DETERMINATION OF THE SEMEN QUALITY IN MALE PARTNERS OF INFERTILE COUPLES IN AMINU KANO TEACHING HOSPITAL, KANO: A THREE YEAR REVIEW

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ABSTRACT

Context

Male infertility contributes a lot to the causes of infertility among couples attending Gynaecology clinics in our environment.

Objectives:

To determine semen quality in male partners of infertile couples attending Gynaecology Clinic in Aminu Kano Teaching Hospital, and to describe the pattern of abnormality found among the semen samples.

Methodology:

Reports of semen samples submitted to the andrology laboratory of AKTH Kano, over a period of three years, were analysed

Results:

A total of 558 semen samples were analysed for semen quality out of 562 samples over the three-year period. Two hundred and eleven (37.8%) had normal semen quality or parameters, while 347 (62.2%) had abnormal semen quality or parameters. The abnormal semen parameters consisted of low sperm volume (25.8%), prolonged liquefaction time (27.2%), azoospermia (14.2%), oligozoospermia (39.4%), teratozoospermia (23.7%), asthenozoospermia (61.6%) and the combined defect of Oligo-Asthenozoospermia (12.8%),Oligo-teratozoospermia (6.0%), Asthenozo-teratozoospermia (5.2%), oligo-astheno-teratozoospermia (11.6%).

Conclusion:

The study showed that abnormal semen parameters are a major contributor of male factor infertility in our environment. Efforts geared towards preventing the contributory factors will go a long way in alleviating the agony of infertile couples due to male factors.

Key words: seminal fluid, male factor, infertility, Kano

INTRODUCTION

Twenty five percent of couples conceive after one month of unprotected intercourse. Sixty three percent conceive after six months, seventy five percent after nine months and eighty five percent after one year. However, about 15% are unable to do so without assistance[1]. Infertility remains a big problem worldwide and the male partner is implicated in 50% of cases.[2,3] Generally, 1 out of 7 couples will have problem with fertility[4]. In sub-Saharan Africa the prevalence is as high as 30%[3,4] though it is a neglected reproductive health issue in our community. In Nigeria, male infertility due to poor semen quality contributes to 20-48%
of all infertile unions[3,5.] Reports indicate that the major causes of male infertility are unexplained.[3]

Trials done in Spain and other countries reported a global decline in semen quality especially the sperm count. Reasons attributed to the decline include global warming and increased incidence of sexually transmitted infections. This has prompted a call for periodic assay in most communities[2] Sexually transmitted infections mostly Neisseria Gonorrhoea and Chlamydia Trachomatis play an important role as a cause of impaired semen quality in our environment. They cause epididymitis, inflammation of vas deferens, prostatitis and urethritis. This could cause blockage of the semen outflow tract. High incidence of these occur in men with multiple sexual partners and those in a polygamous setting[6.] Tuberculosis and Mumps orchitis also directly or indirectly damage the testicular cells leading to poor semen quality and infertility. Ojengbede et al[7] using alpha-glucoside test found occlusion of the vas deference in men with semen abnormality. They also discovered high titres of anti-sperm antibodies in those men.

Other factors attributable to abnormal semen quality and hence male infertility are cigarette smoking, moderate to heavy alcohol and caffeine consumption, types of occupation (exposure to heat as in long distance driving), and concurrent medical illness like diabetes mellitus, hyperthyroidism and hypertension. Others include use of native medication, previous exposure to drugs which depress testicular function such as anti-depressants, anti-hypertensives and nitrofurantoin[6]. Ibeh et al[8] found high concentrations of aflatoxins in infertile Nigerian men who consume native substances and medications. Surgical operations like inguinal herniorrhaphy, repair of testicular maldescent and testicular biopsies are other causes[6]. Idiopathic testicular atrophy, cryptorchidism and hormonal factors such as hyperprolactinaemia as well as chromosomal abnormalities (47xxy or 46xx), testicular tumours and varicocele contribute their quota in abnormal semen quality[9,10].

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Seminal fluid analysis constitutes an important tool in the investigation of infertile male partners. The information obtained aid in diagnosing the nature of the infertility. In 1929, Macomber and Sanders reported the normal sperm density to be 100million/ml[11]. Twenty years later, Abner Weisman reported a density of 80-120 million/ml[11]. It was not until the Macleod and Goldis landmark study in 1951 that a density of 20 million/ml was accepted as a statistically important limit below which the likelihood of infertility appeared to increase[11]. Various parameters have also been proposed for motility and morphology but the widely accepted values remain that of Macleod who proposed 50% progressive motility and 30% morphology as the lower limit and has been adopted by W.H.O. However, Kruger et al in 1986 described a strict criteria where less than 14% normal morphology would indicate the need for assisted conception[12].

