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# Evaluation of Semen Parameters with Hormonal Values in Subfertile Couples: A Study in Mosul City

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## Abstract

The current male infertility crisis is attributed to the increasing rate of infertility; many congenital and acquired conditions have been recognized, but currently, 70 % of the causes are still unknown despite advances in andrology. Many cases are diagnosed as having unexplained infertility, while a large number are recognized as being idiopathic. A prospective cross-sectional study was held in Mosul city, Iraq, at an outpatient infertility clinic. The study includes 216 males of subfertile couples. History examination and investigation were done, seminal fluid analysis and testosterone, follicle-stimulating hormone, prolactin, and zinc were assessed statistical analysis by IBM SPSS Statistics software. percentage of risk factors and encountered seminal abnormalities with significant difference in abnormal<15million/ml sperm count of those 20-30 years old (57%, p-value 0.001), and those have free work constitute to 69% patients with abnormal progressive motility<30% (p-value 0.036), primary infertility had higher percentage of volume ≤1.4 and count <15million /ml at than secondary infertility(p-value 0.003,0.001)and those with previous miscarriage have higher percentage of abnormal viscosity(p-value >0.14). BMI significantly affects testosterone level inversely (p-value 0.010). Smoking significantly has a volume ≤1.4ml, and previous corona infection significantly affects low sperm count (<15 million) (p-value 0.16, 0.21, respectively). Oligoasthenospermia is common in subfertile couples, and lifestyle factors, obesity, and coronavirus infection are among the most common factors related to male infertility.


**Keywords:** Male infertility, Risk factors, Semen parameters, Subfertile

## Introduction

Infertility is a reproductive dysfunction that prevents conception in a woman after one year of unprotected regular sexual intercourse (WHO, n.d). It affects 15% of couples worldwide, with male factor infertility accounting for 50 % and may be the sole reason in 20 % of couples. The prevalence of male infertility has increased globally by 76.9% from 1990 to 2019; this increase is regarded as considerable, especially if it is compared with a 46% population growth rate during the same period. The male infertility rate is increased at 0.291% yearly (Huang *et al*., 2023), with continuous accelerated reduction in semen volume and sperm quality in men, especially after 2000. This trend of decline explains the yearly increase and the current male infertility crisis (Levine *et al*., 2023).

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Many factors contribute to the increased incidence of male infertility. Congenital causes as congenital urogenital (absence or obstruction of the epididymis or undescended testes) and Kallmann syndrome. Genetic and chromosomal abnormalities (Klinefelter syndrome and microdeletion of the Y chromosome (Salona *et al*., 2020). Many other acquired causes are reversible, as varicocele, which is encountered in 40 % of infertile males compared to 10 % in the general population. (Damasgaard *et al*., 2016; Fang *et al*., 2021). Infection of the genital tract by Gonococci and chlamydia, prostatitis, and exposure to numerous environmental toxins as smoking, alcohol, and many chemicals (Evans *et al*., 2022; Lafleur *et al*., 2022; Machate *et al*., 2022; Joshi *et al*., 2023; Česaitis *et al*., 2024). Endocrine disorder (hyperthyroidism), intracranial radiation, and head injury. Malignancies as pituitary macroadenoma, testicular and adrenal tumors, and immunological causes. In addition, sexual dysfunction as premature ejaculation and erectile dysfunction (Leslie *et al*., 2024), and medications with a long list of drugs that have potential toxicity on spermatogenesis (Alhamam *et al*., 2023).

Idiopathic male infertility has been described in about 30 % of males who have reduced quality of sperm without an evident cause. It is mostly related to undiagnosed morbid disease or exposure to pollution that increases reactive oxygen species and DNA damage with genetic/epigenetic alteration, affecting sperm quality and fertility (Agarwal *et al*., 2019; Boeri *et al*., 2024). Despite the advances in andrology and diagnostic technology for male infertility still there a subset of men diagnosed to have unexplained infertility, as they are infertile despite normal seminal fluid analysis. Possible causes for their unexplained infertility may be related to the presence of anti-sperm antibodies, or high levels of reactive oxygen species with sperm DNA damage and sperm dysfunction (Hamada *et al*., 2012).

