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(RESEARCH ARTICLE)

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Characterization of sperm cells in infertile male subjects in southwest Nigeria

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Abstract

Sperm characteristics are used as proxy to estimate or gain insight into the underlying causes of male infertility. The aim of the study was to characterize sperm cells in infertile males in South-West Nigeria. This is a cross-sectional study involving 92 male subjects, grouped as 35 fertile males (control) and 57 infertile males (test subjects). The subjects, who volunteered, were attendees of Fertility Clinics in Lagos Metropolis, Lagos, Nigeria. Semen specimens were collected and analyzed with computer-assisted sperm analyzer (CASA) in conjunction with WHO guidelines for semen preparation and examination. Raw data obtained from the measurements, were subjected to statistical analysis using GraphPad Prism Version 5.03 (San Diego, California, USA). Results were expressed as percentage. The results revealed sperm cells in the infertile subjects as following: (a) based on sperm counts; the sperm cells were oligospermia and azoospermia with prevalence of 54 (79%) and 12 (21%) respectively. (b) Based on sperm cell morphology: the sperm cells were 14 (25%) oligoasthenoteratospermia, 12 (21%) teratospermia, 9 (16%) oligoasthenospermia; 9 (16%) oligoteratospermia, 5 (8%) asthenospermia, 4 (7%) asthenoteratospermia and 4 (7%). Cryptospermia. (c) Based on ejaculatory volume; 14 (24.5%) hypovolaemia, 2 (3.5%) hypervolaemic, and 41 (72%) normovolaemia, (d) Based on viscosity: 53 (93 %) Normoviscosity, and 4 (7%) hyperviscocity. In conclusion, Infertility in the studied population was caused by high percentage of spermatozoa with abnormal morphology.

Keyword: Characterization; Sperm cells; Infertile; Fertile; Male subjects; South-West Nigeria

1 Introduction

Infertility is a serious health problem that causes mental breakdown, trauma, divorce, misery, and long-term depression in most couples in Nigeria [1]. It is estimated that about 7% of males of reproductive age are infertile or sub fertile due to testicular, pre-testicular, or post-testicular problems [2].

Male infertility is defined as a man's failure to impregnate a woman after twelve months of regular and unprotected sexual intercourse when the woman does not have gynecological difficulties [3]. According to global estimates, roughly 72.4 million couples face fertility issues [4].

It might be simple to identify and address some variables that affect fertility, but it can often be challenging to pinpoint the exact cause of infertility. A man's fertility is dependent on the amount and quality of his sperm [5]. Because of limited medical resources, high treatment costs, cultural stigmas, taboos, and anxieties, the burden of infertility is typically greater in poor countries. Where medical resources are already stretched thin by providing basic healthcare, it is much harder to recognize and treat infertility [6].

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Despite many technical advances that have improved diagnostic skills, the etiological factors for male infertility are still obscure, and over 50% of men remain undiagnosed [2, 7].

2 Material and methods

2.1 Study area

Study was carried out in Lagos metropolis in Lagos State, Nigeria.

2.2 Ethical approval

Ethical approval was obtained from Health Research Ethics Committee, College of Medicine, University of Lagos, Nigeria. Also, written permission was obtained from various Clinics authorities and the participants were requested to fill informed consent before being recruited for the study.

2.3 Scope of experimental design

This is a cross sectional study involving 92 volunteered male subjects, recruited after screening.

2.4 Volunteer group

Ninety-two (92) subjects were recruited in the study.

2.5 Control group

This group consisted of thirty-five (35) male fertile subjects within the age range of 30-59 years.

2.6 Experimental group

This group consisted of fifty-seven (57) infertile males within the age range of 30-59 years.

2.7 Inclusion Criteria

According to World Health Organization guidelines, the inclusion was based on the sperm total motility of less than 32% for the infertile male subjects and the control male subjects with total motility greater than 32% [8].

