Gynecology and Obstetrics Clinical Medicine 3 (2023) 56–59

Contents lists available at ScienceDirect

Gynecology and Obstetrics Clinical Medicine

journal homepage: www.keaipublishing.com/en/journals/gynecology-and-obstetrics-clinical-medicine

Research Article

Influence of assisted reproductive technology and uterine leiomyoma on pregnancy outcomes in women with adenomyosis

Yi-Ling Wang [1], Zhao Tian [1], Xiao-Hong Chang, Hong-Lan Zhu [*], Heng Cui

Department of Obstetrics and Gynecology, People's Hospital, Peking University, Beijing, 100044, China

ARTICLE INFO

Keywords:
Adenomyosis
Adverse pregnancy outcomes
Assisted reproductive technology
Uterine leiomyoma

ABSTRACT

Aim: To assess whether adverse pregnancy outcomes in women with adenomyosis are different according to the method of conception and the concurrent of uterine leiomyoma (UL).

Methods: We performed a retrospective study. Fifty-three singleton pregnancy cases complicated with adenomyosis were included in this study. In the study group, 15 women became pregnant with assisted reproductive technology (ART) and 21 women combined with UL. Pregnancy outcomes were compared between ART and non-ART, UL and non-UL groups.

Results: The prevalence for such complications as hypertensive disorder complicating pregnancy (HDCP)and postpartum hemorrhage (PPH)were significantly higher in the women conceived by ART (33.3% vs. 5.3%, P = 0.023) and (53.3% vs. 23.7%, P = 0.037),respectively. And women concurrent with UL of which the diameter≥4 cm were more likely to have severe PPH (44.4% vs. 0%, P = 0.021).

Conclusion: ART may increase the risk of adverse pregnancy outcomes such as HDCP and PPH in women with adenomyosis and UL of which the diameter≥4 cm may further increase the risk of severe PPH.

1. Introduction

Adenomyosis refers to a pathologic condition in which the ectopic endometrial glands and stroma invade the myometrium, leading to dysmenorrhea, dyspareunia, subfertility, etc.[1] Among infertile women, the prevalence of adenomyosis is reported to range from 10% to 90%.[2,3] In recent years, the number of pregnant women with adenomyosis has increased with the trend of delayed pregnancy and the development of ART.[4] For women with adenomyosis who have completed childbirth, removal of the uterus is the most reliable treatment while the treatment strategies for adenomyosis patients with fertility requirements have always been difficult problems faced by gynecologists.

Most previous studies have focused on exploring the negative impact of adenomyosis on the results of ART,[5,6] while are relatively few studies exploring the effect of concurrent UL or ART on pregnancy outcomes in women with adenomyosis. Razavi M et al.[7] reviewed the impact of adenomyosis on pregnancy outcomes in a recent meta-analysis and found that the prevalence of premature delivery, preterm premature rupture of membranes (PPROM), spontaneous abortion, gestational diabetes mellitus (GDM), pre-eclampsia and small for gestational age (SGA) increased significantly in pregnant woman with adenomyosis. Previous studies have shown that ART will also increase the prevalence of adverse pregnancy outcomes to a certain extent.[8,9] Pregnancies achieved via ART are confounded by several obstetric complications, including HDCP and placental malposition. Shin YJ et al.[10] detected the risk of preterm births in pregnant women with adenomyosis and demonstrated that the increased risk of premature birth and low birth weight (LBW) infants was related to those women who conceived by ART but not in women who conceived spontaneously.

Approximately 6%–20% of patients with adenomyosis have concurrent endometriosis, and approximately half of patients have concurrent UL.[11] In the past decades, a large number of studies have reported that

* Corresponding author. Department of Obstetrics and Gynecology, People's Hospital, Peking University, Beijing, 100044, China
E-mail address: honglanzhu01@163.com (H.-L. Zhu).

Publishing services by Elsevier on behalf of KeAi

[1] These author contribute equally to this manuscript.

https://doi.org/10.1016/j.gocm.2023.01.008
Received 6 October 2022; Received in revised form 14 January 2023; Accepted 27 January 2023
Available online 15 February 2023

endometriosis is associated with various adverse pregnancy outcomes.[12,13] In our previous research, we detected that endometriosis significantly increases the risk of PPH and women with endometriosis have an upward tendency of developing other adverse pregnancy outcomes, such as preterm birth, placental abruption, placenta previa, cesarean section, fetal distress and anemia.[14] Scala C et al.[15] recently explored the impact of adenomyosis on pregnancy outcomes in women with endometriosis, and concluded that the presence of adenomyosis in women with endometriosis significantly increases the risk of placental dysfunction and SGA. So we excluded pregnant women who also had endometriosis to investigate the impact of adenomyosis on adverse pregnancy outcomes.

