Original Article

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Prevalence, Clinical Patterns, and Determinants of Male Infertility among Infertile Couples in Sylhet

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Abstract:

Background: Infertility is a major global public health problem affecting about one in six couples and is associated with significant medical, psychological, and social consequences. Male factors contribute substantially to infertility, accounting for around 20% of cases and up to 50% when combined with female factors, yet it remains underdiagnosed in many developing countries, including Bangladesh.

Objective: This study aimed to determine the prevalence, clinical patterns, and determinants of male infertility among infertile couples in Sylhet, Bangladesh.

Methods: A descriptive cross-sectional study was conducted among 233 male partners of infertile couples attending in the Department of Obstetrics and Gynecology, Sylhet Women's Medical College Hospital from November 2025 to April 2026. Participants were selected purposively based on predefined criteria. Data were collected through face-to-face interviews using a semi-structured questionnaire and supplemented with clinical examination and semen analysis reports.

Results: The mean age of participants was predominantly 30–40 years (59.2%), and most were urban residents (58.8%) with middle-income status. More than half were smokers (54.5%) and 48.5% were overweight or obese. Diabetes (22.7%) and hypertension (20.6%) were common comorbidities. Abnormal semen parameters were found in 23.6% of participants, with asthenozoospermia (8.6%) being the most frequent abnormality followed by azoospermia (5.6%). Significant determinants of male infertility included overweight/obesity (OR=2.24, p=0.012), diabetes mellitus (OR=1.98, p=0.037), hypertension (OR=2.10, p=0.026), sexually transmitted diseases (OR=10.67, p<0.001), varicocele (OR=2.78, p=0.004), and testicular trauma (OR=2.09, p=0.049). Smoking, alcohol consumption, and occupational exposure showed increased odds but were not statistically significant.

Conclusion: Male infertility in Sylhet is influenced by multiple modifiable risk factors, particularly obesity, metabolic disorders, and reproductive tract infections. Strengthening early screening, lifestyle modification, and integrated male infertility services is essential for improving reproductive health outcomes.

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Introduction:

Infertility is a major global public health concern affecting a significant proportion of reproductive-aged couples and has important medical, psychological, and social consequences.

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The World Health Organization (WHO) defines infertility as the inability to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.[1] Globally, infertility affects approximately one in six individuals during their reproductive lifetime, highlighting its magnitude as an emerging reproductive health challenge.[1] Beyond its biological dimension, infertility is associated with substantial psychological distress, marital instability, social stigma, and economic burden, particularly in low- and middle-income countries.[2]

Male factor infertility contributes substantially to the overall burden of infertility. Evidence from WHO and epidemiological studies indicates that male factors alone account for approximately 20% of infertility cases, while contributing to nearly 40%–50% of cases when combined with female factors.[1,3] Male infertility is commonly diagnosed through abnormalities in semen parameters, including oligozoospermia, azoospermia, asthenozoospermia, and teratozoospermia, based on standardized WHO laboratory criteria.[4] Over recent decades, several studies have reported a decline in semen quality and sperm counts globally, raising concern about a potential increasing trend in male reproductive dysfunction.[5]

The clinical patterns of male infertility vary widely, ranging from pre-testicular hormonal disorders to testicular and post-testicular causes. Common clinical presentations include abnormal semen analysis, erectile dysfunction, ejaculatory disorders, and reproductive tract infections. Azoospermia and severe oligozoospermia are among the most severe forms, often requiring assisted reproductive technologies for conception.[6] The clinical spectrum of male infertility is further complicated by the coexistence of multiple abnormalities in semen parameters, making diagnosis and management challenging in routine clinical practice.[7]

Male infertility is a multifactorial condition influenced by genetic, environmental, occupational, medical, and lifestyle-related determinants. Genetic abnormalities, including chromosomal defects and Y-chromosome microdeletions, contribute significantly to severe infertility cases.[8] Medical conditions such as varicocele, endocrine disorders, diabetes mellitus, and infections of the reproductive tract are well-established causes of impaired spermatogenesis and sperm dysfunction.[9] Environmental exposures, including pesticides, heavy metals, radiation, and endocrine-disrupting chemicals, have also been strongly associated with reduced sperm quality, particularly in agricultural and industrial populations.[10]

