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Original article

Clinical Properties and Seminal Fluid Analysis of Patients with Primary Infertility Consulting the Urology Outpatient Clinic for the First Time: A Cross-Sectional Study

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SUMMARY

Introduction/Aim. Seminal fluid analysis (SFA) plays a crucial role in helping infertility clinics diagnose the underlying reason of male infertility. The aim of the study was to investigate seminal fluid patterns of male partners of an infertile couple with apparently fertile female partners.

Materials and methods. A cross-sectional study was conducted between January 2019 and December 2022. Patients were attending consultations for delayed conception for more than 12 months with apparently fertile female partner.

Results. Four hundred fifty-three patients were included in the study. The distribution of patients according to age groups showed that 277 patients were young, aged 21 - 30 years (61%). Two hundred sixty-two (58%) patients complained of infertility for 12 - 24 months duration. Four hundred twenty-nine (94.7%) patients had normal semen volume. In terms of sperm count, 174 patients had below the normal sperm count. Sperm concentrations also showed a great decline with advancing age. Motility parameters were shown to be poor. Sperm morphology findings were relatively good. Results of the current study reflects the impact of infertility on young age groups (21-30 years) as 277 (61%) cases of infertility manifests in this age. One hundred fifty-eight (34.8%) patients were suffering from low sperm count which tend to get lower with increasing age. Motility is known to have a stronger impact on fertility rate compared to morphology.

Conclusion. Low motility is caused by several factors which are highly prevalent in society as compared to abnormal morphology factors, including: smoking, drinking alcohol, low exercise, stress, obesity, while morphology on the other hand is affected by other factors which are less prevalent in society.

Keywords: **SFA, morphology, motility, liquefaction**

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INTRODUCTION

Infertility has been, and will continue to be, one of the most significant challenges faced by reproductive medicine. According to the World Health Organization (WHO), infertility is a distinct disease entity, and because of how common it is, it ought to be regarded as a social illness. (1, 2). This percentage is much greater in low-income nations, ranging from 15% to 20% of the population being afflicted by infertility (3). In high-income countries, infertility affects roughly 15% of the population (4).

Infertility is defined by the American Society for Reproductive Medicine as the inability to obtain a viable pregnancy after 12 months or more of frequent unprotected intercourse between the partners (5).

Male infertility encompasses a complex pathophysiology with multivariate underlying factors, the most common being varicocele, cryptorchidism, hypogonadism, genital tract infection, endocrine abnormalities including hypothalamic, pituitary, thyroid, diabetes mellitus, adrenal gland, testicular cancer, environmental toxins, systemic disease, exogenous drugs, and genetic factors (6). Idiopathic infertility is a term that may be used to describe the majority of instances of infertility and/or subfertility since the underlying reasons have not been identified (7).

Traditional diagnostic criteria for male infertility have been based on the standard semen profile established by the World Health Organization (WHO). This is because male infertility is characterized by an inability to produce functionally viable spermatozoa (8).

The WHO's range of "normal levels" does not have a foundation in evidence, either in terms of their diagnostic value or their connection to the population of fertile women (9). There is a significant risk that sperm function abnormalities will render some men sterile, even though their sperm quality meets all of the normal criteria. On the other hand, there is a possibility that some men whose sperm quality is abnormal will have normal sperm function and will be able to have children (10). There is a significant risk that sperm function abnormalities will render some men sterile, even though their sperm quality meets all of the normal criteria. On the other hand, there is a possibility that some men whose sperm quality is abnormal will have normal sperm function and will be able to have children (8).

The objective that must be accomplished by an infertility clinic is to make a diagnosis of the true reason of infertility, and seminal fluid analysis (SFA) is of utmost significance in this respect.

The aim of this study is to investigate the seminal fluid patterns of male partners of an infertile couple with apparently fertile female partners attending the urology outpatient clinic for the first time for fertility check.

