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"STUDY OF MALE INFERTILITY"

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Abstract:

Introduction:

Infertility, marked by the inability to conceive after a year of unprotected intercourse, is a pressing global issue. This study aims to delve into the causes and presentation patterns of male factor infertility, which constitutes 40% of infertility cases worldwide. Despite its significance, male infertility often receives less attention in research. Understanding its etiology and clinical manifestations is vital for effective management, making this study's focus on male infertility crucial.

Materials and Methodology: This retrospective study was conducted at a tertiary care center in India from July 2020 to December 2022. Semen analysis was performed on partners of infertile females attending the gynecological outpatient department. Participants aged 25-40 years with male factor infertility were included. Data were collected through questionnaires and clinical examinations. Statistical analysis was performed using EPI INFO software.

Result: Among 152 infertile couples, 50 were identified with male factor infertility. The mean age of participants was 34.5 years. A significant proportion of couples (38.15%) had been married for less than five years. The main cause of infertility in the study population was male factor infertility (33%). Secondary infertility was observed in 22% of cases. Participants were predominantly educated at the university level (55.3%) and employed (63.2%). Environmental and social exposures, such as alcohol consumption and cigarette smoking, were reported by a minority of participants.

Conclusion: Male factor infertility remains a prevalent issue, with unexplained infertility comprising a significant proportion of cases. Variability in semen analysis standards and potential recall bias among patients were identified as study limitations. Investment in diagnostic technologies and health education initiatives targeting men are essential for addressing male infertility effectively. Further research is needed to explore the complexities of male factor infertility and improve diagnosis and management strategies.

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Key words: Asthenozoospermia, Infertility, Oligozoospermia, Semen analysis, Testosterone

INTRODUCTION:

Infertility pertains to a pathological condition of the male or female reproductive system, characterized by the inability to achieve conception despite engaging in regular, unprotected sexual intercourse for a duration exceeding 12 months [1]. In the general population, approximately 84% of couples are anticipated to conceive within one year of such activity, with around 92% achieving conception within two years [1,2]. However, failure to conceive after two years of consistent, unprotected sexual activity, in the absence of identifiable reproductive pathology, classifies the couple as infertile [2].

Primary infertility denotes the condition wherein a couple has never achieved conception [3], whereas secondary infertility refers to the inability to conceive subsequent to a prior pregnancy [3]. Predominantly, primary infertility afflicts the majority of infertile couples on a global scale. Over the past three decades, infertility has emerged as a burgeoning concern worldwide, attributed in part to societal trends including delayed marriage and childbearing, heightened utilization of contraceptives, particularly intrauterine devices, and the liberalization of abortion practices [3].

The incidence of infertility within a population carries significant demographic and health ramifications [3]. Prevalence rates of infertility exhibit considerable variation, being lower in developed nations and higher in developing countries where resources for investigation and treatment are limited [4]. Globally, infertility constitutes a noteworthy medical and societal concern, with approximately 15% of couples affected, of which 40% are attributed to male factor infertility, 40% to female factor infertility, and the remaining cases involve a combination of both factors [5]. This issue extends across geographical boundaries, with an estimated 60-80 million couples experiencing infertility annually worldwide, with potentially 15-20 million of these cases concentrated in India alone [6].

The World Health Organization (WHO) projects the overall prevalence of primary infertility in India to range between 3.9% and 16.8% [7]. Estimates of infertility exhibit significant divergence across various Indian states, ranging from 3.7% in Uttar Pradesh, Himachal Pradesh, and Maharashtra, to 5% in Andhra Pradesh, and up to 15% in Kashmir [7]. Furthermore, disparities in the prevalence of primary infertility have been observed among different tribes and castes within the same geographical region in India [7]. It is important to acknowledge that these estimates are subject to variations in the definitions of infertility and the time frames considered, thereby complicating direct comparisons across studies.

