



Relationship Between Different Nutritional Status and Specific Hormone Levels in Sub Fertile Women in a Selected Tertiary Level Hospital in Dhaka, Bangladesh

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Abstract

Background: Subfertility is a growing reproductive health concern globally, with obesity increasingly recognized as a contributing factor affecting ovarian reserve. Anti-Mullerian Hormone (AMH) serves as a reliable marker of ovarian reserve, and its relationship with body mass index (BMI) remains a subject of clinical significance.

Aim of the Study: To find out the association between BMI categories and serum AMH levels in sub fertile women.

Methods: A cross-sectional analytical study was conducted at the Department of Obstetrics and Gynaecology, Bangladesh Medical University (BMU), Dhaka, over 18 months. A total of 148 sub-fertile women aged 15-44 years were enrolled using convenient sampling technique. After applying exclusion criteria, data on sociodemographic, reproductive, and clinical factors were collected through a semi-structured questionnaire. BMI was calculated from measured height and weight. Serum AMH levels were measured using Chemiluminescent Magnetic Microparticle Immunoassay (CMIA). Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 26, applying independent sample t-test and regression analysis, with $p < 0.05$ considered statistically significant.

Results: A total of 148 sub-fertile women were included in the study. The majority 48.6% were aged between 25-34 years, and 36.5% had completed graduate-level education or higher. About 64.9% belonged to the lower-middle-income group with monthly family incomes between BDT 30,000 and 50,000. A substantial proportion of 86.5% had experienced subfertility for one year or more, and 62.2% were nulliparous. Polycystic Ovary Syndrome (PCOS) was present in 39.2% of participants, thyroid dysfunction in 32.4%, and diabetes mellitus in 18.2%. A significant association was observed between PCOS and sedentary lifestyle ($p = 0.000$; OR = 2.250, 95% CI: 1.786–2.835). PCOS was also significantly associated with subfertility status ($t = -6.836$, $p = 0.000$). Multinomial logistic regression revealed that both serum AMH levels ($B = 0.380$, $p = 0.000$) and BMI ($B = 0.583$, $p = 0.000$) were significant predictors of sub-fertility, explaining 56.4% of the variance ($R^2 = 0.564$, adjusted $R^2 = 0.558$).

Conclusion: The study was found that lower AMH and non-optimal BMI predict subfertility in women. Sedentary behavior was linked to higher PCOS risk, which was associated with subfertility. Assessing ovarian reserve and BMI is crucial for managing subfertility; promoting physical activity may be beneficial.

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Introduction

Subfertility, a condition affecting a significant portion of the global population, presents a major reproductive health challenge. Recent data from the World Health Organization indicates that approximately 1 in 6 people worldwide experience infertility, underscoring its widespread impact [1]. The prevalence of infertility exhibits geographical variations, with studies highlighting its burden in regions like India [2] and Bangladesh [3, 12, 15]. Among the various factors contributing to infertility in women, PCOS (PCOS), a common endocrine disorder, plays a substantial role [3, 12, 15, 16]. Understanding the determinants of fertility potential is essential for developing effective diagnostic and therapeutic interventions.

BMI has emerged as a key factor under investigation in relation to female reproductive health. AMH, a hormone produced by the ovarian follicles, serves as a crucial indicator of ovarian reserve and is widely utilized in the assessment of infertile women. Numerous studies have explored the association between BMI and AMH levels in diverse populations. Research has indicated a significant relationship between these two parameters in large cohorts of infertile women [4, 5] and in specific conditions such as PCOS [3, 7, 16]. Meta-analyses have further consolidated these findings, providing a broader understanding of the influence of BMI on ovarian reserve [6, 7]. Notably, alterations in metabolic hormones and adipokines associated with different BMI categories can impact ovarian function and AMH production [17, 18].

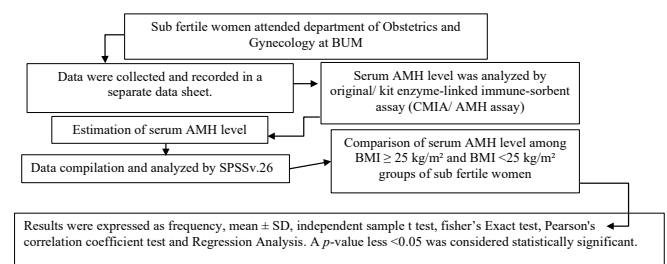
Within the South Asian context, including India and Bangladesh, studies have specifically examined the interplay between BMI and AMH in subfertile women [2, 8, 9, 10, 11, 13, 14]. These investigations contribute valuable insights into how nutritional status, as reflected by BMI, may affect crucial reproductive hormones like AMH in this specific population. Furthermore, evidence suggests that lifestyle modifications, including dietary changes and exercise, can influence both BMI and AMH levels, highlighting the potential for modifiable factors to impact ovarian reserve [19, 20]. The present study aims to further investigate the relationship between different BMI categories and serum AMH levels in subfertile women attending a selected tertiary level hospital in Dhaka City, Bangladesh, adding to the existing body of knowledge in this area.

