

## THE SEMEN OF FERTILE BLACK MALES: ANALYSIS OF 100 CONSECUTIVE CASES

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The fertility potential of any male can be predicted through the evaluation of his semen. Over the years, it seems the figures of sperm density considered compatible with fertility have gradually been reducing. Macleod and Gold<sup>1</sup> and the American Fertility Society<sup>2</sup> recommended that sperm density of 20-40x10<sup>6</sup>/mL should be regarded as the minimum for fertility. These studies were conducted a long time ago and the data were on fertile males from the developed countries.

In 1992, the World Health Organization (WHO)<sup>3</sup> proposed that 20x10<sup>6</sup>/mL should be the universally accepted limit of fertility. This limit has up to recent times been used in assessing the fertility potential of males in both developed and developing countries. However, a wealth of evidence in the reproductive biomedical literature indicates that factors such as nutritional, stress, environmental and demographic status affect the sperm picture of males.<sup>4,5</sup> This implies that there is the need for each country and each region of a country, and even individual laboratories, to establish their own reference parameters. The above studies laid more emphasis on sperm counts. More recent reports specify that other conventional semen parameters, such as morphology, motility and vitality, are equally important in assessing the fertility potentials of males.<sup>6,7</sup> Hence, there is need for the inclusion and increased emphasis on these parameters in all semen analyses and evaluation exercises.

A recent study using the Western and WHO's limits of fertility indicates that the male factor to infertility in Ile-Ife, Nigeria, may be as high as 63.1%.<sup>8</sup> Such a conclusion can only be validated if the normal semen values in fertile males in this environment are known.

Chukudebelu<sup>9</sup> and Osegbe et al.<sup>10</sup> have attempted to establish seminal indices in fertile males in Enugu and

Lagos, Nigeria, respectively. The results of these studies showed a wide variation in the parameters estimated. It is against this background that we conducted the present study to establish the seminal fluid indices of fertile black males in Ile-Ife, Nigeria, where none exist, and to compare the results with those obtained from other parts of the same country.

### Subjects and Methods

This study took place in the antenatal clinics of Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Nigeria. A period of 16 months was fixed for this study. Clearance was sought and obtained from the Research and Ethical Committee of the Obafemi Awolowo University Teaching Hospital Complex for the study.

Every consecutive subject who was contacted and agreed to participate in the study was included. They were made up of male partners of pregnant women attending the antenatal clinics of this hospital. Each woman who attended the clinic within the study period was requested to bring the husband to the succeeding clinic. The purpose of the study was explained to husbands who responded and their informed consent obtained. A total of 148 husbands of fertile couples responded, however, only 100 of them agreed to participate in the study. They were interviewed with structured questionnaires incorporating the following: age, years of marriage, number of children, coital habits, education, occupation and ethnicity. Semen samples were collected by masturbation from each subject using a wide mouth sterile container after at least three days of coital abstinence. Complete semen analysis (sperm count, volume, pH, viscosity, morphology, motility and vitality) was performed as soon as the specimen underwent liquefaction but within two hours of production, following the guidelines in the WHO laboratory manual for the examination of human semen and sperm-cervical mucus interaction.<sup>3</sup>

### Results

Social and personal characteristics of the 100 husbands are shown in Table 1. The mean age of the subjects was 36.83 years. They had been married for a mean period of 6.62 years and had fathered a mean of 2.77 children each.

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TABLE 1. Socio-demographic characteristics of 100 husbands of fertile couples.

Mean age (years±SD)	36.82±9.01	Range (26-60)
Mean years of marriage±SD	6.62±4.88	Range (3-23)
Mean number of children fathered	2.77±1.79	Range (1-9)
	No. of subject	Percentage
Religion		
Christian	90	90
Muslim	10	10
Education		
Educated (literate in English)	78	78
Uneducated	22	22
Occupation		
Civil servants	34	34
Farmers	31	31
Traders	19	19
Technicians	16	16
Ethnicity		
Yoruba	78	78
Igbo	12	12
Others	10	10

TABLE 2. Mean, standard error of the mean (SEM) and standard deviation (SD) of semen parameters of 100 husbands of fertile couples.

