SEMINAL ANALYSIS IN FERTILE AND INFERTILE NIGERIAN MEN

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Semen quality was estimated in 53 males of proven fertility and 370 males in infertile marriages. The mean sperm count for the fertile males and males in the infertile population was 71.2 million/ml and 46.8 million/ml, respectively. In the series, 49.1 percent of the infertile males had pathological spermograms. There is need for epidemiological studies to identify the causative factors and in cases in which therapeutic recovery cannot be achieved, artificial insemination should be encouraged.

Medically, infertility is a unique condition in which one must consider that two individuals, the husband or wife or both, may have factors contributing to reproductive failure. The male role in infertility has been neglected until recently, especially in this culture where sexual potency is equated with normal male fertility potential. There is increasing awareness of the male factor in infertility and levels varying between 36-50 percent have been reported.[1-3]

The basic means for evaluating male fertility is the microscopic examination of semen, a procedure that depends for its effectiveness to a considerable extent on the experience of the examiner. Seminalysis, though subjective, is the most useful and universally accepted method of quantifying male fertility potential.[4] Serum estimation of gonadotrophic hormones and testosterone, although desirable, could be normal in most infertile males.[5]

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In view of the lack of adequate data on semen quality in this environment, this study was initiated in 1974 with the objective of filling the data gaps on the quality of semen in fertile and infertile males.

PATIENTS AND METHODS

On at least two occasions at monthly intervals, semen samples were collected in plastic universal containers, by masturbation and after five days of sexual continence from 53 men of proven fertility and 370 men in infertile marriages. The criterion for selection of men of proven fertility was that their sexual partners were pregnant when request was made for either antenatal care or menstrual regulation at the University College Hospital, Ibadan, Nigeria.

The semen quality was estimated within two hours of collection, noting the volume, viscosity, sperm density, the percentage qualitative motility, abnormal morphology, and white cell level.

RESULTS

The average age of the fertile men was 28.9 years while the average age of men in infertile marriage was 33.2 years (Table 1).

The mean ejaculate volume, which showed no statistical difference between the two groups, was 3 ml for men of proven fertility and 2.3 ml for the men in infertile marriage. Only 1.9 percent of the fertile men had abnormal ejaculate volume, ie, semen volume more than 4.5 ml or less than 1.5 ml. However, among the men in infertile marriages,

TABLE 1. SEMEN QUALITY IN FERTILE MALES AND PATIENTS IN INFERTILE MARRIAGES FREQUENCY DISTRIBUTION OF SPERM (MILLION/ML)

	Number of Patients	Average Age	Mean Volume (ml)	Mean Count (Million/ml)	Frequency Distribution of Sperm (million/ml) <10	10.1-20	20.1-40	40.1-60	60.1-100	>100	Total % of Counts 0-20	*Azoospermia
Fertile Males	53	28.9 SD 7.9	3 ml SD 0.17	71.2 SD 39.8	0 (0)	4 (7.6)	8 (15.1)	12 (22.6)	23 (43.4)	6 (11.3)	4 (7.6)	0
Males In Infertile Marriage	370	33.2 SD 5.6	2.3 SD 1.31	46.8* (SD 48.2)	87 (27.4)	41 (12.9)	49 (15.1)	48 (15.1)	51 (16.1)	41 (12.9)	182 (49.1)	54 (14.6)

*Azoospermia not included in sperm means or in frequency distribution
In parentheses % counts (million/ml)

20 patients (5.4 percent) had ejaculate volumes greater than 4.5 ml while 78 patients (21.0 percent) had ejaculate volumes less than 1.5 ml. The viscosity of the semen showed no obvious relationship to any of the groups.

Table 1 shows the frequency distribution of sperm counts (million/ml) in the two groups. The mean sperm count for the fertile men was 71.2 million/ml compared with 46.8 million/ml for the men in infertile marriages ($P<0.001$). Azoospermic males were excluded from the sperm mean and frequency distribution. Of the males in infertile union 49.1 percent were azooligospermic while in the fertile group only 7.6 percent were oligospermic ($P<0.001$). Table 2 shows the severity of oligospermia in both groups. In the fertile group all oligospermic males were of the mild variety while two thirds of the oligospermic males in infertile marriages were of the moderate to severe variety with 18 percent aspermia.

