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Original article

Azoospermia: How rare is it among male partners of couples seeking infertility treatment? Experience from at a Ghanaian fertility center

John Jude Annan [1, 2, *], Mike Addison [2], Anthony Enimil [3], Robert Aryee [2], Augustine Twumasi [2], Fati Ibrahim [2]

[1] Department of Obstetrics and Gynecology, School of Medicine and Dentistry, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
[2] Emena Diagnostic and Fertility Centre, Aninwah Medical Centre, Kumasi, Ghana
[3] Department of Child Health, School of Medicine and Dentistry, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

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Abstract

Background: Male factor infertility, often characterized by deficiencies in sperm count, motility, and morphology, is a significant concern in the context of infertility. Azoospermia, the absence of spermatozoa in the ejaculate, represents a particularly challenging condition. This study aimed to investigate the prevalence of azoospermia among male partners of couples undergoing infertility treatment at a fertility center in Ghana.

Methods: A six-year retrospective descriptive investigation was conducted, focusing on male partners of couples seeking infertility treatment at the Emena Diagnostic and Fertility Centre. Semen analysis results indicative of azoospermia were systematically retrieved and analyzed. All samples were collected through masturbation and adhered to the stringent criteria outlined by the World Health Organization (WHO).

Results: Among 1,224 semen analyses conducted between 2015 and 2020, 67 cases of azoospermia were identified, accounting for approximately 5.5% of the total cases. Participants' ages ranged from 28 to 69 years, with a mean age of 41.0 (SD = 9.2) years. The majority of azoospermic individuals belonged to the 30–39 age group (44.8%), followed closely by the 40–49 age group (31.3%). Notably, 90% of the cases fell within the age range of 30–59 years. Analysis of semen characteristics revealed variations in viscosity and volume, with hypospermia most prevalent in the 40–49 age group.

Conclusion: This study provides valuable insights into the prevalence and characteristics of azoospermia among male partners seeking infertility treatment in Ghana. These findings contribute to a better understanding of male infertility and can inform strategies for its management and treatment in clinical settings.

Keywords: Azoospermia prevalence, Ghana, Infertility treatment, Male infertility, Semen analysis

Introduction

As per the World Health Organization (WHO) glossary, infertility constitutes a disorder of the reproductive system characterized by the inability to achieve a clinical pregnancy despite consistent attempts at unprotected sexual intercourse for a minimum duration of 12 months (1).

Infertility represents a complex issue involving both male and female factors, thereby encompassing aspects of urology and gynecology. Male infertility often stems from inadequacies in the production of viable spermatozoa, crucial for successful fertilization of the oocyte. Deficiencies in sperm count, motility, or morphology can contribute to this challenge. Africa, characterized by its strong pronatalist culture, grapples with infertility as a deeply sensitive issue, laden with social stigma. The repercussions extend beyond the

***Correspondence author:** Dr. John Jude Annan, Consultant and Senior Lecturer, Department of Obstetrics and Gynecology, School of Medicine and Dentistry, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, Email: judedoc2003@yahoo.co.uk , Tele: 00233-541721792

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individual or couple affected to impact their families and society at large, leading to considerable emotional distress and social burden. Data reveal a notable prevalence of infertility in Africa, particularly within sub-Saharan regions. A staggering 65% of gynecological consultations on the continent are attributed to infertility concerns, underscoring the magnitude of this issue and the pressing need for comprehensive interventions and support systems (2).

Infertility impacts approximately 15% of couples, meaning nearly one in every six couples struggles with childlessness (3). Prevalence rates ranging from 20% to 40% have been observed in certain regions of West Africa (2).

It is essential to evaluate the role of males in infertility cases. The World Health Organization has highlighted that male reproductive deficiencies contribute to infertility in no less than 50% of affected couples worldwide (2).

Hence, the significance of accurately evaluating and treating male infertility cannot be overstated. Typically, male factor infertility is assessed through semen analysis, a method that is objective, cost-effective, and widely accessible. Semen, comprising spermatozoa suspended in seminal plasma, constitutes the bulk of ejaculate volume. Seminal plasma consists of secretions from various glands, including the urethral, Cowper's, and prostate glands, as well as the epididymis, seminal vesicles, and vasa differentia. If semen analysis yields normal results, no further evaluation of the male partner is typically necessary. However, in cases of pronounced abnormality, assistance is often sought through assisted reproductive technology. Azoospermia, the most severe form of semen abnormality, is characterized by the absence of sperm in at least two separate ejaculate samples, including the centrifuged sediment (4, 5).

