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Emerging Endocrine and Reproductive Factors in Female Infertility: Insights from a Large Clinical Cohort in Bangladesh

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Abstract: ***Background*:** Infertility affects approximately one in six adults globally and represents an increasingly important reproductive health concern in low- and middle-income countries. Endocrine and ovulatory disorders, particularly polycystic ovary syndrome (PCOS) and thyroid dysfunction, are emerging as major contributors to female infertility. In Bangladesh, infertility remains under-prioritized within reproductive health programming, and contemporary large-scale clinical data focusing on endocrine drivers of female infertility are limited. ***Methods*:** This hospital-based cross-sectional study was conducted at three tertiary and secondary healthcare centers in Bangladesh. Female partners aged 15 to 49 years with confirmed infertility were consecutively enrolled. Data were collected through a review of medical records and structured interviews. Endocrine and reproductive disorders were diagnosed using standardized clinical, biochemical, and ultrasonographic criteria. Multivariable logistic regression analysis was performed to identify factors independently associated with primary infertility. The model's performance was evaluated using likelihood ratio tests, the Hosmer–Lemeshow goodness-of-fit test, and receiver operating characteristic (ROC) analysis. ***Results*:** A total of 362 infertile women were included (mean age 26.9 ± 4.7 years); 51.9% had primary infertility. PCOS was the most prevalent condition (75.5%), followed by hypothyroidism (32.9%). In adjusted analyses, PCOS (adjusted OR: 2.28; 95% CI 1.25–4.16) and hypothyroidism (adjusted OR 1.79; 95% CI 1.06–3.01) were independently associated with primary infertility. Hyperprolactinemia, body mass index, physical activity, residence, education, and age at marriage were not independently associated. The model demonstrated good calibration (Hosmer–Lemeshow p = 0.256) and acceptable discrimination (AUC = 0.689). ***Conclusion*:** Endocrine disorders—particularly PCOS and thyroid dysfunction—now represent the dominant contributors to female infertility in Bangladesh. These findings highlight the need for early endocrine screening, integrated clinical management, and policy prioritization of infertility as a public health issue.

Keywords: Female Infertility, Polycystic Ovary Syndrome, Endocrine Disorders, Hypothyroidism, Bangladesh.

Research Paper

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INTRODUCTION

Infertility is a common reproductive health condition with substantial global reach. The World Health Organization (WHO) estimates that approximately 17.5% of adults worldwide (about 1 in 6 people) experience infertility at some point in their lives, with broadly similar prevalence across high-income and low- and middle-income settings [1, 2]. Alongside this burden, endocrine and ovulatory dysfunction have become increasingly prominent contributors to female infertility. PCOS, in particular, is recognized as a leading endocrine condition associated with anovulation and subfertility [3, 4]. Thyroid dysfunction and thyroid autoimmunity have also been widely evaluated in relation to infertility and adverse reproductive outcomes, reinforcing the clinical relevance of endocrine assessment in infertility care pathways [5, 6].

In Bangladesh, infertility remains under-recognized within mainstream reproductive health programming, historically shaped by strong population-

control and fertility-reduction priorities. Qualitative evidence from stakeholders has described infertility as a neglected issue within national reproductive health policy discourse, with affected couples facing stigma and limited system-level support [7]. More recent evidence continues to emphasize that infertility is often under-prioritized and that access to services is constrained by affordability and infrastructure limitations [8, 9]. Despite these challenges, contemporary large-scale clinical descriptions focusing specifically on endocrine and metabolic drivers of female infertility in Bangladesh remain limited, particularly those reflecting evolving diagnostic practices and patient profiles in urban and peri-urban clinical settings.

An endocrine-focused assessment is increasingly justified in South Asia, where PCOS, excess adiposity, and thyroid disorders intersect with cardiometabolic risk and reproductive outcomes. WHO identifies PCOS as a common hormonal condition that can impair ovulation and fertility [3]. In Bangladesh, population-level data demonstrate a growing double burden of malnutrition among women of reproductive age, including rising overweight and obesity—factors that may influence ovulatory function and endocrine milieu [10]. Clinical guidance from professional bodies also underscores ongoing practice questions around thyroid dysfunction (including subclinical hypothyroidism) in infertility evaluation, reflecting the importance of systematically documenting thyroid-related factors in infertility cohorts [6]. This study aimed to characterize emerging endocrine and reproductive factors associated with female infertility using data from a large clinical cohort in Bangladesh.

