GinPolMedProject ©
02 (69) 2025 : 001-005 • RESEARCH ARTICLE

Impact of the sperm swim-up technique in semen processing on the success of Intrauterine Insemination (IUI) for Iraqi infertile couples

Saba Sabeh Hussain[1], Muhjah Falah Hassan[2], Safa Jihad[3], Hayder Ridha-Salman[4]*

[1]Department of Anatomy and Embryology, College of Medicine, University of Thi Qar, Nasiriyah, Thi Qar, Iraq

[2]Department of Pharmacology, College of Pharmacy, University of Al Kafeel, Najaf, Iraq

[3]Department of Pharmacology and Toxicology, College of Pharmacy, University of Babylon, Hillah, Iraq

[4]Al-Mustaqbal University, College of Pharmacy, 51001 Hillah, Babylon, Iraq

SUMMARY

Infertility is a medical health problem that has risen in the community recently. It is a sensitive topic to discuss in the Iraqi community due to culture issues, which makes finding the right treatment a hard mission. Infertile couples always face social stigma, which leads to depression and anxiety. Our aim of study is to examine the elements that could predict a successful IUI. Our project mainly performed in a private infertility clinic and partially in the public clinic for the period of time from September 2021 to May 2022. 200 Infertile couples have been chosen for the IUI treatments. We observe and study the clinical pregnancy outcomes rate to know the effect of Sperm swim-up technique of semen processing, we found that media activated the sperm had led to significant increases in the sperm activity and vitality which reflected clinically on increase pregnancy rate.

Keywords: Intrauterine insemination; Men infertility; Women infertility

Address for correspondence:

Dr. Hayder Ridha-Salman,
Al-Mustaqbal University, College of Pharmacy, 51001 Hillah, Babylon, Iraq

Word count: 1702 **Tables:** 02 **Figures:** 01 **References:** 58

Received: 06.03.2025, Manuscript No. gpmp-25-164876; **Editor assigned:** 07.03.2025, PreQC No. P-164876; **Reviewed:** 28.03.2025, QC No. Q-164876; **Revised:** 04.04.2025, Manuscript No. R-164876; **Published:** 30.06.2025

INTRODUCTION

Fertility rate has been lowered globally due to advancement in contraceptive manufacture [1]. Culture norm and social habits are changing as women tend to prefer work over childbearing [2,3] in addition to some endintocrine-disrupting chemicals that can interfere with normal hormonal activity [4]. Infertility is defined as inability to have babies after one year from continues sexual intercourse [5,6]. Historically, the Intrauterine Insemination (IUI) has been unraveled in the 20th century. IUI means use of artificial skills to elevate the likelihood to conceive a woman [7]. In (IUI) a processed semen sample forced in the upper uterine area, sperm will pass the obstacles represented by barriers in the female reproductive tract [8]. Although IUI is expensive, but it is effective and harmless therapy. The selected group of women for IUI should have normal tubes ovulation, while men can be advised to do IUI if they have immunological issues, and ejaculatory disorders [9]. Progesterone is required for preparation of the uterus for embryo implantation [10,11]. It is well known that any reduction in the concentration of serum progesterone during early stages of pregnancy results in abortion [12,13]. Thyroid diseases have proven clinically to cause infertility, so ladies who have shown thyroid gland imbalance was dismissed from the project [14]. Our research has positive impact on the community as we see the psychological problems that infertile couples have such as anxiety and depression [15].

The aim of current study is to evaluate the using swim-up technique of semen processing activated the sperm and increases its vitality and the effect of this technique on pregnancy rate in female undergoes IUI.

MATERIAL AND METHODS

Infertile couples have been seen in the Al-Hussein infertility center and in our private clinic for the period of September 10-2021 to May 2022. We have chosen 200 cases (n=200) for a total of 500 women to be treated by IUI. Those ladies are suffering from infertility due to cervical factors, anovulation and immunological factors. We used this method also if the male's sperm analysis has shown poor sperm movements, clotting and clumps. The standard IUI is accomplished as described by another group of researchers.

Informed consent

Oral and written consent was collected from all couples before the treatment.

Laboratory IUI preparation

Semen analysis: Semen has been tested according to WHO recommendations [16], for all males included in the study. The semen test has been done one week prior to the operation and repeated on the IUI operation day to make sure it is suitable to go further with conception aid.

