ZITA MEDICAL MANAGEMENT

www.hsmc.gr/en/pharmakeftiki-journal/

PHARMAKEFTIKI, 37, 2S, 2025 | 339-343 RESEARCH

https://doi.org/10.60988/p.v37i2S.223

Association between ABO blood groups and Müllerian anomalies: a single-center cohort study of 16,690 infertile women

Saleh Meghil[1], Adnan A. Al-Bdairi[2], Hayder Abdul-Amir Makki Al-Hindy[3,*], Sallama H. Khdhair[4], Osama Shawki[5], Batool Alkhalidi[6], Hadeel K. Kareem[7]

[1]Department of Gynaecology, CHU Brugmann UVC (Brugmann University Hospital), Brussels, Belgium
[2]Teba IVF, Genetic, and Fertility Center, Babylon, Iraq
[3]Department of Pharmacology and Toxicology, College of Pharmacy, University of Babylon, Hillah, Iraq
[4]Alzaitoon Specialized Fertility Center, Baghdad, Iraq
[5]Department of Gynaecology, School of Medicine, Cairo University, Cairo, Egypt
[6]Department of Gynaecology, College of Medicine, University of Kufa, Najaf, Iraq
[7]Department of Gynaecology, Al-Imam Al-Sadiq Teaching Hospital, Babil Health Directorate, Hillah, Iraq

KEY WORDS:
Müllerian anomaly; ABO blood groups; Rh blood group; uterus; congenital

ARTICLE INFO:
Received: January 25, 2025
Revised: February 07, 2025
Accepted: February 17, 2025
Available online: October 10, 2025

*** CORRESPONDING AUTHOR:**
Hayder Abdul-Amir Makki Al-Hindy, Department of Pharmacology and Toxicology, College of Pharmacy, University of Babylon, Hillah, Iraq; e-mail: phar.hayder.abdul@uobabylon.edu.iq

ABSTRACT

This study investigated the relationship between ABO blood groups and Müllerian anomalies in infertile women evaluated at the Teba Infertility Center (TIC) in Babylon, Iraq. Conducted over a three-month period beginning in August 2024, the study retrospectively included infertile couples who attended TIC between 2016 and 2022. A total of 1,215 archived records were reviewed from among 16,690 infertile females diagnosed with Müllerian uterine anomalies. Comprehensive patient reports were compiled, and three-dimensional (3D) sonographic examinations were performed in order to classify uterine morphology according to the standards of the European Society of Human Reproduction and Embryology / European Society for Gynaecological Endoscopy (ESHRE/ESGE). All participants were assessed for ABO blood group and Rhesus (Rh) factor positivity in order to explore potential associations with specific uterine anomalies. Statistical analyses were conducted using the SPSS software, applying frequency and percentage distributions, mean values with standard deviations, and comparative tests for non-normally distributed and categorical variables. The findings revealed significant associations between ABO blood groups and the presence of Müllerian anomalies. Notably, individuals with blood group O exhibited a higher preva-

PHARMAKEFTIKI, 37, 2S, 2025 | 339-343

lence of these abnormalities. These results underscore the relevance of ABO typing in reproductive health assessments and suggest that women with specific blood group profiles may benefit from targeted diagnostic and clinical interventions. Further research is warranted in order to validate these associations and elucidate the underlying biological mechanisms.

1. Introduction

Müllerian anomalies arise from the abnormal development of the female reproductive tract. These congenital conditions affect approximately 7% of the general population, with prevalence rising to 25% among women experiencing infertility and recurrent miscarriage[1]. A deeper understanding of Müllerian anomalies and their implications for fertility is essential in order to elucidate their aetiologies and associated risk factors.

The ABO blood group system is determined by specific antigens on the surface of red blood cells and is encoded on chromosome 9 at locus 9q34. Research has demonstrated that ABO blood types influence physiological processes and disease susceptibility, including both oncologic and non-oncologic conditions[2]. A large-scale retrospective study involving 482,914 individuals found significant associations between ABO blood groups and Rhesus (Rh) factor status with various disease risks across the population[3].

