Original Article

Seminal fluid analysis of male partners of infertile couples in Abakaliki, Ebonyi State, Nigeria

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ABSTRACT

Context: Procreation is one of the greatest desires of every couple, especially in the developing countries like ours. Male infertility is an important but neglected reproductive health issue, and it appears to contribute significantly to infertility in our environment.

Aims: The aim of the study is to review the seminal fluid analysis parameters of male partners of infertile couples attending infertility clinic at the Federal Teaching Hospital, Abakaliki (FETHA).

Materials and Methods: This was a 5-year retrospective study of male partners of couple attending the infertility clinic in FETHA between January 1, 2012, and December 31, 2016. Case notes of couples managed for infertility were reviewed. Information extracted includes the sociodemographic characteristics, duration of infertility, type of infertility, and seminal fluid analysis results with emphasis on the semen volume, sperm morphology, motility, pH, and the microbacterial isolates.

Statistical Analysis: Data were entered into an excel spreadsheet on a personal computer, and statistical analysis was performed using Epi Info 7.2.1 software. Sociodemographic characteristics are presented in frequencies and simple percentages. Means of categorical variables were compared using the Chi-squared test whereas continuous variables were analyzed using Student's *t*-test. A value of $P \leq 0.05$ was considered statistically significant. Assessment of semen analysis was done using the 2010 World Health Organization human values for semen parameters.

Results: Case records of 922 couples attending the infertility clinic were retrieved; however, 756 folders had semen analysis results. During the study, the contribution of the male partner to infertility was 41.0%. The mean age of the patients was 40.10 ± 10.23; the modal age was 34 years; and most of the patients were traders. Majority had normospermia 380 (50.3%) whereas 376 (49.7%) had abnormal semen parameters. There was a high level of leukocytospermia (≥80%) in this study, and the predominant organism cultured was *Staphylococcus aureus* 328 (43.4%). Oligospermia was the most frequent (33.0%) derangement in semen analysis results. The age and duration of the infertility were not significantly related to abnormal semen analysis; however, men who are resident in urban areas, or who consume alcohol or tobacco, and those who were managed for primary infertility had a significant relationship with abnormal semen parameters ($P < 0.05$).

Conclusion: Semen analysis remains an indispensable tool in the overall diagnosis of male infertility in our environment. Men who are resident in the urban areas or consume tobacco/alcoholic beverage had a significant risk of abnormal semen parameters.

Key words: Abnormal semen patterns; male infertility; prevalence of male infertility; seminal fluid analysis; trend.

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Introduction

Procreation, especially in the developing countries like ours, remains one of the greatest desires of couples.[1] Many couples achieve pregnancy after 1 year of unprotected sexual intercourse while the unsuccessful ones are left in great psychological and psychosocial stress.[1,2] Male factor infertility refers to the inability of a man to impregnate a woman after 12 months of regular and unprotected sexual intercourse that is if the woman has no gynecological problem.[2] Beyond just pregnancy or its absence, infertility has significant public health consequences, including psychological distress, social stigmatization, economic constraints, and later onset adult diseases in both males and females.[3]

Male infertility is an important but neglected reproductive health issue in Nigeria.[4-7] The exact incidence of male infertility is unknown since not all infertile couples seek medical care; however, an incidence of 8%–15% has been reported.[1,5,6] In some studies, it is reported to account for infertility in 20%–50% of couples seeking treatment.[1,7]

Seminal fluid analysis remains an indispensable tool in the diagnosis of male factor infertility.[1-10] It gives a picture of both the quantity and quality of sperm production.[5,8,10] Abnormalities of seminal fluid parameters may be found in up to 60% of infertile couples.[4] These abnormalities which may occur singly or in combination and might be the cause of infertility may include oligozoospermia, azoospermia, asthenozoospermia, and teratozoospermia. When these abnormalities coexist, it is described as oligoasthenoteratozoospermia (OAT syndrome).[5] Scrotal ultrasound can be used to assess the testicular volume while testicular biopsy has little or no role.[9]

Treatment of male infertility depends on the etiology, patient's desire, facilities, and expertise.[9] A significant proportion of male infertility is amenable to assisted reproductive technology. In cases where treatment fails, adequate counseling and adoption might provide the much-needed succor to the infertile couple.

