

Original Research Article

Male Infertility in Brazzaville: Prevalence and Sperm Abnormalities Patterns

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Abstract: Background: Male infertility affects 7% of males worldwide (i.e. 30 million of men). The diagnosis of the condition is based firstly on the semen analysis which can show various types of abnormalities. In Congo, data on male infertility are poor. This study aimed to determine the prevalence of male infertility in Brazzaville and to provide the profile of the semen parameters from a cohort of infertile men living at Brazzaville. **Material and Methods:** We studied semens of three hundred and forty-four (344) congolese men affected by infertility. The work was based on medical data to research medical history and the semen to performed the spermogram and spermocytogram in way to precise the sperm parameters, **Results:** The prevalence of male infertility found was 9% and the average age was 39 years old. Medical history highlights mostly the notion of chronic infection, varicoceles and surgery of the genital tract. The most identified sperm abnormalities were moderate asthenozoospermia followed by severe oligoasthenozoospermia and azoospermia. **Conclusion:** The prevalence shows that male infertility is not rare in Brazzaville. As the condition seemed to be related to the infectious, tumoral and professional causes, a complete investigation (based on sperm analysis, biochemical markers and genetic tests) is needed to clarify the etiologies.

Keywords: Infertile Male, Prevalence, Sperm Abnormalities, Brazzaville.

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INTRODUCTION

Infertility is defined as the failure of a couple to get pregnant after 12 months of regular and unprotected sexual intercourse [1- 3]. Note that 8 to 15% of reproductives-aged couples worldwide are concerned [4]; [2, 3]. It precisely affects 7% of males worldwide (i.e. 30 million of men) with probably high rates in Europe, Australia and Africa [5- 7].

According to WHO guidelines 2010 manual for human semen analysis [8], male infertility is based on semen analysis which can show: oligozoospermia (low concentration of spermatozooids), azoospermia (absence of spermatozooids in the ejaculate), asthenozoospermia (decrease or absence of the spermatozoid motility) and teratozoospermia (abnormal morphology of spermatozooids) [6-10]. All these

anomalies have several causes originated from sporadic or genetic etiologies [6-11].

We note that data on male infertility in Central African countries including Congo-Brazzaville seem to be poor [12]. We aimed in the present work to determine the prevalence of infertile men in Brazzaville and to present the profile of the semen parameters in the studied cohort.

PATIENTS AND METHODS

The study was a cross-sectional work conducted during five years (2018 to 2023). Informed consent was previously obtained for all participants and the work was approved by the IRSSA Scientific Committee Reading.

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Patients

We studied a clinical data and semens of three hundred and forty-four (344) Congolese men affected by infertility. They were consulted at five medical care sites in Brazzaville (Congo), specialized in couple infertility: Mother and child clinic FA Silou, Urology medical office, Health Priority medical office, National Institute for Research in Health Sciences (IRSSA) and National Public Health Laboratory.

METHODS

The work was based on medical data to search medical history, the semen to performed the spermogram and spermocytogram in way to precise the sperm parameters, the spermatozoid morphology and their classifications [13, 14].

The Clinical Data

They were been collected at care sites during medical consultations. The main variables studied were: age, weight and body mass index (not reported in this paper), profession, ethnic group, residence and medical history.

Spermogram

It was performed according to the usual protocol [15, 16]. After three to five days of sexual abstinence, the analysis of sperm parameters included: i) semen color, volume, smell, viscosity, pH and the liquefaction of the semen. ii) Spermatozoid characteristics defined by vitality, motility and spermatozoid concentration per ejaculate. The other parameters retained were: quantity of leukocytes, red blood cells, epithelial cells, round cells and the presence of auto-agglutinations and crystals.

Spermocytogram

It was performed according to the usual protocol and the staining used was that of Papanicolaou [17, 18].

Statistical Analysis

It was conducted with epi-info 7.2.2.6. (CDC Atlanta, USA, 2017). The prevalence of infertility has been calculated based on the total number of men residing in Brazzaville during the study period. (382.222 men, Ministry of Planning 2023)

RESULTS

Epidemiological Data

Prevalence

The prevalence of male infertility during the study period was 9% (34.400/382.222 men).

Other Data

- The average age was 39 years with extremes ranging from 17 years to 73 years.
- The dominant profession was the unemployed, 15.99% (55/344), followed by the military, 10.75% (37/344).
- The ethnic groups: almost all the clans (Laris, Mbochis, Bémbés, Tékés, Vili, etc.) are concerned.
- Place of residence: all neighbourhoods of Brazzaville are involved with a higher prevalence in the neighbourhoods of Mfilou (20%), Talangäi (16%) and Ouenzé (14%), Bacongo (10%) (Figure 1).