Meanwhile, there was few research detected the risk of adverse pregnancy outcomes among pregnant women with adenomyosis concurrent UL. This study aimed to assess whether adverse pregnancy outcomes in women with adenomyosis are different according to the method of conception and the concurrent of UL.

2. Materials and methods

Data for the study were obtained from the database of women at the Department of Obstetrics and Gynecology, Peking University People's Hospital. We retrospectively analyzed medical records of singleton pregnant women diagnosed as having adenomyosis at our hospital during the period from January 2015 through December 2020. The diagnostic criteria for adenomyosis is ultrasonography (USG)[16]: (i)a. myometrial anterior posterior asymmetry; and/or b. thickening of the anterior and posterior myometrial walls, with either increased or decreased echogenicity), (ii) women who received routine prenatal checkups during the entire pregnancy and gave birth in the same hospital. The exclusion criteria were (i) women with endometriosis, previous uterine surgery, pregnancies with severe fetal structural abnormalities, known autoimmune diseases or fetal aneuploidy, and multiple pregnancy, (ii) women with malignancies, immune system diseases, endocrine diseases, cardiovascular diseases, and other complications. A total of fifty-three pregnant women who met the above diagnostic criteria and did not meet the exclusion criteria were included in the study.

3. Methods

We compared maternal characteristics and pregnancy outcomes according to mode of conception and concurrent uterine leiomyoma.

Adverse pregnancy outcomes included cesarean section rate, GDM, HDCP, PPROM, PPH, SGA, placenta previa, abortion and preterm birth. Neonatal outcomes included birth weight and gestational age at delivery. PPH, defined as vaginal bleeding ≥500 ml and cesarean bleeding ≥1000 ml within 24 h after delivery, which is not only a serious complication of delivery but also the primary cause of maternal death in China. Severe PPH is defined as bleeding volume ≥1000 ml within 24 h after delivery.

4. Statistical analysis

The data were calculated and analyzed by SPSS 22.0 software. Continuous variables conforming to the normal distribution are presented as mean ± standard deviation (SD) and compared by Student's *t*-test. For continuous variables that do not conform to the normal distribution, the median (interquartile range) is used for statistical description, and Mann-Whitney *U* test is used for comparison. Categorical variables were compared by Chi-square test or Fisher's exact test. We used to binary logistic regression to evaluate the association between exposure covariates and adverse pregnancy outcomes. $P < 0.05$ was considered statistically significant.

5. Results

In the study, 53 women conceived with adenomyosis as the study group were analyzed to investigate pregnancy outcomes. 15 women conceived by ART and 21 women combined with uterine leiomyoma.

As shown in Table 1, we compared the maternal characteristics and pregnancy outcomes according to the method of conception. The proportion of multipara (6.7%) in the ART group was significantly lower than that in the non-ART group (50%) ($P = 0.009$) and the prevalence of HDCP (33.3% vs. 5.3%, $P = 0.023$) and PPH (53.3% vs. 23.7%, $P = 0.037$) were significantly higher in the ART group than in the non-ART group.

Comparative data on pregnancy outcomes with concurrent UL are shown in Table 2. No statistically significant differences were found in maternal characteristics and pregnancy outcomes between the UL group and non-UL group. So we next conducted further research according to the size of UL and found that women with adenomyosis conceived with uterine leiomyoma of which the diameter is ≥ 4 cm was more likely to have severe PPH (44.4% vs. 0%, $P = 0.021$)(Table 3).

6. Discussion

Previous studies have shown a higher incidence of adverse pregnancy outcomes in women with adenomyosis after pregnancy.[7] And we further analyze the above results according to the method of conception and concurrent UL and the results show that the incidence of HDCP and PPH were significantly higher in women with adenomyosis conceived by ART, and women with adenomyosis conceived with UL of which the diameter≥4 cm was more likely to have severe PPH.

