BRIEF REPORT

DESCRIPTION OF THE SEMEN QUALITY FROM MEN TREATED IN AN ASSISTED REPRODUCTION CENTER IN GUAYAQUIL, ECUADOR

Gabriel Morey-León [1,a], Tatiana Puga-Torres [2,a], Xavier Blum-Rojas [2,b], Manuel González-González [1,c], Alexandra Narváez-Sarasti [3,d], Nancy Sorroza-Rojas [3,e]

[1] Facultad de Ciencias Médicas, Universidad de Guayaquil, Guayaquil, Ecuador.
[2] Centro Nacional de Reproducción Asistida Innaifest, Hospital Clínica Kennedy, Guayaquil, Ecuador.
[3] Facultad de Ciencias Médicas, Universidad Espíritu Santo, Samborondón, Ecuador.
[a] Master of Biotechnology; [b] Doctor of Clinical Pathology; [c] Master of Virology; [d] Biologist; [e] Master of Clinical Biochemistry

ABSTRACT

In order to characterize the quality of semen from men in an assisted reproduction center in the city of Guayaquil (Ecuador), 204 semen samples were collected from patients with fertility disorders aged 20 to 57 years, who were admitted between May 2017 and September 2018. A basic spermogram was performed on each sample, following the fabricant recommendations for the examination and processing of human semen. It was found that 27.4% of the samples presented normozoospermia. Among the disorders, it was found that 27.9% had teratozoospermia, 8.8% had oligoteratozoospermia and a higher number of patients were found to be between 30 and 39 years old. A high percentage of patients presented sperm morphology and quality values below the reference limits established by the World Health Organization.

Keywords: Spermatozoa; Male infertility; Spermogram; Sperm morphology; Teratozoospermia (source: MeSH NLM).

INTRODUCTION

Infertility is defined by the inability to achieve clinical pregnancy after 12 months of unprotected sex [(1-3)]. It affects 8-15% of couples worldwide [(4,5)], and 50% of cases are attributable to males [(6,7)]. Factors involved in male infertility are genetics and lifestyle, among others [(8)]; however, about 30% of cases are still considered idiopathic [(9)].

Semen analysis is the first test to be prescribed for the diagnosis of male fertility. This test studies the macroscopic and microscopic characteristics of the semen. It provides essential information about conventional sperm parameters, sperm concentration and sperm motility, viability and morphology [(10)]. The sperm morphology parameter makes it possible to identify the percentage of sperm with morphological alterations [(10-14)].

This study aims to characterize the main variations in semen quality, including abnormalities in sperm morphology that occur in men attending an assisted reproduction center in Guayaquil (Ecuador).

THE STUDY

The study was carried out on patients treated in a fertility clinic in Guayaquil between May 2017 and September 2018, between 20 and 57 years old, who were to have fertility evaluation

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Correspondence to: Gabriel Morey-León, gabriel.moreyl@ug.edu.ec

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by means of a basic spermogram and who agreed to participate in this study by signing an informed consent. Patients with a history of genetic and oncological diseases affecting male fertility were excluded.

For semen sample collection, patients followed the standards set out in the World Health Organization (WHO) laboratory manual for the examination and processing of human semen [10]. After sample collection, patients filled out a form with information on age, days of abstinence and date of last ejaculation.

The basic spermogram was performed following the protocol established in the manual for the examination and processing of human semen [10]. Semen samples were examined within one hour of collection.

The sperm parameters for sperm concentration (10^6 per milliliter), total mobility (progressive and non-progressive) and progressive mobility (%) were evaluated with a Makler camera (Makler® counting camera; Sefi Medical Instruments, Ltd.). Sperm morphology assessment (%) was performed using the differential sperm staining technique (diff-quik rapid staining with the Stat III® Andrology Stain kit [ref: 85316-I; Mid-Atlantic Diagnostic, Inc.]), following its established protocol. Morphological defects were classified according to the strict Kruger criteria of the WHO manual, considering the affected sperm area (head, neck and tail).

The information was analyzed with the InfoStat program 2019. Frequencies and percentages were used for categorical variables; and mean ± standard deviation (SD) for quantitative variables.

The study was approved by the Human Research Ethics Committee of the Hospital Clínica Kennedy, Guayaquil (code F.GHK.DOC-04.XI/15). Patient information confidentiality was guaranteed in accordance with the ethical principles of the Declaration of Helsinki.

KEY MESSAGES

Motivation for the study: Semen quality is an important parameter in the evaluation of couples with fertility difficulties; however, this health problem is not reported in Ecuador's national registries and census (2017).

Main findings: This study identified semen quality parameters below the WHO reference limits in 27.4% of a group of patients with fertility problems in Guayaquil (Ecuador).

Implications: This study allows us to raise awareness of the importance of male fertility evaluation in the Ecuadorian population, mainly in couples with reproductive problems.

FINDINGS

Semen samples from 204 patients were analyzed using basic spermogram, and sperm morphology was evaluated in 76 of these patients. The mean age of the patients evaluated was 36.0 ± 7.1 years. The mean of the parameters analyzed and the number of cases that did not reach the lower reference limits established by the fifth edition of the WHO manual are described in Table 1.

