

A Clinical Assessment of Chronic Alcoholism's Impact on Male Reproductive Health (Abidjan, Côte d'Ivoire)

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Abstract

Introduction: Infertility is a global public health issue affecting 17.5% of adults and 15% of the sub-Saharan African population, and is of particular concern in Côte d'Ivoire. The causes of male infertility include chronic ethanol intoxication. With excessive alcohol consumption being highly prevalent among Ivorian men (43%), our study aimed to evaluate the impact of chronic alcoholism on seminal parameters. **Patients and Methods:** This was a descriptive and analytical cross-sectional study conducted from January 2024 to June 2025 at the Laboratory of Histology, Embryology, and Cytogenetics of the UFR of Medical Sciences, Abidjan. The study was based on performing spermograms and spermocytograms. **Results:** The patients had a mean age of 40.74 ± 8.47 years (with a majority aged 30 - 40 years) and presented with primary infertility in 70.92% of cases. Over half (52%) of the patients had moderate or severe alcohol consumption. Spermogram results were rarely normal (0.34%). Azoospermia affected 15.97% of patients, while oligoasthenoteratozoospermia was the most frequent abnormality (38.66%). Analysis revealed a significant decrease in sperm concentration associated with alcohol consumption. Furthermore, age emerged as a significant factor for the decline in sperm vitality and motility. **Conclusion:** This study confirms the high prevalence of chronic alcoholism among infertile Ivorian men and its significant association with a decrease in sperm concentration. Further research is needed to establish a

causal link and elucidate the underlying mechanisms.

Keywords

Male Infertility, Chronic Alcoholism, Spermatozoa, Félix Houphouët-Boigny University

1. Introduction

Couple infertility is defined by the World Health Organization (WHO) as the inability of a couple to conceive after twelve months of regular, unprotected, and complete sexual intercourse [1]. It affects an estimated 17.5% of the global adult population, or one in six people, making it a major global public health concern [2]. In sub-Saharan Africa, this health issue affects approximately 15% of the population [3] [4]. In Côte d'Ivoire, couple infertility is becoming a significant concern, particularly among young couples [5]. Male infertility accounts for 30% to 50% of cases of conjugal infertility [6]. Its causes are numerous, ranging from endocrine disorders, infectious diseases, genital tract obstructions, gametogenesis abnormalities, implantation failures, erection or ejaculation problems, to psychological or psychiatric issues [7]. Recent studies have also shown that environmental factors and lifestyle, particularly chronic ethanol intoxication, can impair fertility [8]. The Ivorian context is notably marked by a high prevalence of excessive alcohol consumption (43%) among men (61.2%) [9]. Thus, the increasing incidence of male infertility among young subjects in this context in Côte d'Ivoire highlights the relevance of this investigation. The study aims to clarify the role of chronic alcoholism as a potential risk factor or a contributing cause to the deterioration of sperm quality and, consequently, to male infertility in this specific population. By shedding light on these effects, the work aims to contribute to a better understanding of the etiologies of male infertility in Côte d'Ivoire and to inform potential prevention and management strategies.

2. Methodology

This was a descriptive and analytical cross-sectional study conducted from January 2024 to June 2025 at the Laboratory of Histology, Embryology, and Cytogenetics of Félix Houphouët-Boigny University (UFHB) in Cocody, Abidjan. The study population consisted of men consulting for a desire for fatherhood, selected using a non-probabilistic convenience sampling method. Participants included both alcohol-abstinent subjects and alcohol consumers. In contrast, all other patients were excluded from the study, particularly those whose alcoholism was associated with other potential confounding factors such as smoking, obesity, diabetes, genital infections, hydrocele of the tunica vaginalis, or other evident comorbidities. After a clinical examination to collect sociodemographic characteristics and patient histories, sperm was collected by masturbation after 3 to 6 days of

abstinence. After liquefaction, a comprehensive sperm analysis was performed, including a macroscopic and microscopic examination. This analysis consisted of a spermogram and a spermocytogram. The spermogram allowed for the evaluation of macroscopic sperm characteristics, such as volume, viscosity, and pH, as well as the analysis of microscopic parameters, including sperm motility and vitality, and their count using a Malassez cell. In addition, a spermocytogram was performed to analyze sperm morphology and identify any dystrophies. The smear thus prepared was air-dried before being stained according to the Papanicolaou protocol, a trichromic method involving the use of hematoxylin, Orange G, and Eosin Azure 50 (EA 50). The results were interpreted in accordance with the standards established by the World Health Organization in 2021 [10].