METHODS

Study Design and Setting

This study employed a hospital-based cross-sectional design to evaluate the endocrine and reproductive factors associated with female infertility. Data were collected from multiple tertiary and secondary healthcare facilities in Bangladesh, including Aalok Healthcare Centre (Dhaka), MH Samorita Hospital & Medical College (Dhaka), and Confidence Diagnostic Centre (Narayanganj). These centers provide specialized infertility and reproductive health services, catering to patients from diverse urban and peri-urban areas. The study was conducted over a specified period from [specify month/year] to [specify month/year], during which eligible participants were consecutively enrolled.

Study Population

The study population consisted of female partners aged 15–49 years who sought infertility evaluation or treatment at the participating centers. Only confirmed cases of infertility were included. The diagnosis of infertility was established through clinical evaluations by qualified gynecologists, supported by relevant investigations, such as menstrual history, pelvic ultrasonography, hormonal assays, and, when necessary, additional diagnostic procedures. Women with incomplete diagnostic information or without confirmed infertility were excluded from the analysis.

Operational Definitions

Infertility is defined as the inability to achieve a clinical pregnancy after 12 months of regular, unprotected sexual intercourse. Primary infertility applies to women who have never been pregnant, while secondary infertility refers to those with a history of at least one prior pregnancy, regardless of the outcome. Endocrine disorders are diagnosed based on clinical assessments and/or laboratory results. Polycystic ovary syndrome (PCOS) is diagnosed using established clinical and ultrasonographic criteria. Hypothyroidism is confirmed through thyroid function tests or ongoing treatment. Hyperprolactinemia is detected by elevated serum prolactin levels or by a confirmed clinical diagnosis. A summary of these definitions has been created to ensure consistent interpretation across study sites.

Study Variables

The primary exposure variables included PCOS, thyroid disorders, hyperprolactinemia, menstrual regularity, and body mass index (BMI), categorized according to standard cut-offs. Secondary variables included demographic and reproductive characteristics such as age, age at marriage, duration of infertility, socioeconomic indicators (education and residence), and lifestyle factors, including physical activity and other relevant behaviors.

Data Collection and Quality Control

Data were obtained through review of medical records complemented by structured interviews using a pre-tested data collection form. Diagnostic pathways were standardized across centers to minimize inter-site variability. Trained physicians and research staff collected all data, and they routinely reviewed completed forms to ensure accuracy and completeness. Double data checks were performed to identify and resolve inconsistencies or missing information before analysis.

Statistical Analysis

Data were analyzed using STATA version 17. Participant characteristics were summarized using descriptive statistics. Categorical variables were compared using the Chi-square test. While continuous variables were analyzed using the independent t-test or the Mann–Whitney U test, as appropriate based on data distribution. To identify factors independently associated with primary infertility, multivariable logistic regression analysis was performed, with results reported as adjusted odds ratios (ORs) and 95% confidence intervals (CIs). All statistical tests were two-sided, and a p-value <0.05 was considered statistically significant. Model performance was evaluated by assessing overall fit using the likelihood ratio test, calibration using the Hosmer–

Lemeshow goodness-of-fit test, and discriminatory ability using the area under the receiver operating characteristic (ROC) curve.

RESULTS

Socio-Demographic and Anthropometric Characteristics

Among the 362 female participants, the mean age was 26.9 ± 4.7 years. The largest proportion of women was aged 25–29 years (134; 37.0%), followed by those aged 20–24 years (123; 34.0%), 30–34 years (81; 22.4%), and 35 years and above (24; 6.6%). Most participants resided in rural areas (303; 83.7%), while 59 (16.3%) were from urban settings.