The percentage of patients with semen quality parameters within the lower reference limits was 27.4%, while the group of patients with teratozoospermia was the largest group of patients with altered semen quality. Table 2 describes the frequency of patients with different sperm quality abnormalities, based on nomenclature established in the fifth edition of the WHO manual.

Within the group of patients with semen quality alterations according to age, the group of men between 30 and 39 years old presented a greater frequency of semen quality alterations. Figure

Table 1. Mean values of quantitative sperm characteristics of patients.

Semen characteristics	Mean ± SD	Lower reference limits *	Individuals with values below the reference minimums	
			Cases	Percentage
Volume (mL)	3.1 ± 1.4	1.5	24	10.8
Sperm concentration (106/mL)	33.8 ± 31.3	15	76	37.3
Total concentration (millions)	103.2 ± 100.1	39	56	27.5
Mobility (%)	46.1 ± 20.4	40	66	32.4
Total mobile spermatozoa (millions)	53.0 ± 63.2	No aplica	No aplica	No aplica
Sperm with progressive motility (%)	86.2 ± 18.2	32	48	23.5
Normal sperm morphology (%)	12.5 ± 8.1	4	41	23.3

* Reference limits set out in the World Health Organization Manual for the Examination and Processing of Human Semen, Fifth Edition. SD: standard deviation.

1 describes the number of patients with alterations in sperm quality according to age.

From the patients whose sperm morphology was evaluated, 23.3% were not within the lower reference limits, in these cases greater defects were found in the head portion of the spermatozoa. Table 3 describes the number of patients whose sperm morphology was evaluated, stratified by groups according to the percentage of sperm normality.

DISCUSSION

Within the group of patients evaluated, the means of all sperm parameters analyzed were within the reference limits established by the WHO guide for sperm evaluation. However, 37.3% of the cases were not within the reference limits for one of the parameters studied. The frequency of teratozoospermia was the highest (27.9%) among the alterations found, followed by oligoteratozoospermia (8.8%). A decreasing trend in the quality of semen in young fertile and infertile men was observed [15,16]. This is why the WHO, in its human semen analysis manual, has been modifying the lower reference limits of the seminal parameters, decreasing their values from the first edition to the last one, published in 2010 [10].

There are studies published from several countries in which the sperm parameters in different male populations are evaluated; this allows us to have a reference of the seminal quality for the specific population of certain countries. There are no studies published for the Ecuadorian population that characterize the seminal quality of fertile or infertile men of reproductive age. Therefore, the aim of the study was to evaluate and characterize the seminal parameters of a group of men with fertility problems in the population of Ecuador, in order to have a reference for the semen quality of this population.

From all the patients evaluated with the basic spermatogram, only 176 were able to have a spermatozoa morphological evaluation. The group of patients who did not have this evaluation presented anomalies, such as azoospermia (total absence of sperm), cryptozoospermia or severe oligozoospermia (<2x10^6/mL), which did not allow a sufficient number of sperm to be obtained to make the corresponding staining.

Head, neck and tail sperm defects were considered within the morphological parameters evaluated. More head defects than neck and tail defects were found. It has been shown that sperm morphological abnormalities, especially head abnormalities, play an important role in in vitro fertilization treatments. This affects treatment results when these morphological abnormalities are combined with other problems, such as severe teratozoospermia with oligozoospermia. In this study we did not evaluate whether patients underwent or did not undergo in vitro fertilization, so we cannot know if sperm morphology influenced the final outcome of the treatment.

Detailed evaluation of the spermatozoa morphological abnormalities incidence has been described using indexes, such as the spermatozoa deformity index (SDI), teratozoospermia index (TZI), or the multiple anomalies index (MAI) [10]. However, there is little evidence in literature regarding the relevance of this evaluation for any of the three types of morphological abnormality indexes described [13]. The evaluation of the morphological abnormalities incidence was not considered in our analysis, since its use is not part of the daily routine in the analysis of sperm morphology in the laboratory where the analyses were performed.

A greater number of cases with altered semen quality were found in patients aged 30-39 years, teratozoospermia had the highest in incidence this age group. Studies have shown several factors that can influence sperm quality, such as age and lifestyle, among others, which would mainly affect concentration, motility and sperm morphology [7,17]. Considering that this age group is the most economically active population in society, factors such as stress, a very demanding lifestyle due to work activities that may involve prolonged sitting or contact sports could be affecting the morphological quality of the sperm. However, these factors were not evaluated in our study, so it is not possible to say that the sperm quality of this population is reduced by any socio-environmental factor. There are other factors, such as genetics, that can influence sperm quality and that would affect sperm parts and functions, such as the constitution of the flagella and the mobility of the sperm [18,19].

Table 2. Classification of abnormalities in the quality of patients' semen.