The methods of semen analysis range from using conventional methods to the most recent computer aided semen analysis (CASA), which qualifies motility better[4]. Other advanced semen analysis methods include sperm assays, sperm hypo-osmotic swelling test and sperm penetration test. These methods are mainly available in andrology units of advanced countries. On the other hand, most laboratories in the developing world still rely on the older conventional methods of analysis although the modern methods are becoming increasingly available. This has prompted WHO to introduce standard procedures for comparison of variables in semen analysis using these various methods. This also makes interpretation of results comparable. Personnel training and quality control also improve clinical judgment. Semen analysis being a most important diagnostic tool in the investigation of male partners of infertile couple, is usually enhanced when standard procedures are employed by skilled and trained analysts. The interpretation of results obtained should be done with caution especially as it relates to fertility status of the male because it has been shown that about 25% of couples achieve pregnancy within a 2-year period despite abnormal semen quality in the male partners[12].

Various factors have effect on the quality of semen samples analysed. They include duration of abstinence from sexual intercourse, method of semen collection, method of analysis, and the type of counting chamber used. A period of 2-5 days of abstinence from ejaculation is recommended[13]. Longer periods lead to poor motility and morphology but with high counts while shorter periods may lead to low count but improved motility[13]. The semen is best collected by masturbation and all the semen volume are needed for analysis. Semen collected by interrupted intercourse or spillage during masturbation is not favoured as it risks obtaining poor semen sample particularly after loss of the first fraction of ejaculate. Where this occurs, repeat analysis is required. Semen should never be collected into an ordinary condom because it has spermicide[15].

Abnormal semen samples should be repeated up to 3 times at two to three weeks interval to confirm the abnormalities detected earlier. It is pertinent to note that even though normal ranges are given for various parameters, these do not separate clearly between infertile and fertile semen since conception has occurred in males classified as having abnormal semen quality, which then argues for more time in commencing treatment especially if the female parameters point towards good prognosis[12]. Most cases of male infertility defy conventional methods of treatment. Since the causes of male infertility are diverse, a proper search for the aetiological factor which can be treated is proper. Treatment include the proper management of infections, surgical treatment of varicocoeles and undescended testis, limiting exposure to hazardous substances and the use of assisted reproductive technology such as intracytoplasmic sperm injection technique[9].

OBJECTIVES

The objectives of the study were to determine semen quality in male partners of infertile couple attending the gynaecology clinic at Aminu Kano Teaching Hospital Kano and to describe the pattern of abnormalities found in the semen samples.

MATERIALS AND METHODS

The semen samples of 558 males amongst infertile couple being investigated for infertility from 1st July 2001 to 30th June 2004 (a period of three years) were evaluated. The records from the microbiology/Andrology laboratory of Aminu Kano Teaching Hospital Kano were utilized for the study.

The WHO guidelines for analysing semen samples were used. Masturbation was the method of semen collection usually into a sterile container conveniently performed in the facility provided in the laboratory. Home environment was however acceptable provided the sample was rapidly transported within one hour at body temperature to the laboratory. Examination was done after liquefaction or within an hour.

Assessment of the appearance, viscosity and volume were then done. Then using a Pasteur pipette, a drop of the sample was placed on a clean grease free slide with a cover slip placed on top of the slide. Examination under the microscope was done using x10 objective lens to observe for motile sperm cells. Motility pattern observed were graded as rapid progressive motile, slow progressive motile, non-progressive motile and non-motile. Observation under the microscope using x 40 objectives was then done to assess the morphology of the cells.

In order to obtain the sperm count, a 1 in 20 dilution of the semen in distilled water was made i.e., 1ml of semen to 9mls of distilled water. These were mixed and used to charge the counting chamber (Improved Neubaur Chamber). Examination under x 10 microscope objective lens was done and the number of cells in the recommended squares were counted. The total number of cells was obtained by multiplying the number of cells counted by the dilution factor. The result obtained was multiplied by 10^6 to finally arrive at the sperm count or concentration per ml.

In accessing the morphology of the spermatozoa, those samples with no spermatozoa in their wet preparation were centrifuged for 10 minutes and the sediments recovered were examined using x 40 objective microscope. Absence of spermatozoa confirmed azoospermia. Classification of the various forms of semen abnormalities were done using WHO guidelines[13]. Azoospermia was indicated by the absence of spermatozoa in the ejaculate. Oligospermia meant concentration of spermatozoa less than twenty million per ml. Asthenozoospermia meant less than 50% motility. Teratozoospermia meant less than 30% of sperm cells had normal morphology. Abnormalities in volume (less than 2mls of sperm per ejaculate) and prolonged liquifaction time (more than 1 hour) were also noted and recorded.