MATERIALS AND METHODS

This cross-sectional clinical study was conducted between January 2019 and December 2022. The male patients attending the urology outpatient clinic in Al-Kindy Teaching Hospital complaining of delayed conception were interviewed and examined. Patients attending consulting for delayed conception for more than 12 months with apparently fertile female partner (age between 18 - 40 years, regular cycle with normal mid-cycle dominant follicle size and, when relevant, normal hysterosalpingography) and who were not on treatment for their condition in the last three months were included. Those who had apparent female partner problem, where data about the female partner was not available, those who used treatment for their condition in the previous three months, had duration of delayed conception of less than 12 months, or had achieved previous conception with their current or previous partner were excluded from the study.

In the included individuals, seminal fluid analysis was performed after 3 - 5 days of abstinence within two hours after ejaculation and analyzed according to the criteria as specified in the WHO Laboratory Manual 2010 (11).

There was a need for participants to be between the ages of 20 and 70, and they had to provide their written agreement.

Exclusion criteria were: genitourinary infection, primary infertility, recent antibiotic use, history of genital trauma, and varicocele.

The Al-Kindy Medical School and University of Baghdad Ethical and Scientific Review Board both gave their stamp of approval to this work.

The sperm was tested using SFAs as soon as possible after ejaculation, ideally within two hours, and then assessed using the criteria outlined in the WHO Laboratory Manual 2021 (12). Men who had typical results in their seminal fluid tests were not

included. Infertility-related data, including age, infertility duration, and infertility type, was collected. All of the important characteristics of seminal fluid were examined.

The seminal fluid sample was taken by masturbation in a discreet and quiet room next to the semen analysis laboratory after 3 - 5 days of sexual abstinence into a clean, dry, and sterile disposable Petri-dish. Name, age, length of abstinence, and time of sample collection must all be clearly stated on the container. For 30 minutes, the samples were heated to 37 degrees Celsius in an incubator to facilitate liquefaction. After the liquid semen was thoroughly mixed for a few of seconds, it was subjected to macroscopic and microscopic analysis.

Statistical analysis

Calculation of descriptive metrics such as mean value, standard deviation, minimum and maximum value were included in its scope (SPSS software). Microsoft Excel were used to generate descriptive statistics from the collected data.

The t-test and Mann-Whitney test, both of which are dependent on the parameters of the data distribution, have been used in order to investigate the differences that exist between the groups that have normal and increased levels of leukocytes.

A statistically significant p-value was one that was less than 0.05.

RESULTS

One thousand five hundred sixty-five patients were interviewed and examined. From those, 453 patients were included in the study.

The distribution of patients according to age groups is shown in Figure 1, which shows that 277 (61%) patients were young, aged 21 - 30 years. The mean age was 29.1 ± 7.1 years.

In terms of fertility type, all patients were suffering from primary infertility.

Most patients (262 patients (58%)) complained of infertility for 12 - 24 months as shown in Figure 2.

Seminal fluid volume data show that most patients (n = 429, 94.7%) had normal semen volume as shown in Figure 3.

In terms of sperm count, 158 (34.8%) patients have below normal sperm count as shown in Figure 4. The mean sperm count was 31.76 ± 29 million/ml.

Sperm concentrations according to age groups is shown in Figure 5. It also shows a great decline as the results of 158 (34.8%) of patients are below the cuto-ff value of 15 million/ml.