Medical History

All the reasons that motivated the consultation are reported in the Table I.

Table I: Medical consultation

Reason for consultation	Number	Percentage (%)	Predominant cause
Systematic medical check-up	6	1.73	-
Desire for paternity (couple with no children)	283	82.26	-
Testicular pain	21	6.03	Orchitis 17(80,95%)
Chronic infections	11	3.19	Gonorrhea 9 (81,81%), mumps
Genital tract surgery	7	2.03	Hernia 5(71,42%)
Cryptorchidism (lateral)	7	2.03	-
Varicoceles	6	1.73	Grade 3, 3(50%)
Small penile size	3	0.87	-

Semen Parameters

Spermogram

The average ejaculate volume from all the semen samples (344) was 3.77±1.67ml. A normal sperm colour (whitish) has been observed in 72.38% (249) of cases and abnormal colour (yellowish, grayish, hematic or brown) in 27.61% (95) of sperm. They exhibited normal odour and liquefaction in all cases. The pH of the samples was mostly basic (7,2), 99.41% (342/344) of cases. White blood cells have been observed in 32% of cases.

About spermatozoid characteristics: the mean spermatozoid concentration per ejaculate was 32%. Concerning mobility, we mostly noted a predominance of asthenozoospermia (Tables II, III).

Spermocytogram

The examination revealed a predominance of normal morphologies in 78.4% of cases. Abnormal forms (Tables II, III) were observed in 21.6% of cases.

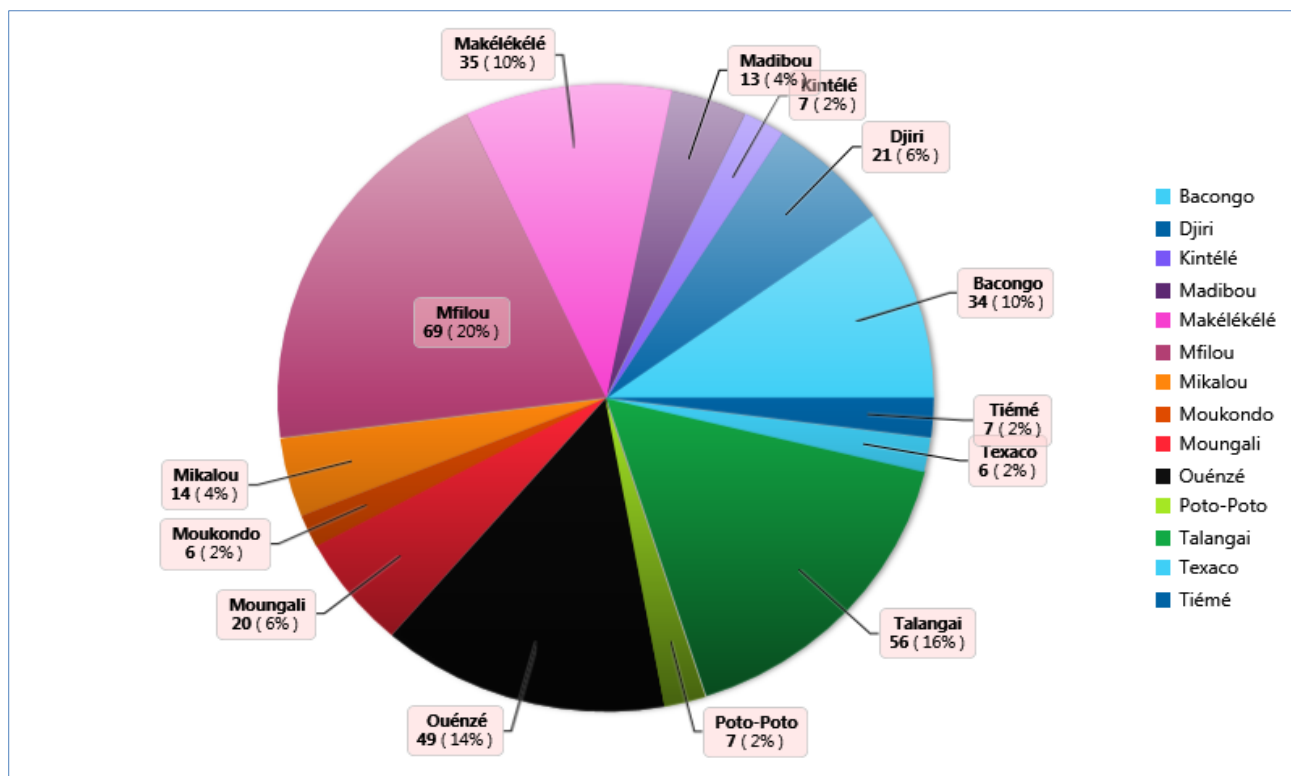


Figure 1: Distribution of subjects according to the residence

The majority of participants resided in Mfilou, Talangai, Ouenzé and Bacongo.