Lifestyle factors play a critical role in male reproductive health. Smoking, alcohol consumption, obesity, physical inactivity, stress, and use of recreational drugs have all been shown to adversely affect sperm production, motility, and morphology.[11] In addition, occupational exposures to heat and toxic substances in certain industries may further increase the risk of infertility among men. These modifiable risk factors highlight the potential for prevention and early intervention in reducing the burden of male infertility.

In South Asia, infertility remains a significant but often under-recognized reproductive health issue. In Bangladesh, infertility affects a considerable proportion of couples, with estimates ranging from 10% to 15% based on national and regional data sources including the Bangladesh Demographic and Health Survey (BDHS) and reports from the National Institute of Population Research and Training (NIPORT).[12,13] Although female infertility is frequently emphasized in clinical settings, evidence suggests that male factors contribute substantially to infertility cases in Bangladesh, similar to global trends. However, sociocultural beliefs often lead to delayed evaluation of male partners, resulting in underdiagnosis of male infertility in routine practice.[14]

Clinical studies conducted in tertiary hospitals in Bangladesh have reported a high prevalence of abnormal semen parameters among infertile men, including oligozoospermia and asthenozoospermia as the most common findings.[15,16] Despite these observations, there is still limited comprehensive evidence on the prevalence, clinical patterns, and determinants of male infertility in different regions of the country, particularly in Sylhet. The lack of region-specific epidemiological data limits the

development of targeted reproductive health interventions.

Furthermore, male infertility in Bangladesh is often influenced by preventable factors such as smoking, infections, obesity, and occupational exposures, yet these determinants are not systematically studied in many local settings.[1,14] The absence of integrated data on clinical patterns and risk factors contributes to gaps in early diagnosis and effective management strategies. Understanding these determinants is essential for designing preventive measures, improving fertility care services, and reducing the social burden associated with infertility.
Therefore, this study aims to determine the prevalence, clinical patterns, and determinants of male infertility among infertile couples in Sylhet, Bangladesh.

Methodology

Study design and settings

This descriptive cross-sectional study was conducted to determine the prevalence, clinical patterns, and determinants of male infertility among infertile couples in Sylhet, Bangladesh. The study was carried out at Sylhet Women's Medical College Hospital from November 2025 to April 2026. The study population included male partners of infertile couples who had failed to conceive after at least 12 months of regular unprotected sexual intercourse. A total of 233 participants were included in the study, and the sample size was calculated based on a male infertility prevalence of 16.5% (p = 0.165).[17] Participants were selected using a purposive sampling technique according to the predefined eligibility criteria.

Sample selection criteria

The study comprised 233 purposively selected men aged 18 years and above who resided in Sylhet and were willing to provide written informed consent. Men with known genetic disorders affecting fertility, severe systemic illnesses such as malignancy or chronic renal failure, and couples in whom female infertility had already been identified as the primary cause of infertility were excluded from the study.

Data collection procedures

Data were collected through face-to-face interviews using a pretested semi-structured questionnaire. The questionnaire included information on socio-demographic characteristics, lifestyle and behavioural factors, occupational exposures, smoking history, medical and surgical history, and knowledge related to fertility determinants. Clinical examination findings and laboratory investigation reports, including semen analysis, were also reviewed and documented. Semen parameters, including sperm count, motility, morphology, and semen volume, were recorded following standard laboratory procedures.

Data analysis

Data were entered, cleaned, and analysed using the Statistical Package for the Social Sciences (SPSS), version 26 (IBM Corp., New York, USA). Descriptive statistics were expressed as frequencies and percentages for categorical variables and as means and standard deviations (SDs) for continuous variables. The chi-square test was used to assess associations between categorical variables. A p-value of <0.05 at a 95% confidence level was considered statistically significant. The study findings were presented using tables and charts.