Hence, it is imperative to acknowledge male infertility as a pertinent public health concern, necessitating a comprehensive investigation into its etiology and clinical manifestations. The significance of this study lies in its potential to furnish essential foundational insights into male factor infertility, a demographic that has hitherto been insufficiently studied in isolation. Presently available data predominantly stems from research conducted on infertile couples, underscoring the need for focused examination of male infertility as a distinct entity. Such elucidation holds promise

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for informing the development of policy directives aimed at the effective management of male factor infertility. The study's ambit encompasses delineating the clinical presentation of male factor infertility by elucidating its underlying causes, prevalence rates, associated factors, and the demographic characteristics of affected populations.

The aim of the present study is to investigate and characterize the causes and presentation patterns of male factor infertility at our institute.

MATERIALS AND METHODOLOGY:

This retrospective study was conducted at the Gynaecological Outpatient Department (OPD) of the tertiary care center, SMT. N.H.L. Municipal Medical College and SVPIMSR Hospital Ahmedabad, Gujarat, India, spanning from July 2020 to December 2022. It primarily focused on partners of infertile females seeking treatment for infertility at the gynaecology OPD. Semen examination was performed on their spouses as part of the infertility investigation. The study population consisted of patients aged between 25 and 40 years with male factor infertility attending the Gynaecological Department of the tertiary care center. All participants provided informed consent in a language understandable to them.

Inclusion criteria encompassed patients with a confirmed diagnosis of male factor infertility determined via semen analysis, who provided consent for study participation and were subsequently followed up. Exclusion criteria included patients declining participation, those previously treated for male factor infertility, and individuals attempting conception for less than one year (12 months).

The study comprised two distinct steps: Step 1 involved providing participants with explanations regarding abnormal semen reports and details about the ongoing study, obtaining consent for participation, and administering a questionnaire. In Step 2, participants were referred to the urology department for completion of the examination section of the questionnaire and subsequent treatment as deemed necessary.

Semen collection was conducted following specific guidelines. Participants were instructed to abstain from sexual activity for 48–72 hours prior to collection to optimize semen quality. To establish a baseline, participants were asked to provide at least two separate semen samples, which were then sent to two standard laboratories. Semen was collected through self-stimulation, coitus interruptus (although less ideal), or using a special, non-spermicidal condom, and deposited into a clean container. Samples were analyzed within one hour of collection to maintain sperm motility, and during transit, they were kept at body temperature.

Statistical Analysis:

The data were entered into Microsoft Excel 2010 and analyzed utilizing EPI INFO, Version 7 software. Qualitative data were expressed as frequency and percentage, while continuous variables like age were summarized using means and standard deviations. Comparison of continuous variables was intended to be performed utilizing the student t-test for normally distributed variables. Categorical variables such as sex, occupation, and level of education attended were summarized

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using proportions and frequency tables. Patients' characteristics were delineated in tabular form, illustrating the distribution of social, economic, demographic, and reproductive health attributes.

RESULT AND DISCUSSION:

Among the total infertile couples attending our institute, 152 consented to participate in our study, of which 50 couples were identified with male factor infertility, with 26 couples attributing male factors as contributing to their infertility. All participants were married individuals. The mean age of the study population was 34.5 years, aligning with findings from a study conducted by Meacham *et al.*, where the majority of patients seeking ambulatory surgery visits for male infertility fell within the age range of 18–34 years [7].

TABLE: 1 DURATION OF MARRIAGE

Duration of Marriage	Frequency	Percentage	Velu A *Et al* [8]
<5	29	38.15	40
5-10	23	30.2	-
>10	24	31.5	-

In our study, 38.15% couples had duration of marriage of <5 years which was like Velu *et al.*, study which had 40% participant having duration of marriage less than 5 years [8].

Table: 2 Causes of Infertility in Couple

Main cause of infertility in the couple	Frequency
Male factor infertility	50
Female factor infertility	76
Mixed factor infertility	26
Total	152

In our investigation, a total of 50 couples were identified as exclusively experiencing male factor infertility, constituting approximately 33% of the total participants. All male partners within these couples, whether solely responsible for infertility or contributing to it, were included in the study cohort.

