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Original Research Article

Seminal Parameters of Infertile Couples Referred to Tertiary Care Centre

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Conflict of interest: Nil

Abstract:

Introduction: Semen analysis is an indispensable diagnostic tool in evaluating the male partner of infertile couples. This study aimed to assess seminal patterns in male partners of infertile couples and identify the possible contribution of male factors to the overall infertility problem.

Methodology: This prospective study was conducted from July 2016 to June 2018 in the Department of Pathology at NRI Medical College, Chinakakani, Guntur, Andhra Pradesh, India.

Results: Among the 200 cases, 125 patients (62.5%) were aged over 30 years, and 66 of these (33%) had abnormal semen analysis. In contrast, 75 patients (37.5%) were aged 30 years or younger, with 44 (22%) having abnormal semen analysis. Of the 200 cases, 49 patients were smokers, with 37 (76%) showing abnormal seminal parameters. Among 53 alcoholics, 31 (58%) had abnormal seminal parameters. Nine patients were both smokers and alcoholics, and all presented with abnormal seminal parameters. Of the 89 nonsmokers and nonalcoholics, 33 cases (37%) had abnormal seminal parameters. The most common seminal abnormality in the present study was oligoasthenozoospermia (20%), followed by oligozoospermia (7.5%).

Conclusion: The study found that age, smoking, and alcohol consumption are risk factors for male infertility.

Keywords: Oligozoospermia, Oligoasthenozoospermia, Infertility.

Introduction

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.[1] The World Health Organization (WHO) estimates that 60–80 million couples worldwide suffer from infertility, with the prevalence in India ranging from 3.9% to 16.8%.[2] Male infertility refers to a male's inability to achieve pregnancy in a fertile female partner. Semen analysis is routinely used to evaluate the male partner in infertile couples. In 50% of involuntarily childless couples, a male infertility-associated factor is identified alongside abnormal semen parameters.[3] Although changes in males with aging are moderate, they are significant, and the capacity to fertilize is generally maintained.[4]

Aims and Objectives

1. To evaluate the seminal patterns in male partners of infertile couples.

2. To determine the prevalence of abnormal semen analysis in relation to age distribution, low sperm count, decreased motility, abnormal morphology, habitual factors such as smoking and alcoholism, decreased semen volume, abnormal pH, increased pus cells, increased viscosity, delayed liquefaction time and their contribution to infertility.

Materials and Methods

This prospective study examined the seminal fluid indices of consenting male partners of infertile couples seen at NRI Medical College and General Hospital from July 2016 to June 2018. WHO standards were used for the collection and processing of samples. Sample collection was performed through masturbation following 3–5 days of abstinence from ejaculation. Samples were collected in sterile screw-capped plastic universal containers. Semen analysis was conducted through physical and microscopic examination.

Duration: 2 years **(**July 2016 to June 2018).

Inclusion criteria:

- Male partners of infertile couple.
- Abstinence from ejaculation for 3–5 days.
- Primary infertility.

Exclusion criteria:

- Abstinence from ejaculation less than 2 days or more than 7 days
- History of antibiotic usage.
- Spilled sample during collection.
- Secondary infertility.

Results: A total of 200 male partners of infertile couples were investigated in this study. The patients' ages ranged from 20 to 43 years, with a mean age of 30 years.

1. Semen analysis in relation to age

Table 1: Semen analysis in relation to age

Age	Normal semen analysis	Abnormal semen analysis	Total
> 30 years	59 (29.5 %)	66 (33 %)	125 (62.5 %)
≤ 30 years	31 (15.5 %)	44 (22 %)	75 (37.5 %)
Total	90 (45 %)	110 (55 %)	200 (100 %)

2. Major seminal parameters

2.1 Sperm concentration: According to the WHO, oligospermia is defined as a sperm count of less than 15 million per millilitre, while aspermia refers to the complete absence of seminal fluid.[5]

Table 2: Sperm concentration in the present study

Abnormal sperm concentration	Percentage (%)
Normal sperm concentration	120 (60 %)
Oligozoospermia	70 (35 %)
Azoospermia	8 (4 %)
Aspermia	2 (1 %)

Table 3: Distribution of sperm concentration in relation to other seminal parameters

Other seminal parameters	Oligozoospermia (n=70)
Asthenozoospermia	40 (57 %)
Increased pus cells	10 (14 %)
Increased liquefaction time	3 (4 %)
Abnormal pH	2 (3 %)
No other abnormality	15 (22 %)