In terms of educational attainment, 200 participants (55.3%) had higher education, 119 (32.9%) had secondary education, 18 (5.0%) had primary education, and 25 (6.9%) reported no formal education. The majority were homemakers (284; 78.5%), with 78 participants (21.5%) employed. The mean body mass index was 25.9 ± 4.6 kg/m². According to Asian BMI cut-offs, 25 participants (6.9%) were underweight, 70 (19.3%) had normal BMI, 142 (39.2%) were overweight, and 125 (34.5%) were classified as obese (Table 1).

Table 1: Socio-Demographic and Anthropometric Characteristics of Female Participants (N = 362)

Variable	Category	n (%) / Mean ± SD
Age (years)	Mean ± SD	26.9 ± 4.7
	20–24	123 (34.0)
	25–29	134 (37.0)
	30–34	81 (22.4)
	≥35	24 (6.6)
Residence	Urban	59 (16.3)
	Rural	303 (83.7)
Educational Status	No formal education	25 (6.9)
	Primary	18 (5.0)
	Secondary	119 (32.9)
	Higher	200 (55.3)
Employment Status	Homemaker	284 (78.5)
	Employed	78 (21.5)
BMI (kg/m²)	Mean ± SD	25.9 ± 4.6
	Underweight (<18.5)	25 (6.9)
	Normal (18.5–22.9)	70 (19.3)
	Overweight (23–27.4)	142 (39.2)
	Obese (≥27.5)	125 (34.5)

Footnote: BMI categories defined according to Asian cut-offs.

Reproductive Characteristics

Among the female participants, 188 (51.9%) had primary infertility and 174 (48.1%) had secondary infertility. The duration of infertility was less than 24 months in 94 participants (26.0%), 24–59 months in 145 participants (40.1%), and 60 months or longer in 123 participants (34.0%).

Most participants reported an age at marriage of less than 18 years (270; 74.6%), while 21 (5.8%) were married between 18 and 24 years, and 71 (19.6%) at 25 years or older. Menstrual patterns were reported as regular in 191 participants (52.8%) and irregular in 171 participants (47.2%).

Regarding reproductive history, 174 participants (48.1%) reported at least one previous pregnancy, whereas 188 (51.9%) reported no prior pregnancies (Table 2).

Table 2: Reproductive Characteristics of Female Participants

Variable	Category	n (%)
Type of Infertility	Primary	188 (51.9)
	Secondary	174 (48.1)
Duration of Infertility (years)	<24	94 (26.0)
	24–59	145 (40.1)
	≥60	123 (34.0)
Age at Marriage (years)	<18	270 (74.6)
	18–24	21 (5.8)
	≥25	71 (19.6)
Menstrual Pattern	Regular	191 (52.8)

Variable	Category	n (%)
	Irregular	171 (47.2)
Previous Pregnancy	Yes	174 (48.1)
	No	188 (51.9)

Distribution of Endocrine and Reproductive Disorders

Among the infertile women, polycystic ovary syndrome was identified in 274 participants (75.5%). Hypothyroidism was documented in 119 participants (32.9%), while hyperprolactinemia was observed in 10 participants (2.8%). Endometriosis was present in 21 participants (5.8%), and ovulatory disorders other than PCOS were recorded in 39 participants (10.8%).

Regarding structural and unexplained etiologies, tubal factor infertility was noted in 31 participants (8.6%), uterine factor infertility in 4 participants (1.1%), and cervical factor infertility in 7 participants (2.1%). Unexplained infertility was documented in 21 participants (5.8%).

Table 3: Distribution of Endocrine and Reproductive Disorders among Infertile Women

Clinical Factor	n (%)
Polycystic Ovary Syndrome (PCOS)	274 (75.5)
Hypothyroidism	119 (32.9)
Hyperprolactinemia	10 (2.8)
Endometriosis	21 (5.8)
Ovulatory Disorders (non-PCOS)	39 (10.8)
Tubal Factor Infertility	31 (8.6)
Uterine Factor Infertility	4 (1.1)
Cervical Factor	7 (2.1)
Unexplained Infertility	21 (5.8)

Note: Participants may have more than one diagnosis.