Thorough evaluation of male factor is required during infertility management but unfortunately this is often missed as modern fertility therapy today focused only on obtaining sperms for intracytoplasmic sperm injection which is possible and several cases of infertility can obtain their biological child even in case of azoospermic male, but this can only be achieved in 31-40% of cases with success rate is affected by many factors (Agarwal *et al*., 2021). Many studies have found that seminal fluid parameters are related to the outcome of ICSI. A study by Bole R. *et al*. (2021) discovered that a total motile sperm count ≤10 million was predictive of ICSI failure, while Chaichian SH. *et al*. (2015) study showed that sperm count and their agglutination have a positive correlation with success in ICSI, while the presence of leucocytes has a negative effect on fertilization. This study was conducted to determine the main factors responsible for male infertility among subfertile couples in Mosul city in Iraq, and to identify semen quality and to identify the important laboratory changes in relation to their significance, as this will be of help in providing a specific plan of management of male infertility (Coppol *et al*., 2022; Marconcini & Abbafati, 2022; García & Jaramillo, 2023; Chou *et al*., 2024; Prada *et al*., 2024; Varoneckaitė *et al*., 2024; Yudhit *et al*., 2024).

## Materials and Methods

This study is a prospective cross-sectional study conducted in Mosul city, Iraq. A study sample of 216 male partners of infertile couples attending the outpatient infertility clinic between Feb. 2024 and Feb. 2025. The ages of male partners of infertile couples were from 20-45 years.

### *Ethical Approval*

This study was approved by the ethical committee of medical research in the University of Mosul College of Medicine, approval Letter number: UOM/COM/MREC/23-24/FEB6, at 14/2/2024.

### *Inclusion Criteria*

All male partners of infertile couples at their initial evaluation, attending the infertility clinics, aged between 20-45 years with normal or variable oligoasthenospermia were included in the study.

### *Exclusion Criteria*

Those excluded were those with Azoospermia, patients on treatment (Tarhan & Sanlier, 2022; Nebotova *et al*., 2023; Bouh *et al*., 2024; Lopez-Ramos *et al*., 2024), patients not able to give a sample by masturbation and require coitus interrupts, and samples collected by condom, or improper samples as when part of the sample was spilled out.

### *Data Collection*

Date collected from February 2024 to February 2025. Information was taken, including age, weight, height, BMI, type of job, duration of infertility, type of infertility, smoking habit, lifestyle, history of testicular trauma or surgery, and history of mumps infection or coronavirus in the past.

### *Preparation and Analysis of Seminal Fluid Sample*

Semen analysis was performed after 3-5 days of abstinence, collected in a private room in the lab, sample obtained by masturbation was collected directly into a sterile container. Identification of the sample by name, time of collection, and transfer to the incubator. Routine semen analysis was performed, including physical characteristics as color, odor, PH, viscosity, and liquefaction, and sample volume. Sperm concentration and sperm motility, and sperm morphology. The criteria used in diagnosis were based on the WHO manual for examination of human semen and sperm –cervical mucus interaction published in 2021(WHO, 2021).

### *Further Laboratory Evaluation*

Evaluation of hormonal parameters, including Testosterone, Follicle-stimulating hormone (FSH), prolactin, using Roche e411, and zinc was tested using Roche c111.

### *Data Statistical Analysis*

The data analysis was conducted using IBM SPSS Statistics software, using Pearson's Chi-Square test and Fisher's exact test.

## Results and Discussion

Around 216 male partners of sub-fertile couples were evaluated in this study by history and examination, and laboratory evaluation (Asiwe *et al*., 2022; Graefen *et al*., 2022; Sefah *et al*., 2022; Uduagbamen *et al*., 2022; Ku *et al*., 2023).

**Table 1** describes the main patient characteristics, including mean and median Age, BMI, and infertility duration. The mean age was 34.277 years, the mean BMI was 28.524 $Kg/m^2$, and the mean duration of infertility was 5.52 years.

**Table 1.** Main patient characteristics among the study group.

| Parameters | Mean | Median | Standard. Error of Mean | Standard Deviation |
|---|---|---|---|---|
| **Age** | 34.2778 | 33.5 | 0.53611 | 7.87913 |
| **BMI** | 28.5241 | 27.76 | 0.34979 | 5.14088 |
| **Infertility duration** | 5.52 | 5 | 0.284 | 4.177 |

**Table 2** shows the percentage of risk factors among the study group. Smoking was the most common factor present in 50 % of infertile males. Trauma was present in 0.5 %, varicocele was present in 14.5%, mumps infection was present in 1.4%, surgery was mostly due to varicocele and was present in 14.8%, previous history of coronavirus infection was present in 22.7%, and alcohol drinking was present in 4.6%.