2.2 Sperm motility: According to the WHO, sperm motility is considered abnormal if total motility is less than 40% or if progressive motility is less than 32%.[5]

Table 4: Sperm motility in the present study

Sperm motility	n=200
Normal	140 (70 %)
Asthenozoospermia	50 (25 %).
Azoospermia and aspermia	10(8+2)5 %

Table 5: Distribution of sperm motility in relation to other seminal parameters

Other seminal parameters	Asthenozoospermia (n=50)
Oligozoospermia	40 (80 %)
Increased viscosity	10 (20 %)
Increased pus cells	0
Increased liquefaction time	0

2.3 Sperm morphology: In the present study, two cases showed less than 4% of sperm with normal morphology.

The abnormalities observed were pyriform head, double head, tapered head, and coiled tail.

3. Minor seminal parameters

3.1 Seminal fluid volume: Among the 200 cases, 198 had normal seminal fluid volumes, with a range of 1.4 to 1.7 mL (average = 1.5 mL). Two cases showed aspermia.

3.2 pH: The pH was within the range of 7.5 to 8.5 in 198 cases (99%). In two cases (1%), the pH was

6.9, and both cases were associated with oligozoospermia.

3.3 Pus cells: Of the 200 cases, 16 (8%) showed more than 5 pus cells per high-power field (HPF), while 184 cases (92%) showed fewer than 5 pus cells per HPF.

Among the 16 cases with increased pus cells, 10 had oligozoospermia, and 6 did not show any association with abnormal seminal parameters.

3.4 Viscosity of seminal fluid: Increased viscosity (greater than 2 cm in length) was noted in 10 cases (5%). All 10 cases showed asthenozoospermia.

3.5 Liquefaction time: Increased liquefaction time (greater than 1 hour) was observed in 15 cases (7.5%). Among these 15 cases, 3 had oligozoospermia.

4. Semen analysis compared with habitual factors

Table 6: Semen analysis compared with habitual factors

Habitual factors	Normal semen analysis	Abnormal semen analysis
Only smokers (n=49)	12	37
Only alcoholics (n=53)	22	31
Both smokers and alcoholics (n=9)	0	9
No habitual factors (n=89)	56	33

4.1 Abnormal semen analysis in smokers

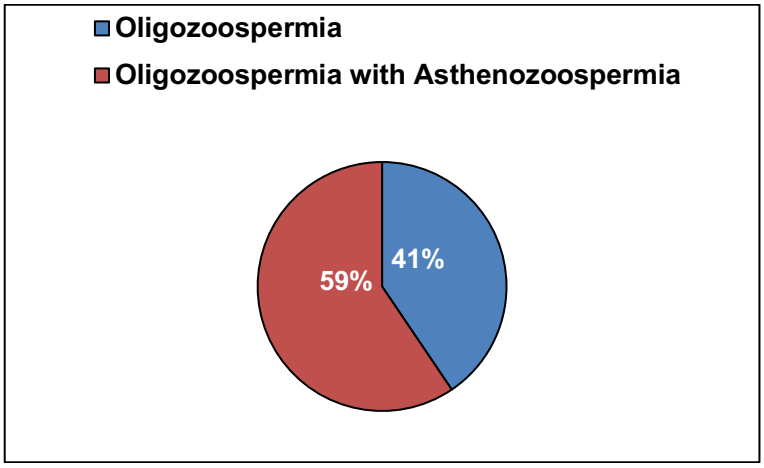

Figure 1: Abnormal seminal parameters in smokers

4.2 Abnormal semen analysis in alcoholics

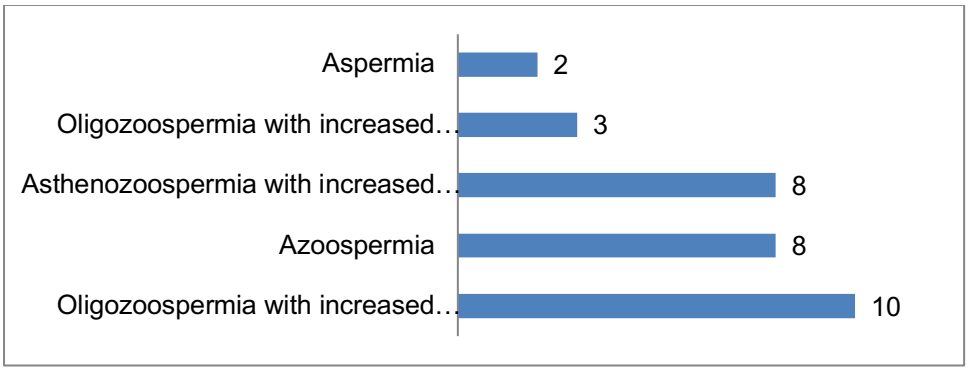

Figure 2: Abnormal semen analysis in alcoholics

Table 7: Distribution of cases according to semen analysis report

Cases	Number (n=200)	Percentage
Oligozoospermia	15	7.5%
Oligoasthenozoospermia	40	20%
Oligozoospermia with increased pus cells	10	5%
Oligozoospermia with increased liquefaction time	3	1.5%
Oligozoospermia with low pH	2	1%