Materials and Methods

Federal Teaching Hospital, Abakaliki (FETHA) was created on December 23, 2011, following the acquisition and merger of the defunct Ebonyi State University Teaching Hospital with the Federal Medical Center by the Federal Government.

This was a retrospective study of the semen analysis results of male partners of infertile couples managed in FETHA over a 5-year period spanning January 1, 2012–December 31, 2016. As a protocol, semen collection, analysis, and culture of male partners of infertile couples are processed using the World Health Organization (WHO) 2010 standard. Case notes of couples managed for infertility during the study were retrieved from the records unit of FETHA. These case notes were reviewed, and the following data about the male partner were extracted, sociodemographic variables, risk factors for infertility, duration of infertility, type of infertility, and seminal fluid culture and analysis results. Review of the semen analysis results was done using the WHO 2010 criteria values for human semen characteristics.[11] Some indices used includes a minimum volume of 1.5 ml, a sperm concentration of $>15 \times 10^6$ cells/ml, progressive motility >32%, and morphology of >4% normal forms.

Table 1: Sociodemographic characteristics of the male partners

Variable	Frequency (%)
Age	
21-30	24 (3.2)
31-40	368 (48.7)
41-50	296 (39.1)
51-60	60 (7.9)
>60	8 (1.1)
Place of residence	
Urban	504 (67.0)
Rural	252 (33.0)
Occupation	
Artisan	76 (10.1)
Civil servant	196 (25.9)
Clergy	40 (5.3)
Commercial drivers	84 (11.1)
Traders	280 (37.0)
Farmers	100 (11.5)
Habits	
Heavy alcoholic beverage consumer	388 (51.3)
Tobacco smoker	20 (2.6)
OAlcohol/tobacco	92 (12.2)
None	256 (33.9)
Total	756 (100)

Data analysis

Data were entered into an excel spreadsheet on a personal computer, and statistical analysis was performed using Epi Info 7.2.1 software (CDC, Atlanta, Georgia, USA). Sociodemographic characteristics are presented as frequencies and simple percentages. Means of categorical variables were compared using the Chi-squared test while continuous variables were analyzed using Student's *t*-test. A value of $P \leq 0.05$ was considered statistically significant. Only case files with complete information were used for data analysis while incomplete case notes were excluded.

Ethical clearance was obtained from the research and ethics committee of FETHA.

Results

A total of 7092 gynecological cases were seen during the study period, and 922 of them were managed for infertility during the study, but 756 cases notes had results of semen analysis and were used for data analysis. A total of 376 (41%) male partners had abnormal seminal fluid analysis results. Table 1 shows the sociodemographic characteristics of the male partners. The age range of the patients was between 22 and 66 years with a mean age of 40.10 ± 10.23 years. Majority (67%) were urban dwellers; trading was the most common occupation (37.0%). Alcoholic beverage and/or tobacco consumption was a common habit among 66.1% of the patients.

Table 2 shows the duration and types of infertility; the mean duration of infertility in the study was 4.26 ± 3.61 years. A total of 464 (61.4%) had a duration of infertility with <5 years, 212 (28%) had a duration of 5–10 years, while 80 (10.6%) had a duration of infertility of >10 years. Secondary infertility accounted for 500 (66.1%) while primary infertility was 256 (33.9%).

Table 3 shows that 376 (49.7%) had abnormal semen parameters. The abnormal semen parameters consist of oligozoospermia 124 (33.0%), asthenozoospermia 88 (23.4%), azoospermia 44 (11.7%), oligoasthenozoospermia 84 (22.3%), asthenoteratozoospermia 20 (5.3%), and OAT 16 (4.26%).

The result of other semen analysis is shown in Table 4, and 604 (79.9%) of the patients had normal sperm volume with a mean of 2.95 ± 1.5 ml. Most (70.4%) of the patients had normal motility of >40% while 64% had normal morphology of >4% of normal forms. Sperm concentration of ≥15 × 10^6 cells/ml was found in 464 (61.4%) patients, with a mean of 45.45 ± 51.06. The lowest recorded sperm concentration was 0 × 10^6 cells/ml whereas the maximum was 241.8 × 10^6 cells/ml with a modal sperm concentration of 15.2 × 10^6 cells/ml. There were high levels of white blood cells (WBC) in the semen of the patients, 84.9% had a WBC count >1 × 10^6 cells/ml.