Hormonal analysis

Hormonal tests of blood have been performed to all couples. For male we tested testosterone, T3, T4. While, for female we tested LH, FSH, T3, T4, prolactin and progesterone [17-21]. For few cases of women who suffer previous incidence of abortion TORCH test has been performed to treat any reason that could kill the embryo [22,23]. Moreover, internal exam has been performed to insure there is no tumor or mass in the cervix [24-26], and breast cancer exam has been done to verify that the breast has no clumps [27-29].

Samples collection and swim up technique

Semen has been collected in special sterile container that has the name, the time of collecting the samples from each patient alone. Semen was left in the incubator to turn into liquid. Semen analysis has been done, and then the semen was centrifugated at 2000 rpm/ 10 min to separate the sperm from the seminal plasma. The semen were aspirated away to get rid of sever cramping, while the sediment that contain the sperm were washed away by suspending with sperm washing pre-warmed media Fertipro flushing media [30,31]. The mixture was centrifuged again, the supernatant was discarded and the sediment was resuspended in Fertipro gain media. The tubes were kept in the incubator at 37 C for 50-60 min. Later, the supernatant was collected with sterile pipette. Finally, the mixture transferred to Gynetic IUI catheter, and, it is ready to be used for IUI [32,33].

In the end, the processed sperms were transported by sterile catheter into the females, where a small catheter is placed through the cervical OS to deliver sperm directly into the uterus, thus bypassing the cervical barrier [34].

Statistical analysis

GraphPad prism version 8 software for Windows, La Jolla California USA, www.graphpad.com, was performed in our project. Percentages compared to the expected results. Significant data symbolized by star as the following: 0.01 ≤ *p <0.05; 0.001 ≤ **p <0.01; ***p <0.001.

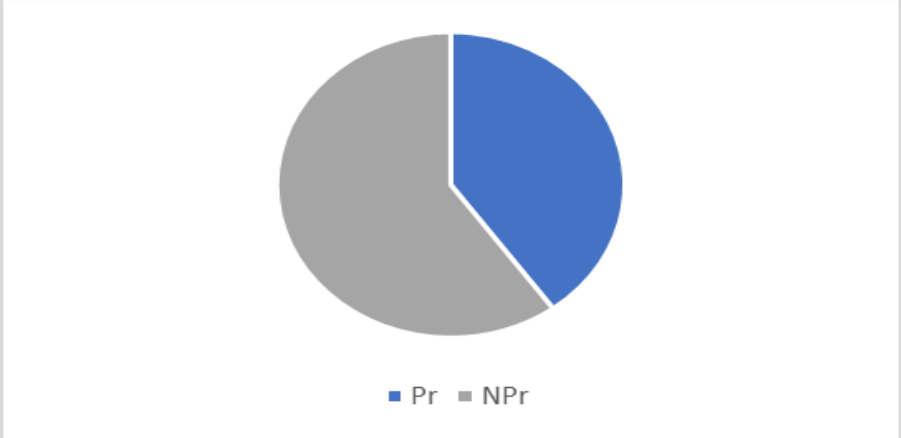
RESULTS

As we stated in Tab. 1., the sperm concentration has lowered significantly, as our IUI methods collect only live and active sperm. On the other hand, we have noticed that the sperm vitality has increased significantly. For sperm activity, we have followed the WHO classification in of the sperm activity by using ABCD system. A is given when the sperm are moving forward fast in a straight line. B means the sperm swim forward in a curved line. C refers to sperm that moves its tail only. D means immotile sperm.

Tab. 1. Semen parameters before and after processing.

Parameter		Seminal fluid analysis	Sperm analysis after processing with gain media	*T* test value Statistical analysis
Sperm concentration (x 10^6/ml)		45.7 ± 2	23.2 ± 1.7	S
Sperm vitality		60	80	S
Sperm activity (%)	Grade A	13 ± 2	20 ± 2	S
	Grade B	25 ± 1.5	30 ± 1.7	
	Grade C	18 ± 2	5 ± 1.5	
	Grade D	30 ± 1.1	7 ± 1.1	
Sperm clumps		10 or more	none	S
Morphologically normal sperm (%)		30	60	S
S means significant relationship between two factors, P=0.01 or higher				

Fig. 1. Number of pregnant women.



Tab. 2. The role of age in having a successful IUI.