Table: 3 Subset of infertility

Variable	**Frequency**	**Percentage**	**Amadi *et al.*, [9]**
Primary	59	78	-
Secondary	17	22	21.1

In this investigation, the prevalence of male participants with secondary infertility was determined to be 22%, which closely paralleled findings from a study conducted by Amadi *et al.*, wherein respondents experiencing secondary infertility accounted for 21.1% of male factor infertility cases [9]. This contrasts with results from a study by Ikechebelu JI *et al.*, who reported a higher proportion

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of couples experiencing secondary infertility (65%) compared to primary infertility (35%) [10]. Discrepancies in findings may stem from the inclusion of female factor infertility when assessing infertility within couples.

Table 4. Social and demographic information

Variable		Frequency	Percentage	Amadi et al., [9]
Level of education.	Secondary	8	10.5	10.6
	College	26	34.2	34.2
	University	42	55.3	55.2
Employment	Employed	48	63.2	63.5
	Self-employed	24	31.6	31.6
	Unemployed	4	5.2	5.3

The majority of participants in our study, totalling 42 individuals, attained a University level of education, constituting 55.3% of the sample, followed by 26 participants at the College level, comprising 34.2%, and 8 individuals at the Secondary level, representing 10.5%. Regarding employment status, 48 participants (63.2%) were employed, 24 (31.6%) were self-employed, and a minority (4.9%) were unemployed. Similarly, findings from the study by Amadi *et al*. reflected a comparable pattern, with a majority of participants, 21 individuals, having attained a university level of education (55.2%), followed by 13 participants at the College level (34.2%), and 4 individuals at the Secondary level (10.6%) [9]. In terms of employment, 24 participants (63.5%) were employed, 12 (31.6%) were self-employed, and a small fraction (5.3%) were unemployed [9].

Table: 5 Environmental and Social Exposure

Environmental and social factor	Variable	Frequency	Velu A *et al* [8]
Alcohol consumption regularly	14	18.4	-
CigaretteSmokingregularly	13	17.1	16
Stress	2	2.6	3

In our investigation, we examined environmental and social exposures, revealing that 14 participants (18.4%) reported regular alcohol consumption, 13 (17.1%) reported regular cigarette smoking, and stress was reported by 2 participants (2.6%). These findings align closely with those of the study by Velu A *et al*., wherein 16% of participants reported regular cigarette smoking and stress was observed in 3% of participants [8].

Table: 6 Sexual Intercourse Frequency

Variable	Frequency	Percentage	Amadi *et al*. [9]
At least onceweekly	54	71.1	71.5
At least twice amonth	21	27.6	-
Less than twice amonth	1	1.3	2.6

The majority of study participants, comprising 54 individuals (71.1%), engaged in sexual intercourse at least once per week, followed by those who engaged at least twice per month (27.6%), and a minority (1.3%) reported having sex less than twice a month. Given that infertility is defined as the

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inability to achieve pregnancy after 12 months of regular unprotected sexual intercourse with the same partner, the frequency of sexual activity among couples is a crucial determinant of their fertility status. Notably, 71.1% of subjects reported engaging in sexual intercourse at least once weekly, a figure consistent with findings from the study by Amadi *et al*., where it was reported as 71.5% [9]. Additionally, 27.6% reported having sexual intercourse at least twice a month, while only 1.3% reported engaging in sexual intercourse less than twice a month, mirroring results from the study by Amadi *et al*., [9]. In couples of reproductive ages, the frequency of intercourse significantly influences couple fecundity. The median sexual intercourse frequency among couples attempting to conceive during follow-up was found to be 6 acts per month, a finding in alignment with our study results.

Table: 7 History of exposure to predisposing factors

Variables	Response	Frequency	%	Amadi *et al* [9]
History ofurethral discharge	No	71	93.4	-
	Yes	5	6.6	5.3
History of mumps	No	76	100	-
	Yes	0	0	-
History ofscrotal swelling	No	76	100	-
	Yes	0	0	-
History ofacute testicular pain	No	6	100	-
	Yes	0	0	-
History oftrauma to groin	No	76	100	-
	Yes	0	0	-

The analysis of participant history revealed that out of the 76 individuals, only 5 (6.6%) reported a history of urethral discharge, while the majority, 71 (93.4%), had no such history. None of the participants reported a history of mumps, scrotal swelling, acute testicular pain, trauma to the groin, or chronic illness. Additionally, all 76 participants (100%) denied any history of these conditions, indicating a lack of such medical events in the cohort.