Although adenomyosis and endometriosis share a number of similar characteristics, some researchers believe that they are two different diseases.[17] Scala C et al.[15] recently explored the effect of adenomyosis on pregnancy and perinatal outcomes in women with endometriosis, and concluded that compared with those with endometriosis only, patients with diffuse adenomyosis had significantly higher prevalence of SGA (40% vs 10.8%) while no statistically significant differences were found in patients with focal adenomyosis compared with those with endometriosis only. Logistic regression analysis demonstrated that diffuse adenomyosis was the only independent risk factor for SGA. In this study, we excluded pregnant women who also had endometriosis to investigate the impact of adenomyosis on adverse pregnancy outcomes. Regarding the pathogenesis involved in adverse pregnancy outcomes of adenomyosis, the role of inflammation, the production of prostaglandins in the myometrium, changes in uterine contractility, increased intrauterine pressure and impaired implantation can explain the association with premature delivery and PPROM.[18–20] Regarding the increasing prevalence of placenta-related diseases such as the HDCP, fetal growth restriction etc., unbalanced perfusion of the placenta caused by the remodeling of myometrial spiral artery and vascular stealing are considered to be the main causes.[21,22]

Pregnancies achieved via ART are confounded by several obstetric complications, including HDCP and placental malposition.[8,23] Shin YJ et al.[10] demonstrated in a recently study that adenomyosis increases the risk of preterm birth and LBW, which is related to the mode of pregnancy, and seems to be more pronounced in pregnant women with ART. Vercellini P et al. concluded in a recent meta-analysis that adenomyosis has a negative impact on the outcome of ART, owing to reduced possibility of clinical pregnancy and implantation, and increased risk of early miscarriage.[3] They suggested that screening for adenomyosis in infertile women entering an ART program is worthy and should be encouraged. In this study, we found that the proportion of multipara was significantly lower and the incidence of HDCP and PPH were significantly higher in the ART group than that in the non-ART group. However, due to the limitations of low sample size and retrospective studies, this conclusion still needs to be confirmed by future large-sample prospective cohort studies and randomized controlled studies.

Previous studies have found that in uterine specimens with adenomyosis, 6%–22% of patients also concomitant endometriosis, and 35%–55% of patients concomitant UL.[11] The presence of myomas, especially

Table 1
Basic characteristics and prevalence of adverse pregnancy outcomes according to the method of conception.

	ART (N = 15)	Non-ART(N = 38)	Statistics(χ^2)	*P* values
Age (y) (95%CI)	36(35–37)	35(31–37)	−0.567	0.571
BMI (kg/m^2) (M ± SD)	23.0 ± 3.0	24.06 ± 3.3	1.016	0.315
Multipara(%)	1(6.7)	19(50)	6.85	0.009
Gestational age (day) (95%CI)	273(259–279)	272.5(256.8–276.3)	−0.376	0.707
UL(%)	5(33.3)	16(42.1)	0.346	0.556
CS(%)	10(66.7)	22(57.9)	0.346	0.556
HDCP(%)	5(33.3)	2(5.3)	5.146	0.023
Preeclampsia(%)	1(6.7)	1(2.6)	< 0.001	1
GDM(%)	5(33.3)	10(26.3)	0.261	0.609
PPROM(%)	0	3(7.9)		0.55
Placenta previa(%)	3(20)	5(13.2)	0.04	0.841
Abortion(%)	1(6.7)	3(7.9)	< 0.001	1
Premature birth(%)	2(13.3)	6(15.8)	< 0.001	1
PPH(%)	8(53.3)	9(23.7)	4.339	0.037
Severe PPH(%)	2(13.3)	5(13.2)	< 0.001	1
SGA(%)	3(20)	2(5.3)	1.281	0.258
Macrosomia(%)	0	2(5.3)		1
Neonatal weight(g)(M ± SD)	3016.4 ± 671.2	3183.0 ± 588.8	0.851	0.399
LBW(%)	3(20)	3(7.9)	0.596	0.44

BMI: body mass index; (y): (year); (w): (week); ART: assisted reproductive technology; CS: cesarean section; HDCP: hypertensive disorder complicating pregnancy; GDM: gestational diabetes mellitus; PPROM: preterm premature rupture of membrane; PPH: postpartum hemorrhage; Severe PPH: severe postpartum hemorrhage; SGA: small for gestational age; LBW: low birth weight infant.

Table 2
Comparison of maternal characteristics and prevalence of adverse pregnancy outcomes according to whether combined with uterine leiomyoma.