The variables studied were dependent and independent. Sperm concentration, motility, vitality, and morphology were the dependent variables. The independent variables were age, duration of abstinence and infertility, and patient history, particularly chronic alcohol consumption. The latter was self-reported according to the Cahalan and Cisin (1968) classification [9], which distinguishes three categories: the light drinker, whose consumption does not exceed two drinks per month; the moderate drinker, who consumes three to four drinks, at most once a month; and the heavy drinker, characterized by a consumption of five or more drinks on several occasions during the week.

The collected data were subjected to descriptive and analytical statistical analysis using Excel and Epi Info version 7.2.6.0 software, and data entry was done using Microsoft Word and Excel 2016. Quantitative variables were expressed as mean with standard deviation, and qualitative variables were expressed as proportions. The variables were compared using analysis of variance (ANOVA), and a P-value ≤ 0.05 was considered significant. Linear regression was then performed to identify the type of consumption and factors associated with a significant variation in sperm parameters. The regression model used compares each type of consumption to non-consumers and other age groups to the 20 to 30 years age group. The coefficients obtained therefore represent the average difference in the dependent variable between the consumer groups and the non-consumer group. The correlation coefficient provides information on the strength and direction of the relationship between the dependent and independent variables (treatment). A coefficient close to one (1) indicates a strong positive correlation, while a coefficient close to minus one (-1) indicates a strong negative correlation. A coefficient close to zero (0) indicates the absence of correlation.

Throughout this study, the anonymity and confidentiality of the data were rigorously respected.

3. Results

The study population consisted of 595 patients who consulted the laboratory of the University Hospital Center (CHU) of Cocody for conjugal infertility. The patients' ages ranged from 28 to 67 years, with a mean of 40.74 ± 8.47 years. The

majority of patients, 54.12%, belonged to the 30-40 years age group, and presented with primary infertility (70.92%) which had lasted an average of 5.18 \pm 4.06 years. Over half of the patients had a moderate to severe level of chronic alcoholism (52%). The average duration of abstinence was 3.98 \pm 0.92 days. The analysis of sperm parameters (**Figure 1**) showed an extremely low prevalence of normal spermograms, with only 2 patients (0.34%) having analyses considered normal. In contrast, azoospermia, characterized by the total absence of spermatozoa in the ejaculate, affected 95 patients (15.97%), thus constituting a major factor in absolute male infertility. However, the most prevalent abnormality was oligoastheno-teratozoospermia, diagnosed in 230 patients (38.66%), combining reduced concentration, decreased motility, and abnormal sperm morphology.

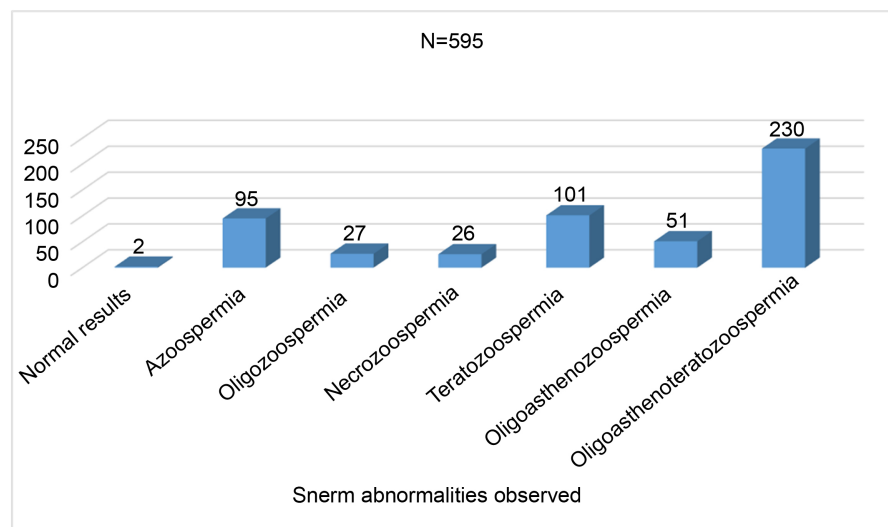


Figure 1. Distribution of the different spermatic abnormalities observed in patients consulting for infertility.

