

Characteristics of semen parameters of Malawian men from couples seeking assisted reproduction

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Abstract

AIM: To profile semen parameters of Malawian men seeking fertility testing.

METHODS: Semen analysis is a key element in the fertility evaluation of men and permits male reproductive potential to be evaluated. Semen samples were collected from consenting men after 3-5 d of sexual abstinence. The samples were collected from 130 males; 78 were male partners of infertile couples while 52 were healthy semen donors. Seminal volume, motility and morphology were assessed. The results were analyzed on Prism 5. All data are expressed as mean \pm SD. Student's *t*-test was used for statistical analysis. Differences were regarded as statistically significant if *P* < 0.05.

RESULTS: Semen volume, sperm concentration, progressive motility and normal morphology were significantly higher in the control group when compared to the participant group. On the other hand, no statistically significant difference was found between the control group total sperm motility when compared to the participant group. Oligozoospermia was found in 25 cases, teratozoospermia detected in 17 cases and abnormal seminal plasma in 16 cases. Asthenozoospermia and azoosper-

mia were found in 12 and 8 participants, respectively. This study has shown that most of the infertile patients seeking fertility testing had oligozoospermia. Teratozoospermia was the second most common abnormality found in the patients seeking fertility testing.

CONCLUSION: Our study is in agreement with previous studies which reported that these parameters have been shown to be good predictors for fertilization.

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Key words: Infertility; Human spermatozoa; Assisted reproduction; Semen analysis

Core tip: In recent years there has been an increase in infertility and some of the causes are due to male factors. Even although some causes of male infertility can be established, others are idiopathic. It has therefore become imperative to investigate infertility patterns in different countries. This paper reports the common causes of male infertility in Malawian men seeking fertility testing.

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INTRODUCTION

Infertility is defined as the inability to conceive after at least 1 year of unprotected intercourse. It affects about 8%-12% of all married couples^[1]. In about one third of these couples, a male factor is the primary cause and in another one quarter, both the male and female partner

contribute to the infertility^[1]. It is noteworthy that even today, recognizable causes of male infertility are present in only 40% of cases^[2]. In the other 60%, infertility presented as an isolated abnormality in the semen analysis without diagnosable pathology^[2]. This would explain why male infertility is generally regarded as a condition that is difficult to treat, especially in the low-cost settings of many developing countries where advanced methods of assisted reproductive techniques, such as intracytoplasmic sperm injection, are not available.

In developing countries, patterns of infertility are quite different from those in developed countries. That is to say, the incidence of preventable infertility is much higher in developing countries^[3]. Recently, estimates of infertility in Malawi show a level of primary infertility or childlessness in women aged 20-44 years of 2%, as measured by the proportion of women who remained childless after at least 7 years of marriage^[4]. However, secondary infertility or infertility subsequent to the birth of at least one child, was at 17%, ranging from a low 7% in women aged 20-24 years to 60% in women aged 40-44 years^[5]. These figures put Malawi in the upper-middle range of infertility prevalence compared to other sub-Saharan African countries.

In African countries women carry the main burden of infertility since they are usually blamed for a couple's childlessness^[6]. It has been reported that self-identified infertility in Malawi varied greatly by sex. None of the men who reported infertility was certain that they were the infertile partner, whereas 60% of the women were certain that they were the infertile one^[5].

Semen analysis is a key element in the fertility evaluation of men and permits male reproductive potential to be evaluated in association with possible risk factors. However, semen samples are difficult to obtain in general population studies and the participation rate which is usually less than 20% may invalidate conclusions when extrapolated to the general population^[7]. Studies of populations in which men are seeking infertility treatment avoid this problem because semen analysis is a key part of their fertility evaluation. Therefore, the aim of this study was to profile semen parameters of Malawian men seeking fertility testing.

MATERIALS AND METHODS

Study area, setting and subjects

The study was carried out at the College of Medicine Andrology Laboratory in Blantyre, Malawi, the first andrology laboratory in Malawi. The study sample consisted of 130 males. Seventy-eight were male partners of infertile couples who had infertility for more than 1 year and who sought their first infertility evaluation between January 2010 and December 2011, while 52 were healthy semen donors of proven fertility. Approval for this study was obtained from the Institutional Review Board. All men enrolled in this study gave written consent after the procedures had been described to them.

Table 1 Different possible causes of infertility in the participant group *n* (%)

Group	Semen analysis	Data
Participants (<i>n</i> = 78)	Azoospermia ¹	8 (10.3)
	Oligozoospermia ²	25 (32.0)
	Asthenozoospermia ³	12 (15.4)
	Abnormal seminal plasma ⁴	16 (20.5)
	Teratozoospermia ⁵	17 (21.8)
Controls (<i>n</i> = 52)	Normal semen	52 (100.0)

¹Total absence of sperm in the semen; ²Sperm concentration of $< 20 \times 10^6$ /mL; ³ $< 50\%$ spermatozoa with forward progression; ⁴Seminal volume less than 2.0 mL or abnormal physical characteristics of semen with normal spermatozoa; ⁵Reduced percentage ($< 14\%$) of morphologically normal spermatozoa.