	UL (N = 21)	Non-UL (N = 32)	Statistics(χ^2)	*P* values
Age (y) (M ± SD)	35.4 ± 4.0	34.8 ± 3.8	−0.601	0.551
BMI (kg/m^2) (M ± SD)	24.5 ± 3.6	23.2 ± 3.0	−1.351	0.184
Multipara(%)	6(28.6)	14(43.75)	1.243	0.265
Gestational age (day) (95%CI)	272(258–275)	273.5(257.5–276.7)	−0.756	0.45
ART(%)	5(23.8)	11(34.4)	0.672	0.412
CS(%)	12(57.1)	20(62.5)	0.152	0.697
HDCP(%)	3(14.3)	4(12.5)	< 0.001	1
Preeclampsia(%)	1(4.8)	1(3.1)	< 0.001	1
GDM(%)	7(33.3)	8(25.0)	0.434	0.51
PPROM(%)	1(4.8)	2(6.3)	< 0.001	1
Placenta previa(%)	4(19.1)	4(12.5)	0.067	0.796
Abortion(%)	2(9.5)	2(6.3)	< 0.001	1
Premature birth(%)	3(14.3)	5(15.6)	< 0.001	1
PPH(%)	8(38.10)	9(28.1)	0.579	0.447
Severe PPH(%)	4(19.1)	3(9.4)	0.363	0.547
SGA(%)	2(9.5)	3(9.4)	< 0.001	1
Macrosomia(%)	2(9.5)	0		0.152
Neonatal weight(g)(M ± SD)	3151.6 ± 795.1	3121.1 ± 464.8	−0.166	0.896
LBW(%)	2(9.5)	4(12.5)	< 0.001	1

BMI: body mass index; (y): (year); (w): (week); UL: uterine leiomyoma; CS: cesarean section; HDCP: hypertensive disorder complicating pregnancy; GDM: gestational diabetes mellitus; PPROM: preterm premature rupture of membrane; PPH: postpartum hemorrhage; Severe PPH: severe postpartum hemorrhage; SGA: small for gestational age; LBW: low birth weight infant.

myomas that distort the uterine cavity and larger intramural myomas, are associated with infertility. In terms of pregnancy outcome, it is associated with increased risks of spontaneous abortion, fetal malpresentation, placenta previa, premature delivery, cesarean section and PPH.[24] No statistically significant differences were found in maternal characteristics and pregnancy outcomes between the women conceived with the UL or not in this study. Current evidence suggests that submucosal fibroids and intramural fibroids larger than 4 cm in diameter have an adverse effect on conception and early pregnancy, while subserosal fibroids seem to have no significant effect on reproduction.[5] So we next conducted further research according to the size of UL and found that women with adenomyosis conceived with UL of which the diameter is greater than or equal to 4 cm was more likely to have severe PPH. The presence of submucosal and/or larger intramural fibroids is also associated with adverse pregnancy outcomes.[5] Among the pregnant women with UL, only one had submucosal fibroids, and the rest were intramural fibroids in the present study. Multi-center studies are necessary to clarify the impact of concurrent UL and adenomyosis on adverse pregnancy outcomes in the future.

The presented study has some important limitations. Firstly, adenomyosis in this study was diagnosed by USG which was reported to have the sensitivity and specificity to be 36.8% and 91.8% in the previous study which undoubtedly increased the risk of selection bias.[25,26] Secondly, it is a retrospective study with a small sample size conducted in a single center, which inevitably reduces the credibility of the conclusion, a larger prospective study is necessary in the future.

7. Conclusion

In women conceived with adenomyosis, ART may increase the risk of HDCP and PPH and UL of which the diameter≥4 cm may further increase the risk of severe PPH. These results are potentially useful for preconception and prenatal counseling of women with adenomyosis and especially those conceived by ART and with UL.

Table 3
Comparison of maternal characteristics and prevalence of adverse pregnancy outcomes according to the size of uterine leiomyoma.

