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Original Research Article

Abnormalities of semen parameters among male partners of infertile couples in a sub-urban tertiary hospital in Nigeria

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ABSTRACT

Background: Infertility is a common reason for gynecological clinic visits in Nigeria. Men contribute significantly to the cause of infertility; however male factor infertility remain underreported compared to commonly reported female factor infertility. This study aimed to evaluate the abnormalities of semen parameters among male partners of infertile couples in Irrua Specialist Teaching Hospital in Edo State, Nigeria.
Methods: A prospective cross-sectional study of 285 semen samples of male partners of infertile couples was conducted at Irrua specialist teaching hospital. The laboratory staff carried out analysis of the semen samples using set parameters outlined by the World Health Organization laboratory manual for the examination and processing of human semen. Socio-demographic data of the participants was also taken in a proforma. The data obtained was then analyzed with the Statistical Package for Social Sciences.
Results: The age range of participants in this study was 20 to 65 years, with a mean age of 33.38 years. A total of 80.7% of the cases reviewed had one or more abnormal semen parameters. In 45.6%, 51.6%, and 47.0% of the analyzed samples, sperm cell count, morphology and total motility were below the WHO reference level, respectively. The severe forms of abnormal semen analysis findings detected in this study were asthenozoospermia (47%), oligozoospermia (15.8%), azoospermia (45.6%), and oligoasthenoteratozoospermia (15.5%). There was also statistically significant finding of rising cases of oligospermia with increasing age among the participants
Conclusions: Male factor infertility although grossly under reported, contributes significantly to the burden of infertility in our setting. There is a need to raise awareness so that men are properly evaluated and treated.

Keywords: Semen parameters abnormality, Infertile couples, Asthenozoospermia, Azoospermia

INTRODUCTION

Infertility is defined as the inability of a couple to achieve pregnancy after one year of unprotected sexual intercourse.[1] It is associated with a lot of emotional, psychological, social and cultural burdens on these couples.[2] It is classified into primary or secondary infertility: in which primary infertility refers to a couple

who have never been able to achieve conception and secondary infertility refers to a couple who have had a previous pregnancy, irrespective of the outcome.[1,3]

It was estimated that approximately 48.5 million couples worldwide were infertile, with a global infertility prevalence rate of 1.9% for primary infertility and 10.5% for secondary infertility for women aged 20-44 years.[4,5] The incidence of infertility varies by location in the world, with the incidence being highest in Africa's so-called infertility belt, which includes Nigeria.[4,5] In contrast to an average incidence rate of 10-15% in developed countries, the prevalence of infertility in Sub-Saharan Africa has been notably very varied, ranging from 20-46%.[5,6] This has been linked to a high prevalence of sexually transmitted diseases, complications from unsafe abortions, and puerperal pelvic infections.[6,7] In some parts of Nigeria, the institutional-based studies in the last decade showed an incidence rate of 11.2%, 4.0%, and 48.1% and 32.0% in Abakaliki (South East), Ilorin (North Central), Oshogbo (South West) and Eku (South South) respectively. [8-11]

The male factor contributes significantly to the burden of infertility among couples but this is mostly under reported despite the availability of well-established diagnostic methods and diagnostic guideline/criteria.[5,6,12] The reason(s) for this trend is due to the cultural/patriarchal nature of some societies as seen in most of Africa and the Arab world which makes it difficult for the males to present themselves for evaluation during fertility work-up.[2,5] In such places, the entire problem of infertility in a couple is blamed on the female.[5] Furthermore, rates of male infertility in North America, Australia, and Central and Eastern Europe ranged from 4.5-6%, 9%, and 8-12%, respectively.[5] In Nigeria, studies have revealed a relatively high rate of male infertility, as demonstrated by a high frequency of low sperm abnormalities among male partners of infertile couples.[13-16] These studies may even underestimate the male factor issues in our environment since men do not readily offer data about their sexual history, and cases of erectile dysfunction and impotence are occasionally ignored.[5] As a result, in all cases of infertility, the male spouse must be evaluated.[13]

Seminal fluid analysis remains an indispensable tool in the in the evaluation of the male partner and in the diagnosis of male factor infertility.[5, 17-25] It gives a picture of both the quantity and quality of sperm production.[21,23,25] Abnormalities of seminal fluid parameters may be found in up to 60% of infertile couples.[20] These abnormalities which may occur singly or in combination and might be the cause of infertility may include oligozoospermi (<20 x 10^6 cells/ml), azoospermia (no sperm cell), asthenozoospermia (abnormal motility), and teratozoospermia (abnormal morphology). When these abnormalities co-exist, it is described as oligoasthenot-eratozoospermia (OAT syndrome).[21]

Due to lack of trained personnel, hospitals and equipment (absence of services) in the sub-urban and rural areas, most research in infertility and evaluation of infertile couples, take place in the urban areas in Nigeria. Male partners of infertile couples in the sub-urban/rural areas are more likely to evade infertility evaluation due to cultural believes and societal factors.[9] We set out to determine the proportion of infertile couple with semen abnormalities and the pattern of semen abnormalities among these infertile couples in a sub-urban hospital in Nigeria. The findings of this research will add to the existing body of knowledge and improve the treatment of infertile couples.