Infertile women No	10	23	44	63	76
Age period	19-20 y	21-225 y	26-30 y	31-37 y	38-45 y
Successful IUI rate	99 %	91 %	81 %	60 %	30 %
Unsuccessful IUI rate	1 %	8 %	19 %	40 %	70 %

However, Fig. 1. is showing the number of successful cases in our research. As we see there is 80 cases Pregnant (Pr) of successful cases out of 200 women participated in the study (40%). By this we have 120 NPr Non pregnant cases (60%).

Our findings have documented a significant relationship between the women age and the productive IUI rate (Tab. 2.).

DISCUSSION

Female infertility can result from a complex interplay of inflammatory, metabolic, and immune factors that disrupt normal reproductive function [35,36]. Chronic inflammation often linked to conditions like endometriosis and pelvic inflammatory disease, can damage the reproductive organs, create scar tissue, and interfere with implantation. These inflammatory conditions trigger the release of cytokines and other immune mediators that impair ovulation and embryo development [37-39]. Metabolic disorders, particularly Polycystic Ovary Syndrome (PCOS), are major contributors to infertility due to hormonal imbalances, insulin resistance, and disrupted ovulatory cycles [40-42]. Obesity and diabetes, both metabolic in nature, further exacerbate hormonal dysregulation, negatively impacting egg quality and menstrual regularity [43-45]. Immune-related infertility occurs when the body's defense system mistakenly attacks reproductive tissues or sperm, as seen in autoimmune diseases like lupus or thyroid disorders. In some cases, the presence of antisperm or anti-ovarian antibodies disrupts fertilization and ovarian function. The immune system may also interfere with embryo implantation by rejecting the embryo as a foreign body. These factors are often intertwined; for example, metabolic imbalances can promote systemic inflammation, while chronic inflammation can trigger autoimmune responses [46,47]. Diagnosis usually involves hormonal assays, imaging, and immune testing. Treatment depends on the underlying cause and may include anti-inflammatory drugs, hormonal therapy, lifestyle modifications, or immunosuppressive medications [48-50]. Addressing these root causes improves the chances of conception and a healthy pregnancy.

Sperm analysis was shown that the sperm concentration has lowered significantly. These results were expected as our methods collect the life and active sperm, while the dead and slow active sperm were discarded with centrifugation. Our methods were based on other groups of researchers with minor modification [51,52]. Sperm swim up methods were seen as a good method in separating the active motile sperm. Our results have agreed with other researchers who have used the same methods [53,54]. Fig. 1. has showed our successful work as we have gotten 80 pregnant cases so far. These cases tell us that the barrier for the pregnancy is in the cervical area and by using IUI we have overcome this obstacle successfully [55,56]. However, we have 120 cases have not been conceived, but our percentages is similar to several research that have been done worldwide [57,58]. Finally, we also have done hormonal analysis for all the participants, but we decided to publish them in a separate paper.

CONCLUSION

Using swim-up technique of semen processing activated the sperm and increase its vitality and this technique effect positively on pregnancy rate in female undergo IUI Moreover, female younger age play a role in IUI success.

ACKNOWLEDGEMENT

The authors would like to acknowledge the High Institution for Infertility Diagnosis and Assisted Reproductive Technologies, Al- Nahrain University, Baghdad, Iraq. The authors also express their thankfulness to the College of Medicine, Thi-Qar University for the support provided to accomplish this study.

ETHICS APPROVAL

This research was conducted was conducted in accordance with the Declaration of Helsinki. This study was approved by the ethical committee of high institute for infertility diagnosis and assisted reproductive technologies, Al-Nahrain University, Baghdad, Iraq after evaluating the most recent installment, topic information, and research plan. An informed written/ oral consent was obtained from all participants.

FUNDING

There is no funding for this study.

CONFLICT OF INTEREST

There are no conflict of interest interests to declare.

AUTHOR CONTRIBUTIONS

Saba Sabeh Hussain conducted the investigation, wrote and refined the first draft of the document, participated in its design and provided financing and other forms of assistance. Muhjah Falah Hassan donated supplies, equipment, and finished the final copy of the research article. Safa Jihad created the theoretical framework for the researched project and specified the parameters of the exploratory analysis. Hayder Ridha-Salman outlined the main goals through an in-depth assessment of the findings and supplemented with insightful criticism and supervision.

DATA AVAILABILITY STATEMENT

Data verifying the results of the research can be acquired from the corresponding author with an appropriate request.