**Table 2.** Percentage of risk factors among the study group.

| Variables | | frequency | percent |
|---|---|---|---|
| **Smoking** | **Yes** | 108 | 50.0 |
| | **No** | 108 | 50.0 |
| **Trauma** | **No** | 215 | 99.5 |
| | **Yes** | 1 | 0.5 |
| **Varicocele** | **No** | 184 | 85.2 |
| | **Yes** | 32 | 14.8 |
| **Mumps** | **No** | 213 | 98.6 |
| | **Yes** | 3 | 1.4 |

| | | | |
|---|---|---|---|
| **Surgery** | **No** | 184 | 85.2 |
| | **Yes** | 32 | 14.8 |
| **Corona_infection** | **No** | 167 | 77.3 |
| | **Yes** | 49 | 22.7 |
| **Alcohol** | **No** | 206 | 95.4 |
| | **Yes** | 10 | 4.6 |

**Table 3** shows the percentage of patients expressing the normal and abnormal values during their seminal analysis according to the WHO laboratory manual (2021), the normal semen volume was <1.4 ml in 6.9%. Prolonged liquefaction time >30 minutes was present in 12.5% the sperm count <15 million /ml in 38.9%, abnormal progressive motility <30% was 94%, total motile sperm <39 million in 38.9%, immotile sperms ≥20million in 78.7%, and pus cells ≥5 in 30.6%.

**Table 3.** Percentage of semen parameters among the study group.

| **Variables** | | **Frequency** | **Percent** |
|---|---|---|---|
| **Volume** | ≤ 1.4 ml | 15 | 6.9 |
| | >1.4 ml | 201 | 93.1 |
| **Liquefaction time** | ≤30 | 189 | 87.5 |
| | > 30 | 27 | 12.5 |
| **Count** | < 15 million | 84 | 38.9 |
| | ≥ 15 million | 132 | 61.1 |
| **Progressive** | < 30% | 203 | 94.0 |
| | ≥ 30% | 13 | 6.0 |
| **Total Motile** | < 39 % | 84 | 38.9 |
| | ≥39 % | 132 | 61.1 |
| **Immotile** | < 20% | 46 | 21.3 |
| | ≥ 20% | 170 | 78.7 |
| **Number of pus cells** | < 5 | 150 | 69.4 |
| | ≥5 | 66 | 30.6 |

**Table 4** shows the distribution of normal and abnormal limits for semen analysis among different groups, with no significant differences of semen liquifection between different age groups, nor with different BMI, nor with occupation and infertility type, only with cases with previous miscarriage a significant differences was obtained, a previous miscarriage was present in 26% of patients with prolonged time ≥ 30 minutes compared to 12% of those with normal liquefaction time with significant p-value at 0.014 (p-value ≤0.05).

Semen volume had no significant differences among the different groups, but there was a significant difference between the type of infertility and the semen volume, 100% of those with abnormal semen volume ≤ 1.4 ml while there was 0% in the secondary infertility type, those with normal volume of ≥ 1,4 ml had 61% of primary type and 39% in secondary type. With a significant p-value at 0.003.

Sperm count had a highly significant difference between the different age groups. Fifty four percent of those sperm count less than 15 million /ml was in those 20-30 years while remaining were 39%, and 21% in 31-40 years and >40 years groups while those normal count of ≥ 15 ml was present in higher value of 45% in the 31-40 years groups and 28%, and 26 in 20-30 and >40 age groups (p-value of 0.001).

Also, the sperm count shows only a highly significant difference with the type of infertility,68% of those with sperm count <15 million were of the primary type of infertility while 32% were in the secondary, also those with sperm count of ≥15 ml had 61% and 39% in both primary type and secondary type (p-value of 0.001).

Progressive motile sperms more than 30 %, had no significant differences in distribution among different groups, only a significant differences with the patient's occupation type, as 69% of those with <30% progressive motile sperms were present in the free work group while 24% in those employed in regular job and 7% were those in military work (p-value at 0.036). The percentage of immotile sperm <20% and ≥20% had no significant differences among different groups.