METHODS

Study design, location and population

This was a prospective cross-sectional study carried out in the Irrua Specialist Teaching Hospital between 1 January 2017 and 31 December 2017. The Irrua Specialist Teaching Hospital is a 400-bedded Federal Tertiary Institution located in Edo Central Senatorial District of Edo state Nigeria. It is the district's biggest tertiary hospital and receives referrals from North Central district of Edo and neighboring States like Delta, Ondo and Kogi States. The study took place at the Fertility and Reproductive Health unit of the Obstetrics and Gynaecology department where patients presenting with infertility are initially evaluated. Male patients who attended the Family Medicine clinic and subsequently the Fertility and Reproductive Health clinic of the obstetrics and gynaecology department in the Irrua Specialist Teaching Hospital for fertility work-up. Patients with male factor infertility are then subsequently referred to the andrology unit of the Urology department for subsequent management and follow-up.

Inclusion and exclusion criteria

Male partners of infertile couples were included in this study. Patients who are unable to produce the semen sample by masturbation and patients who did not consent to participate in the study were excluded.

Sample size determination and sampling technique

The sample size was calculated using the statistical formula mentioned below;[26]

$$N = z2pq/d2$$

Where: N=The desired sample size, Z=The standard normal deviation, set at 1.96, which corresponds to the 95% confidence level, P=Prevalence of men with abnormal semen parameters, q=1- p and d=Degree of accuracy (set at 0.05). Based on 75.4% prevalence of men with at least one abnormal semen parameter in a study done in Nigeria, with a 95% confidence interval.[16] the sample size was calculated as n=285. The patients who met the inclusion criteria were consecutively recruited until the sample size was attained.

Semen specimen collection

The patients who consented to participate in the study were further counselled and specimen container given to them for the production of the semen by masturbation. The masturbation was adopted for uniformity of sample collection method. A private and conducive room was provided for the participants in the microbiology department of the hospital for the purpose of production of the semen. Participants who stayed near the hospital and could submit the sample within 1 hour of production were allowed to produce the sample from home. The specimen produced outside the hospital was transported at the body temperature by putting the specimen container in the inner pocket or holding it against the body with undergarments. A period of 48 to 72 hours of abstaining from ejaculation (including masturbation) was required to obtain accurate sperm concentrations.[27]

Specimen analysis

The specimen were analysed using the 2021 W.H.O parameters for semen analysis.[6] These parameters are: Total sperm number (x10^6 per ejaculate)-39 (35-40), Volume (ml)-1.4 (1.3-1.5), Total Motility (%)-42 (40-43), Progressive motility (%): 30 (29-31), Non progressive motility (%)- 1, Immotile sperm (%): 20, Vitality (%): 54 (50-56) and Normal Forms (%): 4 (3.9-4). The figures in parenthesis constitute the normal ranges.

Interpretation of results

Oligospermia was taken as total sperm number less than 39 x 10^6 per sample. Azoospermia was taken if no sperm can be found in the sample even after the sediments of a centrifuged sample have been examined. Cryptospermia was taken as sperm count less than 500,000/ml. Asthenospermia was taken as total motility less than 42%. Teratospermia was taken as normal forms less than 4%. A combination of abnormal semen parameters may also be allowed example Asthenoteratozoospermia and oligoteratospermia.

Data analysis

Data obtained via the proforma was inputted and analysed using the IBM statistical package for scientific solutions (SPSS) version 25.0 software.

RESULTS

A total of 285 cases were recruited, studied and analyzed. Table 4.1 shows the sociodemographic distribution of the cases under review. Their ages ranged between 20 and 70 years with a mean of 33.38±5.09 years. Majority of the men under review were between the ages of 35-40 years, accounting for 54.7%, while those between the ages of 20-25 accounted for the least, representing 3.5% of the men under study. 69.12% of the men under study attained tertiary level of education while 4.56% had no formal education at all.

