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The prevalence of risk factors and seminal fluid abnormalities in infertile men in Babylon Province

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Abstract

Background: Male infertility is a global health issue with multifactorial origin of medical, environmental, and lifestyle factors. The aim of this study was to investigate the prevalence of risk factors and seminal fluid abnormalities in infertile men in Babylon Province, Iraq.

Methods: In this cross-sectional study, 150 infertile men were recruited for the study and the prevalence of male infertility risk factors including varicocele, smoking, obesity, cryptorchidism, systemic diseases, and genital tract infections was determined. All patients underwent seminal fluid analysis according to World Health Organization (WHO) 5th criteria to assess the prevalence of seminal abnormalities such as oligospermia, asthenospermia, teratospermia, azoospermia, and their combination.

Results: Varicocele was the most common risk factor affecting 64% of participants followed by obesity (42%) and smoking (38%). Genital tract infections and systemic diseases were present in 16% and 35% of patients respectively. Seminal fluid abnormalities were prevalent with oligoasthenospermia observed in 32% of participants and azoospermia in 19%. Mean sperm concentration in infertile men was 28.1 ± 23.5 million/mL, progressive motility 24.1 ± 16.8%, and normal morphology 5.6 ± 4.2%.

Conclusion: Several modifiable risk factors such as varicocele, cryptorchidism, obesity, systemic diseases, smoking and genital infections are prevalent among Iraqi men with infertility. The most common seminal fluid abnormalities in these patients comprised oligoasthenospermia, azoospermia and oligospermia. Addressing these modifiable risk factors and seminal fluid abnormalities could enhance fertility outcomes in Iraqi men with infertility.

Keywords: Male Infertility; Risk Factors; Semen; Iraq

1. Introduction

Male infertility is a significant global health issue, affecting approximately 8–12% of couples worldwide and contributing to half of all infertility cases[1]. Male infertility is a multifactorial condition with a complex interplay of genetic, environmental, and lifestyle factors[2]. Despite advances in diagnostic and therapeutic strategies, male infertility remains poorly understood in many regions, particularly in developing countries. Understanding the prevalence and determinants of male infertility is crucial for improving diagnostic tests, designing targeted interventions and improving reproductive outcomes in these patients.

Seminal fluid analysis is the cornerstone for diagnosing male infertility, providing insight into key parameters such as semen volume, sperm concentration, motility, morphology, and leukocyte count[3]. Identifying the risk factors associated

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with these abnormalities is essential for effective clinical management. Several studies have highlighted the role of modifiable risk factors in male infertility. Smoking has been associated with reduced sperm quality due to oxidative stress and DNA damage[4]. Obesity, another critical factor, has been linked to hormonal imbalances and impaired spermatogenesis, with studies reporting a significant correlation between higher body mass index (BMI) and decreased semen quality[5]. Varicocele, a leading cause of reversible infertility, affects approximately 15% of the general male population but is present in 35–40% of infertile men[6]. Additionally, genital tract infections and leukocytospermia contribute to male infertility by inducing inflammation and oxidative stress, leading to poor semen quality[7]

In Iraq, male infertility poses unique challenges due to the combined effects of genetic, environmental, medical, lifestyle, and occupational factors[8]. Moreover, sociocultural stigma surrounding infertility often delays diagnosis and treatment, further complicating management. Despite these challenges, data on male infertility in Iraq remain limited, with existing studies focusing on specific risk factors or small-scale regional observations[9,10]

This study aims to address these gaps by evaluating the prevalence of risk factors and seminal fluid abnormalities in infertile men. Specifically, the study examines the associations between smoking, obesity, varicocele, infections, systemic diseases and environmental exposures with semen parameters such as sperm concentration, motility, morphology, and leukocyte count. By identifying modifiable risk factors and their impact on semen quality, this study contributes to the growing body of evidence on male infertility and highlights the need for targeted public health interventions in Iraq. Addressing these factors can improve diagnostic accuracy, treatment strategies, and ultimately, reproductive outcomes in local, regional and global contexts.

2. Methods

This cross-sectional study aimed to evaluate the prevalence of risk factors and seminal fluid abnormalities in infertile men. 150 infertile men were recruited from Infertility Clinic at Babylon Province, Iraq. Inclusion criteria comprised history of inability to father a child for twelve months or more with abnormal seminal fluid analysis. Medical history and physical examination were performed for all patients and data were collected using dedicated questionnaire. Data collected comprised demographics, duration of infertility, previous pregnancies outcomes, presence of varicocele, cryptorchidism, smoking, obesity, genital infections and systemic diseases relevant to male infertility. The research was approved the ethical research committee at the College of Medicine, University of Babylon (Document No.1 dated 10-9-2024).