**Table 4.** Comparison of semen parameters across different groups

| **Age** | **Total N(%)** | **Liquefaction** | | **Volume** | | **Count /ml** | | **Progressive** | | **immotile** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **<30** | **≥30** | **≤1.4** | **>1.4** | **<15** | **≥15** | **<30** | **≥30** | **<20** | **≥20** |
| | | **189** | **27** | **15** | **201** | **84** | **132** | **203** | **13** | **46** | **170** |
| **20-30 years** | 86 | 76<br>40% | 10<br>37% | 8<br>54% | 78<br>39% | 48<br>57% | 38<br>28% | 80<br>40% | 6<br>46% | 20<br>43% | 66<br>39% |
| **31-40 years** | 85 | 74<br>39% | 11<br>41% | 5<br>33% | 80<br>40% | 25<br>29% | 60<br>45% | 80<br>40% | 5<br>38% | 16<br>34% | 69<br>41% |
| **> 40 years** | 45 | 39<br>21% | 6<br>22% | 2<br>13% | 43<br>21% | 11<br>13% | 34<br>26% | 43<br>20% | 2<br>15% | 10<br>21% | 35<br>20% |
| **P value** | | 0.950 | | 0.516 | | **0.001*** | | 0.844 | | 0.767 | |
| **BMI** | **N (%)** | **Liquefaction** | | **Volume** | | **Count /ml** | | **Progressive** | | **immotile** | |
| | | **<30** | **≥30** | **≤1.4** | **>1.4** | **<15** | **≥15** | **<30** | **≥30** | **<20** | **≥20** |
| **< 25** | 51 | 44<br>23% | 7<br>26% | 1<br>6% | 50<br>25% | 25<br>30% | 26<br>20% | 47<br>23% | 4<br>31% | 12<br>26% | 39<br>23% |
| **25-29 kg/m2** | 97 | 88<br>46% | 9<br>34% | 6<br>40% | 91<br>45% | 30<br>36% | 67<br>51% | 94<br>46% | 3<br>23% | 14<br>31% | 83<br>49% |
| **≥ 30 kg/m2** | 68 | 57 | 11 | 8 | 60 | 29 | 39 | 62 | 6 | 20 | 48 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30% | 40% | 54% | 30% | 34% | 29% | 31% | 46% | 43% | 28% |
| **P value** | | 0.400 | | 0.106 | | 0.075 | | 0.257 | | 0.062 | |
| **Occupation** | **N %** | **Liquefaction** | | **Volume** | | **Count /ml** | | **Progressive** | | **immotile** | |
| | | **<30** | **≥30** | **≤1.4** | **>1.4** | **<15** | **≥15** | **<30** | **≥30** | **<20** | **≥20** |
| **Employed** | 55 | 47<br>25% | 8<br>30% | 3<br>20% | 52<br>26% | 19<br>23% | 36<br>27% | 50<br>24% | 5<br>38% | 17<br>37% | 38<br>22% |
| **Military** | 17 | 15<br>8% | 2<br>7% | 0<br>0% | 17<br>8% | 5<br>5% | 12<br>9% | 14<br>7% | 3<br>24% | 1<br>2% | 16<br>9% |
| **Free work** | 144 | 127<br>67% | 17<br>63% | 12<br>80% | 132<br>66% | 60<br>72% | 84<br>64% | 139<br>69% | 5<br>38% | 28<br>61% | 116<br>68% |
| **P value** | | 0.868 | | 0.389 | | 0.461 | | **0.036*** | | 0.057 | |
| **Type of infertility** | **N (%)** | **Liquefaction** | | **Volume** | | **Count /ml** | | **Progressive** | | **immotile** | |
| | | **<30** | **≥30** | **≤1.4** | **>1.4** | **<15** | **≥15** | **<30** | **≥30** | **<20** | **≥20** |
| | | **189** | **27** | **15** | **201** | **84** | **132** | **203** | **13** | | **170** |
| **Primary** | 138 | 120<br>63% | 18<br>67% | 15<br>100% | 123<br>61% | 57<br>68% | 81<br>61% | 128<br>63% | 10<br>77% | 29<br>63% | 109<br>64% |
| **Secondary** | 78 | 69<br>37% | 9<br>33% | 0<br>0% | 78<br>39% | 27<br>32% | 51<br>39% | 75<br>37% | 3<br>23% | 17<br>37% | 61<br>36% |
| **P value** | | 0.748 | | **0.003*** | | **0.001*** | | 0.313 | | 0.893 | |
| **Miscarriage** | **N (%)** | **Liquefaction** | | **Volume** | | **Count /ml** | | **Progressive** | | **immotile** | |
| | | **<30** | **≥30** | **≤1.4** | **>1.4** | **<15** | **≥15** | **<30** | **≥30** | **<20** | **≥20** |
| | | **189** | **27** | **15** | **201** | **84** | **122** | **203** | **13** | **46** | **170** |
| **None** | 186 | 166<br>88% | 20<br>74% | 15<br>100% | 171<br>85% | 76<br>90 % | 110<br>90% | 174<br>86% | 12<br>92% | 40<br>87% | 146<br>86% |
| **Previous miscarriage** | 30 | 23<br>12% | 7<br>26% | 0<br>0% | 30<br>15% | 8<br>10% | 22<br>10% | 29<br>14% | 1<br>8% | 6<br>13% | 24<br>14% |
| **P value** | | **0.014*** | | 0.273 | | 0.181 | | 0.639 | | 0.444 | |
| ***significant difference between groups (p value ≤ 0.05)** | | | | | | | | | | | |