Ethical approval

They were informed of their right to withdraw at any time without consequences, and confidentiality of all data was strictly maintained. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Sylhet Women's Medical College (Reference No.: SWMC/Eth.C/IERB/20260093).

Result

Table 1 shows that the study population was predominantly aged 30–40 years (59.2%), followed by 40–50 years (23.2%). Regarding education, the highest proportion had completed HSC level (25.8%), followed by graduate education (22.3%). Business was the most common occupation (38.6%), followed by service holders (32.2%). More than half of the respondents resided in urban areas (58.8%). In terms of monthly income, the majority (51.5%) earned 25,000–50,000 taka.

The findings show that more than half of the respondents were smokers (54.5%), with a mean smoking duration of 12.9±11.2 years

and an average consumption of 6.2±2.1 sticks per day. Only 5.6% reported alcohol consumption. Regarding BMI, 48.5% were overweight or obese. Most respondents (75.5%) reported no occupational exposure; however, 24.5% had exposure to high temperature, radiation, chemicals, or pesticides, with a mean exposure duration of 10.2±4.3 years. In terms of chronic illness, 45.1% had no history of disease, while diabetes (22.7%) and hypertension (20.6%) were the most common conditions, followed by thyroid disorders (15.0%) and STDs (9.0%). (Table 2)

Table 3 presents the distribution of surgical history and semen analysis parameters among the respondents. A minority had a history of testicular trauma (16.7%) and Varicocele (18.0%). Most participants (85.8%) had no prior surgical history, while abdominal surgery (5.2%), herniorraphy (4.7%), urogenital surgery (2.1%), and hydrocele surgery (2.1%) were less common. The mean semen parameters showed a volume of 2.41±1.16 ml, sperm concentration of 24.92±10.25 $\times 10^6$/ml, motility of 38.11±11.33%, and abnormal morphology of 30.01±21.96%. Regarding semen analysis outcomes, 76.4% had normal fertility status, while 23.6% showed abnormalities. The most frequent abnormal pattern was Asthenozoospermia (8.6%), followed by Azoospermia (5.6%), with mixed semen defects observed in a smaller proportion of respondents.

In the figure 1, the majority of respondents were found to have normal fertility status (76.4%, n= 178), while 23.6% (n= 55) were identified as infertile based on semen analysis.

In the table 4, the analysis shows that several lifestyle and clinical factors were significantly associated with male infertility. Overweight/obesity (BMI ≥25 kg/m²) was significantly associated with infertility (OR= 2.24, p= 0.012). Similarly, diabetes mellitus (OR= 1.98, p= 0.037) and hypertension (OR= 2.10, p= 0.026) were also significant predictors. A strong association was observed between history of sexually transmitted diseases (STD) and infertility (OR= 10.67, p< 0.001). Varicocele (OR= 2.78, p= 0.004) and history of testicular trauma (OR= 2.09, p= 0.049) were also significantly associated with infertility. Although smoking, alcohol consumption, and occupational exposure showed higher odds of infertility, these associations were not statistically significant (p > 0.05).

Table 1: Sociodemographic characteristics (n= 233)

Variables	Frequency (n)	Percentage (%)
Age group (years)		
<30	35	15.0
30–40	138	59.2
40–50	54	23.2
≥50	6	2.6
Education		
Illiterate	31	13.4
Primary	27	11.6
SSC	40	17.2
HSC	60	25.8
Graduate	52	22.3
Masters	23	9.9
Occupation		
Business	90	38.6
Service	75	32.2
Agriculture	31	13.3
Abroad	20	8.6
Day labour	11	4.7
Others	8	3.4
Residence		
Urban	137	58.8
Rural	96	41.2
Monthly Income (taka)		
<25000	39	16.7
25000–50000	120	51.5
50000–75000	50	21.5
>75000	24	10.3