Semen parameter	Mean±SEM (SD)
Volume (ml)	2.26±0.74 (1.07)
Sperm count(x10 <sup>6</sup> /ml)	57.05±4.77 (47.71)
Vitality (%)	65.34±1.47 (14.72)
PH	7.76±0.06 (0.25)
Morphology (%)	65.2±1.0 (9.98)
Motility (%)	62.02±1.37 (11.6)

TABLE 3. Distribution of male partners of fertile couples by sperm counts.

Semen counts range (10 <sup>6</sup> /ml)	No. of male partners
0-9	8
10-19	25
20-29	8
30-39	6
40-49	5
50-59	7
60-69	8
70-79	5
80-89	6
90-99	9
Above 100	13

Other personal characteristics show that 90% were Christians, while Muslims constituted 10%. Also, 78% of the subjects were educated. Civil servants, farmers and technicians constituted 34%, 31% and 16% of the total population, respectively. The Yorubas constituted 78%, Igbos 12%, and 10% were from the remaining ethnic groups. The mean, standard error of the mean (SEM), and standard deviation (SD) of semen parameters of male partners of fertile couples are shown in Table 2. The mean values obtained were: volume 2.26 mL, sperm count 57.05x10<sup>6</sup>/mL, vitality 65.34%, pH 7.76, normal morphology 65.2%, and motility 62.02%.

Table 3 shows the distribution of male partners of fertile couples by sperm count. Twenty-five percent of them had sperm counts of 10-19x10<sup>6</sup>/mL. Semen parameters in fertile Nigerians within the past 20 years are shown in Table 4. It is observed that 33% of male partners of fertile couples in the present study had sperm counts below 20x10<sup>6</sup>/mL.

## Discussion

In this study, semen analyses were done strictly on husbands whose wives were pregnant. Hence, this result can provide a predictive index of the fertility potential of these males. As shown in Table 2, the mean sperm count of fertile males in this study was 57.05x10<sup>6</sup>/mL. In related studies from other parts of Nigeria such as in Ibadan,<sup>11</sup> Enugu,<sup>9</sup> Lagos<sup>10</sup> and Ilorin,<sup>12</sup> the sperm counts obtained were 71.2x10<sup>6</sup>/mL, 37.5x10<sup>6</sup>/mL, 54.56x10<sup>6</sup>/mL, and 87.9x10<sup>6</sup>/mL, respectively (Table 3).

Sharp and Skakkebaek<sup>4</sup> and Vine<sup>13</sup> proposed that environmental exposure to harmful compounds and other social and behavioral factors such as smoking and drinking may cause a variation in sperm counts of people from different parts of the world and even from different regions in the same country. The above variation in sperm counts of men from different regions of Nigeria may be due to some of these factors. However, subject selection and variations in laboratory methods are contributing factors that would greatly influence research results, since confounding factors are sometimes not controlled. For instance, sperm count may be affected by a period of abstinence from sex prior to semen collection.<sup>14</sup> Despite this, different laboratories ask their subjects to abstain for varying number of days. Also the semen analysis values obtained in the present study with a sample size of 100 are similar to those of Lagos<sup>10</sup> with the same sample size, but differ from results from Ibadan<sup>11</sup> and Ilorin<sup>12</sup> with sample sizes of 53 and 20 subjects, respectively. Hence, sample size could be one of the factors responsible for variations in results. Table 4 further shows that other semen parameters such as motility, vitality and morphology differ from one study to another. Thus, it is suggested that adequate measures should be taken to standardize the measurements of these parameters. This will be of immense assistance to reproductive health scientists in making reliable comparison of semen parameters from different environments.