**Table 5** shows the laboratory test among the different male infertile groups, including serum testosterone, follicle-stimulating hormone (FSH), prolactin, and zinc level. Serum testosterone shows mean values in the lower range in all the groups, with no significant difference between the groups, including Age, occupation, and infertility type, and the presence or absence of a previous miscarriage, but there was a significant difference between the testosterone serum level and different BMI groups.the mean testosterone level was 3.93±1.85 in those with BMI of <25 kg/m2 and serum testosterone level of 3.4±1.36 in the 25-29 Kg/m2 and 2.92±1.03 in the higher BMI group of ≥30 Kg/m2 with p-value of 0.010.

Serum FSH shows no significant differences between the patient groups, including Age, BMI, occupation, infertility types, and presence or absence of miscarriage. Prolactin level shows significant differences with patients' age groups only with the mean serum level being 23.99±20.75 in those 20-30 years old and 14.92±7.28 in the 31-40 years old, and 15.19±7.59 in the >40 years old groups, with a p-value of 0.003. Zinc also shows no significant levels among different patient groups, although most of the values are in the lower normal range.

**Table 5.** Hormonal Values in Comparisons to Age, BMI, Occupation, Infertility Type, and Miscarriage groups.

| **Parameters** | **N (%)** | **Laboratory test** | | | |
|---|---|---|---|---|---|
| **Age** | | **Testosterone** | **FSH** | **Prolactin** | **Zinc** |
| **20-30 years** | 42% | 3.39±1.63 | 5.27±3.71 | 23.99±20.75 | 65.16±14.98 |
| **31-40 years** | 37% | 3.28±1.38 | 6.35±3.48 | 14.92±7.28 | 67.11±15.36 |
| **> 40 years** | 21% | 3.39±1.06 | 5.17±2.77 | 15.19±7.59 | 71.57±15.65 |
| **P value** | | 0.911 | 0.210 | **0.003*** | 0.206 |
| **BMI** | **N (%)** | **Testosterone** | **FSH** | **Prolactin** | **Zinc** |
| **< 25** | 22% | 3.93±1.85 | 6.06±2.84 | 19.03±6.95 | 70.23±15.44 |
| **25-29 kg/m2** | 43% | 3.4±1.36 | 5.92±4.04 | 20.18±19.34 | 66.56±14.65 |
| **≥ 30 kg/m2** | 35% | 2.92±1.03 | 5.04±3 | 16.97±13.16 | 66.07±16.17 |
| **P value** | | **0.010*** | 0.344 | 0.575 | 0.482 |
| **Occupation** | **N (%)** | **Testosterone** | **FSH** | **Prolactin** | **Zinc** |

| | | | | | |
|---|---|---|---|---|---|
| **employed** | 18% | 3.39±1.5 | 5.04±2.91 | 20.86±21.9 | 65.61±17.77 |
| **military** | 8% | 3.39±0.96 | 5.74±3.51 | 14.41±6.28 | 66.75±19.11 |
| **Free work** | 74% | 3.33±1.46 | 5.79±3.6 | 18.76±13.81 | 67.66±14.4 |
| **P value** | | 0.980 | 0.634 | 0.532 | 0.841 |
| **Infertility Type** | **N (%)** | **Testosterone** | **FSH** | **Prolactin** | **Zinc** |
| **Primary** | 63% | 3.25±1.45 | 5.48±3.31 | 18.47±13.56 | 67.86±14.54 |
| **Secondary** | 37% | 3.24±1.47 | 4.79±2.55 | 17.58±11.54 | 65.98±16.83 |
| **P value** | | 0.953 | 0.962 | 0.117 | 0.625 |
| **Miscarriage** | **N(%)** | **Testosterone** | **FSH** | **Prolactin** | **Zinc** |
| **None** | 88% | 3.37±1.44 | 5.73±3.59 | 19.96±15.87 | 67.26±15.78 |
| **One** | 5% | 3.91±1.65 | 3.58±1.46 | 11.4±1.75 | 72.77±12.48 |
| **>= 2** | 7% | 2.64±0.9 | 6.26±2.33 | 10.09±3.35 | 62.32±10.06 |
| **P value** | | 0.190 | 0.243 | 0.070 | 0.402 |
| ***significant difference between groups (p value ≤ 0.05)** | | | | | |

**Table 6** shows semen parameters compared to the main lifestyle, medical, and surgical conditions.

Smoker infertile male patients have a significantly higher percentage of lower semen volume compared to non-smokers (11% versus 3%), p-value at 0.016, no other significant differences of the effect of smoking on liquefaction time, count/ ml, percentage of progressive motility, nor on white blood cells count.