Semen collection and analysis

Two semen analyses of not less than fourteen and not more than 90 d apart were routinely undertaken. Semen samples were obtained by masturbation in a room next to the laboratory after 3-5 d of sexual abstinence. Semen assessment was performed as soon as the samples were liquefied but within 1 h from collection according to the routine method described by the World Health Organization^[8]. Seminal volume was measured in a graduated pipette accurate to within 0.1 mL. Sperm concentration was determined by a hemocytometer (improved Neubauer counting chamber) after an appropriate dilution. Sperm motility and progressive motility were assessed by direct observation under a microscope ($\times 400$). Smears were made on clean slides and air dried, after which they were stained with hemacolor (Merck, Darmstadt, Germany). Morphology was analyzed by oil immersion light microscopy according to the Tygerberg strict criteria^[9].

Statistical analysis

Data are expressed as mean \pm SD and the level of significance for comparison set at $P < 0.05$. Comparisons between the two groups were made using the χ^2 test for categorized independent variables and the *t*-test for continuous independent variables.

RESULTS

Characteristics of the population

The general characteristics of the men seeking fertility testing and health semen donors enrolled in this study are as follows. The mean age for infertile men was 34 ± 0.3 vs 33 ± 0.4 for the normal fertile donors ($P > 0.05$). There was no statistically significant difference between the groups in age. The number of years they had been married did not statistically differ between the two groups ($P > 0.05$).

Semen analysis

Table 1 shows the different possible causes of infertility in the patients seeking fertility testing. The most commonly detected abnormality was oligozoospermia, which was found in 25 cases (32%). In the remaining cases,

Table 2 Different semen parameters

	Controls	Participants	P value
Volume (mL)	3.52 ± 0.17	1.8 ± 0.23	< 0.05
Concentration (10 ⁶ /mL)	56.89 ± 4.34	34.21 ± 6.45	< 0.05
Total motility (%)	82.56 ± 4.32	76.45 ± 8.95	> 0.05
Progressive motility (%)	59.92 ± 3.54	44.34 ± 4.56	< 0.05
Normal morphology (%)	19.12 ± 2.45	7.35 ± 4.45	< 0.05

teratozoospermia was detected in 17 (21.8%) cases and abnormal seminal plasma in 16 (20.5%) cases. Asthenozoospermia and azoospermia were found in 12 (15.4%) and 8 (10.3%) patients, respectively.

Table 2 shows the different semen parameters of the participants seeking fertility testing compared to the controls. Semen volume, sperm concentration, progressive motility and normal morphology were significantly higher in the control group when compared to the participant group ($P < 0.05$). On the other hand, no statistically significant difference was found between the control group total sperm motility when compared to the participant group ($P > 0.05$).

DISCUSSION

This study has shown that most of the infertile participants seeking fertility testing had oligozoospermia (sperm concentration of $< 20 \times 10^6$ /mL). In recent years there have been reports of declining sperm concentration in men around the world^[10,11]. With assisted reproduction, participants with severe oligozoospermia can still do well in terms of fertilization and pregnancy outcome if enough sperm can be obtained with separation techniques. Kruger *et al*^[12] reported that no impact could be found on pregnancy outcome after assisted reproduction using the concentration/mL in the initial sample as a yard stick.

Teratozoospermia [reduced percentage ($< 14\%$) of morphologically normal spermatozoa] was the second common abnormality found in the participants seeking fertility testing. In this study, the Tygerberg strict criteria were used to assess sperm morphology. Using this criterion it has been reported that participants with fewer than 14% normal morphological forms are found to have a decreased fertilization rate^[13]. Morphological characteristics of spermatozoa have been reported to be the best predictor for fertilization^[13,14].

The findings of our study indicate that oligozoospermia was the most prevalent abnormality in the semen of the infertile participants, followed by teratozoospermia (reduced percentage of morphologically normal spermatozoa). Our study is in agreement with previous studies which reported that these parameters have been shown to be good predictors for fertilization^[13-15]. Apart from known factors that contribute to male infertility, idiopathic factors also contribute to infertility. A study in Poland trying to investigate the pattern of infertility reported that 16% of male infertility was due to idiopathic causes^[16]. Thus, we speculate that the infertility of the

participants who took part in this study was mainly due to oligozoospermia and teratozoospermia. This study involved only 78 participants seeking fertility testing. A larger sample size would probably produce more conclusive results. We recommend that studies should be carried out to establish infertility patterns in different countries. These studies should involve large sample sizes in order to come up with conclusive results that can be extrapolated to the general population.

COMMENTS

Background

In recent years there has been an increase in infertility and some of the causes are due to male factors. Even although some causes of male infertility can be established, others are idiopathic. It has therefore become imperative to investigate infertility patterns in different countries.

Research frontiers

Semen analysis is a key element in the fertility evaluation of men and permits male reproductive potential to be evaluated in association with possible risk factors. However, semen samples are difficult to obtain in general population studies and the participation rate which is usually less than 20% may invalidate conclusions when extrapolated to the general population.

Innovations and breakthroughs

This study has shown that most of the infertile patients seeking fertility testing had oligozoospermia. Teratozoospermia was the second most common abnormality found in the patients seeking fertility testing.

Applications

Studies of populations in which men are seeking infertility treatment avoid this problem because semen analysis is a key part of their fertility evaluation.

Peer review

It is a descriptive study that analyzes the semen of 78 male partners of infertile couples who had infertility for more than 1 year and the controls who were 52 healthy semen donors of proven fertility.

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