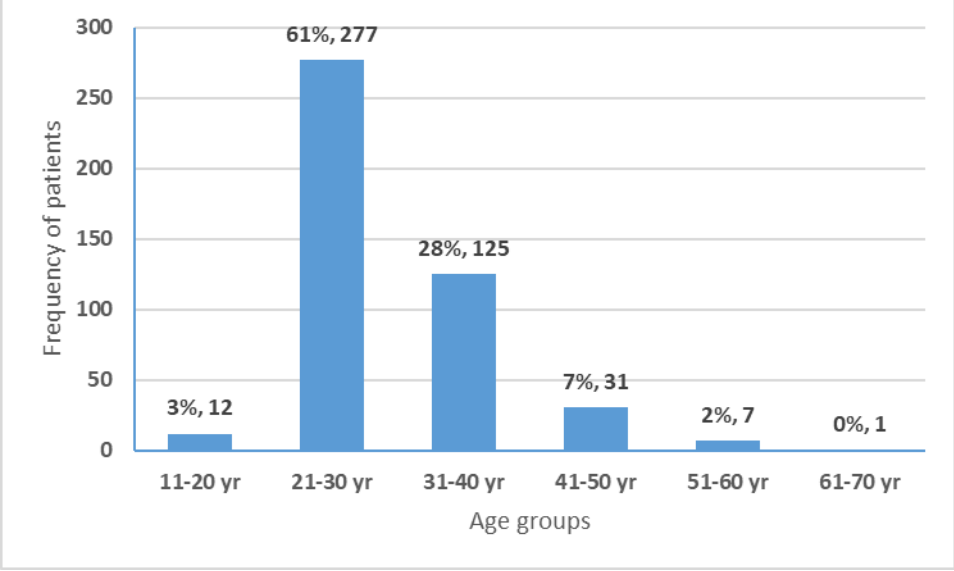

Figure 1. *Distribution of infertile patients according to age groups*

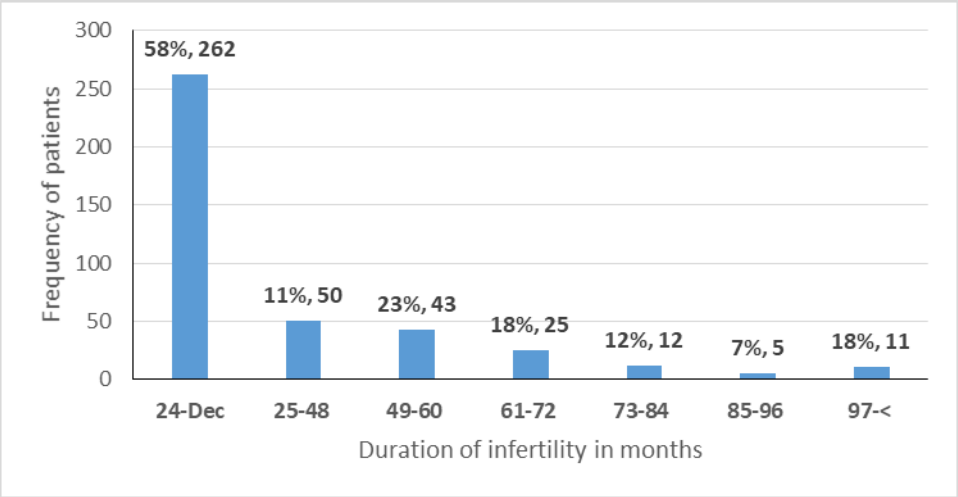

Figure 2. *Patients' distribution according to duration of infertility*

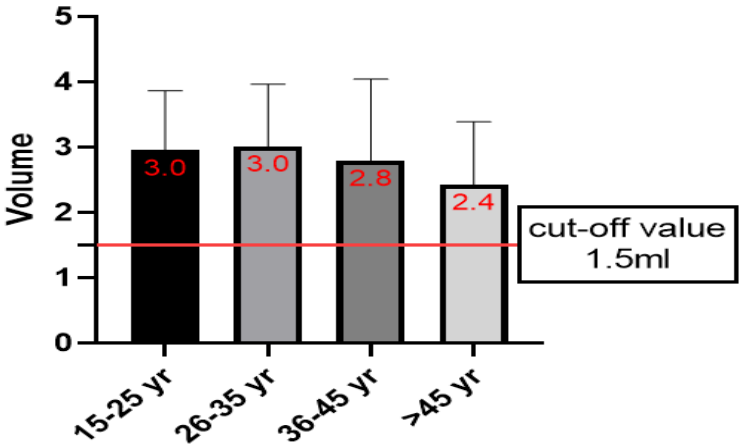

Figure 3: *Volume of sample patients' seminal fluid presented in ML and plotted according to age groups*