Previous corona infection (Covid-19) in the past has a significant difference between those infected, having a higher percentage of normal liquefaction, with a p-value of 0.043. Also, previous infection with Corona coronavirus shows a significant difference with a higher percentage of <15 million /ml sperm count than those noninfected (26% versus 43%, p-value at 0.021). Other semen parameters have a higher percentage of normal values compared to the non-infected group, but without reaching significant values. Alcohol drinking did not show any differences in sperm parameters, only showed lower progressive sperm motility, but without any statistically significant differences (p-value 0.087).

**Table 6.** Semen Parameters in Different Risk Factor Groups.

| **Parameters** | **N (%)** | **Smoker** | | **Varicocele** | | **Surgery** | | **Corona** | | **Alcohol** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Liquefaction** | | **No% 108** | **Yes% 108** | **No% 184** | **Yes% 32** | **No%184** | **Yes% 32** | **No% 167** | **Yes% 49** | **No% 206** | **Yes% 10** |
| **< 30** | 189 | 97 90% | 92 85% | 161 88% | 28 87% | 161 88% | 28 87% | 85% 142 | 96% 47 | 182 88% | 7 70% |
| **≥ 30** | 27 | 11 10% | 16 15% | 23 12% | 4 13% | 23 12% | 4 13% | 25 15% | 2 4% | 24 12% | 3 30% |
| **P value** | | 0.304 | | 0.993 | | 0.997 | | **0.043*** | | 0.087 | |
| **Volume** | **N (%)** | **Smoker** | | **Varicocele** | | **Surgery** | | **Corona** | | **Alcohol** | |
| | | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** |
| **<1.4** | 15 | 3 3% | 12 11% | 14 8% | 1 3% | 15 8% | 0 0% | 14 8% | 1 2% | 14 6% | 1 10% |
| **≥1.4** | 201 | 105 97% | 96 89% | 170 92% | 31 97% | 169 92% | 32 100% | 153 92% | 48 98% | 192 84% | 9 90% |
| **P value** | | **0.016*** | | 0.357 | | 0.094 | | 0.125 | | 0.698 | |
| **Count/ml** | **N (%)** | **Smoker** | | **Varicocele** | | **Surgery** | | **Corona** | | **Alcohol** | |
| | | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** | **No 167** | **Yes 49** | **No%** | **Yes%** |
| **< 15** | 84 | 40 37% | 44 41% | 70 37% | 18 56% | 72 39% | 16 50% | 43% 71 | 26% 13 | 85 41% | 3 30% |
| **≥ 15** | 132 | 68 63% | 64 59% | 116 63% | 14 43% | 112 61% | 16 50% | 57% 96 | 74% 36 | 121 59% | 7 70% |
| **P value** | | 0.782 | | 0.053 | | 0.248 | | **0.021*** | | 0.479 | |

| Progressive | N (%) | Smoker | | Varicocele | | Surgery | | Corona | | Alcohol | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No% | Yes% | No% | Yes% | No% | Yes% | No% | Yes% | No% | Yes% |
| **< 30** | 203 | 103<br>95% | 100<br>93% | 173<br>94% | 30<br>94% | 172<br>93% | 31<br>97% | 159<br>95% | 44<br>90% | 193<br>94% | 10<br>100% |
| **≥ 30** | 13 | 5<br>5% | 8<br>7% | 11<br>6% | 2<br>6% | 12<br>7% | 1<br>3% | 8<br>5% | 5<br>19% | 13<br>6% | 0<br>0% |
| **P value** | | 0.391 | | 0.952 | | 0.456 | | 0.161 | | 0.413 | |
| **WBC** | **N (%)** | **Smoker** | | **Varicocele** | | **Surgery** | | **Corona** | | **Alcohol** | |
| | | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** | **No%** | **Yes%** |
| **< 5** | 150 | 70<br>65% | 80<br>74% | 126<br>68% | 24<br>75% | 127<br>69% | 23<br>72% | 118<br>71% | 32<br>65% | 144<br>70% | 6<br>60% |
| **≥ 5** | 66 | 38<br>35% | 28<br>26% | 58<br>32% | 8<br>25% | 57<br>31% | 9<br>28% | 49<br>29% | 17<br>35% | 62<br>30% | 4<br>40% |
| **P value** | | 0.140 | | 0.460 | | 0.746 | | 0.474 | | 0.507 | |

*significant difference between groups (p value ≤ 0.05)

**Table 7** presents a comparative analysis of selected laboratory test results (Testosterone, FSH, Prolactin, and Zinc) based on various lifestyle and medical factors, including smoking status, presence of varicocele, surgery, COVID-19 infection, and alcohol consumption.