Results:

Among the 558 semen samples studied, 211(37.8%) had normal parameters while 347(62.2%) had at least one abnormal parameter. Abnormalities in volume of semen samples (less than 2mls per ejaculate) were encountered in 144 (25.8%) of the 558 samples tested (Table I).

Prolonged liquefaction time was seen in 152 (27.2%) of the samples (Table II).Oligospermia was noted in 220 (39.4%) of the specimen while azoospermia was noted in 79 (14.2%). Two hundred and fifty nine (46.4%) of the specimen had normal sperm count (Table III). Teratozoospermia was seen in 132 (23.7%) of the samples (Table IV). Motility was noted to be markedly reduced in 344 (61.6%) of the semen samples (Table V). Combined abnormalities/defects in sperm functions were seen in 12.8% (Oligo-asthenozoospermia). Six percent (6.0%) had Oligo-teratozoospermia, 5.2% had Astheno-teratozoospermia and 11.6% had Oligo - astheno –teratozoospermia (Table VI). Agglutination of sperm cells were seen in 9 (1.6%) of the semen samples while significant leucocytes were detected in 41 (7.35%) of the samples.

Other round cells constituted 51 (9.13%) of the samples analysed.

Table I: Semen Parameters

Volume of Semen Samples		
Volume(mls)	Frequency	Percentage
< 2ml	144	25.8%
e 2ml	414	74.2%
Total	558	100.0%
Liquefaction time of semen		
Time (mins)	Frequency	Percentage
d 60 mins	406	72.8%
> 60mins	152	27.2%
Total	558	100.0%
Sperm concentration of semen samples		
Count x1MILLION/ML	Frequency	Percentage
e 20	259	46.4%
< 20	220	39.4%
Nil	79	14.2%
Total	558	100.0%
Sperm morphology of semen samples		
Morphology (%)	Frequency	Percentage
< 30%	132	23.7%
e 30%	426	76.3%
Total	558	100.0%
Spermmortality of semen samples		
Motility (%)	Frequency	Percentage
< 50%	344	61.6%
e 50%	214	38.4%
Total	558	100.0%

Table 2: Combined Defects

DEFECT	FREQUENCY	PERCENTAGE
Oligozoospermia/Asthenozospermia	71	12.8%
Oligozoospermia/teratozoospermia	33	6.0%
Asthenozospermia/teratozoospermia	29	5.2%
Oligozoospermia/Asthernozoospermia/teratozoosper-mia	65	11.6%

DISCUSSION:

Infertility and in particular poor semen quality is an important health problem worldwide. Eight out of every 10 male partners in this study had some abnormal semen quality. This tallies with the finding of 7 out of 10 male partners in infertile union reported by other authors [2,3,5,14].

About twenty six percent of the semen samples submitted were of sub-optimal volume. This value is higher than 4.9% obtained by Chukwudebelu in Enugu[15]. The disparity may be attributed to the use of 1ml as the lower cut off value as well as the smaller sample size. It has been found that decreased frequency of emission leads to decreased semen volume but increased sperm count[16]. Also low volume of semen produced may suggest anxiety at collecting a sample, incomplete collection, partial retrograde ejaculation or incomplete epididymal obstruction from an old infection. Due to cultural aversion to masturbation, most of the samples produced were obtained by coitus interruptus which may have led to some in vivo loss of semen. Efforts in ensuring optimal sperm collection should be encouraged. An insight into liquefaction abnormality was seen in 27.2% of the samples analysed. Liquefaction time of 60 minutes was used. Other studies employed 30 minutes. The cause of the abnormality may be due to prostatitis and seminal vesiculitis. In-depth studies in liquefaction abnormalities are very few in our environment mainly because of lack of facilities in analyzing samples and aversion to the method of collection which is by prostatic massage.

About 54% of the samples analysed had abnormalities in sperm concentration. Thirty nine percent was contributed by oligozoospermia and 14.2% by azoospermia. These figures agree with those of Ajabor et al[17] in Benin where they recorded that 53.8% of husbands of couples in infertile union were subfertile based on semen concentration alone. Oligozoospermia contributed 35.5% and azoospermia 18.3%. The above findings were slightly higher than those of Imade and Ujah et al[3] in Jos where 21% were contributed by oligozoospermia and 9.1% by azoospermia. This low value may be attributed to the smaller sample size in the Jos study. However, the general agreement is that oligozoospermia constitutes the commonest cause of semen abnormality[2]. The causes may range from infection as enumerated earlier to poor sample collection technique. Emphasis has been placed on sperm count as the main determinant of male fecundity but recently, it has been suggested that counts less than 20 million/ml but greater than 10 million/ml is adequate for conception provided that motility and morphology are satisfactory[11].