REFERENCES

1. **Mohsin HA, Mossa HA, Jawad MA**. The impact of serum and follicular fluid secreted frizzled-related protein-5 on ICSI outcome in Iraqi infertile women with different body mass index. *Biomedicine*. 2023;43(4):1239-1246.
2. **Sengupta P, Hassan MF, Dutta S, et al.** Orexins: the â€¯multitaskingâ€™ neuropeptides in the energy metabolism and immune regulation of male reproduction. *Chem Biol Lett.* 2021;8(4):202-212.
3. **Khalil R, Mossa H, Jwad M**. Mitofusin 1 as a marker for embryo quality and development in relevance to icsi outcome in infertile females. *Georgian Med News*. 2023;345:58-56.
4. **Herez SH, Jawad MA, Abbood MS.** Effect of Bisphenol A Level in Follicular Fluid on ICSI OutCome. *J Pharm Negat Results*. 2022;13(4).
5. **Heidenreich A, Bonfig R, Wilbert DM, et al.** Risk factors for antisperm antibodies in infertile men. *Am J Reprod Immunol*. 1994;31(2-3):69-76.
6. **Abd Ali A, Al-Hilli N, Jawad MA.** Effect of obesity on ICSI outcome in Iraqi infertile females. *Biochem Cell Arch*. 2020;20(2).
7. **Al-Tamemi KI, Abood MS, Al-Ammar MA.** Effect of Intrauterine Flushing of Hcg on Day of Trigger on Iui Outcome. *Pharmacology*. 2021;2:890-903.
8. **Mohammed ZA, Seiman MO, Fibog MA, et al.** Comparison between the effect of GnRH agonist and HCG injection on the luteal phase support in patient undergoing IUI. *J Int Dent Med Res*. 2020;13(4):1504-1509.
9. **Jawad MA, Mohammed AA, Sahib HB, et al**. Effect of alcohol extract of *Prunus avium* on *in vitro* sperm activation of human semen samples. *Int J Pharm Science*. 2014;25(1):65-68.
10. **Kadhim BH, Salman MO, Jwad MA.** Comparison between the effect of atosiban and piroxicam administration before embryo transfer on *in vitro* fertilization outcome. *Pharmacol Online Arch.* 2021;1:511-516.
11. **Dawood SA, Jwad MA, Mossa HA**. The impact of serum and follicular fluid irisin on oocyte and embryonic characteristics in infertile women undergoing ICSI according to BMI. *Al-Rafidain J Med Sci*. 2023;5:211-217.
12. **Posthuma-Trumpie GA, van Amerongen A, Korf J, et al.** Perspectives for on-site monitoring of progesterone. *Trends Biotechnol*. 2009;27(11):652-660.
13. **Raaf GB, Mohammed AA, Jawad MA.** The Comparison of the Effect of Recombinant FSH in Antagonist Protocol on Serum and Follicular Fluid Kisspeptin between PCOS and non-PCOS Infertile Women during ICSI. *Int J Drug Deliv Technol*. 2022;12(1):33-38.
14. **Tarfa SJ, Faez Khalaf M.** Prevalence of women's infertility with TSH, PRL and LH impairment. *Int J Pharm Res*. 2020;(1).
15. **Frederiksen Y, Farver-Vestergaard I, Skovgård NG, et al**. Efficacy of psychosocial interventions for psychological and pregnancy outcomes in infertile women and men: a systematic review and meta-analysis. *BMJ Open*. 2015;5(1):e006592.
16. **Boitrelle F, Shah R, Saleh R, et al.** The sixth edition of the WHO manual for human semen analysis: a critical review and SWOT analysis. *Life*. 2021;11(12):1368.
17. **Poppe K, Velkeniers B**. Female infertility and the thyroid. *Best Pract Res Clin Endocrinol Metab.* 2004;18(2):153-165.
18. **Hollowell JG, Staehling NW, Flanders WD, et al**. Serum TSH, T4, and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). *J Clin Endocrinol Metab*. 2002;87(2):489-499.
19. **Verma I, Sood R, Juneja S, et al**. Prevalence of hypothyroidism in infertile women and evaluation of response of treatment for hypothyroidism on infertility. *Int J Appl Basic Med Res*. 2012;2(1):17-19.
20. **Hussain SS, Hassan MF.** The effectiveness of using r-HMG+ r-FSH vs. r-FSH alone during COS on ICSI outcome. *Ann Trop Med Health*. 2019;22:82-86.