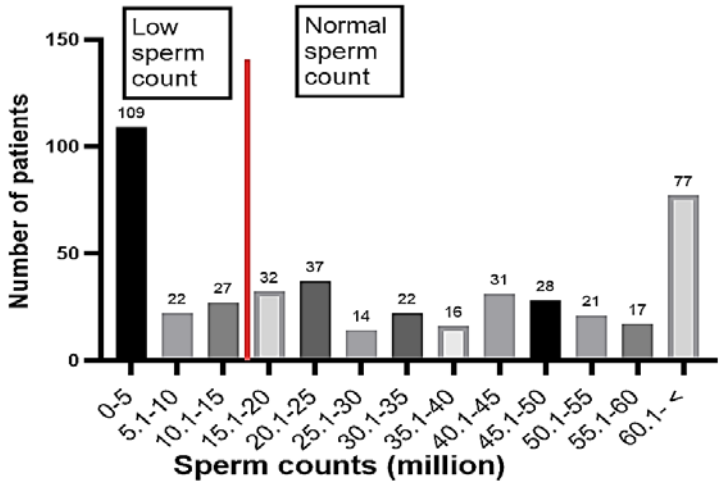

Figure 4. *Patients' frequency according to results of sperm counts*

Motility parameters were shown to be poor as presented in Figure 6, where the results are below the cut-off values in terms of A: rapid progressive, B: progressive, C: non-progressive and immotile or static. On the other hand, sperm morphology findings are relatively good as most patients have normal morphology percentage (above 4%).

Looking deeper into previous findings by segregating patients on age groups to identify variations between age groups, we can notice that motility and morphology findings are getting lower with higher age group as shown in Figure 7.

In terms of liquefaction time, most patients (n = 430, 95%) have normal liquefaction time of their semen, however, it is evident from Figure 8 that liquefaction time gets lower with increasing age although it was not statistically significant (using ANOVA).

Patients sample investigations have revealed other findings that may lead to fertility impairment as shown in Table 1. High percentages of patients suffered from varicose veins, semen agglutination, presence of pus or RBCs.

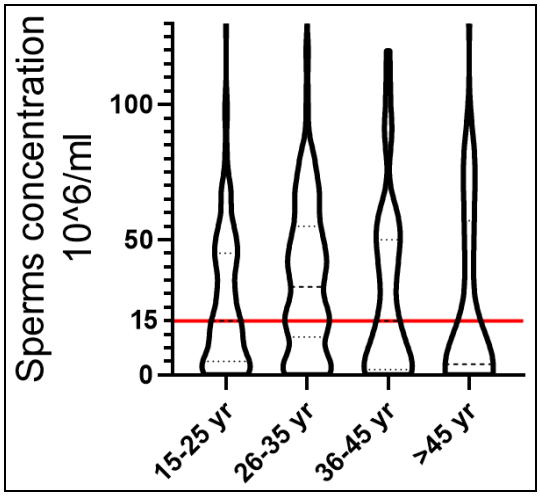

Figure 5. *Sperm concentrations of sample patients plotted according to age groups. The red line represents the lowest acceptable count 15*10^6/ml.*

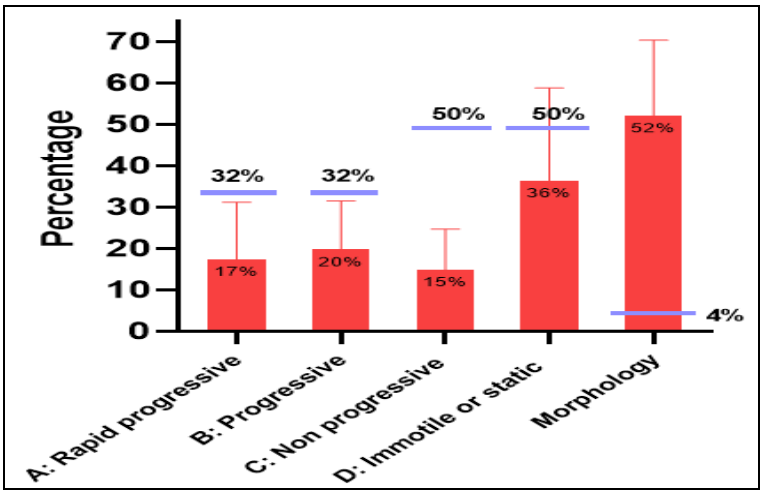

Figure 6. *Motility and morphology parameters of sample patients are presented in percentage with standard deviation. The blue lines represent the lowest normal cut-off value which was set by criteria outlined in the WHO Laboratory Manual 2021.*