The Emena Diagnostic and fertility center in Kumasi was founded in 2014. Since its establishment, there has been a steady rise in the number of patients and couples seeking fertility treatment each year, paralleled by an increase in the volume of semen analyses conducted at the center. While the prevalence of azoospermia is well-documented globally, there is a noticeable dearth of data within our center, hindering the development of tailored treatment strategies for affected individuals. In response to this gap, this retrospective descriptive study aimed to ascertain the prevalence of azoospermia among male partners of couples undergoing infertility treatment at The Emena Diagnostic and Fertility Centre in Kumasi, Ghana, spanning from 2015 to 2020.

Materials & Methods

This retrospective study, conducted over a six-year period from January 2015 to December 2020, aimed to evaluate the prevalence of azoospermia among male partners of infertile couples. The investigation exclusively focused on male partners who underwent semen analysis at the Emena Diagnostic and Fertility Centre during the specified timeframe and were diagnosed with azoospermia, defined as the absence of spermatozoa in the ejaculate.

Rigorous scrutiny and analysis of these results were conducted with utmost attention to maintaining client confidentiality. The study excluded semen analysis records of male partners without infertility issues, couples with less than a year of infertility history, semen analyses of male sperm donors, and those not conducted at the fertility center. The Emena Diagnostic and Fertility Centre, situated in Kumasi, Ghana's second-largest city, is renowned for providing comprehensive fertility services to a diverse clientele from Ghana, the wider West African Sub-region, Europe, and North America.

The study utilized a meticulously designed data extraction tool to collect pertinent information from semen analysis results indicating azoospermia, with adherence to rigorous criteria outlined by the World Health Organization (WHO). Samples were meticulously collected, transported, and processed in accordance with standardized protocols. Data integrity and confidentiality were ensured through stringent measures such as data cleaning, password protection, and restricted access to investigators only. There was no patient contact. Therefore, the consenting process involved written consent obtained from the fertility center to conduct the study and ethical approval from Komfo Anokye Teaching Hospital Institutional Review Board. Statistical analysis was performed using SPSS version 20, facilitating thorough exploration and interpretation of the findings. The study received ethical approval from the Institutional Review Board for Research and Development (IRB/R&D) of the Komfo Anokye Teaching Hospital.

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Therefore, the consenting process involved written consent obtained from the fertility center to conduct the study and ethical approval from Komfo Anokye Teaching Hospital Institutional Review Board. Statistical analysis was performed using SPSS version 20, facilitating thorough exploration and interpretation of the findings. This was part of the ethical approval obtained from the Institutional Review Board for Research and Development (IRB/R&D) of the Komfo Anokye Teaching Hospital with approval number: KATHIRB/AP/055/21

Results

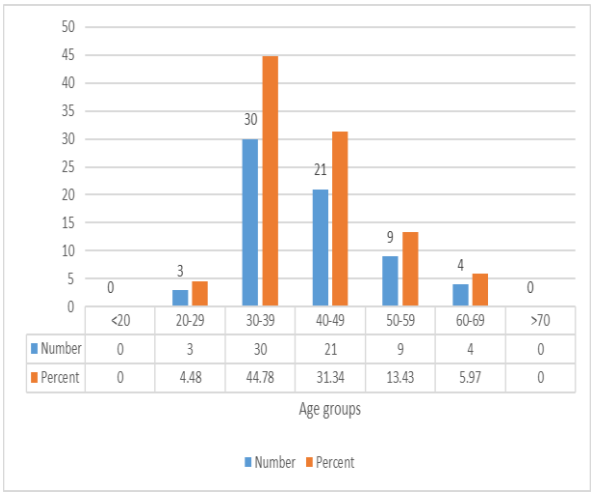
As delineated in Table 1, among the 1224 semen analyses conducted at the fertility center during the period spanning 2015 to 2020, 67 cases (5.5%) exhibited azoospermia. The annual prevalence rates of azoospermia are further elucidated. Notably, the pronounced decrease in the incidence of azoospermia observed in 2020 can be attributed to the imposition of lockdown measures and the subsequent closure of the center in response to the global Covid-19 pandemic.

Table 1. Annual trend of azoospermia of male partners (n = 1224)

Year	Semen analysis (n)	Azoospermia detected (n)	Percentage (%)
2015	134	12	8.9
2016	165	10	6.0
2017	130	11	8.4
2018	219	10	4.5
2019	379	21	5.5
2020	197	3	1.5

Figure 1 provides an overview of the age group distribution among individuals diagnosed with azoospermia. The distribution is delineated as follows: 20-29 years: n=3, 30-39 years: n=30, 40-49 years: n=21, 50-59 years: n=9, and 60-69 years: n=4. The age range of participants spanned from 28 to 69 years, resulting in a mean age (SD) of 41.0 (9.2) years. Noteworthy findings include the predominance of individuals aged 30 to 39 years, constituting the largest proportion at 44.8% of cases, followed by the 40 to 49 age group at 31.3%. Cumulatively, individuals aged 30 to 59 years accounted for 90% of the total cases of azoospermia, while the 20 to 29 age group exhibited the lowest incidence rate at 4.5%.

