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ORIGINAL ARTICLE

Clinical and Etiological Profile of Necrozoospermia in Infertile Male of the Couple: Analysis of 12 Observations with Literature Review

Daouda Kanté[1], Alexandre Vahina Gamamou[1], Lahoumbo Ricardo Gnammi[1], Aboubacar Cherif[1], Abdoulaye Bobo Diallo[1,2] and Telly SY[2]

[1]*Urology Department Ignace Deen, Faculty of Health Sciences and Technology, Conakry, Republic of Guinea*

[2]*Medicis Clinic, Conakry, Republic of Guinea*

***Corresponding author:** *Gamamou Alexandre Vahina, Urology Department Ignace Deen, Faculty of Health Sciences and Technology, Conakry, Republic of Guinea*

Abstract

Introduction: Isolated necrozoospermia is a rare and poorly documented spermiological abnormality of male infertility.

The objective of our study was to describe the clinical presentations and highlight the etiologies of necrozoospermia in the infertile man of the couple.

Materials and methods: We conducted a descriptive study with retrospective collection during the year 2023 at the Medicis clinic in Conakry. We included patients with isolated necrozoospermia on two successive spermograms performed at least three months apart, who consulted for infertility.

Results: We collected 12 records of patients with isolated necrozoospermia who consulted for infertility.

Necrozoospermia accounted for 5.04% of spermiological abnormalities.

The mean age of our patients was 34.4 years ± 7.1 and the age group of 25 to 34 years was the most affected, i.e. 66.67%.

The average duration of our patient's marital union was 5.5 years and the majority of our patients had a union duration of between 1 and 5 years, i.e. 58.33% of cases.

Merchants and bakers were the most affected professional categories, at 41.67% and 25% respectively.

50% of our patients were smokers and 25% had moderate obesity.

Primary infertility accounted for 66.67%.

The mean viable sperm rate was 33.33% and 80% of patients had sperm vitality ≤ 40%.

The majority of patients 66.66% presented moderate necrozoospermia.

Sperm culture was positive in 50% of cases and the most isolated germs were *Neisseria gonorrhea* (n = 2), *Ureaplasma urealyticum* (n = 2), *Mycoplasma genitalium* (n = 2).

Chlamydia serology was positive in 41.66% of our patients.

83.33% of our patients had a clinical varicocele, 40% of which were grade II and 60% of which were grade III.

Conclusion: Isolated necrozoospermia is an uncommon spermiological abnormality in the infertile man of the couple. Etiological factors are dominated by infections, varicocele and smoking.

Keywords

Necrozoospermia, Infertility, Spermogram

Introduction

In men, the World Health Organization (WHO) has defined the minimum or maximum values characterizing good quality sperm. According to these standards, necrozoospermia corresponds to a sperm vitality of less than 58% [1].

Necrospermia is still a poorly documented cause of male infertility, with an incidence reported in the

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literature of 0.2% to 0.4%, with a wide variety of etiologies including infections, varicocele, chronic pathologies, and exposures to toxic substances, unexplained necrospermia, and epididymal necrospermia [2].

Infections may account for nearly half of the causes of necrozoospermia [3]. Impaired sperm vitality may be explained by several mechanisms including direct damage to sperm by infectious organisms, effects of inflammatory mediators, and/or possible long-term alteration of the genital tract environment [4].

Determining the clinical profiles and etiologies of necrozoospermia based on research into andrological history, physical examination and complementary assessment is an essential step in the therapeutic management of this condition in the infertile man in the couple.

The objective of our study was to describe the clinical presentations and highlight the etiologies of necrozoospermia in the infertile man of the couple.

Materials and Methods

This was a descriptive study with retrospective data collection lasting one year, from January to December 2023.

The data collection sheet, consultation records, results of biological, spermiological and ultrasound assessments of patients served as study material.

We included in the study all patients who consulted for infertility and in whom there was isolated necrozoospermia on two successive spermograms carried out within an interval of at least three months.

All sperm tests were performed in a single medical analysis laboratory.

The sampling conditions (laboratory sampling by masturbation after three days of ejaculatory abstinence), analysis and interpretation were carried out according to WHO 2021 standards. The eosin-nigrosin staining test [5] was used by the laboratory for the evaluation of sperm vitality. The primary outcome measure was sperm vitality less than 58%.

We have divided the anomalies into:

- Total necrozoospermia, when there were 0% viable sperm,
- Severe necrozoospermia, when there were 1 to 19% viable sperm,
- Moderate necrozoospermia, when there were 20 to 39% viable sperm,
- Mild necrozoospermia, when there were 40 to 57% viable sperm.