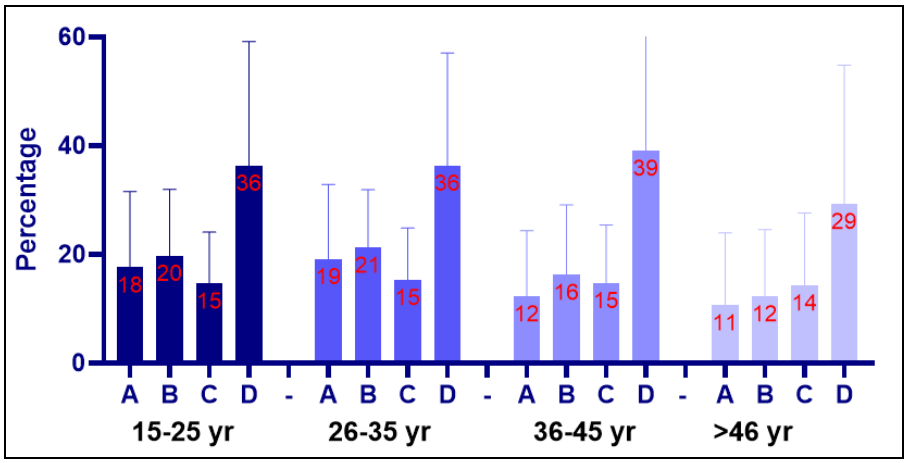

Figure 7. *Motility parameters of sample patients presented in percentage with standard deviation and plotted according to age groups*

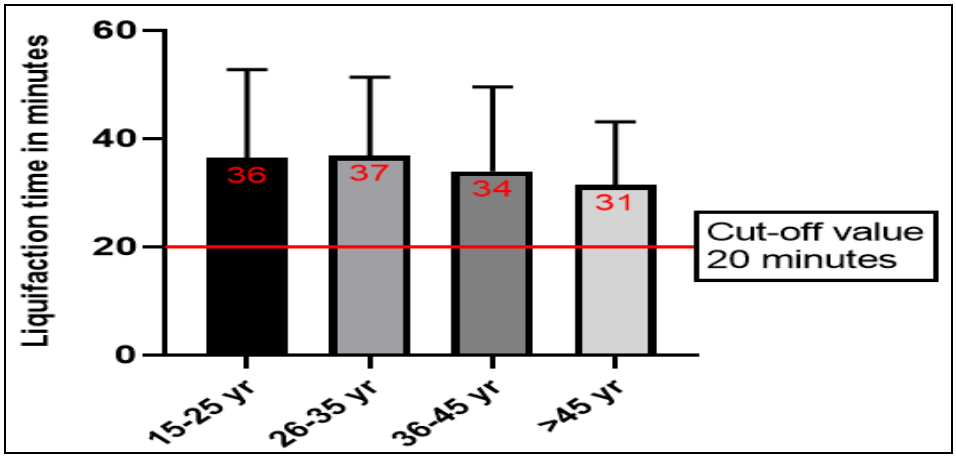

Figure 8. *Liquefaction of sample patients seminal fluid presented in minutes and standard deviation and plotted according to age groups*

Table 1. *Presentations of the sample patients in terms of complaints including varicose veins, presence of agglutinated sperms, pus and RBC*