Furthermore, statistical analysis (**Table 1** and **Table 2**) revealed a significant decrease in sperm concentration associated with chronic and severe alcohol consumption. Nevertheless, no significant correlation was established between alcohol consumption and sperm vitality, motility, or morphology. However, a multivariate analysis including age, duration of abstinence, and type of consumption revealed that age was a significant factor in the decrease of sperm motility and vitality (**Table 2**).

Table 1. Effects of chronic alcoholism on sperm parameters.

Variables	Abstinent/Light Drinker	Chronic Moderate Alcoholism	Chronic Heavy Alcoholism	P-value
Sample Size	220	220	40	
Concentration ($10^6/ml$)	55.47 \pm 47.37	34.22 \pm 29.97	12.13 \pm 12.97	0.02
Vitality (%)	46.18 \pm 15.28	41.22 \pm 17.96	32.16 \pm 22.48	0.21
Progressive Motility (%)	26.22 \pm 10.62	21.77 \pm 10.98	16.00 \pm 15.27	0.12

Continued

Normal Typical Form (%)	04.40+/-2.97	04.95+/-2.47	03.66+/-2.80	0.56
Acrosome Abnormalities (%)	03.31+/-2.73	03.40+/-2.53	04.16+/-4.34	0.80
Head Abnormalities (%)	46.22+/-7.72	49.54+/-11.37	47.83+/-9.55	0.53
Midpiece Abnormalities (%)	37.33+/-12.14	39.96+/-6.73	38.09+/-12.33	0.77
Flagellum Abnormalities (%)	12.59+/-7.88	14.36+/-13.66	12.50+/-4.23	0.83

This table, illustrating the impact of chronic alcoholism on sperm parameters, shows a significant decrease in concentration.

Table 2. Impact of age, duration of abstinence, and chronic alcoholism on sperm parameters.

Variables	Concentration		Vitality		Motility		Morphology	
	Coef	P	Coef	P	Coef	p	Coef	P
Age group (31 - 40 years /20 - 30 years)	16.04	0.58	-6.18	0.61	-13.50	0.02	-1.88	0.36
Age group (41 - 50 years /20 - 30 years)	8.26	0.78	-18.07	0.15	-15.44	0.01	-2.74	0.19
Age group (51 - 60 years /20 - 30 years)	22.00	0.52	-15.16	0.29	-9.95	0.15	-2.42	0.32
Age group (61 - 70 years /20 - 30 years)	-0.82	0.98	-42.91	0.05	-26.23	0.01	0.39	0.91
Duration of abstinence	-1.60	0.79	1.55	0.55	0.60	0.63	-0.43	0.32
Alcohol (Moderate drinker/no drinker)	-21.81	0.07	-6.17	0.22	0.86	0.71	0.50	0.54
Alcohol (heavy drinker/no drinker)	-40.27	0.04	-9.44	0.26	-0.63	0.87	-0.92	0.51
Constant	48.72	0.18	51.14	0.00	26.45	0.00	8.27	0.00
Correlation coefficient	0.15		0.25		0.21		0.11	

Comments: Only chronic and severe alcohol consumption has a significant negative effect on concentration compared to non-consumers. Furthermore, these results confirm that aging has a detrimental and cumulative effect on sperm motility and vitality.

4. Discussion

The mean age of the patients in this study was 40.74 ± 8.47 years, with ages ranging from 28 to 67 years. The distribution by age groups revealed that the category most affected by infertility was that of young subjects (30 - 40 years), representing 54.12% of the studied population. These observations align with those of Abroulaye *et al.* in 2021, who reported a mean age of 40.20 years [11]. This trend could be explained by a sociodemographic phenomenon where men, before the age of 30, often prioritize professional achievement over parenthood. Thus, once a stable job is secured, the desire to procreate becomes more intense, leading young couples facing conception difficulties to consult a doctor. This hypothesis is corroborated by data from the National Social Security Fund (CNPS, 2022), which indicate that the average age of new employees registered in the first half of 2022 was 32 years. Furthermore, the results showed a significant decline in motility and vitality re-

lated to age, in line with recent studies. Research has consistently shown that paternal aging is associated with a decrease in sperm quality, particularly motility, vitality, and DNA integrity [1] [2]. This phenomenon is attributed to various physiological mechanisms, such as the accumulation of oxidative damage and the alteration of sperm mitochondrial function [12]. The predominant impact on motility indicates that the mechanisms of energy production and propulsion of the spermatozoon are particularly sensitive to the aging process.