For ultrasound assessment of testicular volume, testicular hypotrophy was defined as a volume less than 15 ml.

For the assessment of body mass index (BMI) we adopted the following classification:

- Less than 18.5: Underweight (thinness)
- 18.5 to 25: Normal build
- 25 to 30: Overweight
- 30 to 35: Moderate obesity
- 35 to 40: Severe obesity
- Over 40: Morbid or massive obesity

We conducted an exhaustive recruitment, with patients who met our inclusion criteria representing our sample size.

The study variables were frequency, age, occupation, and duration of the couple's union, vices, BMI, type of infertility, andrological history of the patients, results of the biological assessment (spermogram, sperm culture, spermocytogram, hormonal assessment, and dosage of anti-sperm antibodies), chlamydia serology, and results of scrotal ultrasound.

Data collection was carried out using a survey form incorporated into the *EPI-info database version 7.0*, previously established in accordance with the objectives of the study.

Our data were analyzed by *Epi-Info software version 7.0*, entered and presented by software from the *Office Pack 2016*.

Quantitative variables were described by mean, standard deviation, median and interquartile range. Qualitative variables were presented as frequency and percentage.

Results

In one year, we collected 12 files of patients with isolated necrozoospermia who consulted for infertility, representing an annual frequency of 6 cases.

Necrozoospermia accounted for 5.04% of spermiological abnormalities.

The average age of our patients was 34.4 years ± 7.1 with extremes 25 and 52 years, the age group of 25 to 34 years was the most affected, i.e. 66.67% of cases.

The average duration of the marital union of our patients was 5.5 years with extremes of 1 year and 14 years, and the majority of our patients had a duration of the union between 1 and 5 years, i.e. 58.33% of cases.

Merchants and bakers were the most affected professional categories, at 41.67% and 25% respectively.

50% of our patients were smokers, one patient was an alcoholic and another was an alcoholic and smoker.

Primary infertility accounted for 66.67%.

Patients with isolated necrozoospermia had a history

Table 1: Types of spermiological anomalies.

Sperm abnormalities	Workforce	Percentages
Oligoasthenonecrozoospermia	79	33.19
Azoospermia	52	21.84
Oligoasthenonecroteratozoospermia	16	6.72
Oligozoospermia	14	5.88
Asthenozoospermia	14	5.88
Oligoasthenozoospermia	13	5.46
Necrozoospermia	12	5.04
Asthenonecrozoospermia	12	5.04
Oligonecrozoospermia	12	5.04
Oligoasthenoteratozoospermia	8	3.36
Oligonecroteratozoospermia	3	1.26
Asthenonecroteratozoospermia	3	1.26
TOTAL	238	100

of epididymo-orchitis in 33.33% of cases, bilateral varicocelectomy in 33.33% of cases, left orchiectomy and left testicular trauma respectively in 16.67% of cases.

The mean viable sperm rate was 33.33% and 80% of patients had sperm vitality ≤ 40%.

The majority of patients 66.66% had moderate necrozoospermia, and no patient had total necrozoospermia.

All patients had a sperm culture performed, the culture was positive in 50% of cases and the most isolated germs were *Neisseria gonorrhoea* (n = 2), *Ureaplasma urealyticum* (n = 2), *Mycoplasma genitalium* (n = 2).

No abnormalities were found in the hormonal assessment (FSH, LH) carried out in 4 patients.

Only one patient (history of orchiectomy) underwent the assay of antisperm antibodies in seminal plasma which concluded in the absence of antisperm antibodies.

All patients had a scrotal ultrasound. Scrotal ultrasound noted bilateral testicular hypotrophy in 25% (n = 3) of cases and unilateral testicular hypotrophy in 25% (n = 3) of cases.

Scrotal ultrasound noted a varicocele in 83.33% (n = 10) of cases, this varicocele was bilateral in 58.33% (n = 7), unilateral left in 25% (n = 3). It was grade III in 41.66% (n = 6) of cases, grade II in 33.33% (n = 4) of cases.

One patient had bilateral testicular microcalcifications and another patient had a right epididymal cyst (Table 1, Table 2, Table 3, Table 4, Table 5 and Figure 1).

Discussion

The low frequency of isolated necrozoospermia in the infertile man of the couple because it was a single-center hospital study on the one hand and the lack of data on patient follow-up on the other hand were the main limitations of our study.

Nevertheless, this study made it possible to understand the different clinical presentations and the main etiological factors of isolated necrozoospermia in our context.