Despite these findings, few studies have explored the relationship between ABO blood groups and Müllerian anomalies, and comprehensive investigations remain scarce. It is known, for example, that parental blood group AB may influence the outcomes of *in vitro* fertilization (IVF) and intracytoplasmic sperm injection (ICSI) in Chinese women[4]. However, the impact of ABO blood groups on congenital uterine anomalies has not been thoroughly examined. Given the potential implications for reproductive health, further research is warranted to investigate the association between ABO blood types and Müllerian anomalies. The present study aims at evaluating this relationship among female infertility patients attending a tertiary care clinic in Babylon, Iraq, with the goal of identifying novel risk factors and informing more effective diagnostic and therapeutic strategies.

2. Methodology

Building upon prior investigations into infertility[5,6], this cross-sectional descriptive study was conducted at the Teba Infertility Center (TIC) in Babylon, Iraq. The study spanned a three-month period beginning in August 2024 and included infertile couples who attended TIC between 2016 and 2022. From a total of 16,690 patients, 1,215 infertile women diagnosed with Müllerian anomalies were selected for analysis. Each participant's medical, gynaecological, and obstetric history was reviewed in detail. Uterine morphology was assessed using two-dimensional (2D) and three-dimensional (3D) transvaginal sonography so as to identify Müllerian anomalies, which were classified according to the standards of the European Society of Human Reproduction and Embryology / European Society for Gynaecological Endoscopy (ESHRE/ESGE)[5]. Blood group and Rh factor status were determined for all patients with diagnosed uterine anomalies. The evaluation protocol included 2D/3D vaginal ultrasonography, complete blood count, coagulation profile, electrolyte panel, and serum human chorionic gonadotropin (hCG) testing. All clinical data were meticulously documented.

Data extraction was performed by using Microsoft Excel, and statistical analyses were conducted by using the SPSS software. Mann–Whitney U tests were applied to non-normally distributed variables,

PHARMAKEFTIKI, 37, 2S, 2025 | 339-343

Table 1. Distribution of the characteristics of congenital uterine anomalies (age, ABO, Rh, types of anomalies) and their correlations among women attending the Teba Infertility Center.

Variable	Categories	N	%	*R* or (B)	*p*-value
Age groups	<20 years	5	0.4%	-	-
	20–30 years	237	19.5%	-	-
	30–40 years	594	48.9%	-	-
	40–50 years	355	29.2%	-	-
	≥50 years	24	2.0%	-	-
Unicornuate uterus	Rh-positive	23	1.87%	0.18	0.045
	Rh-negative	4	0.33%	-0.12	0.067
Bicornuate uterus	Rh-positive	12	1.02%	0.22	0.012
	Rh-negative	2	0.18%	-0.08	0.091
T-shape	Rh-positive	70	5.78%	0.15	0.033
	Rh-negative	12	1.02%	-0.1	0.056
Septum	Rh-positive	926	76.33%	0.3	<0.001
	Rh-negative	164	13.47%	-0.05	0.045
Correlation of Rh groups with uterine anomalies	Rh-positive	1,033	85.0%	0.25	<0.001
	Rh-negative	182	15.0%	-0.18	0.045
Correlation of detailed blood groups with uterine anomalies	O	450	37.0%	0.12	0.045
	B	328	27.0%	-0.05	0.22
	A	340	28.0%	0.08	0.13
	AB	97	8.0%	0.02	0.57
Detailed association of uterine anomalies with blood group	Unicornuate	24	2.0%	0.21	0.012
	Bicornuate	12	1.0%	0.14	0.034
	T-shape	85	7.0%	0.18	0.025
	Septum	1,094	90.0%	0.15	0.045

while Fisher's exact and chi-square tests were used in order to assess associations between categorical variables, with statistical significance set at $p<0.05$. Categorical data were expressed as frequencies and percentages. The study protocol was approved by the Institutional Review Committee of the College of Pharmacy of the University of Babylon (approval number: A0040 / 2023).