21. **Ali ZH, Mossa HA, Abood MS**. Evaluation of endometrial receptivity and pregnancy outcome in view of assessment of serum and follicular fluid level of CD44 following administration of hyaluronic acid to infertile women. *Pharmacology*. 2021;3:536-544.
22. **Muhammad SM, Al-Anbari LA, Abood, MS**. Evaluating Endometrial Thickness at Antagonist Starting Day as an Adjuvant Criterion to Decide Gnrh Initiation in Flexible Antagonist Protocols. *HIV Nurs*. 2022; 22(2): 2073-2081.
23. **Al-Kafajy M.** Identifying the Correlation between the Incidence of Breast Cancer and Hepatitis B Virus of Iraqi Women. *Indian J Forensic Med Toxicol*. 2020;14(2):2250-2255.
24. **Bray F, Ferlay J, Soerjomataram I, et al**. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6):394-424.
25. **Jemal A, Siegel R, Ward E, et al**. Cancer statistics, 2009. *CA Cancer J Clin*. 2009;59(4):225-249.
26. **Ziadeh C, Ziogas A, Jiang L, et al.** Breast cancer characteristics in Middle Eastern women immigrants compared with non-Hispanic white women in California. *JNCI Cancer Spectr*. 2018;2(2):pky014.
27. **Al-Kafajy M.** Breast cancer risk trends of Iraqi women. *Med Leg Update*. 2020;20(1):383-386.
28. **El Saghir NS, Anderson BO.** Breast cancer early detection and resources: where in the world do we start?. *Breast*. 2012;21(4):423-425.
29. **Abdulhussain AF, Ghazi HF, Abood MS**. Measurement of Seminal plasma myd88 protein and Bacterial Lipopolysaccharide in infertile male as an indicator for Leukocytospermia and bad Seminal fluid analysis. *Ann Trop Med& Public Health*. 2020; 23(S16): SP231631.
30. **Dickey RP, Brinsden PR, Pyrzak R, et al.** Manual of intrauterine insemination and ovulation induction. *Cambridge University Press*; 2009.
31. **Abdullah M, Abdulhamed W, Abood M.** Effects of Vaginal Sildenafil Citrate on Ovarian Blood Flow and Endometrial Thickness in Infertile Women Undergoing Intra-uterine Insemination. *Clin Transl Sci*. 2021;11(4):1451-1453.
32. **Jameel T.** Sperm swim-up: a simple and effective technique of semen processing for intrauterine insemination. *JPMA*. 2008;58(2):71-74.
33. **Hussain FA, Muyad AS.** Correlation Study between Level of zinc and lead in Serum and Seminal Plasma in Infertile Patients. *Ann Trop Med Public Health*. 2020; 23(16).
34. **Whynott RM, Summers KM, Van Voorhis BJ, et al.** Effect of body mass index on intrauterine insemination cycle success. *Fertil Steril*. 2021;115(1):221-228.
35. **Vaisi-Raygani A, Asgari R.** Association of inflammation with female reproductive system disorders. *Cent Asian J Med Pharm Sci Innov*. 2021;1(2):67-73.
36. **Ghazy N.** Effects of apremilast on induced hypertrophic scar of rabbits. *Arch Razi Inst.* 2021;76(6):1803.
37. **Ameho S, Klutstein M.** The effect of chronic inflammation on female fertility. *Reproduction.* 2025;169(4).
38. **Yahiya YI, Hadi NR, Raghif AA, et al.** Role of Iberin as an anti-apoptotic agent on renal ischemia-reperfusion injury in rats. *J Med Life.* 2023;16(6):915.
39. **Ali BF, Abu-Raghif AR, Ridha-Salman H, et al.** Vildagliptin topical ointment: an effective treatment for imiquimod-induced psoriasis in mice. *J Mol Histol*. 2025;56(3):1-21.
40. **Al-Tuma AM, Hussain SS, Hassan MF.** Treatment with Metformin Can Improve Insulin Resistance and Lipid Profile in Non-Diabetic Iraqi Women with Polycystic Ovary Syndrome. *Med J Babylon.* 2024;21(Suppl 2):S185-S188.
41. **Thammer MR, Sahib HB, Ridha-Salman H.** Skin Healing Potential of Bioactive Components From Lycoperdon lividum Mushroom Versus β-Sitosterol in Rat Model of Burn Wounds. *Microsc Res Tech*. 2025.
42. **Manna MJ, Abu-raghif A, Muhsin HY.** The effect of Niclosamide in acetic acid induce colitis: an experimental study. *Prensa Med Argent*. 2019:309-316.