The culture results panel shows that the predominant organism cultured was *Staphylococcus aureus* accounting for 328 (43.4%) of cases. Other micro-bacterial isolates were Coliform 24 (3.2%), *Streptococcus* spp. 40 (5.3%), *Escherichia coli* 28 (3.7%), *Klebsiella* spp. 12 (1.6%) and *Pseudomonas* spp. 16 (2.1%). There were no micro-bacteria isolated in 308 (40.7%) of the cases.

Table 5 shows a regression analysis of some demographic characteristics and duration and type of infertility to the semen analysis. The age and duration of the infertility were not significantly related to abnormal semen analysis; however, men who are resident in urban areas or who consume alcohol or tobacco and those been managed for primary

Table 2: Duration and type of infertility

Variable	Frequency (%)
Duration (years)	
<5	464 (61.4)
5-10	212 (28.0)
>10	80 (10.6)
Type	
Primary	256 (33.9)
Secondary	500 (66.1)
Total	756 (100)

Table 3: Abnormal semen pattern of the male partners

Abnormality	Frequency (%)
Asthenozoosprmia	88 (23.4)
Asthenoterataozoospermia	20 (5.3)
Azoospermia	44 (11.7)
Oligospermia	124 (33.0)
Oligoasthenozoospermia	84 (22.3)
Oligoasthenoteratozoosperm	16 (4.3)
Total	376 (100)

Table 4: Seminal fluid analysis and culture results

Variable	Frequency (%)
Volume	
<1.5	152 (20.1)
≥1.5	604 (79.9)
pH	
7	300 (39.7)
8	456 (60.3)
Morphology (%)	
<4	272 (36.0)
≥4	484 (64.0)
Concentration	
$<15\times10^6$	292 (38.6)
$\geq15\times10^6$	464 (61.4)
Motility	
<40	224 (29.6)
≥40	464 (70.4)
White blood cells ($\times10^6$)	
<1	114 (15.1)
>1	642 (84.9)
Culture results	
Staphylococcus aureus	328 (43.4)
Coliform bacteria	24 (3.2)
Streptococcus pyogenes	40 (5.3)
Escherichia coli	28 (3.7)
Klebsiella spp.	12 (1.6)
Pseudomonas aeruginosa	16 (2.1)
No growth	308 (40.7)
Total	756 (100)

Table 5: Determinants of abnormal semen parameters

Variable	Normal semen	Abnormal semen	Frequency	AOR (95% CI)
Age (years)				
≤40	208	181	389	1.30 (0.98-1.73)
>40	172	195	367	
Place of residence				
Urban	218	286	504	0.42 (0.39-0.58)*
Rural	162	90	252	
Habits				
Alcohol/tobacco	207	293	500	0.33 (0.28-0.47)*
None	173	83	256	
Duration of infertility (years)				
≤5	238	226	464	1.11 (0.83-1.49)
>5	142	150	292	
Type of infertility				
Primary	104	152	256	0.56 (0.41-0.75)*
Secondary	276	224	500	

*Significant relationship. AOD, adjusted odds ratio; CI, confidence interval

infertility had significant relationship with abnormal semen parameters ($P < 0.05$).

Discussion

Male factor infertility is increasingly assuming a significant role in the etiology of infertility. In this study, the prevalence of male partners with abnormal semen analysis among couples attending the infertility clinic within the study was 41%. This finding is similar to 40.7% reported by Ajah *et al*. in a previous study,[12] 42.5% reported by Uadia and Emokpae in the southwest Nigeria,[2] and 38.2% prevalence reported from Ado Ekiti.[13] This high prevalence may be because men are becoming more aware of the importance of male factor screening and contribution to infertility treatment.

The mean age of the male patients who presented to the infertility clinic within the study period was 40.1 ± 10.23 years. This was similar to a mean age of 41 ± 7.3 years and 43.72 ± 1.5 years, respectively, reported by Omokanye *et al*.[14] and Benjamin *et al*.[15] but less than the 30.3 ± 5.7 years and 29.24 years, respectively, reported by Jajoo *et al*.[16] and Jain *et al*.[17] This difference in the mean age may due to educational levels of the participant. It has been shown that social class and levels of educational attainment affect the health-seeking attitudes of infertile couples.[9]

In this study, the mean duration of infertility was 4.26 ± 3.61, male partners with duration of <5 years accounted for 61.4%, 5–10 years was 28%, while >10 years was 10.6%. This is similar to values reported in central India[16] and Western India.[17] However, this was contrary to reports in Saudi Arabia by AlEnezi where the duration of infertility was reported to be between 1 and 5 years.[18] Although Saudi Arabian women are blamed for infertility due to social stigma and cultural attitude of the men, these women are usually willing and ready to attend the clinic for investigation and treatment necessitating their early presentation and thus their spouse. Jain reported that African American experience longer duration of infertility before presentation than Caucasians.[17] This may be related to the levels of education and income.