Table 1: Sociodemographics (n=285).

Parameters	N (%)
Age (years)	
20-24	10
25–34	106
35-45	156
Above 45	13
Mean age: 33.38±5.09	
Level of education	
No formal education	13
Primary	50
Secondary	25
Tertiary	197
Religion	
Christian	152
Islam	121
African traditional religion	12
Occupation	
Professionals	66
Managerial and technical	51
Skilled occupations	115
Partly skilled	30
Unskilled	23
Marital status	
Single	5
Married	280
Occupation	
Professionals	66
Managerial and technical	51
Skilled occupations	115
Partly skilled	30
Unskilled	23

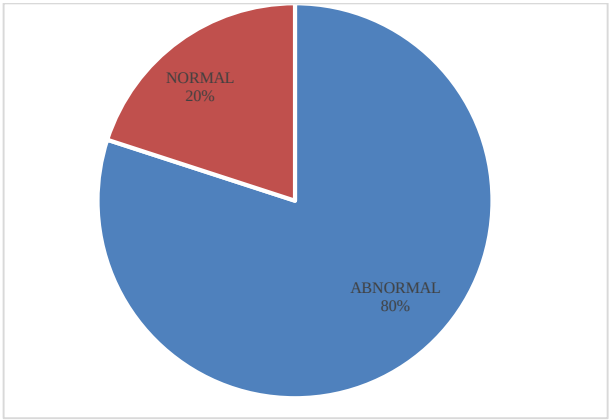

Figure 1: Proportion of couples with at least one abnormal semen parameter.

53.3% of man recruited in this study were Christians, with Muslims representing 42.4% of the study population under study. 98.25% of men in this study were married. Our

study showed that in 80% of the cases we reviewed, at least one semen parameter was abnormal.

Table 2: Semen parameters of male partners of infertile couples (n=285).

Characteristics	N
Semen volume	
Volume <1.4 ml	40
Volume >1.4 ml	245
Seminal fluid count	
Azoospermia	130
Cryptospermia	14
Oligospermia	45
Normal count	96
Motility	
Asthenospermia (motility <40%)	134
Motility > 40%	151
Morphology	
Teratospermia	147
Normal morphology	138
Combined characteristics	
Asthenoteratozospermia	73
Oligoasthenospermia	3
Oligoteratospermia	2
Oligoasthenoteratozospermia	32
Isolated abnormalities	96

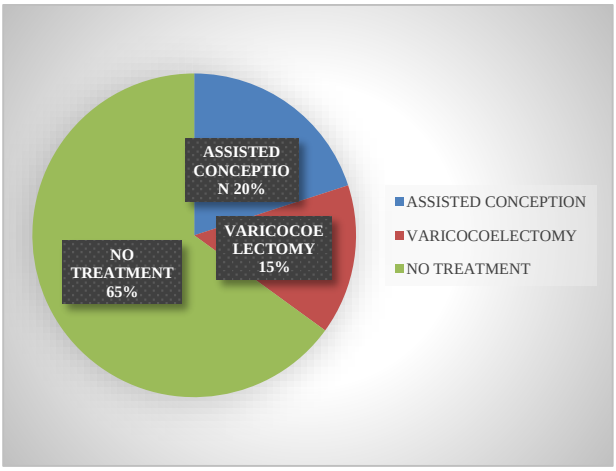

Figure 2: Interventions done for male partners of infertile couples.

The other 20% had normal semen parameters. The most common abnormal semen parameter observed in 51.6% of the cases studied was teratozoospermia. Asthenospermia, azospermia, isolated abnormalities, and asthenoteratozo-spermia, were also common, accounting for 47%, 45.6%, 46.6%, and 35.4% respectively. 34.4% of the cases had a normal sperm count, and 86% of the cases reviewed had normal semen volume. 48.4% of sperm had normal morphology, and 53.3% had normal sperm motility. Our study revealed that only 100 of the 285 men in the study had a documented intervention done on them. Majority of the men had no documented intervention done. Of the men who had interventions done, most opted to have in-vitro fertilization or intracytoplasmic sperm injection, accounting for 20% of the cases under study. About 15% opted for varicolectomy. Our findings showed a significant association between age and reduced volume of semen (<1.4 ml). The number of abnormal result (reduced volume) increased with age, with highest percentage (38.46%) seen in those aged above 45 (p=0.023). We also found a strong association between age and asthenospermia. The age group with highest percentage (76.92%) was seen in those aged above 45 (p=0.021), however number of abnormal results did not increase with increasing age. There is also a significant association between age and abnormal sperm count. The age group with highest percentage (76.92%) was seen in those aged above 45 (p=0.0063), however number of abnormal results did not increase with increasing age. Our findings did not show any statistically significant relationship between age and teratozospermia (p=0.45).