Methods:

This cross-sectional analytical study was carried out at the Department of Obstetrics and Gynaecology, (BUM), Dhaka, over a period of 18 months (January 2023 - June

2024). A total of 148 sub-fertile women aged 15-44 years were enrolled using convenient sampling technique. Women with premature ovarian insufficiency, ovarian pathology, or previous ovarian surgery were excluded. Data on sociodemographic, reproductive, and clinical profiles were collected using a semi-structured questionnaire. Body weight and height were measured to calculate BMI. Two milliliters of venous blood were collected aseptically, and serum AMH was measured using CMIA at the BUM, Dhaka, endocrine lab. The comparison of AMH levels between the two groups was performed using appropriate statistical tests in SPSS version 26. Descriptive statistics were presented as frequency, percentage and appropriate graphs, and inferential statistics including independent sample t-test and regression analysis were applied. A p -value < 0.05 was considered statistically significant. Informed written consent was obtained from all participants, and confidentiality and ethical issues were strictly maintained.

Data Processing plan:



Results

In this study Most participants 48.6% were aged 25–34 years, followed by 35-44 years 27.0% and 15–24 years 24.3%. About education, 36.5% had graduate-level or higher education, 32.4% completed higher secondary education, and 5.4% had simply primary education. Most respondents 64.9% stated a monthly family income of BDT 30,000-50,000, while 27.0% earned above BDT 50,000 and 8.1% got below BDT 30,000.

Subfertility above for one year was reported by 86.5% of participants. Nulliparity was noted at 62.2%, suggesting a high rate of initial infertility. Systematic menstrual cycles were noted in 59.5%, while 40.5% had unusual cycles. PCOS was displayed in 39.2% of participants, thyroid dysfunction in 32.4%, and diabetes mellitus in 18.2%.

A significant association was found between PCOS and physical activity level ($p = 0.000$), with sedentary women being 2.25 times more likely to have PCOS. PCOS was also significantly associated with subfertility status ($t = -6.836$; $p = 0.000$). Regression analysis showed that both serum

AMH ($B = 0.380$; $p = 0.000$) and BMI ($B = 0.583$; $p = 0.000$) had significant effects on subfertility, supporting the association between BMI categories and AMH levels in sub-fertile women.

Table 1: Distribution of respondents by socio-demographic factors

Age (in yrs)	Frequency	Percent
15-24	36	24.3
25-34	72	48.6
35-44	40	27
Educational Status		
Primary	8	5.4
Secondary	38	25.7
Higher secondary	48	32.4
Graduate and above	54	36.5
Total	148	100

Table 1 shows most sub fertile women were in the 25-34 years age group 48.6%, followed by 35-44 years 27.0% and 15-24 years 24.3%. Regarding educational status, a considerable proportion had completed graduate-level education or higher 36.5%, while 32.4% had completed higher secondary education. Only 5.4% had education up to the primary level.

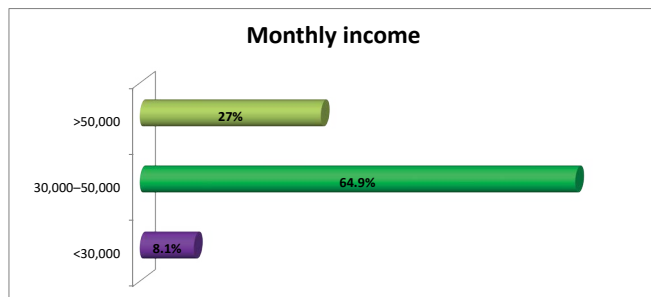


Figure 1: Distribution of the respondents by monthly family income.

Figure 1 shows most respondents 64.9%, reporting a monthly family income between BDT 30,000 and 50,000, indicating a predominance of lower-middle-income households. A smaller proportion 27.0% belonged to higher income groups >BDT 50,000, while only 8.1% reported earnings below BDT 30,000.