Table 2: Life style related factors of the respondents (n= 233)

Determinants	Frequency (n)	Percentage (%)
Smoking related profile		
Smoker		
Yes	127	54.5
No	106	45.5
Duration of smoking (years), mean±SD	12.9 ± 11.2	
Stick per day (n=127), mean±SD	6.2 ± 2.1	
Alcoholic consumption		
Yes	13	5.6
No	220	94.4
BMI status (kg/m²)		
Normal (18-24.9)	120	51.5
Overweight & obese (25–29.9)	113	48.5
Occupational exposure		
High temperature	29	12.4
Radiation	3	1.3
Chemical	12	5.2
Pesticide	13	5.6
No history of exposure	176	75.5
Duration of exposure (years) (n=57) , mean±SD	10.2 ± 4.3	
History of chronic illness		
No history	105	45.1
Diabetics	53	22.7
Hypertension	48	20.6
Thyroid disorders	35	15.0
STDs	21	9.0
*Multiple responses		

Table 3: Clinical patterns and semen analysis profile of infertility among respondents (n= 233)

Clinical pattern	Frequency (n)	Percentage (%)
Surgical history		
Trauma to testis		
Yes	39	16.7
No	194	83.3
Suffering from varicocele		
Yes	42	18.0
No	191	82.0
History of operation		
No surgery	200	85.8
Abdominal surgery	12	5.2
Herniorraphy	11	4.7
Urogenital surgery	5	2.1
Hydrocele surgery	5	2.1
Semen analysis		
Physical characteristics		
Volume (ml), mean±SD	2.41 ± 1.16	
Concentration (×10⁶ ml), mean±SD	24.92 ± 10.25	
Motility (%), mean±SD	38.11 ± 11.33	
Abnormal morphology (%), mean±SD	30.01 ± 21.96	
Outcome of semen analysis		
Normal (Fertile)	178	76.4
Azoospermia	13	5.6
Asthenozoospermia	20	8.6
Both Asthenozoospermia and Teratozoospermia	4	1.7
Both Oligospermia and Asthenozoospermia	10	4.3
Both Oligospermia, Asthenozoospermia and Teratozoospermia	8	3.4

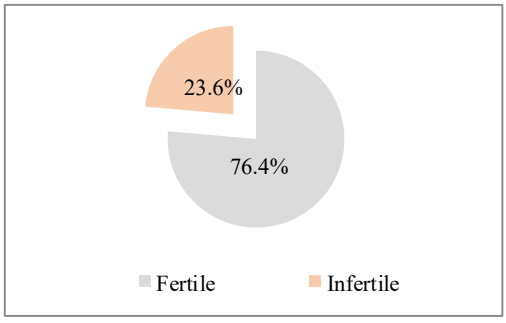

Figure 1: Fertility status of the respondents (n=233)

Table 4: Association between risk factors and male infertility (n=233)

Variables	Fertility status		Odds Ratio (95% CI of OR)	p-value
	Infertile (n = 55)	Fertile (n = 178)		
	Frequency (%)	Frequency (%)		
Occupational exposure (Yes)	18 (32.7)	39 (21.9)	1.73 (0.89–3.37)	0.105
BMI (≥25 kg/m²)	35 (63.6)	78 (43.8)	2.24 (1.19–4.22)	**0.012***
Smoking (Yes)	36 (65.5)	91 (51.1)	1.82 (0.96–3.44)	0.064
Alcohol consumption (Yes)	6 (10.9)	7 (3.9)	2.99 (0.96–9.28)	0.052
Diabetes mellitus (Yes)	18 (32.7)	35 (19.7)	1.98 (1.04–3.77)	**0.037***
Hypertension (Yes)	17 (30.9)	31 (17.4)	2.10 (1.09–4.03)	**0.026***
STD history (Yes)	15 (27.3)	6 (3.4)	10.67 (4.05–28.09)	**<0.001***
Trauma to testes (Yes)	14 (25.5)	25 (14.0)	2.09 (1.00–4.38)	**0.049***
Varicocele (Yes)	17 (30.9)	25 (14.0)	2.78 (1.38–5.59)	**0.004***