2.1. Semen analysis

All the patients were asked to avoid sexual activity for two to three days before the collection of the semen sample. The collection of semen samples was achieved by masturbation and the patients were instructed to provide a complete sample. Following collection, the semen sample was held at 37°C for liquefaction and then analyzed according to WHO 2010 5th criteria for all semen parameters[11]**.** All the analyses were undertaken by the same investigators and for all participants, two semen samples were assessed and their average value was used for this study. The prevalence of risk factors for male infertility were expressed as proportions. Seminal fluid analysis results were expressed as mean ± SD

3. Results

The study included 150 infertile Iraqi men with a mean age of 37.6 ± 15.6 years. Among the participants, 72% presented with primary infertility, while 28% reported secondary infertility. The average duration of infertility was 8.2 ± 5.7 years.

Table 1 Patients characteristics

Age (year)	**37.6±15.6**
Type of infertility	
Primary	108 (72%)
Secondary (%)	42 (28%)
Duration of infertility (%)	8.2±5.7

The most prevalent risk factor was varicocele, observed in 64% of the participants. Among these cases, varicocele was predominantly left-sided in 29%, right-sided in 8%, and bilateral in 27%. Cryptorchidism was present in 9% of participants, with unilateral cases accounting for 7% and bilateral cases for 2%. Smoking was reported by 38% of the men, while obesity was identified in 42%, with 15% classified as overweight and 27% as obese. Genital tract infections were diagnosed in 16% of the cohort. Systemic diseases were noted in 35% of participants, with hypertension present in 14%, diabetes mellitus in 11%, and neurological conditions in 3%.

Table 2 Prevalence of male infertility risk factors

Risk factor	**No.**	**(%)**
Varicocele	96	64
Left	44	29
Right	12	8
Bilateral	40	27
Cryptorchidism	14	9
Unilateral	10	7
Bilateral	4	2
Smoking	57	38
Obesity	63	42
Overweight	23	15
Obese	40	27
Genital tract infection	24	16
Systemic diseases	52	35
Hypertension	20	14
Diabetes Mellitus	16	11
Neurological Diseases	4	3
Other diseases	12	8

Seminal fluid analysis revealed a variety of abnormalities. Oligospermia was detected in 17% (26) of participants, asthenospermia in 14% (21), and teratospermia in 8% (12). Azoospermia was observed in 19% (29) of men. Combined abnormalities were common, with oligoasthenospermia present in 32% (48) and oligoasthenoteratospermia in 10% (15).

Table 3 Prevalence of seminal fluid abnormalities in infertile men

Seminal fluid abnormality	**No.**	**(%)**
Oligospermia	26	17
Asthenospermia	21	14
Teratospermia	12	8
Azoospermia	29	19
Oligoasthenospermia	48	32
Oligoasthenoteratospermia	14	10

The mean semen volume was 2.8 ± 0.5 ml, and the mean sperm concentration was 28.1 ± 23.5 million/ml. The mean of progressive motility was 24.1 ± 16.8%, while total motility was 32.3 ± 20.15%. The mean percentage of morphologically normal sperm was 5.6 ± 4.2%. Leukocytospermia was evident, with a mean white blood cell (WBC) count of 5.2 ± 3.9 million/ml.

Table 4 Mean and SD of semen parameters in infertile men

Seminal fluid abnormality	Mean± SD
Semen Volume (ml)	2.8 ± 0.5
Sperm Concentration (million/ml)	28.1 ± 23.5
Progressive Motility (%)	24.1 ± 16.8
Total Motility (%)	32.3 ± 20.15
Normal Morphology (%)	5.6 ± 4.2
WBC Count (million/ml)	5.2 ± 3.9

4. Discussion

This study examined the prevalence of risk factors and seminal fluid abnormalities in a cohort of infertile Iraqi men. The results provide important insights into the etiology of male infertility in Iraq, highlighting similarities and differences when compared to regional and global studies.

The prevalence of varicocele in this study was 64%, a finding consistent with other studies conducted in Iraq and neighboring countries. Mohammed and Al-Khafaji (2018) reported similar rates in their study on infertile Iraqi men[10]. Varicocele is widely recognized as a major reversible cause of male infertility, with a global prevalence among infertile men ranging from 30% to 40%[1]. However, the higher prevalence in Iraq may reflect delays in diagnosis and treatment, as well as differences in healthcare access. Regional studies from Saudi Arabia and Jordan have reported slightly lower varicocele prevalence rates, between 50% and 60% [12], suggesting geographic and environmental variability.