This infertility was more primary than secondary (70.92%) as in most studies [13]. In addition, 52% of patients consulting for infertility had moderate or severe chronic alcohol consumption. This high prevalence is remarkably similar to the 53% observed in the general population by Yao *et al.* in 2015 [9]. Although chronic alcoholism is not necessarily more frequent in infertile men than in the general male population, these data reveal that more than one in two men consulting for infertility is affected by chronic alcohol consumption, which indicates the potential impact of this factor on their fertility. A recent study revealed that pre-conception alcohol consumption was inversely proportional to male infertility. Although some trends were observed, no statistically significant association was found between male beer consumption and sperm quality parameters [14]. The analysis of sperm parameters showed various abnormalities, including azoospermia, asthenozoospermia, teratozoospermia, and, most frequently, oligoasthenoteratozoospermia. These observations are consistent with those reported in most studies on the subject [11] [13]. Thus, the significant decrease in sperm concentration in men with severe alcoholism is consistent with the scientific literature reporting the deleterious effects of alcohol on testicular function and spermatogenesis, confirmed by an experimental study conducted on rats [15]. Indeed, alcohol can disrupt the hypothalamic-pituitary-gonadal axis, leading to a decrease in the production of testosterone and other hormones essential for sperm production [16]. Furthermore, alcohol could have a direct toxic effect on germ cells. In a recent study, alcoholic beer consumption induced a disruption of the cell division process in the seminiferous tubules [17]. Indeed, alcohol caused oxidative stress, linked to a decrease in the expression of cyclin D1 and a concomitant increase in the expression of the p21 protein, thus contributing to a reduction in the production and quality of spermatozoa. Furthermore, the study showed a decrease in vitality and progressive motility in chronic and severe alcohol consumers compared to non-consumers or occasional and light consumers. The lack of statistical significance for vitality and progressive motility, although downward trends were observed, could be due to the relatively small size of the severe alcoholism group ($n = 40$), which limits the statistical power to detect more subtle differences. In addition, these results are consistent with recent literature on male fertility [18]. It is also possible that the impact of alcohol on these parameters is less pronounced or that there is greater individual variability within the groups. As for morphological abnormalities, the average rates of head, midpiece, and flagellum abnormalities were remarkably similar for the three classes of alcohol consumers, and there was no statistically

significant association. It could thus be inferred that the levels of alcoholism studied do not significantly affect the morphology of spermatozoa in this population. However, it is important to note that the evaluation of sperm morphology is complex, varies in the same patient between two samples, and can be influenced by various factors [19].

5. Conclusions

This cross-sectional study examined the impact of chronic alcohol consumption on male fertility. It revealed that the mean age of participants was 40.74 years, with a high prevalence of infertility among men aged 30 - 40 years, which may be explained by a sociodemographic phenomenon of delayed fatherhood. The results confirm a significant decline in sperm motility and vitality with aging, an effect attributed to the accumulation of oxidative stress.

The study also observed a high prevalence of moderate to severe alcoholism (52%) among infertile men, highlighting the potential of this factor. A significant association was found between severe alcoholism and a decrease in sperm concentration, which is consistent with the scientific literature on the toxic effects of alcohol on spermatogenesis and hormones. Although alcohol showed downward trends on other sperm parameters, these results were not statistically significant. The study's limitations include its cross-sectional nature, which prevents the establishment of a direct causal link, and the potential bias of self-reported chronic alcohol consumption. The low correlation coefficients suggest that other unmeasured factors, such as diet, oxidative stress, or environmental exposure, could be major contributors. Further research is needed to deepen these conclusions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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