Chi-square test and Binary logistic regression analysis done, P value <0.05 was considered as statistically significant value

Discussion:

This study assessed the prevalence, clinical patterns, and determinants of male infertility among infertile couples in Sylhet, Bangladesh. The findings indicate that approximately 23.6% of participants had abnormal semen parameters, which is consistent with clinic-based studies from South Asia reporting male factor infertility in about 20%–30% of infertile couples.[18,19] However, this proportion is lower than reports from some African studies where male infertility has been reported to account for up to 40%–50% of infertility cases, possibly due to differences in environmental exposures, healthcare access, and diagnostic practices.[5,6,20]

In this study, most participants were aged 30–40 years and belonged to middle-income urban populations. Similar demographic patterns have been reported in the studies, where male infertility is more commonly diagnosed in the third and fourth decades of life, reflecting delayed fertility seeking behavior and increased awareness among urban populations.[8,21] The predominance of urban residents in this study may also reflect better access to tertiary infertility services, while rural populations remain underrepresented.

Lifestyle-related risk factors were highly prevalent. Smoking was reported in more than

half of the participants (54.5%), although its association with infertility was not statistically significant. However, previous meta-analyses have demonstrated that smoking negatively affects sperm concentration, motility, and morphology through oxidative stress mechanisms and DNA damage.[22] Similarly, obesity (48.5%) showed a significant association with infertility in this study, which aligns with evidence from the study showing that increased BMI disrupts hormonal balance, increases scrotal temperature, and impairs spermatogenesis.[22,23]

Metabolic diseases such as diabetes mellitus and hypertension were also significantly associated with male infertility in this study. These findings are consistent with PubMed-indexed literature showing that diabetes can impair sperm motility and increase DNA fragmentation through oxidative stress and microvascular damage, while hypertension is associated with erectile dysfunction and reduced semen quality.[24,25] These results highlight the growing importance of non-communicable diseases as emerging determinants of male reproductive health.

A strong association was observed between sexually transmitted diseases (STDs) and male infertility (OR=10.67, p<0.001). This is consistent with studies evidence indicating that infections such as chlamydia and gonorrhea can lead to epididymal obstruction, testicular damage, and impaired spermatogenesis.[26,27] Varicocele was also significantly associated with infertility (OR=2.78, p=0.004), supporting well-established evidence that varicocele is a major correctable cause of male infertility due to increased scrotal temperature and oxidative stress-induced sperm damage.[28]

Regarding clinical patterns, asthenozoospermia was the most common abnormality, followed by azoospermia. Similar findings have been reported in Bangladesh and other developing countries, where reduced sperm motility is a predominant semen abnormality among infertile men.[16] The mean semen parameters in this study were also lower than WHO reference values, indicating impaired overall sperm quality in a substantial proportion of participants.

Occupational exposure to heat, chemicals, radiation, and pesticides showed higher odds of infertility, although not statistically significant. However, previous studies have reported that occupational toxins can adversely affect spermatogenesis through endocrine disruption and oxidative stress pathways.[29,30] The lack of statistical significance in this study may be due to sample size limitations or variability in exposure duration and intensity.

The findings suggest that male infertility in Sylhet is multifactorial, with significant contributions from metabolic disorders, reproductive tract diseases, and lifestyle factors. These results are consistent with global evidence highlighting the complex interaction of biological and environmental determinants in male infertility

Conclusion:
Male infertility in Sylhet is a significant reproductive health issue, with about one-quarter of men showing abnormal semen parameters. Asthenozoospermia and azoospermia were the most common clinical patterns. Key determinants included obesity, diabetes, hypertension, sexually transmitted infections, varicocele, and testicular trauma, with infections showing the strongest association. Male infertility is multifactorial, highlighting the need for early evaluation, prevention, and improved male-focused infertility services in Bangladesh.

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