We collected in one year, 12 files of patients with necrozoospermia who consulted for infertility. This small sample could be explained by the fact that our series only concerns isolated necrozoospermia which is an uncommon spermiological anomaly.

In the literature, the frequency of necrozoospermia is very disparate, due to the diversity of assessment methods.

Regarding our study on isolated necrozoospermia, this represented 5.04% of the spermiological anomalies found in the infertile men of the couple.

Zhang, et al. [6] reported 3.4% necrozoospermia in his study population.

Tilahun, et al. [7] and Matumo, et al. [8] reported 25.2% and 55.6% of necrozoospermia, respectively. This large difference with our study would be related to selection because unlike these authors, we did not take into account necrozoospermia when it was associated with other spermiological anomalies.

Although there is no consensus classification on the degree of necrozoospermia, we divided our patients into four groups according to the severity of necrozoospermia.

The majority of our patients (66.66%) had moderate necrozoospermia and none had total necrozoospermia.

There are several techniques for the assessment of sperm vitality in the laboratory, two of which have been frequently described in the literature.

The eosin-nigrosin test which is the most commonly used method, it is based on the exclusion of a vital dye by living spermatozoa. Eosin is a supravital stain and

Table 2: Sociodemographic characteristics and vices.

	Workforce	Percentages
Age (years)		
25-34	8	66.67
35-44	2	16.67
45-54	2	16.67
Duration of marital union (years)		
1-5	7	58.33
6-10	03	25
11-15	02	16.67
Occupation		
Merchant	05	41.67
Baker	03	25
Official	02	16.67
Driver	02	16.67
Vices		
Tobacco	06	75
Alcohol	01	12.5
Tobacco + Alcohol	01	12.5
Number of wives		
Monogamous	07	58.33
Polygamous	05	41.66
BMI (Body Mass Index)		
Normal weight	08	66.66
Overweight	01	8.33
Moderate obesity	03	25

Average age = 34.4 years ± 7.1 years Extreme: 25 and 52 years

Average duration of marital union: 5.5 years Extreme: 1 year and 14 years

Table 3: Andrological history and type of infertility.

	Workforce	Percentages
Background		
Epididymo-orchitis	2	33.33
Varicocelectomy	2	33.33
Unilateral orchidectomy	1	16.67
Left testicular trauma	1	16.67
Type of Infertility		
Primary	8	66.66
Secondary	4	33.33

Table 4: Results of sperm culture and chlamydia serology.

Sperm culture	**Workforce**	**Percentages**
Sterile culture	6	50
Neisseria gonorrhea	2	16.67
Mycoplasma genitalium	2	16.67
Ureaplasma urealyticum	2	16.67
Chlamydia serology		
Positive	5	41.66
Negative	7	58.33

Table 5: Results of scrotal ultrasound.

	Workforce	Percentages
Testicular volume		
Normal	6	50
Bilateral testicular hypotrophy	3	25
Unilateral testicular hypotrophy	3	25
Varicocele		
Absence of varicocele	2	16.66
Bilateral varicocele	7	58.33
Left varicocele	3	25
Varicocele grade		
Grade II	4	40
Grade III	6	60

nigrosin is a violet dye that serves as a counterstain [2,5].

This is the method that was used for the evaluation of sperm vitality in all our patients because it is an easy and effective method, but it can only be used for diagnostic purposes when performing the spermogram and not