Nomenclature related to semen quality *	Frequency	Percentage
Teratozoospermic	57	27.9
Normozoospermic	56	27.4
Oligoteratozoospermic	18	8.8
Astenoteratozoospermic	16	7.8
Oligoastenoteratozoospermic	16	7.8
Oligozoospermic	14	6.8
Oligoastenozoospermic	9	4.4
Azoospermic	7	3.4
Astenozoospermic	6	2.9
Cryptozoospermic	4	1.9
Necrozoospermic	1	0.4

* Classification based on the nomenclature from the fifth edition of the World Health Organization manual.

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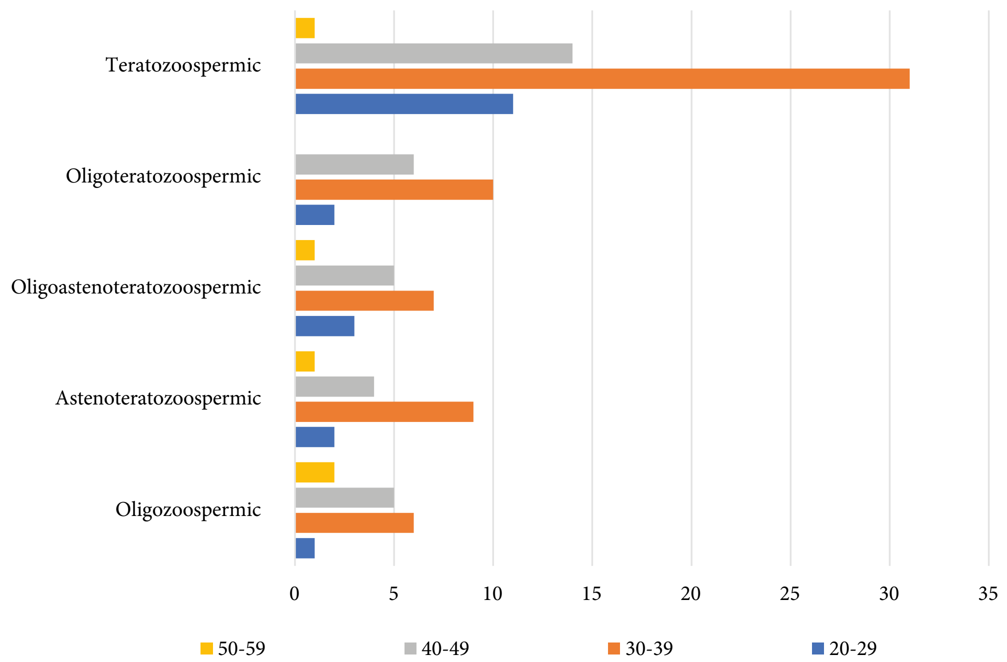

Figure 1. Patients with different alterations in sperm quality according to age

In this study, only patients who attended an assisted reproduction center to evaluate the male component of the infertile couple were included. It this scenario poor sperm quality plays an important role, so it cannot be extrapolated to the entire infertile male population of the city and much less of Ecuador.

Published studies have shown regional differences in semen quality; as well as a clear decrease in semen quality due to several factors (16). It is worrying that we do not have a database that allows us to characterize the ranges of sperm quality in our population and the possible factors that are affecting its quality. Infertility due to the male factor could be a long-term health problem, since the population of young men would be affecting their sperm quality due to modern lifestyle factors and they would have to resort to reproductive treatments to achieve offspring. It is therefore necessary to carry out studies to characterize the quality of semen in Ecuador's fertile male population and to identify the causes that affect its quality in order to prevent future reproductive health problems.

In conclusion, this study has identified that the quality parameters of semen are below the reference limits established by the WHO; however, it is not possible to extrapolate these results to the infertile population of the whole country. It is necessary to carry out a more extensive study to characterize the quality of semen in the fertile and infertile population of Ecuador.

Author's contribution: GML participated with statistical advice, data analysis and interpretation, and writing of the article. TPT contributed with the collection of results, the critical review of the

Table 3. Distribution of concentration, mobility and sperm defects in relation to morphology.

Normal sperm morphology	Number of patients	Sperm concentration in 10^6/mL (Mean ± SD)	Mobility in percentage (Mean ± SD)		Sperm defects in percentage		
			(Mean ± SD)	Progressive	Head	Neck	Tail
≤4%	41	23.7 ± 24.9	25.4 ± 30.6	81.6 ± 20.2	50.9 ± 12.7	24.8 ± 8.1	21.3 ± 9.1
5 - 9%	25	28.6 ± 21.9	40.0 ± 43.3	83.0 ± 22.9	50.6 ± 9.3	21.7 ± 6.1	19.8 ± 8.5
10 - 14%	39	35.9 ± 29.3	73.5 ± 77.1	89.0 ± 11.2	45.5 ± 11.1	23.7 ± 6.6	18.8 ± 8.3
≥14%	71	33.8 ± 31.2	53.0 ± 63.4	86.2 ± 18.6	45.2 ± 11.4	22.5 ± 7.0	19.3 ± 8.4

SD: Standard Deviation

article and the approval of the final version. XBR participated with the conception and design of the article, the contribution of patients or study material and the obtaining of funding. MGG participated with statistical and technical or administrative advice. ANS and NSR contributed with the contribution of patients or study material, obtaining funding and technical or administrative assistance.

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