Tables 2a and 2b present the semen viscosity profiles of individuals diagnosed with azoospermia. Among the sampled population, the majority (64.2%) exhibited normal viscosity, while 29.9% were hyper-viscous, and 6.0% displayed reduced viscosity. Specifically, within the category of normal viscosity, the age group 30 to 39 years demonstrated the highest prevalence at 21 out of 43 cases (48.84%), followed by



the 40 to 49 age group with 13 out of 43 cases (30.23%). In contrast, among those with hyper-viscous semen, the highest proportion of 8 out of 20 cases (40%) was observed within the 30 to 39 age group, with the 40 to 49 age group representing the second-highest incidence at 5 out of 20 cases (25%).

Figure 1. Age distribution of male partners with azoospermia

Table 2a. Type of viscosity among males with azoospermia (n = 67)

Viscosity	n	%
Hyperviscous	20	29.8
Normal	43	64.1
Reduced viscosity (watery)	4	5.9

Table 2b. Age groups and viscosity (n = 67)

Age group	Type of viscosity		
	Hype viscous	Normal	Reduced
<20	0	0	0
20 – 29	1	2	0
30 – 39	8	21	1
40 – 49	5	13	3
50 – 59	3	6	0
60 – 69	3	1	0

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>70	0	0	0

Tables 3a and 3b present the semen volume characteristics of individuals diagnosed with azoospermia. The analysis reveals that the majority (68.7%) exhibited normal semen volume, while 26.9% displayed reduced volume, and 4.47% demonstrated increased volume. Notably, among those with reduced volume (hypospermia), the highest proportion of cases, 8 out of 18 (44.4%), was observed within the 40 to 49 age group.

Table 3a. Type of semen volume among clients with Azoospermia

Semen volume	n	%
Hypospermia (reduced volume)	18	26.8
Normal	46	68.6
Hyperspermia (High volume)	3	4.4

Table 3b. Type of semen volume by age group (n= 67)

Age group	Type of volume		
	Normal	Hypo spermia	Hyper spermia
<20	0	0	0
20 – 29	3	0	0
30 – 39	24	3	3
40 – 49	13	8	0
50 – 59	5	4	0
60 – 69	1	3	0
>70	0	0	0

Discussion

In African societies, male fertility is often assumed if erection and ejaculation occur, leading to men's reluctance for fertility assessments, especially in polygamous relationships. Yet, optimal sperm parameters are crucial for fertilization. Men usually undergo only semen analysis, fearing being labeled as the cause of infertility. Semen analysis detects abnormalities affecting fertility, including azoospermia, the absence of spermatozoa in ejaculate samples (4, 5).

The prevalence of infertility within married couples is estimated to be approximately 15%, with male factors contributing to 30-50% of cases (6). Genetic, geographic, age, occupational, and body composition differences influence male infertility rates (7).

Our retrospective analysis revealed a prevalence rate of azoospermia at 5.5% within our study cohort spanning from 2015 to 2020. Prevalence rates of azoospermia exhibit significant variability. For instance, Jarvi et al. (2010) reported an azoospermia rate of approximately 1% within the male population, while other studies have cited higher rates, up to 20% (6, 7). Numerous studies have reported substantially elevated prevalence rates of azoospermia. For instance, a study conducted on male infertility in Turkey by Karabulut et al. (2018) documented an incidence rate of 18.3% (8). In the investigation conducted by Wosnitzer et al. (2014), a prevalence rate ranging between 10% to 20% was observed (9). Furthermore, Owolabi et al. (2013) conducted a study in Nigeria which revealed a prevalence rate of 6.2% (10). Meanwhile, a separate study conducted in Nigeria by Umar et al. (2020) reported a 47.5% prevalence of azoospermia within their study cohort (11).

In contrast, alternative studies have documented lower prevalence rates of azoospermia. For instance, Fogle et al. (2006) reported a prevalence rate of 3% (12), This finding was congruent with the 4% rate documented in the identical institution in the year 2000 (13) Meanwhile, Peter et al. (2016) identified a prevalence rate of 3.5% in their investigation conducted in Nigeria (14). Consequently, this rate does not holistically represent the broader azoospermia prevalence within our demographic. However, this data provides a foundation for facilitating the provision of resources such as surgical sperm retrieval and donor semen. Further investigations are warranted to discern the etiology of azoospermia, distinguishing between obstructive and non-obstructive factors.