Table 3, which illustrates the qualitative motility in the two patient groups, shows that among the fertile males only 5.7 percent had an average percentage motility grade less than 40 percent while in males in infertile marriages 28.7 percent had poor motility index. These patients also had a low sperm density.

Table 4 illustrates the range of percentage abnormal sperm morphology in the two groups. Only 3.8 percent of the fertile group had a percentage of abnormal sperm morphology >30 percent while 34.6 percent of men in the infertile marriages group had pathologically high abnormal sperm morphology in their ejaculate.

About two thirds of semen from infertile males had pus cells and, interestingly, 25 percent had more than five pus cells per high power field (HPF). Twenty patients (37.7 percent) in the fertile group also had pus cells in their ejaculate, however, there were few, ie, one to three pus cells per HPF.

DISCUSSION

In establishing an infertility clinic, the gynecologist should have adequate knowledge about the normal spermogram in his environment,

TABLE 2. SEVERITY OF OLIGOSPERMIA IN FERTILE MALES AND MALES IN INFERTILE MARRIAGES

Serum Count (million/ml)	Fertile group	Infertile group
10.1-20 (mild)	4 (100%)	41 (32.0)
5.1-10 (moderate)	0 (0)	30 (23.4)
1-5 (severe)	0 (0)	34 (26.6)
<1 (aspermia)	0 (0)	23 (18.0)
Total	4 (100)	128 (100)

In parentheses % of oligospermic patients, ie, sperm count ≤20 million/ml

TABLE 3. QUALITATIVE OR PURPOSEFUL MOTILITY IN FERTILE MALES AND MALES IN INFERTILE MARRIAGES (Mean Percentage Motility)

	Number of Cases 1-20		20.1-40	40.1-60	60	Necrospermia
Fertile Males	53	—	3 (5.7)	22 (41.5)	28 (52.8)	—
Males in Infertile Marriages	317*	35 (11.0)	55 (17.4)	92 (29.0)	120 (37.9)	15(3.7%)

In parentheses % motile sperms
*Azoospermic patients not included

particularly in less privileged communities where andrologists are either very few or do not exist, coupled with a large clientele with a greater number of morbid urological problems. Infertile males in such environment are usually in an unfavorable situation with regard to medical attention and their only hope is that a physician will be available with sufficient interest and adequate facilities to examine them and give rational therapy if indicated. That the gynecologist should be sufficiently familiar with normal and abnormal semen profiles is essential since in the final analysis, the study of the infertile couple is done by the gynecologist.

The seminal ejaculate volume is not standardized; however, it has been suggested that semen volume is significantly higher in infertile than fertile men.[3] Amelar and Dubin[6] suggested a normal seminal volume range of one to four ml while others recommended a range of two to five ml as normal with an average of 3.1 ml.[7] In this study, although there is no statistical difference in the mean ejaculate volume, more males in infertile marriage had seminal volume less than 1.5 ml when compared

TABLE 4. ABNORMAL SPERM MORPHOLOGY (%)

	Number of Patients	<10	10.1-20	20.1-30	30.1-40	>40
Fertile Patients	53	22	21	8	2	—
Patients in Infertile Marriages	260	50	65	55	60	30

with the observations in fertile males. The low seminal volume was often associated with a pathologically low sperm density. This is in support of the observation of Cockett et al.[8] The fertile males in this study had a mean seminal volume of 3 ml which is within the range of 2.50-3.36 ml reported in the literature for fertile population.[3,7,9,10] However, there may be no relationship between semen volume and ease of conception.[11]