3. Results and Discussion

This study evaluated the association between ABO blood groups and congenital Müllerian anomalies among women attending a tertiary infertility center. The data revealed significant correlations between specific blood groups and types of uterine anomalies, with particular emphasis on Rh factor status.

Age distribution analysis showed that the majority of participants were aged 30–40 years (48.9%), followed by those aged 40–50 years (29.2%). These findings are consistent with previous studies indicating that reproductive tract anomalies are more prevalent in these age groups. Among 200 infertile women aged 15–45 years, the incidence of uterine anomalies was 6%, with a mean age of approximately 30 years[7]. However, the incidence was not significantly higher in the 30–40-year age group compared to other age ranges. Congenital uterine anomalies affect an estimated 5% of the general population, with prevalence rates of 0.5% among fertile women and 3.5% among infertile women[8]. Notably, women under 20 years of age represented only 0.4% of cases, thereby suggesting that Müllerian anomalies are infrequently diagnosed in this demographic (Table 1).

PHARMAKEFTIKI, 37, 2S, 2025 | 339-343

Rh-positive individuals exhibited a markedly higher prevalence of septate uterus (76.33%) compared to Rh-negative individuals (13.47%; $p<0.001$). This finding aligns with prior research linking Rh positivity to adverse pregnancy outcomes. Rh-negative women have been reported to experience increased rates of preeclampsia and restricted foetal growth[9], although a larger cohort study found no significant differences in pregnancy outcomes between Rh-positive and Rh-negative women[10].

In terms of ABO distribution, uterine anomalies were most prevalent among patients with blood group O (37%), followed by groups A (28%) and B (27%). Group AB accounted for 8% of cases (Table 1). These results suggest a higher susceptibility to Müllerian anomalies among individuals with blood group O[2].

The most common anomaly identified was a septate uterus (90%), followed by a T-shaped uterus (7%) and an unicornuate uterus (2%). A septate uterus was disproportionately observed in Rh-positive patients, prompting further investigation into the underlying mechanisms of susceptibility.

Statistical analyses revealed strong associations between specific blood groups and distinct types of uterine anomalies. An unicornuate uterus was consistently associated with blood group O, while a T-shaped uterus was more frequently observed in Rh-positive individuals. These findings support the hypothesis that ABO and Rh blood group systems may contribute to the pathogenesis of Müllerian anomalies, although further research is needed in order to elucidate the biological pathways involved.

Understanding the relationship between blood group profiles and Müllerian anomalies may enhance clinical decision-making in reproductive medicine. Identifying blood type-related risk factors can facilitate personalized diagnostic protocols and early therapeutic interventions for women with suspected reproductive tract anomalies. Healthcare providers should consider genetic and haematologic profiles when evaluating patients for uterine anomalies. Expanding research to include diverse populations will be essential in order to validate these associations and to potentially inform blood group-based therapeutic approaches for reproductive disorders.

4. Conclusion

The present study highlights significant associations between ABO blood groups and Müllerian anomalies, with implications for reproductive health. Incorporating blood group information into the diagnostic and therapeutic framework may improve outcomes for women with congenital uterine anomalies. Identifying individuals at elevated risk enables clinicians to implement targeted testing and treatment strategies aimed at enhancing fertility and pregnancy success. Further research is warranted in order to clarify the mechanisms underlying these associations and to develop evidence-based interventions.

Acknowledgements

The authors express their gratitude to the administrative staff of the Teba Infertility Center for their support.

Conflicts of interest

None exist.