The etiology of azoospermia encompasses conditions affecting pre-testicular, testicular, and post-testicular levels. Pre-testicular causes, often amenable to treatment, involve endocrine disorders such as hypogonadotropic hypogonadism, hyperprolactinemia, and androgen resistance. Testicular causes stem from intrinsic disorders within the testis, including genetic abnormalities, undescended testes, varicocele, testicular torsion, mumps orchitis, and exposure to medications or radiation. With the exception of varicocele, these conditions tend to be irreversible. Post-testicular causes, on the other hand, are frequently correctable and encompass ejaculatory disorders such as retrograde ejaculation, obstructive issues arising

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from the absence or obstruction of the vas deferens, as well as obstructions affecting the epididymis or ejaculatory ducts.

Due to the Covid-19 pandemic, semen analyses declined in 2020 due to lockdowns and center closures. Our study omitted sociodemographic and medical factors known to influence semen parameters. Further multicenter research with larger cohorts is needed to explore these associations and azoospermia prevalence. Counseling for infertility should emphasize sperm presence over semen volume to encourage earlier semen analysis. Azoospermia with normal volume may result from vasal obstruction or spermatogenesis issues, requiring hormonal evaluation, particularly serum follicle-stimulating hormone (FSH) levels. Low volume azoospermia with normal-sized testes may stem from accessory gland fluid abnormalities, likely ejaculatory dysfunction or ejaculatory duct obstruction (EDO), with EDO being the primary consideration (15).

In our study, 68.7% had normal semen volume, 26.9% had hypospermia (<2ml), and 4.47% had hyperspermia. Comparable findings were observed in a Sudanese study: 89.7% had adequate volume, and 10.3% had abnormal volume (16). Moreover, an investigation conducted in Nigeria revealed that a substantial proportion of the participants (91%) exhibited satisfactory semen volume, whereas a minority (9%) manifested abnormal semen volume, characterized by 7.3% with hypospermia and 1.7% with hyperspermia (17).

The predominance of clients exhibiting normal semen volume may be ascribed to adherence to the recommended 3-4 days of sexual abstinence prior to sample collection, underscoring the importance of this practice for accurate semen analysis. Existing literature substantiates the influential role of semen viscosity in sperm function. While semen viscosity holds negligible relevance in cases of azoospermia, its abnormality in the presence of spermatozoa significantly compromises sperm function and fertilization. Normal semen viscosity is imperative for facilitating spermatozoa entry into cervical mucus (18). Assists in preserving sperm motility following mucus penetration and regulates the distribution of surface charges on the sperm membrane during maturation (19), prevention of the lipid peroxidation reaction (20), and maintenance of the chromatin integrity of spermatozoa (21).

The presence of a thick and coagulated semen leads to the condition known as semen hyperviscosity (SHV), which compromises the physical and chemical attributes of seminal fluid (22). Recent research indicates a prevalence rate of semen hyperviscosity (SHV) ranging from 12% to 29%. SHV is recognized as a factor contributing to compromised sperm motility, semen quality, and suboptimal outcomes in in vitro fertilization procedures (23, 24, 25). Hence, the presence of spermatozoa in semen underscores the significance of assessing semen viscosity. This study provided an overview of semen analysis outcomes with a focus on azoospermia. Nonetheless, numerous inquiries persist, including the classification of azoospermia and the identification of associated risk factors among males, encompassing genetic, environmental, nutritional, and socioeconomic determinants. Addressing these queries necessitates a prospective investigation, currently under consideration.

This study has several limitations. Firstly, due to its retrospective nature, only data already documented in the semen analysis reports were examined. Secondly, the study was carried out solely at a single fertility center. Consequently, the extrapolation of the findings should be exercised with caution.

Conclusion

In conclusion, this retrospective study provides valuable insights into the prevalence and characteristics of azoospermia among male partners seeking infertility treatment at the Emena Diagnostic and Fertility Centre over a six-year period. The findings reveal that azoospermia accounted for 5.5% of semen analyses conducted during this timeframe, with notable fluctuations observed across the years, including a marked decrease in 2020 likely attributed to the Covid-19 pandemic-related lockdown measures. Age distribution analysis highlights individuals aged 30 to 59 years as comprising the majority of azoospermia cases, with the 30 to 39 age group being the most prevalent. Additionally, semen viscosity and volume profiles shed light on the characteristics of individuals diagnosed with azoospermia, with variations observed across different age groups. These findings underscore the importance of comprehensive evaluation and management strategies tailored to address the multifaceted aspects of male infertility, with

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considerations for age-specific factors and associated semen parameters. Further research efforts are warranted to delve deeper into the underlying etiologies and potential interventions aimed at mitigating the impact of azoospermia on male fertility and reproductive outcomes.

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Conflicts of Interest

We have no commercial or financial gains for this study.

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