In terms of long-term medication usage, all 76 respondents reported no use of such medications, accounting for 100% of the cohort. Furthermore, none of the respondents had a history of groin surgery, indicating that the entire cohort, 76 out of 76 participants, or 100%, lacked any surgical intervention in the groin area. To summarize the clinical characteristics analysis, the majority of respondents did not report past exposure to suspected predisposing factors such as testicular pain, trauma, or swelling.

Regarding clinical characteristics potentially influencing fertility status, only 2 patients reported a history of urethral discharge, suggestive of infections. None of the subjects had a history of mumps, scrotal swelling, acute testicular pain, testicular trauma, chronic illness, long-term medication use, or groin surgery. Consequently, a significant proportion of subjects (60.5%) experienced unexplained infertility, as discussed previously.

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In the study conducted by Amadi *et al*., the prevalence of participants reporting urethral discharge was 5.3%, this is closely resembling the findings of our investigation. Additionally, the percentage of participants with no history of congenital syndrome reported in Amadi *et al*.'s study, at 97.4%, is similar to the results of our study [9].

Table: 8 Physical Assessment and Investigation for Male with Reduced Fertility

Parameters	Response	Frequency	%	Amadi*et al* [9]	Velu A *et al*., [8]
Erection	Inadequate	11	14.5	15.6	-
	Adequate	65	85.5	-	-
Ejaculation	Normal	76	100	-	-
	Abnormal	0	0	-	-
Varicocele	No	53	69.7	-	
	Yes	23	30.3	32.3	24
Undescended testis	No	76	100	-	-
	Yes	0	0	-	-
Testicularmass	No	76	100	-	-
	Yes	0	0	-	-
Palpable vas deferens	No	0	0	-	-

Among all participants, 85.5% exhibited normal erection, while 14.5% reported inadequate erection, a proportion comparable to the findings of Amadi *et al*., where 15.6% of participants experienced erectile problems [9].

Regarding ejaculation, all 65 respondents (100.0%) reported normal ejaculation, with no instances of abnormal ejaculation observed. Similarly, in terms of varicocele, 30.3% of the 76 respondents were found to have varicocele, a prevalence consistent with that reported by Amadi *et al*., where 32.3% of participants had varicocele, and Velu A *et al*., where the percentage was 24% [8,9]. None of the respondents (100.0%) reported an undescended testis or testicular mass. Additionally, all participants had palpable vas deferens, with none lacking this anatomical feature.

All respondents (100%) consented to undergo semen analysis testing, as reflected in the test results. The analysis of semen analysis revealed that 21.1% exhibited asthenozoospermia, 13.2% had both asthenozoospermia and oligozoospermia, 28.9% presented with azoospermia, and 36.8% demonstrated oligospermia. Regarding hormonal profiling, 92.1% of respondents had undergone testing, with 7.9% yet to complete their hormonal profile. Among those tested, 15.2% exhibited low serum testosterone levels. Testicular biopsy was performed on 13.2% of participants, with only one individual (14.2%) receiving an abnormal report. This report indicated Leydig cell clumping, seminiferous tubule scarring, and absence of sperm.

Only 4 participants, comprising 5.3% of the total, underwent transrectal ultrasonography, revealing ejaculatory duct obstruction in one participant. Semen analysis remains the primary and most essential diagnostic tool in the investigation of male factor infertility. This straightforward test evaluates sperm formation, maturity, and interaction with seminal fluid, providing valuable insights

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into sperm count, motility, morphology, and overall quality. Semen analysis was conducted on all subjects enrolled in the study, revealing oligozoospermia as the most prevalent abnormality at 36.8%, followed by azoospermia at 28.9%, asthenozoospermia at 8%, and a combination of oligozoospermia and asthenozoospermia at 13.2%.

Additional notable findings from this study include a 14.2% prevalence of erectile dysfunction among males, with no instances of inadequate ejaculation observed. Hormonal levels were within normal ranges for 84.8% of participants, while abnormalities were detected in 15.2% of cases, characterized by low testosterone levels. These findings underscore the pressing necessity for establishing an andrology unit dedicated to the comprehensive management and follow-up of male factor infertility patients.