The mean sperm density among the fertile population in this series was 71.2 million/ml which is statistically greater than the value of 46.8 million/ml observed in the infertile marriage population ($P<0.001$). The mean sperm count reported in the literature for the Caucasian fertile population is higher, with a range between 79-137 million/ml[3,7,9,12] while, for the infertile marriage population, our mean sperm density is similar to the observation of Santomauro et al[13] who also reported a mean ejaculate volume of 2.2 ml. The sperm density in this group is, however, lower than the values reported by others.[3,7,14] Among the fertile population 7.6 percent had sperm counts of $\leq$ 20 million/ml. While 11.3 percent had a sperm count > 100 million/ml. The latter observation is extremely low compared with the observation of between 20-44 percent reported in the literature,[3,9,10,12] but similar to the results of Nelson and Bunge.[15] In the infertile population 40.3 percent of our patients had sperm count $\leq$ 20 million/ml while 12.9 percent had sperm count > 100 million/ml. The former value is much higher than the observation of Macleod and Wang[7] which suggests that a higher proportion of our infertile marriage population has low sperm density thus highlighting the magnitude of male infertility in this environment. This difference in the frequency distribution explains the lower mean sperm count in this series as compared with that of Macleod and Wang.[7] Moreover, in our series, 14.6 percent of the patients were azoospermic, an observation which is also higher than 3.7 percent reported by Macleod and Wang.[7] It is generally accepted that sperm density of 0-20 million/ml is indicative of poor fertility potential, hence, that 49.1 percent of patients in the infertile population fall into this category is highly significant.

Sperm count per se is meaningless unless it is considered in the context of the value of qualitative or purposeful motility. The sperm motility index is by far the most important parameter in semen quality[3] and can be a strong compensating factor when sperm counts are consistently low. At least 40 percent of spermatozoa in any given ejaculate must show active motility to ensure a reasonable chance of pregnancy in a fertile woman.[6,16] In this study 94.3 percent of the fertile population had mean percentage motility score over 40 percent while among the infertile population only two thirds of the patients were similarly scored. Among the latter group there were also 15 cases (3.7 percent) of necrospermia. In general, patients with low sperm density tend to have poor motility indexes.

Although sperm concentration and motility can be affected by stress factors such as viral infections, the sperm morphology is relatively unaffected.[17] The concentration of abnormal sperm morphology is unequivocally as important as the sperm motility index in determining the fertility potential of an individual. In this study 3.7 percent of the fertile population as compared with 34.6 per-

cent (<0.001) of the infertile population had mean percentage abnormal sperm morphology greater than 30 percent. This is similar to observation of other workers who also reported that the magnitude of morphologically abnormal sperms can also be related to sperm density and motility.[3,8,18] Consequently, an ejaculate specimen with high abnormal spermatozoa will have markedly reduced fertilizing potential. Increase in abnormal sperm morphology has been reported in association with stress factors, varicocele prostatitis, and epididymitis.[4,17,19] Postligation seminalysis study in cases of varicocele have shown considerable improvement in sperm morphology, density, and motility.[4,20] However, of these improved parameters, the most important factor, positively enhancing and related to the number of subsequent pregnancies, is improved qualitative motility. The dominance of sperm motility in these pregnancies was most significant at the sperm count level of ≤ 10 million/ml.[20]

In this study, the semen quality of the fertile population is significantly better than that of males in infertile marriages. Although there was no statistical difference in the mean ejaculate volume the observation of low sperm density (0-20 million/ml) in 49.1 percent of the males in infertile marriage highlights the significance of the male contribution to sterility in this environment. There is an urgent need for prospective epidemiological study to provide a rational explanation for an increasing male sterility in a society generally assumed to be highly fecund. Gonadal sclerosing factors may not be unconnected with prevailing stress factors and widespread sexually transmitted venereal diseases.[21,22]

An understanding of the cause-effect relationship between these pathogens and sterility will no doubt help in preventive health programs. This is essential, considering the premium on childbearing and parenthood in this culture. In cases in which therapeutic recovery leading to conception cannot be achieved by conventional methods, artificial insemination should be encouraged.

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