Association of Endocrine Factors with Type of Female Infertility

Polycystic ovary syndrome was reported in 156 women (87.2%) with primary infertility and in 118 women (72.8%) with secondary infertility (p=0.001). Hypothyroidism was observed in 70 women (39.1%) with primary infertility and 49 women (30.3%) with secondary infertility (p = 0.087), while hyperprolactinemia was reported in 6 women (3.4%) and four women (2.5%) in the primary and secondary infertility groups, respectively (p = 0.629).

Obesity (BMI ≥27.5 kg/m²) was present in 127 women (67.6%) with primary infertility and 110 women (63.2%) with secondary infertility (p = 0.386). Menstrual irregularity was reported in 104 women (55.3%) with primary infertility and 67 women (38.5%) with secondary infertility (p = 0.001).

Table 4: Association between Endocrine Factors and Type of Female Infertility

Variable	Primary Infertility n (%)	Secondary Infertility n (%)	p-value
PCOS	156 (87.2)	118 (72.8)	0.001
Hypothyroidism	70 (39.1)	49 (30.3)	0.087
Hyperprolactinemia	6 (3.4)	4 (2.5)	0. 629
Obesity (BMI ≥27.5)	127 (67.6)	110 (63.2)	0.386
Menstrual Irregularity	104 (55.3)	67 (38.5)	0.001

Chi-square test or exact test, Significance level: $p < 0.05$

Multivariable Logistic Regression Findings

In the adjusted analysis, polycystic ovary syndrome had an adjusted odds ratio of 2.28 (95% CI: 1.25–4.16; p = 0.007), and hypothyroidism had an adjusted odds ratio of 1.79 (95% CI: 1.06–3.01; p = 0.029), while hyperprolactinemia showed an adjusted odds ratio of 1.08 (95% CI: 0.27–4.27; p = 0.913).

Using underweight as the reference category, body mass index categories yielded adjusted odds ratios of 0.50 (95% CI: 0.16–1.56; p = 0.231) for normal weight, 0.87 (95% CI: 0.25–2.96; p = 0.819) for overweight, and 0.71 (95% CI: 0.15–3.45; p = 0.671) for obesity; when BMI was modeled as a continuous variable, the adjusted odds ratio per kg/m² increase was 0.96 (95% CI: 0.87–1.07; p = 0.495).

With women aged <25 years as the reference group, adjusted odds ratios were 0.38 (95% CI: 0.21–0.69; p = 0.001) for ages 25–29 years, 0.23 (95% CI: 0.11–0.48; p<0.001) for ages 30–34 years, and 0.35 (95% CI: 0.12–0.98; p=0.047) for ages ≥35 years. Compared with marriage before 18 years of age, the adjusted odds ratios were 1.35 (95% CI: 0.49–3.74; p =

0.564) for marriage at 18–24 years and 1.76 (95% CI: 0.88–3.54; p=0.110) for marriage at ≥25 years.

Relative to urban residence, rural residence had an adjusted odds ratio of 0.66 (95% CI: 0.34–1.27; p = 0.217). Compared with no formal education, adjusted odds ratios were 0.81 (95% CI: 0.17–3.81; p=0.790) for primary education, 0.67 (95% CI: 0.23–1.95; p = 0.461) for secondary education, and 0.75 (95% CI: 0.25–2.28; p = 0.612) for higher education. Regular physical activity, compared with no regular exercise, showed an adjusted odds ratio of 0.91 (95% CI: 0.44–1.91; p = 0.808).

Table 5: Multivariable Logistic Regression Analysis of Factors Associated with Primary Female Infertility (N = 339)