	UL ≥ 4 cm (N = 9)	UL < 4 cm(N = 12)	Statistics(χ^2)	*P* values
Age (y) (M ± SD)	35.2 ± 4.6	35.5 ± 3.7		
BMI (kg/m^2) (M ± SD)	24.6 ± 4.1	24.5 ± 3.3		
Multipara(%)	4(44.4)	2(16.6)	1.944	0.331
Gestational age (w) (M ± SD)	267.4 ± 16.9	249.1 ± 46.3		
ART(%)	2(22.2)	3(25)	0.022	1
CS(%)	5(55.6)	7(58.3)	0.016	1
HDCP(%)	1(11.1)	2(16.7)	0.130	1
Preeclampsia(%)	0	1(8.3)	0.788	1
GDM(%)	2(22.2)	5(41.7)	0.875	0.642
PPROM(%)	0	1(8.3)	0.788	1
Placenta previa(%)	2(22.2)	2(16.7)	0.103	1
Abortion(%)	0	2(16.7)	1.658	0.486
Premature birth(%)	1(11.1)	2(16.7)	0.130	1
PPH(%)	5(55.6)	3(25)	2.036	0.203
Severe PPH(%)	4(44.4)	0	6.588	0.021
SGA(%)	1(11.1)	1(8.3)	0.046	1
Macrosomia(%)	2(22.2)	0	2.947	0.171
Neonatal weight(g)(M ± SD)	3048.9 ± 833.9	324 ± 791.4		
LBW(%)	1(11.1)	1(8.3)	0.046	1

BMI: body mass index; (y): (year); (w): (week); UL: uterine leiomyoma; CS: cesarean section; HDCP: hypertensive disorder complicating pregnancy; GDM: gestational diabetes mellitus; PPROM: preterm premature rupture of membrane; PPH: postpartum hemorrhage; Severe PPH: severe postpartum hemorrhage; SGA: small for gestational age; LBW: low birth weight infant.

Author contributions

WYL and TZ contributed to study conception and drafted the article. ZHL directed the project, contributed to discussion, reviewed and edited the manuscript. CXH and CH contributed to manuscript editing and revision. ZHL as the corresponding author had full access to all the information in the study and had final responsibility for the decision to submit for publication.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Peking University People's Hospital Ethics Committee.

Consent to participate

This study is a retrospective study and informed consent had been waived by Ethics Committee of Peking University People's Hospital.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This work was supported by “Natural Science Foundation of Beijing Municipality” [No: 7222206].