Among all comparisons, a statistically significant difference was observed only in testosterone levels between individuals with and without a history of COVID-19 infection ($p = 0.007$). Post-COVID individuals showed lower mean testosterone levels (2.76 ± 0.91) compared to those without infection (3.39 ± 1.55). This may suggest a potential impact of COVID-19 on male hormonal balance.

No other variables demonstrated significant differences across the studied factors ($p > 0.05$), indicating that smoking, varicocele, surgery, and alcohol consumption did not show a statistically meaningful effect on the measured lab parameters in this sample.

**Table 7.** Comparison of Laboratory Test Results Based on Lifestyle and Medical Factors

| Lab test | Smoker | | Varicocele | | Surgery | | Corona | | Alcohol | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No% | Yes% | No% | Yes% | No% | Yes% | No% | Yes% | No% | Yes% |
| **Testosterone** | 3.28±1.48 | 3.22±1.43 | 3.27±1.42 | 3.13±1.67 | 3.27±1.42 | 3.16±1.66 | 3.39±1.55 | 2.76±0.91 | 3.22±1.45 | 3.81±1.6 |
| **P value** | 0.763 | | 0.625 | | 0.699 | | **0.007*** | | 0.211 | |
| **FSH** | 5.04±2.98 | 5.42±3.16 | 5.22±3.22 | 5.31±1.99 | 5.2±3.23 | 5.41±1.89 | 5.22±2.99 | 5.25±3.34 | 5.2±2.98 | 5.82±4.68 |
| **P value** | 0.369 | | 0.868 | | 0.714 | | 0.967 | | 0.537 | |
| **Prolactin** | 17.55±9.23 | 18.74±15.68 | 18.37±13.64 | 16.87±6.66 | 18.35±13.63 | 16.98±6.81 | 18.53±13.15 | 16.83±11.79 | 18.2±12.9 | 17.11±12.42 |
| **P value** | 0.495 | | 0.544 | | 0.579 | | 0.417 | | 0.795 | |
| **Zinc** | 66.43±13.3 | 68.16±17.54 | 67.17±15 | 67.46±17.9 | 67.38±15.07 | 66.18±17.28 | 67.67±15.31 | 65.38±15.58 | 67.24±15.45 | 66.44±13.55 |
| **P value** | 0.534 | | 0.942 | | 0.759 | | 0.499 | | 0.909 | |
| ***significant difference between groups (p value ≤ 0.05)** | | | | | | | | | | |

In our study, oligoasthenospermia is frequently reported in males among sub-fertile couples (asthenospermia in 94% of the study sample and oligospemia encountered in 38.9%), and it is well known that oligoasthenospermia has a great impact on reducing the chance of conception. Despite the presence of different risk factors that were included in the study, no single cause was recognized that had a statistically significant effect on all parameters. This may be because there were many contributing factors with different mechanisms that can contribute to this syndrome, and in addition, in many cases, the aetiology may remain unknown (Colpi *et al*., 2018).

The mean age in the study sample was 34.27 years, with regard to this age the male infertility start to decline after age of 30 years, but in fact oligoasthenospermia has no specific age for presentation as many factors as lifestyle or varicocele attribute to the condition more than the age alone, further it is usually diagnosed at the time when the male try to conceive. The patient's age is very important in predicting response to treatment (Yao & Cai, 2022; Bratt & Naimi-Akbar, 2023; Marchão *et al*., 2023; Taylor *et al*., 2023), as young patients have a better response to treatment and older patients have a higher chance of decline in semen quality with time (Carlos *et al*., 2022).

In our study Age shows no significant effect on semen parameters nor on hormonal value except for low sperm count showed a significant higher percentage in those with 20-30 years old compared to normal (57% compared to 28% at p-value 0.001) while in the 31-40 and 40-45 years the higher percentage of male showed normal sperm count with a highly significant difference, this could be explained that younger age male may have different life style or other factors that attribute to this result and it is recognized that Age affect testosterone level and semen parameters but was not the case in our study, as it was clear from many studies that this Age related decline is more pronounced in old age male (>65 years) with adiposity and those with chronic illnesses (Bh *et al*., 2022).