The issue of the lowest sperm count compatible with fertility has been a point of controversy in the reproductive health literature. WHO<sup>3</sup> recommended the general acceptance of 20x10<sup>6</sup>/mL as the minimum requirement for fertility, concordant with the reports of Macleod and Gold<sup>1</sup> and the American Fertility Society.<sup>2</sup> The results of the present study and other related studies in Nigeria (Table 4), show that the limit of 20x10<sup>6</sup>/mL may be unrealistic in this environment. Between 7.6% and 36.1% of male partners of fertile subjects in studies that have been conducted in

TABLE 4. Comparison of the results of semen parameters in fertile Nigerians within the past 20 years.

Author	Year	Mean volume (ml)	Mean sperm count $\times 10^6/\text{ml}$	Motility %	Morphology %	Count less than $20 \times 10^6/\text{ml}$	No. of subjects
Ladipo <sup>11</sup> (Ibadan)	1980	3	71.2	60	62	7.6	5.3
Chukudebelu <sup>9</sup> (Enugu)	1981	2.4	37.5	54	67	36.1	122
Osegbe et al <sup>10</sup> (Lagos)	1986	2.6	54.65	61	71	34	100
Sobowole/Akinwumi <sup>12</sup> (Ilorin)	1989	–	87.90	54.5	74.5	–	20
Present study (Ile-Ife)	2000	2.26	57.05	62.02	65.2	33.0	100

Nigeria, including those in the present study, will not meet the lowest limit of the  $20 \times 10^6/\text{mL}$  proposed. What is clear is that if the partners of these subjects had not been pregnant, they would have been declared infertile and have been subjected to treatment.

Examining data that had been published in 61 papers between 1938 and 1991 on 14,947 men, Carlsen et al.<sup>15</sup> observed a clearly significant decline in average sperm count from  $113 \times 10^6/\text{mL}$  in 1940 to  $66 \times 10^6/\text{mL}$  in 1990. This implies that the mean sperm count for both fertile and infertile males has been decreasing with stable or rising fertility, as observed in certain places.

Frequency distributions of male partners of fertile couples by sperm count in this study show that the highest proportion of them (25%) had sperm counts between 10 and  $19 \times 10^6/\text{mL}$  (Table 3). This may possibly indicate the most likely range for fertile men in Ile-Ife, Nigeria. A mean semen volume of 2.26 mL, motility of 62.02%, morphology of 65.2%, vitality of 65.3% and pH of 7.76 obtained in the present study (Table 2) is adequate for fertility, and might have been what has increased the fertility potentials of these men despite higher proportion of sperm counts below the universally accepted range.

Studies by Ombelet et al.<sup>16</sup> using receiver-operating characteristics curve obtained a threshold value of sperm morphology of 10% as minimum requirement for fertility in a group of patients in Belgium. More recently, Gunalp et al.<sup>17</sup> similarly applied the receiver-operating characteristics curve and positive- and negative-predictive values on semen collected from a population in Turkey and proposed that threshold values of 5% morphology, 14% progressive motility, 30% motility and a concentration sperm count of  $9 \times 10^6/\text{mL}$  should be considered as the minimum limit for fertility in men. Though these studies were conducted among Caucasians, there is a need for similar studies that will incorporate receiver-operating characteristics and positive- and negative-predictive values in this locality for comparison. These studies further confirm the fact that sperm parameters lower than the WHO<sup>3</sup> proposed range may be adequate for fertility.

Earlier studies in Yaounde, Cameroon,<sup>18</sup> and Lagos, Nigeria,<sup>19</sup> had proposed that in so far as the other semen parameters are normal, minimum sperm count of 10 million per mL could be adequate for fertility. A compensated increase in pregnancy rates with sperm of lower counts has been suggested to be due to good quality of other semen

parameters, better understanding of genital diseases in women, improved diagnostic methods coupled with effective treatment that has increased the reproductive potential of women.<sup>8,10</sup>

These results indicate that there is need for a uniform protocol for semen analysis, and that the assessment of the fertility potential of a male should not be based on sperm count alone but other conventional parameters as well. The results also show that the criteria used in assessing the fertility potential of males in developed countries are not compatible with the situation in this environment. Hence, there is need for a larger community-based study that will establish normal ranges of both sperm count and other semen parameters in fertile black males in this locality and presumably in other developing countries.

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