	Varicose veins	Agglutination	Pus	RBC
15-25 yr	16.97%	4.85%	20.00%	1.21%
26-35 yr	18.52%	12.50%	23.61%	2.31%
36-45 yr	12.28%	14.04%	22.81%	3.51%
46-55 yr	6.67%	6.67%	13.33%	6.67%

DISCUSSION

Infertility is a growing global problem that has several etiologies that may vary between age groups. Results of the current study reflects the impact of infertility on young age groups mainly as most cases of infertility manifest in this age. Most of patients were suffering from low sperm count which tend to get lower with increasing age. This finding is consistent with several studies (12 - 15). The natural decline in testosterone that occurs with growing age could be to blame for this. Seminal fluid of Iraqi population shows higher sperm concentration, total count, and total and progressive sperm motility as compared to semen of people of the United States. This could be attributed to the lower total antioxidant capacity in seminal fluid of Iraqi population as shown by a study comparing seminal fluid quality of Iraqi people with those of the United States (16). Low antioxidant capacity is due to poor life style and high level of pollutants in Iraqi environment which is the consequence of several decades of corruption, wars, poor health facilities, services and infrastructures. Low antioxidant capacity is proved to have negative impact on sperm quality (17).

Obviously, morphology results are much better than motility results which are very low compared to normal standards. This finding has several implications. Motility is known to have a stronger impact on fertility rate compared to morphology (18). Low motility is caused by several factors which are highly prevalent in society as compared to abnormal morphology factors. These include: smoking, drinking alcohol, low exercise, stress, obesity, in other words, unhealthy lifestyle (19 - 22).

On the other hand, morphology is affected by other factors which are less prevalent in society. These include genetic disorders, exposure to oxidative stress, infections, exposure to chemicals, radiation and varicocele (23).

Thus, our results reflect the situation of Iraqi society and the problems which Iraqi people are facing, i.e. the lifestyle of low health status.

The analysis of liquefaction time results show comparable results by which the liquefaction time is prolonged in infertile men with a tendency to decrease with advancing age. The liquefaction time reflects problems of prostate and seminal vesicle and bulbourethral glands. Any malfunction of these organs would lead to delayed liquefaction which has its negative impact on fertility.

Until now, there is no unified opinion about the normal time of liquefaction as a parameter in general semen analysis, and there was no definite opinion that liquefaction time is an effective factor in determining fertility in males (24 - 26).

All these results supported our conclusion that there is a significant correlation between prolonged time of liquefaction and defects in other parameters of semen analysis that were measured by the conventional methods. They could be the cause behind a significant delay in conception in those hypofertile men with long infertility duration.

Another important finding in the current study is the high prevalence of varicoceles, agglutination of sperms (which reflects underlying antisperm antibodies or other abnormalities like genital tract infections or ascorbic acid deficiency (27). In addition to this, there are signs of infection as supported by the presence of pus cells or RBCs.

CONCLUSION

Infertility in men is triggered and modulated by several factors that interact with each other. Consequently, a complete check-up of any infertile patient should be focused on these medical conditions with the aim of proper management in addition to any additional factors affecting the female partner.

References

1. Becker G, Nachtigall RD. Eager for medicalisation: the social production of infertility as a disease. Sociol Health Ill. 1992;14(4):456-71. https://doi.org/10.1111/1467-9566.ep10493093

2. Radulović O, Babić S, Veljković M, Stefanović A, Šagrić Č, Bulatović K. Reproductive health of youth in the world and Serbia. Acta Fac Med Naiss 2014;31(4):219-24.

3. Agarwal A, Mulgund A, Hamada A, Chyatte MR. A unique view on male infertility around the globe. Reprod Biol Endocrinol. 2015;13(1):37. https://doi.org/10.1186/s12958-015-0032-1

4. Makwe CC, ugwu AO, Ojewola RW, Onyeze CI. Seminal fluid parameters of male partners of infertile couples seeking care at the Lagos University Teaching Hospital. IJRCOG. 2021;10(4):1018203/2320-1770ijrcog20211109. https://doi.org/10.18203/2320-1770.ijrcog20211109