Our study groups tend to have a mean low value in the normal testosterone range, as all our patients suffer from sub-fertility and have many factors that tend to lower testosterone levels, with its major direct impact on male infertility, reducing sperm production and indirectly influencing patients' sexual drive (Zinah, 2024). Prolactin level shows a significant reduction with age, as indicated by many studies that detect a decrease in prolactin level in males with aging due to decreased TSH-stimulated prolactin secretion (Veldhuis, 2013).

Our study sample of sub-fertile male had a mean BMI of 28.5Kg/m$^2$ and 43% were overweight and 35% were obese with statistical significant effect on testosterone level (Bh *et al*., 2022), but without statistical significant effect on semen parameters probably because the study only includes sub-fertile couples (comparison with fertile couples may be more informative) in addition to the presence of other risk factors or may be there is other additional still un recognized causes. In fact, high BMI shows an effect on semen parameters in some studies and not in others. This may be related to the complex underlying pathophysiology and complex interaction (Cole *et al*., 2022; King & Adams, 2023; Leroy *et al*., 2023; Hakami, 2024; Tanaka *et al*., 2024) with gonadotrophins and oxidative stress and its effect on fertility, but as a whole, obesity management with good medical treatment gives a good promise in reproductive outcome (Ameratunga *et al*., 2023).

In our study, the mean duration of infertility was 5.52 years. It was found that the longer the infertility duration, more was the risk of oligoasthenosperma and even progress to azoospermia (Boeri *et al*., 2018). Occupation of the patient may be a risk factor for reduced progressive motility, with those with are work have a higher percentage (69%), employed persons had 24% while military forces persons have the lowest incidence (7%). This may be due to lifestyle and stress, or any occupational hazard exposure that possibly affects their fertility (Abdoli *et al*., 2022).

Semen abnormalities, including semen volume ≤1.4 ml and sperm count <15 ml, were significantly more common in primary infertility than in secondary type. This was also explained by other studies (Sethi *et al*., 2024). Viscosity of semen, that is, a prolonged liquefaction time, was encountered in our study sample with a significant difference in the presence of miscarriage (26% compared to12%) as semen viscosity has been associated with impaired sperm DNA integrity and increased miscarriage rate (Yu *et al*., 2025). Smoking shows a significant effect on semen volume, with a semen volume <1.4ml compared to a non-smoker (11% compared to 3%). As this was shown in previous studies, one of them demonstrates the effect of smoking and especially hookah on semen volume by Hamadneh J *et al.* (2025).

Patients with a previous history of COVID-19 infection show a significantly higher percentage of normal seminal liquefaction. This was explained by Dipankar SP *et al*. (2022), in a study that revealed that most of the semen parameter abnormalities may revert to normal after the virus was cleared from the semen. Also covid-19 infection had a significant difference with lower testosterone level, Although most cases recovered from corona have testosterone reverts to normal but 50% remain in low level after 7 months (duration of the study) and further 10% may have further decrease in testosterone level and may have worse prognosis (Salonia *et al*., 2021), and by this effect corona virus infection will still have a possible detrimental effect even if the semen parameters reverts to normal (Al-Sanjary, 2025).

It is evident that male infertility has a complex interaction of different causes and despite major efforts in male infertility diagnosis the cause of infertility still obscure in 70% of cases, and in our study life style factors (smoking present in 50%) and obesity (39%of the study group ) remains of the most important variables that could explain male infertility when other causes are absent (varicocele present in only 14% and mumps in only 0.5%), this approach accepted by Babakhanzadeh E. *et al*. (2020). The current lifestyle and behavior(Johansson & Andersson, 2022; Wei & Zhao, 2022; Endeshaw *et al*., 2024; Mitchell & Howard, 2024; Sigurdsson *et al*., 2024) have many unhealthy male habits together with unbalanced dietary intake, in addition to many of the environmental exposures beyond a person's will, which will impact male fertility with variable individual susceptibility depending on the genetic and epigenetic personal predisposition and the presence of underlying systemic disorder or current medication (Tesarik, 2025).

From our study and many others trying to understand male infertility, it's clear why the European Academy of Andrology recommends that patients with oligoasthenospermia should at least quit smoking, reduce their weight, and avoid alcohol before trying assisted reproductive technologies (Colpi *et al*., 2018).

## Conclusion

Male infertility crisis is mainly due to current lifestyle and behavior, with obesity, smoking, and individual occupation, in addition to previous corona infection can affect seminal fluid quality and sperm DNA integrity in a complex manner, and improvement of the lifestyle is mandatory during infertility treatment and before IVF.

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