ORCIDs

0000-0003-2344-3579 (S. Meghil); 0000-0001-2156-1607 (A.A. Al-Bdairi); 0000-0001-6232-8501 (H.A.A.M. Al-Hindy); 0000-0002-4545-9777 (S.H. Khdhair); 0009-0006-2303-8302 (O. Shawki); 0000-0003-2256-6817 (B. Alkhalidi); 0009-0007-6325-9289 (H.K. Kareem)

PHARMAKEFTIKI, 37, 2S, 2025 | 339-343

References

1. Sugi M.D., Penna R., Jha P., Põder L., Behr S.C., Courtier J., *et al.* Müllerian duct anomalies: role in fertility and pregnancy. *Radiographics* 41(6), 1857–1875, 2021. DOI: 10.1148/rg.2021210022
2. Abegaz S.B. Human ABO blood groups and their associations with different diseases. *Biomed. Res. Int.* 2021, 6629060, 2021. DOI: 10.1155/2021/6629060
3. Bruun-Rasmussen P., Hanefeld Dziegiel M., Banasik K., Johansson P.I., Brunak S. Associations of ABO and Rhesus D blood groups with phenome-wide disease incidence: a 41-year retrospective cohort study of 482,914 patients. *Elife* 12, e83116, 2023. DOI: 10.7554/eLife.83116
4. Bao X., Zhao F., Shi H., Bu Z., Liang Y., Sun Y. Parent joint AB blood group is associated with clinical outcomes of *in vitro* fertilization and intracytoplasmic sperm injection treatment in Chinese women. *Front. Med. (Lausanne)* 9, 813781, 2022. DOI: 10.3389/fmed.2022.813781
5. Al-Bdairi A.A.H., Al-Hindy H.A.A.M., Rahmatullah W.S., Alshukri W.S.M. Impact of congenital uterine anomalies on ectopic pregnancy: a cross-sectional observational study of 510 cases. *Med. J. Babylon* 21(s1), s52–s57, 2024. DOI: 10.4103/mjbl.mjbl_352_23
6. Al-Bdairi A.A.H., Al-Kadhim H.K.H., Al-Shaikh S.F., Al-Hindy H.A.A.M. ABO blood grouping and Rhesus factor: association with ovarian reserve and the outcomes after *in vitro* fertilization. *Hist. Med.* 8(1), 18–28, 2022. DOI: 10.17720/2409-5834.v8.1.2022.003
7. Gaharwar A., Pandey P., Pasricha N., Sthapak E., Narayan S. An ultrasonographic assessment to document the prevalence of various congenital uterine anomalies and their probable clinical outcome in the Eastern Uttar Pradesh region: a prospective study. *Natl J. Clin. Anat.* 11, 217–221, 2022. DOI: 10.4103/njca.njca_142_22
8. Spurlin E.E., Jimenez P.T. Peek and shriek or look and learn: when an aborted surgery leads to the best outcome. *Fertil. Steril.* 121(1), 52–53, 2024. DOI: 10.1016/j.fertnstert.2023.11.020
9. Devi G.R., Patnaik U.S., Usha P. Prevalence of Rh negative pregnancy in antenatal women with evaluation of maternal and foetal outcome. *J. Evid. Based Med. Healthc.* 3, 5400-5403, 2016. DOI: 10.18410/jebmh/2016/1121
10. Jin Y., Dong M., Yang S.W., Lee K.M., Han S.W., Seo S.H., *et al.* Evaluation of maternal rhesus blood type as a risk factor in adverse pregnancy outcomes in Korea: a nationwide health insurance database study. *Obstet. Gynecol. Sci.* 63(4), 448–454, 2020. DOI: 10.5468/ogs.20004

HOW TO CITE:
Meghil S., Al-Bdairi A.A., Al-Hindy H.A.A.M., Khdhair S.H., Shawki O., Alkhalidi B., Kareem H.K. Association between ABO blood groups and Müllerian anomalies: a single-center cohort study of 16,690 infertile women. *Pharmakeftiki* 37(2s), 339-343, 2025. https://doi.org/10.60988/p.v37i2S.223