Azoospermia	8	4%
Aspermia	2	1%
Asthenozoospermia with increased viscosity	10	5%
Increased liquefaction time	12	6%
Increased pus cells	6	3%
Teratozoospermia	2	1%
Normozoospermia	90	45%

Discussion

The WHO has established lower reference limits for various seminal parameters.[5] Although these reference ranges are useful for epidemiological studies related to men's health, no single parameter can reliably indicate fertility or infertility, except when the values are at the extremes of the range.[6]

Table 8: WHO lower reference limits for semen characteristics (2010) [5]

Parameter	Lower reference limit
Semen volume (mL)	1.5 (1.4 – 1.7)
Total sperm number (10^6 per ejaculate)	39 (33 – 46)
Sperm concentration (10^6 per mL)	15 (12 – 16)
Progressive motility (PR %)	32 (31 – 34)
Total motility (PR+NP %)	40 (38 – 42)
Sperm morphology (normal forms %)	4 (3 – 4)
Vitality (live spermatozoa %)	58 (55 – 63)
pH	7.2

Due to lifestyle changes, the growing concern about male infertility is on the rise globally, including in India.

Table 9: Comparison of abnormal seminal parameters in relation to age

Age	Present study (n=110)	Jajoo S et al. [8] (n=52)
>30 years	66 (60%)	27 (52%)
≤30 years	44 (40%)	25 (48%)

In the present study, among individuals more than 30 years of age, the most common abnormal seminal parameter was oligoasthenozoospermia (46%). In contrast, in the study by Jajoo S et al.[8], asthenozoospermia (59%) was the most common abnormal seminal parameter. In the present study abnormal seminal parameters among ≤30 years of age group were oligozoospermia (23 %), oligoasthenozoospermia (23 %) and oligozoospermia with increased pus cells (23 %). In Jajoo S et al.[8] study, asthenozoospermia was most common abnormal seminal parameter. In the present study, among abnormal sperm concentrations, oligozoospermia (35%) was the most common, similar to the findings of other studies by Samal et al.[9] (29.13%) and Kalavathi et al.[7] (24.8%). The next most common abnormality was azoospermia, which was found in 4% of cases in the present study, similar to other studies by Samal et al.[9] (6.75%) and Kalavathi et al.[7] (8.4%). In contrast, the study by Fauzia Butt et al.[10] reported azoospermia (14.89%) as the most common abnormal sperm concentration, followed by oligozoospermia (11.11%).

Table 10: Abnormalities in sperm concentration compared with other studies

Author	Normal sperm concentration	Oligozoospermia	Azoospermia	Aspermia
Present study (n=200)	120 (60%)	70 (35%)	8 (4%)	2 (1%)
Samal et al.[9] (n=3000)	1800 (61.98%)	846 (29.13%)	196 (6.75%)	—
Kalavathi et al.[8] (n=250)	164 (65.6%)	62 (24.8%)	21 (8.4%)	—
Fauzia Butt et al.[10] (n=396)	293 (73.99%)	44 (11.11%)	59 (14.89%)	—

Sperm motility: In the new WHO manual (2010), the percentage of motile spermatozoa and the proportion of progressively motile spermatozoa are assessed irrespective of speed. The absence of progressive motility measurement is unfortunate because the mean quality of progressive motility is an important prognostic fertility factor.

Especially when the proportion of motile spermatozoa is below 40%.[10] In the present study, we found that asthenozoospermia was the second most common cause of abnormal semen analysis.