Secondary infertility accounted for 66% of infertility in this study. This was similar to findings reported by Omokanye *et al*. in Ilorin[14] and Nwajiaku in Nnewi[9] but in contrast to findings by Ikechebelu *et al*. in Nnewi[19] who found that primary infertility accounted for 65% while secondary was 35%.[19] This pattern of infertility in our study might be attributed to high prevalence of sexually transmitted infections and inadequate treatment due to ignorance and poverty.[9]

In this study, 49.7% had one or more abnormal seminal fluid parameter. This was comparable to 46% and 52% reported in Ile-Ife[20] and central India,[16] respectively. Idrisa in Maiduguri[4] and Ugwuaja in Abakaliki[10] reported higher values for abnormal parameters in 70% of the patients while Ikechebelu in Nnewi[19] and Olatunji in Ogun[1] state found lower values. Oligospermia and asthenozoospermia were the most common abnormal sperm pattern contributing 33.0% and 23.4%, respectively, in this study. An earlier study by Ajah *et al*. reported comparable figures[12] while Ugwuaja *et al*. reported oligospermia and teratozoospermia as the most frequent abnormal parameters.[10] Idrisa in Maiduguri noted azoospermia (12.8%) and oligozoospermia (26.8%) as the most frequent semen abnormality.[4] Our findings were also similar to the pattern of seminal fluid parameters reported by Owolabi in Ile-Ife,[20] Omokanye *et al*. in Ilorin,[14] and Ajah *et al*. in Abakaliki.[12]

Semen analysis remains a useful investigation in the search for male factor infertility, and it gives a picture of both semen production and sperm quality.[5] It is now recognized that it is a guide to fertility and not an absolute proof of fertility of an individual except in cases of azoospermia where the cumulative conception rate is reduced to zero.[20] In this study, the most recent WHO 2010 criteria for human values for semen characteristics was applied.[11] Majority of the patients had normal semen analysis result; however, there was high level of leukocytospermia in this study in both normospermic and oligospermic patients, same was reported by Ajah *et al*.[12] and Omokanye *et al*.[14] This goes to buttress the possible role of sexually transmitted infection in male factor infertility in our environment.

Pathogenic microorganisms were cultured in 59.3% of our patients with *S. aureus* being the most common bacteria

isolated in 43.4% of the case. Genital tract infection has previously been implicated as a cause of male factor infertility and may account for this high bacteria culture. This finding is comparable to the finding in NNewi where Ugwuaja *et al* reported bacterial isolates in 56.0% of client semen.[10] However, Owolabi in a study at Ile-Ife reported a higher value of 74.9% for bacteria growth.[20] In a similar study from our setting, *S. aureus* was the most common organism isolated accounting 25.6%.[12]

The age of the male partner and the duration of the infertility were not significantly related to abnormal semen analysis, and this may be related to the fact that the age of the male alone is not a determinant of abnormal sperm analysis, and also, the duration of the infertility was not related to abnormal findings. This is at variance with a previous study which demonstrated a significant correlation between age and abnormal semen analysis. In contrast, men who are resident in the urban areas or who consume alcohol or tobacco and those who were managed for primary infertility had a significant relationship with abnormal semen parameters. Various studies had shown that excessive alcohol consumption with or without tobacco has detrimental effects on spermatogenesis and hence male fertility.[2,10,12] Men who are resident in the urban areas are more likely to consume tobacco/alcoholic beverages which may be the determinant to their poor semen parameters.[12]

Conclusion

The study has shown that male factor infertility contributes significantly to infertility cases in our setting. Public enlightenment on the causes, couple presentation for evaluation, prompt treatment of sexually transmitted infections, lifestyle modifications, and timely treatment will bring the much-needed succor to subfertile couples due to male factor.

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Conflicts of interest

There are no conflicts of interest.

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