2.8 Exclusion Criteria

Male subjects with any of the following criteria were excluded from the study, varicocele, cryptorchidism, iatrogenic infertility, testis trauma, previous genital infections, and exposure to chemotherapeutics or radiation, Klinefelter's Syndrome, cystic fibrosis, addiction to smoking, alcohol drinking and environmental exposure like driving job, miners, bakers, and workers of chemical plants).

2.9 Specimen collection and processing

Semen specimen was collected from eligible subjects (test subjects and control subjects) into universal sterile plastic containers by masturbation after abstinence period of 72 hours. The seminal plasma specimens were obtained by centrifugation at 4500 rpm for 10 minutes and transferred into a new clean leak free container and stored at -70 ºC prior to analysis.

2.10 Semen analysis (Computer-assisted sperm analyzer)

Computer-assisted sperm analyzer (CASA) machine was to estimate the sperm cells and semen parameters.

2.11 Statistical analysis

GraphPad prism version 5.03 (San Diego, California, USA) was used to express the results as percentage, mean ± standard deviation. Analysis of variance and Tukey's post-hoc of multiple comparisons was used to compare significance of difference of the measured parameters set at $p<0.05$.

3 Results and discussion

Table 1 Age category of study subjects

Age (years)	Number	Prevalence	% Prevalence	X^2 value	P value	Remark
30-39 (control)	19	0.206	20.6	47. 4435	0.0001	S
40 -49 (control)	14	0.152	15.2			
50 -59 (control)	2	0.22	2.2			
30-39 (Infertile)	33	0.358	35.8			
40-49 (Infertile)	22	0.239	23.9			
50-59 (Infertile)	2	0.22	2.2			

The chi-square result showed significant difference ($p<0.05$) in the number of subjects in each age category when compared.

Table 2 Characterization of sperm cell volume in the infertile male subjects (n=57)

Ejaculatory Volume (mL)	Number	Prevalence	% Prevalence	X^2 Value	P value	Remark
Hypovolaemia	14	0.245	24.5	43.043		S
Normovolaemic	2	0.035	3.5			
Hypervolaemia	41	0.719	72			

The results showed hypovolaemia, normovolaemic and hypervolaemia in the infertile male subjects. Chi-square result indicating significant difference in prevalence ($p<0.05$).

Table 3 Characterization of semen viscosity in the infertile male subjects (n=57)

Semen viscosity	Number	Prevalence	% Prevalence	X^2 value	P value	Remark
Hyperviscocity	4	0.070	7	40.06	0.001	S
Normoviscocity	53	0.929	93			

The results showed infertile male subjects' semen as hyperviscous and normoviscous, with significant difference in prevalence ($p<0.05$).

Table 4 Characterization of sperm cell count in the infertile male subjects (n=57)

Sperm counts	Number	Prevalence	% Prevalence	X^2 Value	P value	Remark
Oligospermia	45	0.789	79	18.674	0.0001	S
Azoospermia	12	0.210	21			

The results showed the infertile sperm cells as oligospermia and azoospermia, with higher prevalence of oligospermia.

The results showed the morphology of infertile sperm cells as oligoasthenospermia, teratospermia, asthenoteratospermia, oligoteratospermia, Cryptospermia, and oligoathenoteratospermia, with oligoathenoteratospermia showing the highest prevalence.

Table 5 Characterization of sperm cell morphology in the infertile male subjects (n=57)

Sperm morphology	Number	Prevalence	% Prevalence	X^2 value	P value	Remark
Asthenospermia	5	0.087	8.77	0.0075	0.9312	**NS**
Oligoasthenospermia	9	0.157	15.78			
Teratospermia	12	0.210	21.05			
Asthenoteratospermia	4	0.070	7.012			
Oligoteratospermia	9	0.157	15.78			
Cryptospermia	4	0.070	7.02			
Oligoathenoteratospermia	14	0.254	24.56			

4 Conclusion

Infertility in the studied population was caused by high percentage of spermatozoa with abnormal morphology. We observed more of the infertile male subject to characterised as oligoasthenoteratospermic with normovolaemic and normoviscous semen.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval was obtained from Health Research Ethics Committee, College of Medicine, University of Lagos, with the approval number CMUL/HREC/02/21/543.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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