Table II: Characteristics of the ejaculate and the spermatozooids

Sperm parameters	Mean	Normal values [7, 10, 11, 22, 28, 30]
Semen volume (ml)	33.77	≥ 1,5ml
pH	7,2	7,2-8
Sperm concentration (millions/ml)	32.05	≥ 15 millions/ml
Mobility (%)	23.77	> 50%
Vitality (%)	54.45	≥ 58%
Abnormal morphology (%)	21.60	< 30%
White blood cells (millions/ml)	32.05	< 1 millions/ml

Table III: Anomalies from spermogram and spermocytogram

Anomalies	Number of cases	%
Moderate asthenozoospermia	89	25.87
Moderate azoospermia associated with leucospermia	18	5.23
Severe asthenozoospermia	27	7.84
Azoospermia	35	10.17
Moderate oligoasthenozoospermia	21	6.10
Severe oligoasthenozoospermia	39	11.33
Severe oligoasthenozoospermia associated with leucospermia	11	3.19
Severe asthenozoospermia associated with moderate oligozoospermia	13	3.77
Azoospermia associated with hypospermia	7	2.03
Severe asthenozoospermia associated with leucospermia	6	1.74
Severe oligoasthenozoospermia associated with	6	1.74
Necrozoospermia	6	1.74
Teratozoospermia	4	1.16
Others	68	19.76
Total	344	100

DISCUSSION

Epidemiological and Socio-Demographic Data

Prevalence

Male infertility is not a rare pathology as reported in numerous studies [19-21]. Indeed, the reported percentage of infertile men is 8 to 12% in Central and Eastern Europe, 4.5 to 6% in North America and 9% in Australia [19]. Africa is also concerned, since the following frequencies are reported: 2.5 to 4.8% in Sub-Saharan Africa; 7.7% in the Democratic Republic of Congo and 10% in Cameroon [22-24]. The prevalence obtained in our study (9%) is in the order of those usually reported. However, higher rates have been reported in other countries: one can note 53% in Morocco, 45% in India [20, 21]. These variations would be linked to environmental factors, genetic predisposition and even lifestyle factors. In light of this, male infertility screening is very important in cases of infertile couples, even if it is not always approved by some African men.

Age

Data from literature and our study show that male infertility is mostly discovered between 31 to 39 old of age [19- 24]. That age range reflects a period leading to the desire of marriage with the wish to become a father. Infertility in younger age groups is generally reported in the context of infection or surgery such as varicoceles (Table I) [12- 20]. All these data illustrate convincingly the need of sperm examination in context of chronic infection and genital tract surgery.

Professions

Some of them appear to be high-risk factors frequently reported in numerous articles [19- 23]. The most high-risk professions indexed in male infertility are: the drivers (especially of heavy machinery), the bakeries, the cooks or the miners [4- 19]; [23, 24]. All these professions can affect the semen quality and therefore sperm parameters, through the genital tract compression or a high temperature in testicles. Normal temperature in the testis is 37°C - 2°C to 4°C [25, 26].

Note that, our data showed a predominance of the unemployed, followed by soldiers, teachers and chemists. These results suggest other risk factors (reported in literature) affecting their spermatogenesis: for example toxic chemicals from the environment (related to the residence and the work place) or diet that lead to endocrine disturbances [27].

Medical History

Globally, they draw the infertility etiologies. However, the dominant reason (Table I) for consultation in our series was the desire for paternity, expressed at a mean productive age of 39 years. The other causes that motivated the consultation were the same as those reported in the literature [20- 11]. Among them, we note: varicoceles (in young subjects), chronic infections (sexually transmitted diseases, mumps),

cryptorchidism and reconstructive surgery of the genital tract [12- 22]; [6].

Sperm Disturbances and Etiologies

Spermogram Anomalies

Data from the literature show that the most abnormal parameters concern: mobility, vitality and concentration of the spermatozooids [28]. The present study reveals at the same times a disturbance of mobility in the first hour and a decrease in vitality (Table II). Defect of spermatozoid mobility is known to be a frequent cause of male infertility [28]. A recent study published by Mohammad *et al* [2021] has reported a decline in vitality in 36.9% of cases associated with a drop in sperm concentration in 29.7% of cases. Note that the variations from countries can be linked to the environmental factors, the lifestyle or and genetic predisposition [11- 27].