Variable	Adjusted OR (95% CI)	p-value
Endocrine factors		
Polycystic ovary syndrome (PCOS)	2.28 (1.25–4.16)	0.007
Hypothyroidism	1.79 (1.06–3.01)	0.029
Hyperprolactinemia	1.08 (0.27–4.27)	0.913
Body mass index (BMI category)		
Underweight (reference)	1.00	—
Normal	0.50 (0.16–1.56)	0.231
Overweight	0.87 (0.25–2.96)	0.819
Obese	0.71 (0.15–3.45)	0.671
Female age (years)		
<25 (reference)	1.00	—
25–29	0.38 (0.21–0.69)	0.001
30–34	0.23 (0.11–0.48)	<0.001
≥35	0.35 (0.12–0.98)	0.047
Age at marriage (years)		
<18 (reference)	1.00	—
18–24	1.35 (0.49–3.74)	0.564
≥25	1.76 (0.88–3.54)	0.110
Residence		
Urban (reference)	1.00	—
Rural (Village)	0.66 (0.34–1.27)	0.217
Educational status		
No formal education (reference)	1.00	—
Primary	0.81 (0.17–3.81)	0.790
Secondary	0.67 (0.23–1.95)	0.461
Higher	0.75 (0.25–2.28)	0.612
Physical activity		
No regular exercise (reference)	1.00	—
Regular exercise	0.91 (0.44–1.91)	0.808
BMI (continuous, kg/m²)	0.96 (0.87–1.07)	0.495

Model Diagnostics and Performance Assessment

The multivariable logistic regression model showed good overall fit (likelihood ratio $\chi^2 = 40.72$, p = <0.001) with acceptable explanatory power (pseudo-R^2 = 0.086). Polycystic ovary syndrome and hypothyroidism remained independently associated with primary infertility after adjustment for key demographic, anthropometric, and lifestyle factors, with no evidence of misspecification, collinearity, or instability. Model calibration was adequate based on the Hosmer–Lemeshow test (χ^2 = 10.13, p = 0.256), and discriminatory performance was acceptable (AUC = 0.689), indicating good calibration, moderate discrimination, and strong internal validity suitable for inference and reporting.

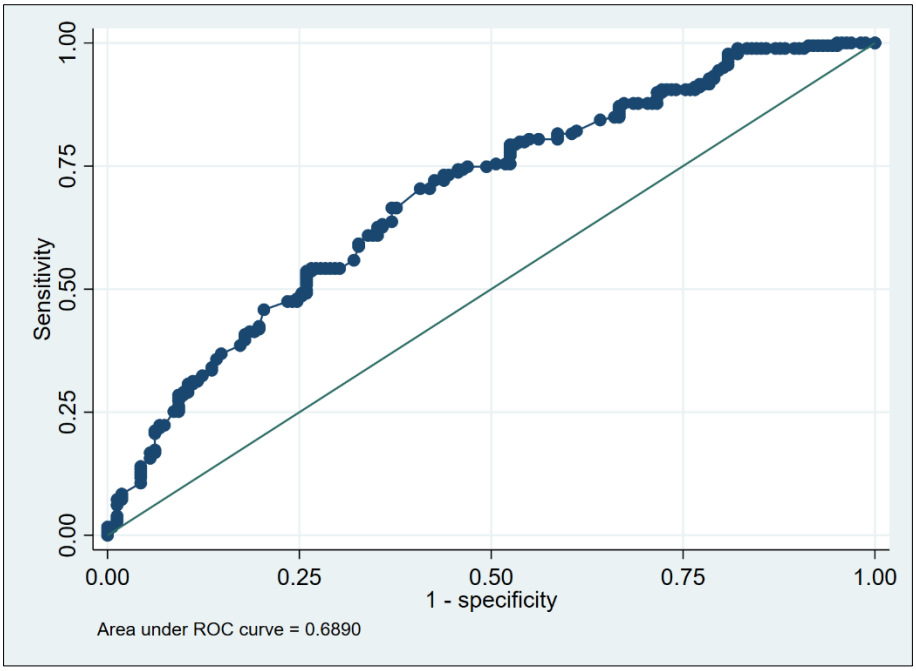

Figure 1: Receiver operating characteristic (ROC) curve for the multivariable logistic regression model predicting primary infertility. The area under the curve (AUC) was 0.689, indicating acceptable discriminatory performance

DISCUSSION

In this cohort of women seeking infertility care, the mean age was relatively young, with the majority clustered in the 20–29-year age range and progressively fewer women in older age groups. This age distribution suggests that most women presented for infertility evaluation during the early reproductive years, a pattern that has also been reported in clinical infertility cohorts from other low- and middle-income settings [11].