Cryptorchidism was observed in 9% of patients, comparable to findings in other Iraqi studies [8]. Globally, the prevalence of cryptorchidism ranges from 5% to 10% [13]. The slightly higher rate in Iraq may be attributed to limited early surgical intervention and delayed presentation, particularly in rural areas.

Smoking was identified as a risk factor in 38% of the participants, a prevalence consistent with Iraqi studies and slightly lower than in neighboring countries like Jordan and Kuwait, where rates often exceed 40% [9]. Globally, smoking remains a significant contributor to male infertility, with well-documented effects on sperm quality, including reduced concentration, motility, and increased DNA fragmentation [4].

Obesity and overweight were present in 42% of participants, with 27% classified as obese. These rates are consistent with Iraqi data, where obesity prevalence among infertile men ranges from 25% to 35% [14]. Regional studies in the Middle East report even higher rates due to dietary habits and sedentary lifestyles [15]. Globally, obesity's impact on male fertility is well-documented, with evidence linking it to hormonal imbalances and impaired spermatogenesis [16]

Genital tract infections, identified in 16% of participants, align with findings from other Iraqi and regional studies. Mohammed and Al-Khafaji (2018) reported similar rates of genital infections, often associated with inflammation and oxidative stress[10]. However, some studies in neighboring countries, such as Egypt and Turkey, report higher prevalence rates exceeding 20% [3]. Globally, infections are underdiagnosed but significant contributors to male infertility [7].

Systemic diseases, particularly hypertension and diabetes mellitus, were present in 35% of participants. These findings are consistent with studies in Iraq and the broader Middle East, where the prevalence of non-communicable diseases is rising [12].

The prevalence of oligospermia in this study was 17%, consistent with findings from other studies in Iraq [14]. This prevalence is slightly lower than rates observed in Saudi Arabia and Kuwait, where oligospermia affects 20–25% of infertile men [12]. Globally, oligospermia rates are reported at 15–20%, confirming its significance as a major cause of male infertility [17].

Asthenospermia (14%) and teratospermia (8%) were less prevalent in this study compared to rates reported in regional studies. For instance, studies in Egypt and Jordan report asthenospermia rates exceeding 20% and teratospermia rates above 10% [3]. Globally, asthenospermia is among the most common abnormalities, often linked to lifestyle factors, oxidative stress, and infections [4].

Azoospermia, observed in 19% of participants, aligns with findings from other Iraqi and regional studies. Mohammed and Al-Khafaji (2018) reported similar rates in their study on Iraqi men[10]. Globally, azoospermia prevalence ranges from 10% to 15%, with higher rates in developing countries due to environmental exposures and healthcare disparities [18].

Combined abnormalities such as oligoasthenospermia (32%) and oligoasthenoteratospermia (10%) were the most common conditions identified in this study. These findings are consistent with regional and global data, where combined abnormalities are recognized as significant contributors to infertility [17].

The mean semen volume (2.8 ± 0.5 mL) and sperm concentration (28.1 ± 23.5 million/mL) were within the lower range of WHO reference values (WHO, 2010). These results are consistent with other Iraqi studies, where mean sperm concentrations range from 25 to 30 million/mL (Hameed et al., 2017). Progressive motility (24.1 ± 16.8%) and total motility (32.3 ± 20.15%) were below WHO thresholds, consistent with findings from regional and global studies [19,20,21,22].

Compared to regional and global studies, the results highlight several key patterns. The high prevalence of varicocele in infertile men Iraq underscores the need for targeted diagnostic and treatment strategies. Obesity, smoking, and systemic diseases remain significant modifiable risk factors for male infertility in Iraq, mirroring global trends. However, the slightly lower prevalence of asthenospermia and teratospermia warrants further investigation of the predisposing genetic and environmental factors specific to Iraqi populations. This study provides a comprehensive assessment of risk factors and seminal fluid abnormalities in infertile Iraqi men, situating the findings within a regional and global context. Future research should focus on longitudinal studies and genetic analyses to further elucidate the etiology of male infertility in Iraq.

5. Conclusion

Many risk factors are prevalent among infertile men in Iraq including varicocele, cryptorchidism, smoking, obesity, genital tract infections and systemic diseases. Similarly, many seminal fluid abnormalities are prevalent among these men including oligoasthenospermia, azoospermia and asthenospermia. Further large-scale studies are warranted to estimate the prevalence at national and global levels.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict-of-interest to be disclosed.

Ethical Approval

The research was approved the ethical research committee at the College of Medicine, University of Babylon (Document No.1 dated 10-9-2024).

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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