Concerning the spermatozoid concentration, the present study shows mainly severe oligoasthenozoospermia followed by azoospermia (Table III). The commonest reported pathozoospermia in literature are: oligozoospermia (in 22% to 42 % of cases), asthenozoospermia (11-25 % of cases) and azoospermia (severes forms of infertility identify approximately in 11- 16% of cases) [7; 12; 19; 20]. These disorders may be a result of sporadic or genetic etiologies. However, no etiologies are found in 40% to 50% of sperm disorders and idiopathic causes (infertile male with normal parameters) are report in 10% to 20% [3, 4]; [29].

Among the main sporadic etiologies, we can note the causes previously reported in medical history, namely: cryptorchidism, varicoceles, infections (Table I). Varicoceles are frequently reported in approximately 40 to 42 % of infertile men [12- 20]. The infections (also suggested in our study by increased of white blood cells in the semen analysis) are noted in 22% of cases [20]. The microbes involved in male infertility are various, but the commonest are: mumps viral, neisseria gonorrhoeae, chlamydia trachomatis, trichomonas vaginalis and staphylococcus [4- 20]. They can lead to testicular lesions such orchitis (described at young age in case of viral mumps infection). The others etiologic factors that affect sperm parameters are: endocrine failure; thyroid diseases; environmental factors like fungicides, herbicides, heavy metals (lead, iron, copper); lifestyle involving diet (e.g. folate deficiency), obesity, alcoholism and cigarette smoking [4- 27]. Male infertility can be also induced by testicular cancers, chemotherapy and radiotherapy, neuropsychiatric diseases and anatomical anomalies [4, 6].

The known genetic etiologies linked to oligoasthenozoospermia and azoospermia are also multiple. They are estimated to be responsible of 30% of male infertility [3]. They can be chromosomal aberrations (identified in approximately in 3 to 16% of

infertile male), or genes disorders [1- 29]. Examples of chromosomal diseases leading to male infertility are: Roberstsonian translocation; deletion of Y chromosome, Klinefelter syndrome responsible of 15% of azoospermic infertile men [29].

Genes disorders usually reported in male infertility are: microdeletions of the AZF (azoospermia factor) on chromosome Y; CFTR (cystic fibrosis transmembrane conductance regulator) mutations known to cause azoospermia; KAL1, FGFR1, FGF8, PROKR2 or PROK2 mutations responsible of Kallmann syndrome [27]. The latter condition is characterized by a smell failure, small penis, cryptorchidism, delayed puberty and azoospermia; mutations in the genes polymorphisms CYP11A1, MTHFR, GSTM1 or USP26 are also indexed [3- 29]. In the absence of an obvious etiology, especially in the case of azoospermia and teratozoospermia, genetic analysis is needed [1- 11]. Indeed, knowledge of etiologies is important for the treatment and to guide some candidates to assisted reproductive techniques for men.

Spermatozoid Forms

The presence of abnormal spermatozoid forms (teratozoospermia in 21.60% of cases) found in our work get listed with those of published papers in DRC and Morocco, Their reported prevalences are respectively 10.5% and 41% abnormal forms [20- 23]. However, low percentages of 1% are reported [30].

As result of the data, it is important to note that, abnormal forms of spermatozoids are not systematically found in optical microscopy during the infertility investigation.

The underdiagnosis of these anomalies could be attributed to the method of diagnosis: use of an optical microscope with small magnification (x1000) and the type of slide staining [18- 31].

The best methods to specify the morphology of the spermatozoid are: fluorescent microscopy and the best: electron microscopy with a high magnification (x100 000), not accessible in current diagnosis [31]. The latter makes it possible to observe the organelles at the origin of rare pathologies which can lead to male infertility. These investigation methods are indicated in case of teratozoospermia and asthenozoospermia [31].

CONCLUSION

The male infertility prevalence obtained in this study shows that is not a rare pathology in Brazzaville. It is an heterogenous condition identified in reproductive age and originated from infectious, tumoral and professional causes. The most identified sperm abnormalities are asthenozoospermia, oligoasthenozoospermia and azoospermia, which are weakly associated with teratozoospermia. Finally, this

preliminary study made it possible to map the most detectable sperm anomalies in Brazzaville, which can lead to better clarify the etiologies of infertile men in childless couples.

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AUTHORS' CONTRIBUTIONS

Designed the study: PH. Performed the analysis: MC. Analyzed the data: MC and PH. Contributed patients, reagents and statistical analysis: OAWS, SMJF, PGE, ZTM, MJV. Wrote the paper: PH and MC.

CONFLICT OF INTEREST

No competing interests exist for any of the authors

CONSENT FOR PUBLICATION

All contributors have read and approved the submission to the journal.

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