About 24% of the samples analysed showed abnormalities in morphology of the sperm cells. This was smaller than 41% obtained by Ajabor in Benin[17] but higher than 4.2% obtained by Imade et al[3] in Jos. The difference in values obtained may be accounted for by the various sample sizes used and the various techniques available in each centre for determination of sperm functions. Currently, work is in progress by W.H.O to validate the strict criteria put forward by Krager et al[12] which may improve the fertilizing ability of some sperm cells.

Sixty one percent of the semen samples have abnormal motility pattern. This comes close to 57.5% observed in Benin[17] where it was also observed as in this study that majority of the abnormalities observed in motility occurred mostly in those samples with abnormal count. Imade et al[3] recorded lower values of 5.1% most likely because of his sample size. Sperm motility has been shown to be a better index for determining male infertility when compared with sperm density. Motility of the sperm is said to compensate for diminished number of sperm provided the morphology is optimal[3]. There is also a positive correlation between leutenizing hormone level and sperm motility in oligospermic patients. Treating hormonal imbalance in these men will enhance both outcome[9].

The combined defects of 12.8% due to oligo-asthenozoospermia, 6.0% by oligo-teratozoospermia, 5.2% by astheno-theratozoospermia and 11.6% by oligo-astheno-teratozoospermia were observed. The above findings agree closely with those of Ujah et al[3] in Jos where multiple abnormalities were noted in some of their samples. It has been observed that samples with multiple defects have low fertilizing capacity. Hence, a useful guide to prognosis is that a one-factor abnormality tends to be associated with a better prognosis than a two-factor abnormality which in turn is better than a three factor abnormality[3].

Pus cells were detected in 7.35% of the semen samples analysed. They were mostly detected in those samples with deranged parameters especially those with abnormal count. This was also observed in Enugu by Megafu[9]. This however has led to calls by some authorities that all samples for seminalysis be accompanied by culture and

sensitivity tests[9]. It has also been noted that eradication of any infection in the semen followed by treatment with hormone preparation gives better result[9].

It will be deduced from this study that poor semen count and motility were the main problems encountered. This common prevalence was also found by Imade et al[3] in Jos and Ojiyi et al[2] in Maiduguri suggesting that environmental temperature may not have effect on semen quality. But reports by Jung et al[18] in Germany showed that an improvement in oligo-astheno-teratozoospermic men occurred when natural cooling effect on the scrotum was applied since it was noted that most men with abnormal semen parameters had marginally raised scrotal temperatures. The causes of abnormal semen quality as discussed earlier ranged from endocrine abnormalities, infections, anatomical defects and anti-sperm antibodies. Reduction in the prevalence of semen abnormalities should focus not only on the primary and secondary prevention of sexually transmitted disease but on improving the skills of health providers to offer quality treatment. The pattern of health care seeking behaviour to reportage of symptoms of sexually transmitted infections should as well improve. Appropriate and prompt treatment of sexually transmitted infections can reverse the symptoms and prevent long term complications[6]. Syndromic management of sexually transmitted diseases relying on elucidation of symptoms recommended by the Federal Ministry of Health should be encouraged. Measures to decrease levels of alcohol and native medication consumption should be encouraged as well as seeking orthodox means of treatment when the need arises. Varicocoelectomy has been shown to have a definite value in the treatment of oligoozospermia with resultant increase in semen quality[19]. Those exposed to hazardous substances because of their job description should be given adequate protection.

The advent of newer micro manipulative techniques of assisted reproductive technology such as sub zonal insemination (SUZI) and intracytoplasmic sperm injection (ICSI) has improved the chances of conception especially in men with multiple defects like oligo-terato-asthenozoospermia.[5,20] Due to the high cost of these assisted reproductive technologies, most couples are not able to access the services. Provision of regional sperm banks by Federal and State government should be encouraged to assist males with poor semen parameters who cannot access assisted reproductive technology Adoption as a viable alternative should be promoted in sub-Saharan Africa despite the unfavourable predisposition in the region[21]. Abnormal semen quality having been shown to be a major contributor to male infertility in our environment and due to high cost of these assisted reproductive technologies, efforts geared towards preventing some of the known causes and promotion of barrier methods of contraception will go a long way in reducing the contribution of this and hence male factor infertility in our environment[22,23,24].

In conclusion, despite its deceptive simplicity, routine semen analysis requires attention to its diagnostic usefulness. It is a valuable tool in discussing and determining the likelihood of pregnancy over a given period of time or the possible need for assisted reproduction.[3,25] However, it is recommended that a wider study using greater number of sample size and search for the secondary factors involved in male infertility will go a long way in elucidating the various aetiological causes of abnormal semen quality and its subsequent management.

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