5. Jacobson MH, Chin HB, Mertens AC, Spencer JB, Fothergill A, Howards PP. Research on Infertility: Definition Makes a Difference. Am J Epidemiol. 2018;187(2):337-46. https://doi.org/10.1093/aje/kwx240

6. De Kretser DM. Male infertility. The lancet. 1997;349(9054):787-90. https://doi.org/10.1016/S0140-6736(96)08341-9

7. Bracke A, Peeters K, Punjabi U, Hoogewijs D, Dewilde S. A search for molecular mechanisms underlying male idiopathic infertility. RBMO. 2018;36(3):327-39. https://doi.org/10.1016/j.rbmo.2017.12.005

8. Krausz C, Farnetani G. Clinical Interpretation of Semen Analysis. In: Bettocchi C, Busetto GM, Carrieri G, Cormio L, editors. Practical Clinical Andrology. Cham: Springer International Publishing; 2023. p. 173-84. https://doi.org/10.1007/978-3-031-11701-5_13

9. Fritz MA, Speroff L. Clinical gynecologic endocrinology and infertility: lippincott Williams & wilkins; 2011.

10. Ngwu M, Omo-Aghoja L, Adeyinka A. Pattern of Seminal Fluid Parameters and Their Clinical Correlates amongst Infertile Men in the Niger-Delta Region of Nigeria. Postgrad Med J. 2017;Vol. 6:90-7. https://doi.org/10.60014/pmjg.v6i2.123

11. World Health O. WHO laboratory manual for the examination and processing of human semen Geneva: World Health Organization; 2010 [updated 2010. 5th ed:[Available from: https://apps.who.int/iris/handle/10665/44261

12. Boitrelle F, Shah R, Saleh R, Henkel R, Kandil H, Chung E, et al. The sixth edition of the WHO manual for human semen analysis: a critical review and SWOT analysis. Life. 2021;11(12):1368. https://doi.org/10.3390/life11121368

13. Pino V, Sanz A, Valdés N, Crosby J, Mackenna A. The effects of aging on semen parameters and sperm DNA fragmentation. JBRA Assist Reprod. 2020;24(1):82-6. https://doi.org/10.5935/1518-0557.20190058

14. Al-Qazzaz HK, Al-Awadi SJ, editors. Study the relationship between hormone levels and seminal fluid parameters in oligospermia patients in Iraq 2022: AIP Publishing LLC. https://doi.org/10.1063/5.0094496

15. Bašić M, Milojević M, Mitić D, Cvetković J. Ethical Aspects in the Area of Assisted Reproduction. Acta Fac Med Naiss. 2010;27(3).

16. Palani A, Sengupta P, Agarwal A, Henkel R. Geographical differences in semen characteristics: Comparing semen parameters of infertile men of the United States and Iraq. Andrologia. 2020;52(3):e13519.

https://doi.org/10.1111/and.13519

17. Maulida S, Eriani K, Fadli N, Siti-Azizah MN, Kocabas FK, Kocabas M, et al. Effect of type and concentration of antioxidant on sperm motility, viability, and DNA integrity of climbing perch Anabas testudineus Bloch, 1792 (Pisces: Anabantidae) post-cryopreservation. Cryobiology. 2024:104851. https://doi.org/10.1016/j.cryobiol.2024.104851

18. Nallella KP, Sharma RK, Aziz N, Agarwal A. Significance of sperm characteristics in the evaluation of male infertility. Fertil Steril. 2006;85(3):629-34. https://doi.org/10.1016/j.fertnstert.2005.08.024

19. Mohamad Al-Ali B, Eredics K. Synergistic effects of cigarette smoking and varicocele on semen parameters in 715 patients. Wien Klin Wochensch. 2017;129(13):482-6. https://doi.org/10.1007/s00508-017-1199-6

20. Fozooni R, Shirazi MRJ, Saedi S, Jahromi BN, Khoradmehr A, Anvari M, et al. Male subfertility effects of sub-chronic ethanol exposure during stress in a rat model. Alcohol. 2021;96:63-71. https://doi.org/10.1016/j.alcohol.2021.08.003