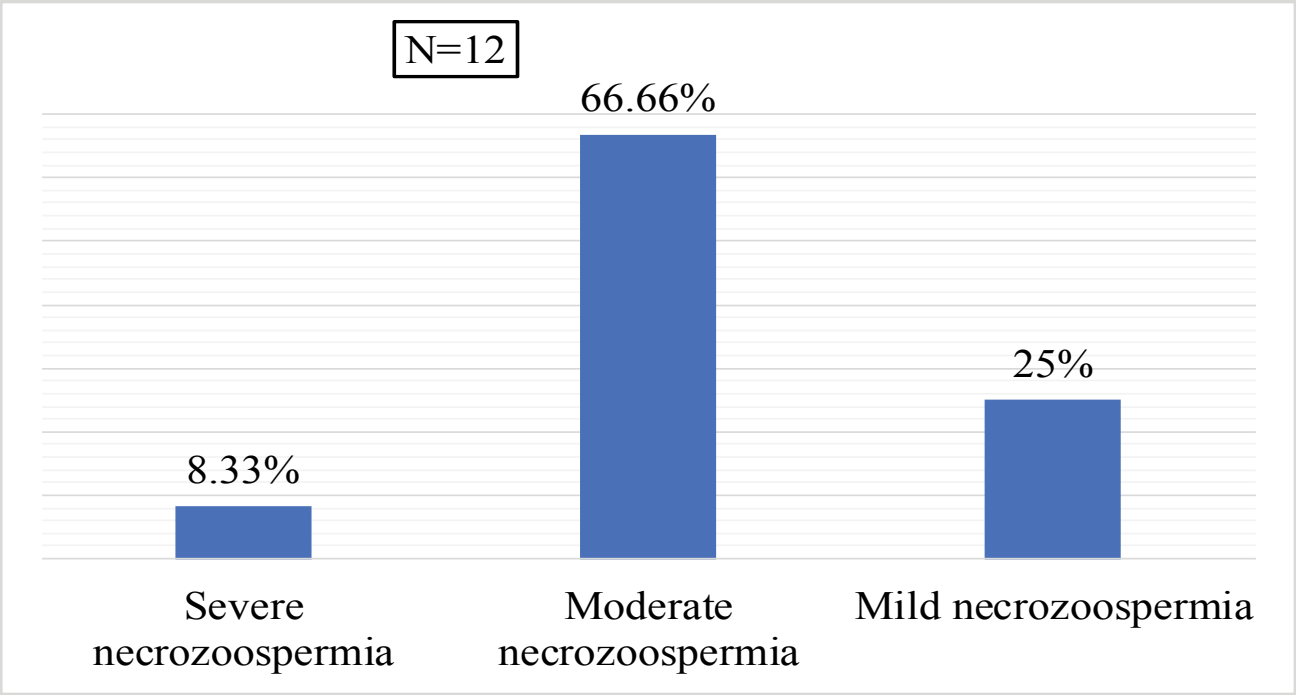

Figure 1: Proportion of patients according to the degree of necrozoospermia.

for therapeutic purposes, when selecting sperm before intracytoplasmic injection due to the introduction into the sperm of a potentially harmful substance [9].

The hypoosmotic flagellar coiling test "HOST" (hypoosmotic swelling test) which assesses the functional integrity of the sperm plasma membrane [2,5].

It has the advantage of being able to be used in diagnosis and therapy during the selection of spermatozoa during ICSI [2,9].

The mean age of our patients was 34.4 years ± 7.1.

Our results are comparable to those of Diallo AB, et al. [10] and Halidou M, et al. [11], who reported mean ages of 38 and 34 years respectively in their series.

This predominance of young adults found in our study, joins the data of the literature which reports that infertility would interest an increasingly younger population with a decline in the quality and the fertilizability of sperm in men aged 20-40 years [12]. Furthermore, this age group would consult a specialist doctor much more for infertility of the couple, by the fact that the young man remains sexually more active with an intense desire for paternity, in particular among young married people.

Collodel, et al. [13] in their study on the influence of age on sperm characteristics evaluated by light and electron microscopy found a mean age of 36.41 ± 6.379 years and reported that advanced age was correlated with decreased sperm concentration and motility and increased sperm necrosis.

The influence of age on spermiological parameters remains controversial and the mechanisms are poorly elucidated [12].

The average duration of our patients' marital union was 5.5 years.

This result could be explained by the fact that infertility is a taboo subject in our society, leading men to get tested late. Beyond this observation, the responsibility for a lack of conception is generally attributable to the woman in our context. Men only feel concerned after a certain period of medical investigations focused on the woman without a cause being detected.

This is easily understood if we know that 41.66% of our patients were polygamous at the time of the study.

The recourse to a second marital union and the hope that this arouses is an important factor in the extension of the duration of the union before any specialized consultations.

Bah MB, et al. [14] in their study on the profile of male infertility reported a duration of 4.43 years on average with extremes of 2 to 11 years.

Merchants were the most represented in our study in 41.67% of cases followed by bakers in 25% of cases.

Certain professional categories would promote the occurrence of necrozoospermia due to exposure factors such as chemicals and prolonged increase in scrotal temperature.

This could apply in our context by the fact that the profession of merchant or baker, would be linked to a prolonged sitting position and a professional environment with high temperature, which would

thus cause an increase in scrotal temperature and would reinforce the occurrence of abnormalities of spermatogenesis in our patients already carrying a varicocele.

The impact of environmental factors on sperm vitality is formally established [15,16].