References

1. Devlieger R, D'Hooghe T, Timmerman D. Uterine adenomyosis in the infertility clinic. *Hum Reprod Update*. 2003;9(2):139–147. https://doi.org/10.1093/humupd/dmg010.
2. Yeniel O, Cirpan T, Ulukus M, et al. Adenomyosis: prevalence, risk factors, symptoms and clinical findings. *Clin Exp Obstet Gynecol*. 2007;34(3):163–167.
3. Vercellini P, Consonni D, Dridi D, et al. Uterine adenomyosis and in vitro fertilization outcome: a systematic review and meta-analysis. *Hum Reprod*. 2014;29(5):964–977. https://doi.org/10.1093/humrep/deu041.
4. Pontis A, D'Alterio MN, Pirarba S, et al. Adenomyosis: a systematic review of medical treatment. *Gynecol Endocrinol*. 2016;32(9):696–700. https://doi.org/10.1080/09513590.2016.1197200.
5. Vlahos NF, Theodoridis TD, Partsinevelos GA. Myomas and adenomyosis: impact on reproductive outcome. *BioMed Res Int*. 2017;2017, 5926470. https://doi.org/10.1155/2017/5926470.
6. Buggio L, Monti E, Gattei U, et al. Adenomyosis: fertility and obstetric outcome. A comprehensive literature review. *Minerva Ginecol*. 2018;70(3):295–302. https://doi.org/10.23736/S0026-4784.17.04163-6.
7. Razavi M, Maleki-Hajiagha A, Sepidarkish M, et al. Systematic review and meta-analysis of adverse pregnancy outcomes after uterine adenomyosis. *Int J Gynaecol Obstet*. 2019;145(2):149–157. https://doi.org/10.1002/ijgo.12799.
8. Sullivan-Pyke CS, Senapati S, Mainigi MA, et al. In Vitro fertilization and adverse obstetric and perinatal outcomes. *Semin Perinatol*. 2017;41(6):345–353. https://doi.org/10.1053/j.semperi.2017.07.001.
9. Lei LL, Lan YL, Wang SY, et al. Perinatal complications and live-birth outcomes following assisted reproductive technology: a retrospective cohort study. *Chin Med J (Engl)*. 2019;132(20):2408–2416. https://doi.org/10.1097/cm9.0000000000000484.
10. Shin YJ, Kwak DW, Chung JH, et al. The risk of preterm births among pregnant women with adenomyosis. *J Ultrasound Med*. 2018;37(8):1937–1943. https://doi.org/10.1002/jum.14540.
11. Ferenczy A. Pathophysiology of adenomyosis. *Hum Reprod Update*. 1998;4(4):312–322. https://doi.org/10.1093/humupd/4.4.312.
12. Berlac JF, Hartwell D, Skovlund CW, et al. Endometriosis increases the risk of obstetrical and neonatal complications. *Acta Obstet Gynecol Scand*. 2017;96(6):751–760. https://doi.org/10.1111/aogs.13111.
13. Leone Roberti Maggiore U, Ferrero S, Mangili G, et al. A systematic review on endometriosis during pregnancy: diagnosis, misdiagnosis, complications and outcomes. *Hum Reprod Update*. 2016;22(1):70–103. https://doi.org/10.1093/humupd/dmv045.
14. Li H, Zhu HL, Chang XH, et al. Effects of previous laparoscopic surgical diagnosis of endometriosis on pregnancy outcomes. *Chin Med J (Engl)*. 2017;130(4):428–433. https://doi.org/10.4103/0366-6999.199840.
15. Scala C, Leone Roberti Maggiore U, Racca A, et al. Influence of adenomyosis on pregnancy and perinatal outcomes in women with endometriosis. *Ultrasound Obstet Gynecol*. 2018;52(5):666–671. https://doi.org/10.1002/uog.18989.
16. Maheshwari A, Gurunath S, Fatima F, et al. Adenomyosis and subfertility: a systematic review of prevalence, diagnosis, treatment and fertility outcomes. *Hum Reprod Update*. 2012;18(4):374–392. https://doi.org/10.1093/humupd/dms006.
17. Lacheta J. Uterine adenomyosis: pathogenesis, diagnostics, symptomatology and treatment. *Ceska Gynekol*. 2019;84(3):240–246.
18. Vannuccini S, Clifton VL, Fraser IS, et al. Infertility and reproductive disorders: impact of hormonal and inflammatory mechanisms on pregnancy outcome. *Hum Reprod Update*. 2016;22(1):104–115. https://doi.org/10.1093/humupd/dmv044.
19. Ota H, Igarashi S, Sasaki M, et al. Distribution of cyclooxygenase-2 in eutopic and ectopic endometrium in endometriosis and adenomyosis. *Hum Reprod*. 2001;16(3):561–566. https://doi.org/10.1093/humrep/16.3.561.
20. Dueholm M. Uterine adenomyosis and infertility, review of reproductive outcome after in vitro fertilization and surgery. *Acta Obstet Gynecol Scand*. 2017;96(6):715–726. https://doi.org/10.1111/aogs.13158.
21. Brosens I, Pijnenborg R, Benagiano G. Defective myometrial spiral artery remodelling as a cause of major obstetrical syndromes in endometriosis and adenomyosis. *Placenta*. 2013;34(2):100–105. https://doi.org/10.1016/j.placenta.2012.11.017.
22. Yorifuji T, Makino S, Yamamoto Y, et al. Time spatial labeling inversion pulse magnetic resonance angiography in pregnancy with adenomyosis. *J Obstet Gynaecol Res*. 2013;39(10):1480–1483. https://doi.org/10.1111/jog.12088.
23. Toshimitsu M, Nagamatsu T, Nagasaka T, et al. Increased risk of pregnancy-induced hypertension and operative delivery after conception induced by in vitro fertilization/intracytoplasmic sperm injection in women aged 40 years and older. *Fertil Steril*. 2014;102(4):1065–1070. https://doi.org/10.1016/j.fertnstert.2014.07.011. e1.
24. Egbe TO, Badjang TG, Tchounzou R, et al. Uterine fibroids in pregnancy: prevalence, clinical presentation, associated factors and outcomes at the Limbe and Buea Regional Hospitals, Cameroon: a cross-sectional study. *BMC Res Notes*. 2018;11(1):889. https://doi.org/10.1186/s13104-018-4007-0. Published 2018 Dec 13.
25. Sam M, Raubenheimer M, Manolea F, et al. Accuracy of findings in the diagnosis of uterine adenomyosis on ultrasound. *Abdom Radiol (NY)*. 2020;45(3):842–850. https://doi.org/10.1007/s00261-019-02231-9.
26. Tian Z, Lai J, Zhai QJ, et al. Influence of previous laparoscopic surgical and pathological diagnosis of endometriosis on pregnancy outcomes in women with adenomyosis. *Gyneco and Obstet Clin Med*. 2022;2(3):147–150. https://doi.org/10.1016/j.gocm.2022.07.001.