43. **Hussain SS, Rustum HM**. Evaluation of anti-zona pellucida antibodies in serum and follicular fluid for polycystic ovarian women undergoing intracytoplasmic sperm injection programme. *Int J Res Pharm Sci*. 2018;9(4):1533-1537.

44. **Luty RS, Al-Zubaidy AA, Malik AS, et al.** Protective effect of orientin on diabetic nephropathy in rat models of high-fat diet and streptozotocin-induced diabetes. *Naunyn Schmiedebergs Arch Pharmacol*. 2025:1-6.

45. **Aal-Aaboda MS, AR AR, Hadi NR**. Renoprotective potential of the ultra-pure lipopolysaccharide from Rhodobacter Sphaeroides on acutely injured kidneys in an animal model. *Archives of Razi Institute*. 2021;76(6):1755.

46. **Raghif AR, Yaseen YA, Dawood MH**. Effects of coenzyme Q10 administration on glucose homeostasis parameters in prediabetic patients. *J Pharm Sci Res*. 2017;9(11):2274-2277.

47. **Ali KA, Abu-Raghif AR, Ridha-Salman H.** Evaluation of common topical therapeutic agents of plane warts. *Arch Dermatol Res*. 2025;317(1):1-7.

48. **Khorsheed SM, Abu-Raghif AR, Ridha-Salman H.** Alleviative effects of combined topical melatonin and rutin on imiquimod-induced psoriasis mouse model. *Pharmacia*. 2024;71:1-3.

49. **Kadhim H, Gatea F, Raghif AA, et al.** Role of topical Ritodrine hydrochloride in experimentally induced hypertrophic scar in rabbits. *Iraqi J Pharm Sci*. 2022;31(2):260-270.

50. **Oubaid EN, Abu-Raghif A, Al-Sudani IM.** Ibudilast ameliorates experimentally induced colitis in rats via down-reg-ulation of proinflammatory cytokines and myeloperoxidase enzyme activity. *Pharmacia*. 2023;70 (1): 187-195.

51. **Yavas Y, Selub MR.** Intrauterine insemination (IUI) pregnancy outcome is enhanced by shorter intervals from semen collection to sperm wash, from sperm wash to IUI time, and from semen collection to IUI time. *Fertil Steril*. 2004;82(6):1638-1647.

52. **Abunaila R, Al-Anbari LA, Abbood MS.** The effects of adding gonadotropin-releasing hormone antagonist on cycle characteristics and pregnancy rate in stimulated intrauterine insemination (IUI) cycle. *Int J Res Pharm Sci*. 2020;11(3):3053-3060.

53. **Butt F, Chohan MA**. Comparative efficacy of density gradient and swim-up methods of semen preparation in intrauterine insemination cycles. *JPMA*. 2016;66(8):932-937.

54. **Al-Yasiry RZ, Jawad MA, Abbood MS**. Association of Methylenetetrahydrofolate Reductase Gene Polymorphism C677T with Oocyte Number and Embryo Quality in Iraqi Infertile Women Undergoing Intracytoplasmic Sperm Injection. *Al-Rafidain J Med Sci*. 2024;6(1):39-45.

55. **Dawood SA, Hussaini HA, Ali M**. Effect of oral estradiol valerate versus vaginal sildenafil on endometrial receptivity evaluated by ultrasound and pregnancy rate in Iraqi infertile females. *Syst Rev Pharm*. 2020;11(6):627-632.

56. **Al-Anbari LA, Jwad MA, Kadhim AA, et al**. Oral intake of Salvia officinalis improves intrauterine insemination outcomes in women with polycystic ovary syndrome. *Ginekol Pol.* 2025;1(69):001-5.

57. **Allahbadia GN**. Intrauterine insemination: Fundamentals revisited. *J Obstet Gynaecol India*. 2017;67(6):385-392.

58. **Alhussien ZA, Mossa HA, Abood MS.** The effect of L-carnitine on apoptotic markers (annexin V and clusterin) in polycystic ovarian syndrome women undergoing ICSI. *Int J Drug Deliv Technol*. 2022;12:1682-1686.