Most participants in this study resided in rural areas, with a substantially smaller proportion from urban settings, indicating that the participating facilities predominantly served women from rural backgrounds. Similar variability in rural–urban representation has been reported in other infertility studies, reflecting differences in access to services, referral pathways, and underlying sociodemographic characteristics across settings [12].

More than half of the participants had attained higher education, while nearly one-third had secondary education, and smaller proportions had primary or no formal education. Despite this relatively high educational attainment, most women were homemakers, with fewer engaged in paid employment. Previous studies have reported variations in educational and occupational profiles among infertility cohorts, often discussing these differences in relation to health-seeking behavior and reproductive outcomes in regional contexts [11-13].

Anthropometric assessment showed a relatively high mean BMI, with a large proportion of participants classified as overweight or obese according to Asian cut-offs, while fewer women had normal BMI or were underweight. Similar patterns of elevated BMI have been reported among women presenting for infertility evaluation in other settings, underscoring the frequent coexistence of excess adiposity with reproductive and endocrine conditions in infertility populations [14].

In terms of reproductive Characteristics, primary infertility (51.9%) and secondary infertility (48.1%) were nearly equally represented, consistent with reports from other infertility studies showing comparable contributions of both types across different populations and healthcare settings. Although the relative balance can vary by population and access to reproductive care [15]. 26.0% of women had experienced infertility for less than 24 months, 40.1% for 24–59 months, and 34.0% for 60 months or longer, indicating that a substantial proportion presented after prolonged durations of infertility, consistent with reports of delayed evaluation in clinical infertility populations [15]. Most women were married before 18 years of age (74.6%), with substantially smaller proportions marrying at 18–24 years (5.8%) or at 25 years and above (19.6%), reflecting the continued prevalence of early marriage in South Asia and its relevance to reproductive timing and fertility patterns [16].

Regarding reproductive history, just over half of the participants reported regular menstrual cycles (52.8%), while 47.2% reported irregular cycles, a pattern commonly observed in infertility cohorts and frequently reported in association with ovulatory and endocrine disorders [17]. Nearly half of the women reported at least one previous pregnancy, while a comparable proportion had never conceived. This balanced distribution aligns

with the observed near-equal prevalence of primary and secondary infertility in the cohort and is consistent with patterns described in other clinical and epidemiological infertility studies [15].

The predominance of endocrine and ovulatory disorders in this cohort underscores the central role of hormonal dysregulation in female infertility within the Bangladeshi clinical context. PCOS emerged as the most frequently identified condition, affecting more than three-quarters of the participants. This proportion is notably higher than global prevalence estimates among reproductive-aged women and is consistent with reports from infertility clinics in South Asia, where PCOS is increasingly recognized as a leading contributor to anovulatory infertility. International guidelines and recent reviews continue to highlight PCOS as a major endocrine disorder linking metabolic, hormonal, and reproductive dysfunction, particularly in populations undergoing rapid lifestyle and nutritional transitions [3-18]. Hypothyroidism was documented in nearly one-third of the cohort, reinforcing the relevance of thyroid dysfunction in infertility evaluation. This finding aligns with growing evidence and professional society recommendations emphasizing thyroid assessment in infertile women, especially in regions where iodine status, autoimmune thyroid disease, and metabolic risk factors are prevalent [6]. In contrast, hyperprolactinemia was relatively uncommon, consistent with contemporary infertility guidelines that describe prolactin abnormalities as less frequent and typically identified in specific clinical contexts rather than as a dominant cause of infertility [19]. Endometriosis and non-PCOS ovulatory disorders were observed in smaller but clinically meaningful proportions. Endometriosis, although likely underdiagnosed in settings with limited access to advanced imaging or laparoscopy, remains an established contributor to infertility globally [20]. The identification of ovulatory disorders beyond PCOS further highlights the heterogeneity of endocrine dysfunctions encountered in infertility practice and the need for systematic hormonal evaluation.