Table 11: Abnormalities in sperm motility compared with other studies

Author	Asthenozoospermia, N (%)
Present study (n=200)	50 (25 %)
Samal et al.[9] (n=3000)	42 (1.44 %)
Kalavathi et al.[7] (n=250)	3 (1.2 %)
Fauzia Butt et al.[10] (n=337)	87 (25.81 %)
Jajoo S et al.[8] (n=100)	28 (28 %)

Table 12: Comparison of sperm concentration in relation to sperm motility with other studies

Parameter	Present study 2017 (n=200)	Owolabi et al.[11] 2013 (n=661)
Oligoasthenozoospermia	40 (20 %)	15 (2.2 %)
Normal sperm concentration with asthenozoospermia	10 (5 %)	20 (3 %)

Sperm morphology: In the present study of 200 cases, 2 cases (1%) showed teratozoospermia. Similarly, Fauzia But et al. [10] and Jajoo et al. [8] also reported a low incidence of teratozoospermia, at 3.26% and 9%, respectively.

Comparison of abnormal seminal parameters in relation to smoking and (or) alcoholism with other studies: In the present study, smoking and alcohol consumption individually had a significant association with abnormal seminal parameters. The highest percentage of semen abnormality was found in patients who smoked and consumed alcohol, followed by only smokers (75.5%), and then only alcoholics (58.5%).

In contrast, cases with no habitual factors showed a low percentage (37%) of abnormal seminal parameters. The relationship between alcohol consumption and smoking with abnormalities of semen was evident, similar to the findings of Samal et al.[9] study of 2905 cases, smokers were 1767 cases and alcoholics were 185, among them 627 and 160 cases had abnormal seminal parameters in smokers and alcoholics respectively. Kalavathi et al.[7] study reported that alcoholics had significant association with abnormal seminal parameters and Jajoo S et al.[8] study total number of alcoholics were 33 cases in which 11 cases had abnormal seminal parameters.

The significant relationship between alcoholism and cigarette smoking with semen abnormalities was appreciated in the present study. However, there may be underreporting of smoking habits, as patients are generally uncomfortable disclosing any addiction history.

Semen volume: In the present study of 200 cases, 2 cases (1%) showed aspermia and 8 cases (4%) showed azoospermia. In the study by Samal et al.[9], 196 cases (6.7%) of azoospermia were noted out of 2,904 cases, with no instances of aspermia.

pH: In the present study among 200 cases, 2 cases (1%) showed low pH, both associated with oligozoospermia. In the study by Owolabi et al.[11], 3.6% of cases with abnormal pH had associated oligozoospermia, and 2.2% of cases had associated normozoospermia.

Pus cells: In the present study among 200 cases, 16 cases (8%) had increased pus cells, of which 10 cases (62.5%) were associated with oligozoospermia. In the study by Jajoo S et al.[8], 33 cases (33%) showed increased pus cells. In Owolabi et al. [11], 166 cases (86.6%) had increased pus cells associated with oligozoospermia, and 269 cases (59.8%) with normozoospermia.

Viscosity: In the present study of 200 cases, increased viscosity was noted in 10 cases (5%), all associated with asthenozoospermia. The study indicated that high viscosity was linked to abnormal sperm motility. In the study by Gopal Krishnan K et al.[12] of 269 cases, 30 cases (11.15%) showed hyperviscosity, which was reported to alter sperm chromatin integrity and significantly decrease sperm count and motility. In Siciliano L et al.[13] of 120 semen samples, 14 cases (11.6%) were hyperviscous with asthenozoospermia, and 16 cases (13.3%) were hyperviscous with oligozoospermia.

Liquefaction: In the present study, liquefaction time was increased in 15 cases (7.5%), among which 3 cases (20%) were associated with oligozoospermia. In the study by Siddeek B M et al. [14] of 284 cases, 65 cases (23%) had increased liquefaction time, and 119 cases (42%) had normal liquefaction time.

Semen analysis is the cornerstone of the investigation of male infertility.[15] To this day, controversy persists as to what constitutes normal spermatozoa in semen, as normal and pathologic forms coexist.[16] Routine semen analysis provides

useful information concerning sperm production, motility, viability, the patency of the male genital tract, secretions of the accessory organs, as well as ejaculation and emission.[6]

Conclusion

The present study demonstrated abnormal seminal parameters in 55% of infertile males. Age-wise results showed that those over 30 years had more abnormal seminal parameters compared to those 30 years or younger. As age increased, so did the abnormalities in semen. The most common abnormality found in the present study was oligoasthenozoospermia, followed by asthenozoospermia. Abnormal semen analysis was higher in smokers and alcoholics compared to non-smokers and non-alcoholics. Measurements of sperm concentration, motility, and morphology provide useful information for diagnosing male infertility. Conventional semen analysis to diagnose male infertility remains focused on threshold counts for sperm number, motility, and morphology, emphasizing the classification of patients into descriptive groups such as oligozoospermic and asthenozoospermic.

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