DISCUSSION

In this study we prospectively analysed the pattern of semen abnormalities of male partners of infertile couples that were evaluated at this facility over a period of one year. According to this study, up to 80% of male partners of couples seeking medical attention for inability to conceive in our environment have abnormal sperm quality. This is higher than the 67%, 68.0%, 31.8% and 75.4% found in similar studies conducted in Nnewi, Ile-Ife, Sokoto and Jarkata respectively.[13-15,28] This high figure could be attributed to the study area serving as a referral center for urologic conditions to urology clinics and gynaecologic conditions to gynaecologic clinics. Oligospermia and Asthenospermia affected 15.8% and 47% of the study population, respectively. This was higher than the 15.6% and 43.1% reported for Oligospermia and Asthenozospermia in a similar study in Sokoto, but less than the 25.6% and 11.5% reported in Ile-ife, South Western Nigeria.[14,15] It is also less than 33% but higher than 23.4% for Oligospermia and Asthenozospermia respectively in Abakaliki.[29] Semen volume abnormalities were observed in 40 (14%) participants who had a volume of less than 1.4 ml. This is lower than the 14.6% reported in an earlier study in Birnin-kudu, North Eastern Nigeria, and higher than 12.6% reported in South Western Nigeria, and also higher than the 7.3% reported by Nwafia in Enugu, Nigeria.[30-32] In this study, 45.6% of the participants were Azospermic. This reported value is higher than the 47.5% reported by Umar and colleagues in Sokoto, Nigeria, 26.98% in Birnin Kudu, and significantly higher than the 6.2% reported by Owolabi and colleagues in Abeokuta.[13,14,32] The disparities between centers could be attributed to sample size and laboratory influence. Furthermore, the strict measures and close supervision of both sperm collection and various laboratory techniques may contribute to the disparities. This study found Oligo-Astheno-zospermia, Oligo-terato-zospermia, and Oligo-Astheno-teratozospermia (OAT syndrome) in 1.5%, 1%, and 15.5% of male participants, respectively.

Table 3: Association between age and abnormal semen parameters.

Demographic parameters	Semen parameters		x^2	P value
Age (years)	**Semen volume N (%)**			
	<1.4 ml	**>1.4 ml**		
20-24	1 (10)	9 (90)	9.21	0.023
25–34	9 (8.49)	97 (91.51)		
35-45	25 (16.03)	131 (83.97)		
Above 45	5 (38.46)	8 (61.54)		
Age (years)	**Asthenospermia N (%)**			
	Yes	**No**		
20-24	2 (20)	8 (80)	9.13	0.021
25–34	55 (51.89)	51 (48.11)		
35-45	67 (42.95)	89 (57.05)		
Above 45	10 (76.92)	3 (23.08)		
Age (years)	**Semen count N (%)**			
	Normal	**Abnormal**		
20-24	8 (80)	2 (20)	6.342	0.0063
25–34	70 (66.04)	36 (33.96)		
35-45	108 (69.23)	48 (30.77)		
Above 45	3 (23.08)	10 (76.92)		
Age (years)	**Teratozospermia N (%)**			
	Normal	**Abnormal**		
20-24	8 (80)	33 (30)	12.43	0.45
25–34	70 (66.04)	36 (33.96)		
35-45	108 (69.23)	48 (30.77)		
Above 45	2 (15.38)	11 (84.62)		

This is significantly lower than the 12.7%, 33.3%, and 33.3% found in a similar study conducted in Birnin Kudi.[30] Owolabi and colleagues reported Oligoasthenozospermia and Oligoteratozospermia in Ile-Ife at 3.2% and 2.3%, respectively.[14] These findings were consistent with those reported in this study. In an Abeokuta study, the percentage of Oligo-Astheno-terato-zospermia (OAT syndrome) was 11.2%.[32] This figure was lower than the 15.5% found in our study. Oligoasthenozospermia, Oligoteratozospermia, and Oligoasthenoteratozospermia were found in Abeokuta at rates of 23.8%, 9.8%, and 11.20%, respectively.[32] These findings were significantly higher than what we found in our study.

CONCLUSION

The findings of this study revealed, very high prevalence of sperm abnormalities and high prevalence of male factor infertility in our sub-urban setting. Further studies to establish the prevalent risk factors in this setting will aid in the establishment of appropriate preventive measures and hence reduction in the prevalence of male factor infertility in our people.

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