21. Karevanpour F, Tavalaee M, Kazeminasab F, Abdollahi M, Shirkhani S, Rahmani M, et al. The effect of green coffee and/or endurance exercise on sperm function in pre-diabetic mice. Andrologia. 2022;54(10):e14560. https://doi.org/10.1111/and.14560

22. Al-Imam A, Michalak M. Iraq's Meth Crisis: Prioritizing Research to Combat Suicidal Ideation. KCMJ. 2024;20(1):78-9. https://doi.org/10.47723/f2m0tp28

23. Oehninger S, Kruger TF. Sperm morphology and its disorders in the context of infertility. F&S Reviews. 2021;2(1):75-92 https://doi.org/10.1016/j.xfnr.2020.09.002

24. Walsh TJ, Smith JF. Male Infertility. In: McAninch JW, Lue TF, editors. Smith & Tanagho's General Urology, 19e. New York, NY: McGraw Hill; 2020.

25. Mar'ie SB. Evaluation of Significance of Prolonged Liquefaction Time of Semen in Hypofertile Men. IPMJ. 2016;15(3).

26. Jungwirth A, Giwercman A, Tournaye H, Diemer T, Kopa Z, Dohle G, et al. European Association of Urology guidelines on Male Infertility: the 2012 update. Eur Urol. 2012;62(2):324-32. https://doi.org/10.1016/j.eururo.2012.04.048

27. Hsieh TC, Shin P. Male infertility A. Agarwal SPE, editor. New York, NY: Springer; 2012.

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Kliničke kararakteristike i analiza semene tečnosti bolesnika sa primarnim infertilitetom koji se javljaju urologu prvi put: studija preseka

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SAŽETAK

Uvod/Cilj. Analiza semene tečnosti ima važnu ulogu u pružanju pomoći klinikama za lečenje neplodnosti pri dijagnostikovanju osnovnog uzroka neplodnosti muškaraca. Cilj ove studije bilo je ispitivanje obrazaca semene tečnosti muškaraca koji su bili u neplodnom paru sa potvrđeno zdravom ženom.
Materijal i metode. Sprovedena je studija preseka u periodu od januara 2019. godine do decembra 2022. godine. Bolesnici su odlazili na konsultacije zbog odsustva začeća dužeg od 12 meseci sa potvrđeno zdravom ženom.
Rezultati. U studiju su bila uključena 453 bolesnika. Raspodela bolesnika prema starosnim grupama pokazala je da je 277 bolesnika bilo mlado; imali su od 21 do 30 godina (61%). Dvesta šezdeset dva (58%) bolesnika patila su od neplodnosti 12–24 meseca. Četiri stotine dvadeset devet (94,7 %) bolesnika imalo je normalan volumen sperme. Kada je reč o broju spermatozoida, kod 174 bolesnika broj spermatozoida bio je ispod normalnih vrednosti. Koncentracija sperme takođe se drastično smanjivala sa starenjem. Pokazalo se da su parametri motilnosti loši. Nalazi morfologije sperme bili su relativno dobri. Rezultati aktuelne studije odražavaju uticaj neplodnosti na mlade starosne grupe (21–30 godina) budući da je u ovoj starosnoj grupi zabeleženo 277 (61%) slučajeva neplodnosti. Kod sto pedeset osam (34,8 %) bolesnika utvrđen je nizak broj spermatozoida, i to sa tendencijom njihovog smanjivanja sa starenjem. Poznato je da motilnost ima jači uticaj na stopu plodnosti nego morfologija.
Zaključak. Nisku motilnost uzrokuje nekoliko faktora koji su rasprostranjeniji u društvu od abnormalnih morfoloških faktora. Tu spadaju pušenje, konzumiranje alkohola, retka fizička aktivnost, stres i gojaznost. S druge strane, morfologija je prouzrokovana drugim faktorima koji su manje rasprostranjeni u društvu.

Ključne reči: **analiza semene tečnosti, morfologija, motilnost, likvefakcija**