Structural causes of infertility, including tubal, uterine, and cervical factors, accounted for a comparatively smaller proportion of cases in this cohort, with tubal factor infertility being the most frequently recorded structural diagnosis. These findings contrast with reports from some other low- and middle-income settings where tubal pathology contributes a larger share of infertility, suggesting potential differences in underlying risk exposures, diagnostic pathways, or referral patterns [21]. The relatively low proportion of unexplained infertility may reflect the comprehensive endocrine-focused diagnostic approach employed at the participating centers, which may reduce the likelihood of infertility remaining unclassified after evaluation [22].

In the adjusted analysis, polycystic ovary syndrome (PCOS) and hypothyroidism emerged as independent factors associated with primary infertility. Women with PCOS had more than twofold higher odds of primary infertility, consistent with extensive evidence identifying PCOS as the leading endocrine cause of anovulatory infertility worldwide [23, 24]. The pathophysiological mechanisms—chronic anovulation, hyperandrogenism, insulin resistance, and altered endometrial receptivity—are well described and align with contemporary international PCOS guidelines [24, 2]. Similarly, hypothyroidism was independently associated with higher odds of primary infertility, supporting prior evidence that thyroid hormone dysregulation can disrupt ovulatory function, menstrual regularity, and luteal phase adequacy [6, 4]. These findings reinforce the importance of systematic endocrine evaluation, particularly for PCOS and thyroid dysfunction, in infertility work-ups in South Asian settings. Female age also showed a significant graded association with primary infertility. Compared with women aged <25 years, those in older age categories had progressively lower odds of primary infertility, reflecting the expected demographic pattern whereby younger women are more likely to present with primary infertility, while secondary infertility becomes more prevalent with increasing age and prior reproductive exposure. Age remains a fundamental determinant of reproductive potential, with well-documented biological changes in ovarian reserve and oocyte quality across the reproductive lifespan [25].

In contrast, hyperprolactinemia was not significantly associated with primary infertility after adjustment, consistent with guideline-based infertility evaluations, which indicate that clinically relevant hyperprolactinemia is relatively uncommon and typically identified in selected clinical scenarios rather than as a dominant cause of infertility [19]. Neither body mass index (BMI)—modeled as categories or as a continuous variable—nor physical activity showed independent associations with primary infertility in the adjusted model. Although excess adiposity is often linked to reproductive dysfunction, particularly through its interaction with PCOS and metabolic pathways, its independent effect may diminish after controlling for underlying endocrine disorders [26]. Similarly, age at marriage, residence (rural vs. urban), and educational status were not independently associated with primary infertility. These findings suggest that, within this clinical cohort, biological and endocrine factors have stronger associations with primary infertility than sociodemographic characteristics. The latter may influence access to care or the timing of presentation, rather than the etiology of infertility itself. Comparable observations have been reported in other clinic-based infertility studies from low- and middle-income countries [27].

Strengths

This study draws strength from its large clinical cohort, which enhances the precision and reliability of

the estimates and allows for detailed subgroup analyses. The multicenter design, encompassing diverse tertiary and secondary care facilities, improves the generalizability of the findings across different service delivery contexts within Bangladesh. Additionally, the study employed comprehensive endocrine profiling, enabling a robust assessment of key hormonal and reproductive factors and their independent associations with primary infertility.

Limitations

Several limitations should be considered when interpreting these findings. The hospital-based design may limit external validity, as the study population reflects women who sought specialized infertility care and may not fully represent community-based infertility patterns. The cross-sectional nature of the analysis precludes causal inference and limits the ability to assess temporal relationships between endocrine disorders and infertility. Furthermore, the absence of long-term follow-up data restricts evaluation of treatment responses, pregnancy outcomes, and longitudinal reproductive trajectories.

CONCLUSION

Endocrine disorders now represent the dominant contributors to female infertility in Bangladesh, with polycystic ovary syndrome and thyroid dysfunction emerging as key determinants in this large clinical cohort. These findings underscore the need for early detection and integrated management of endocrine abnormalities within infertility care pathways. Beyond clinical practice, the results provide compelling evidence to prioritize infertility as a public health issue, supporting the development of national strategies that incorporate affordable endocrine diagnostics, strengthen clinical capacity, and integrate infertility services into broader reproductive health programs.

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