It appears in several studies [2,17,18] that exposure to environmental factors such as tobacco, alcohol, medications, stress, overweight, endocrine disruptors and frequent and poorly treated urogenital infections represent a significant part of the etiologies of necrozoospermia in infertile men. This impact would be mediated not by genetic modifications but rather by epigenetic variations of sperm DNA.

Smoking has deleterious effects on male fertility. Oxidative stress generated by tobacco appears to be one of the main causes of impaired sperm quality, mainly leading to fragmentation of their DNA and resulting in necrozoospermia [2,19].

Evidence for the negative impact of excess weight on male fertility is controversial [17,20,21].

Several studies [22-24] admit overweight and obesity as having a deleterious effect on spermiological parameters.

Altered spermiological parameters would be linked to a significantly reduced testosterone/estradiol ratio in overweight or obese men [22,24].

The spermiological assessment of primary male infertility was the predominant circumstance of discovery of necrozoospermia in our study.

This result could be explained by the fact that men who have never conceived consult a professional much more often than those who have already had a child. The pressure of wanting a child varies depending on whether one has already conceived or not.

Frikh, et al. [25] and Bah MB, et al. [14] reported 61.8% and 65% primary infertility respectively.

Studies of male infertility report a relatively low rate of secondary infertility encountered in consultation, with little data on this subject [26].

Recurrent urogenital infections as well as a history of testicular trauma, spermatic cord torsion and varicocele were commonly found in necrozoospermic patients in our study. Sequelae testicular hypotrophy and secretion of antisperm antibodies are thought to be major etiological factors of necrozoospermia in patients who have had spermatic cord torsion or testicular trauma [27,28].

The causes of necrozoospermia can be local or general, testicular or extratesticular, or unexplained and some of them can be associated in the same patient [2].

Reactive oxygen species (ROS), and the development of inflammatory bowel disease. Oxygen species » (ROS), oxidative stress, and increased sperm DNA fragmentation [6,29].

In our patients, necrozoospermia was associated with varicocele in 91.67% of cases.

Infections may account for nearly half of the causes of necrozoospermia [2].

The impairment of sperm vitality by infections can be explained by several mechanisms including, among others, direct damage to spermatozoa by infectious organisms, the effects of inflammatory mediators and/or possible long-term alteration of the environment of the genital tract [2,4].

More than half of our patients had genital infection and/or a history of urogenital infections.

Necrozoospermia due to direct damage to spermatozoa is most frequently due to *Escherichia coli, Chlamydia trachomatis, Candida albicans* and *Mycoplasma hominis* [4].

Co-incubation of *Chlamydia trachomatis* with spermatozoa induces a decrease in motile spermatozoa and apoptosis of these [30].

Recurrent and poorly treated urogenital infections represent a significant part of the etiologies of infertility [31].

Inflammatory cells including neutrophils and macrophages can have harmful effects on sperm by increasing the rate of sperm DNA fragmentation [32].

In cases of recurrent epididymitis, the epididymal epithelium may become altered and lose some of its secretory and resorption capacities, leading to possible impairment of sperm motility, fertility and vitality [4,30].

Ureaplasma urealyticum, for example, is thought to be responsible for a drop in epididymal alphaglucosidase secretion [33].

Neisseria gonorrhoeae impairs male fertility by causing urethritis and urethral strictures. Although sometimes isolated in semen, its direct impact on sperm quality has not been established [31].

Vasilios, et al. [3] in a meta-analysis concluded that bacteriospermia would negatively affect spermiological parameters including sperm vitality.

Neisseria gonorrhea infections: The presence of antisperm antibodies (ASA) would be significantly associated with a decrease in sperm count, motility and vitality [5].

The presence of ASA is secondary to a breakdown of the blood-testicular barrier, which can be encountered during testicular, epididymal or vas deferens lesions (testicular trauma, testicular or epididymal surgery, spermatic cord torsion, testicular biopsy, testicular tumors or obstruction of the vas deferens) [27].

One of the situations that best illustrates the impact of AAS on sperm vitality is represented by post-vasovasostomy necrozoospermia [34].

Although not addressed in our study because these were relatively young patients who consulted in the context of fertility exploration, systemic etiologies of necrozoospermia including hyperthyroidism, spinal cord injuries, polycystic kidney disease and cannabis use play a significant role [2,35-37].

Conclusion

Isolated necrozoospermia is an uncommon spermiological abnormality in the infertile man of the couple. It occurs mainly in its moderate form and is more often discovered in primary infertility. Etiological factors are dominated by infections, varicocele and smoking. Further studies including the therapeutic component are needed to better understand the impact of necrozoospermia on the infertile man in the couple.

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