometrium [26]. TVS with a sensitivity of 89.2% and specificity of 99.6% for diagnosing UF is the first and low-cost choice among all other imaging techniques. But some studies suggest that MRI (magnetic resonance imaging) may be a better choice than TVS when imaging results are modified with the patient's demographical and clinical data[27, 28].

Small fibroids are dynamic and grow faster, and their complications and dangerous outcomes, such as pregnancy loss or preterm delivery rate, are more than bigger ones [29]. In our study, patients' TVS results showed they all have at least one UF, the largest size of them was about 5 cm and most UFs were anteriorly and the intramural type (FIGO4).

The features of UF help the physician to choose the proper treatment. When the patient shows moderate symptoms and wishes to preserve her fertility myomectomy in laparoscopic style is a good choice, but when the patient is in the postmenopausal phase or has severe symptoms hysterectomy will be done and it seems women who go under hysterectomy will experience a better quality of life-changing[30,31].

The outcomes of these surgeries' treatments are related to various factors, including gravidity, parity, preoperative and postoperative hemoglobin differences, NLR and even the number of fibroids. The severity of symptoms and features of UF in our patients showed TAH as the common choice for surgery. At 2021 one meta-analysis study in the Middle East showed disease factors or characteristics for UF may be different in Middle East origin women [32].

Conclusion

Our results showed that NLR and PLR were increased in patients with UF. Additionally, we found the patient's age and the number of fibroids could predict UF size. UF outcomes for patients and treatment options are usually connected to UF's size. Further studies may find a good predicting model based on UF's characteristics which can be used by the physician to choose the best treatment.

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