Table: 9 Causes of Infertility in Male

Variable	Frequency	Percentage	Amadi *et al.*, [9]	Improved semen report after management
Unexplained	**50**	**65.7**	**60.5**	**25**
Varicocele	**23**	**30.3**	**-**	**0**
Ejaculatory duct obstruction	**1**	**1.3**	**-**	**0**

In this study, male factor infertility was attributed to various causes, with 65.7% classified as unexplained, 30.3% attributed to varicoceles, and 1.3% attributed to ejaculatory duct obstruction. This aligns with global data indicating varicoceles as a prevalent cause of infertility, observed in 19 to 41% of men with infertility. The observed high rate of unexplained infertility (65.7%) surpasses the global estimate of 50%, likely influenced by the predominance of intratesticular disorders in male factor infertility cases. Additionally, approximately 10% of male factor infertility cases stem from chromosomal translocations, although such data were not available among the study subjects. The study findings echo similarities with those reported by Amadi *et al.*, who also observed a substantial proportion of unexplained cases (60.5%) [9].

Table: 10 Causes of Infertility Vs Semen analysis

	Unexplained	Varicocele	Ejaculatory duct obstruction
Asthenozoospermia	14	4	0
Asthenozoospermia +Oligozoospermia	0	9	0
Azoospermia	11	5	1
Oligozoospermia	25	5	0

Unexplained fertility was observed in 14 patients (27.3%) with asthenozoospermia, 11 patients (22.7%) with azoospermia, and 25 patients (50%) with oligozoospermia. Varicocele was associated with 4 patients (15.4%) exhibiting asthenozoospermia, 9 patients (38.5%) presenting with both asthenozoospermia and oligospermia, 5 patients (23.1%) with azoospermia, and 5 patients (23.1%) with oligozoospermia. Additionally, ejaculatory duct obstruction was identified in 1 patient (100%) with azoospermia. Furthermore, 2 patients had normal semen analysis results

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TABLE: 11 Testosterone Levels Vs Semen Analysis Results

	Low testosterone level	Normal testosterone level
Asthenozoospermia	**0**	**14**
Asthenozoospermia + Oligozoospermia	**0**	**7**
Azoospermia	**7**	**16**
Oligozoospermia	**4**	**22**

Among the 70 patients assessed, 11 exhibited low testosterone levels. Among these, 7 patients presented with concomitant azoospermia, while 4 patients had oligozoospermia. Among the 59 participants with normal testosterone levels, 14 had asthenozoospermia, 7 had both asthenozoospermia and oligozoospermia, 16 had azoospermia, and 22 had oligozoospermia.

Regarding management, one patient diagnosed with ejaculatory duct obstruction underwent surgical intervention in the form of epididymovasostomy performed by a Uro-surgeon. Varicocele cases were managed surgically through vein ligation via an inguinal approach, also conducted by a Uro-surgeon. Patients with unexplained infertility received antioxidant therapy and clomiphene treatment, resulting in conception for 25 couples.

Limitation of the study:

Several limitations were encountered in this study. Firstly, variability in semen analysis standards due to the use of different laboratories was addressed by only including results from ISO certified facilities. Secondly, potential recall bias among patients was mitigated by allowing ample time for responses. Additionally, incomplete case records and the possibility of socially desirable responses were acknowledged, with confidentiality measures implemented to address these concerns. Overcoming patient refusal to participate was achieved through sensitization and assurance of no harm. Low clinic turnout posed a challenge, and the hospital-based nature of the study limits generalizability. Quality variability in laboratory evaluation was minimized by adhering to WHO guidelines, though the small sample size restricted association analyses, emphasizing the need for further research despite these limitations.

CONCLUSION:

Male factor infertility represents a prevalent and emotionally taxing condition for affected individuals. However, challenges in accurately and meaningfully diagnosing male reproductive dysfunction hinder our comprehension of the epidemiology and etiology of male infertility. Given that precise treatment relies on an accurate diagnosis, investment in local diagnostic and treatment technologies is imperative to address this disease effectively. Additionally, health education initiatives should be tailored to men, focusing on male factor infertility, to empower them to actively participate in the management of infertility within couples.

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