Figure 2 shows a substantial proportion of the respondents, 86.5% experienced subfertility for one year or more. Most women were nulliparous 62.2%, highlighting their primary infertility status. Regular menstrual cycles were reported by 59.5% of the participants, while 40.5% had irregular cycles. Notably, 39.2% of the respondents had PCOS, which is a common endocrine disorder associated with subfertility. Thyroid dysfunction was present in 32.4% of women, and 18.2% had diabetes mellitus.

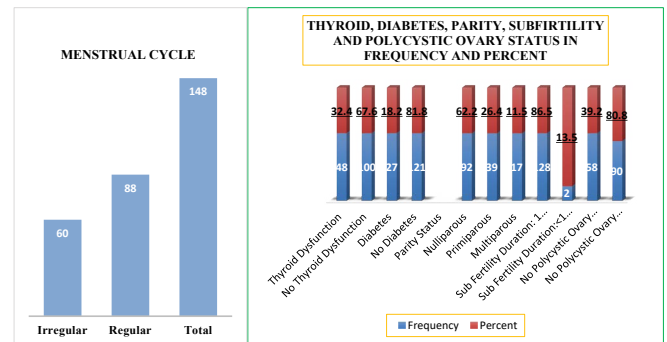


Figure 2: Distribution of the respondents by present medical conditions (n=148).

Table 2 shows that there was a significant association between PCOS and level of physical activity ($p=0.000$), OR=2.250 indicates that PCOS is 2.25 times higher among sedentary lifestyle than physically active participants.

Table 2: Association between PCOS and level of physical activity

PCOS	Level of Physical activity		p-value	OR (odds ratio)	95% Confidence Interval	
	Sedentary	Active			Lower	Upper
Yes	58	0	.000 ^f	2.25	1.786	2.835
No	40	50				
Total	98	50	148			

Table 3 shows that the calculated t-value is -6.836 and p-value is .000 (2-tailed) which is (<0.05) with 146 degrees of freedom. This indicates that there is a significant association between sub-fertility status and PCOS.

Table 3: Association between sub-fertility status and PCOS

	PCOS	F	t	Df	p-value
Sub fertility	Yes	833.033	-6.836	146	0
	No				

* Independent Samples t-Test

Table 4 shows that regression Coefficients (Unstandardized Coefficients and standardized Coefficients), p-value (sig) and 95% Confidence intervals (CI) for regression coefficients of all explanatory variables in the model along with the constant. The Unstandardized regression Coefficients (B) are for Serum AMH level (0.380; $p=0.000$) and BMI (.583; $p=0.000$). It was concluded that the Serum AMH level and BMI had significant influence on sub-fertility status of the participants.

Table 4: Adjusted regression coefficients of explanatory variables with their significance

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R	R Square	Adjusted R Square
	B	Std. Error	Beta					
(Constant)	0.384	0.115		3.347	0.001	.751 ^a	0.564	0.558
Serum AMH level	0.38	0.028	0.912	13.414	0			
BMI	0.583	0.057	0.695	10.215	0			

*Dependent Variable: Sub-fertility * b. Predictors: (Constant), BMI, Serum AMH level

Discussion

Our findings revealed a significant association between PCOS and the level of physical activity, with sedentary women having a 2.25 times higher likelihood of PCOS compared to physically active women. This aligns with existing literature highlighting the beneficial role of physical activity in managing PCOS [20, 21]. Moreover, the independent samples t-test demonstrated a strong association between subfertility status and the presence of PCOS, corroborating the established link between this endocrine disorder and impaired fertility [8, 22]. Notably, both serum AMH levels and BMI emerged as significant independent predictors of subfertility status in our study population, collectively explaining approximately 56% of the variance in subfertility. This finding underscores the importance of both ovarian reserve markers and nutritional status in the context of female fertility.

The significant predictive role of AMH levels in subfertility is consistent with its established utility as a marker of ovarian reserve [4, 23]. Lower AMH levels often indicate diminished ovarian follicle quantity and quality, which can directly impact the likelihood of conception. Similarly, the significant association between BMI and subfertility aligns with a wealth of research demonstrating the adverse effects of both underweight and overweight/obesity on reproductive outcomes [5, 9, 24]. Alterations in adipokines, insulin resistance, and hormonal imbalances associated with extremes of BMI can disrupt ovulation, oocyte quality, and endometrial receptivity [17, 18, 25]. The strong predictive value of the model incorporating both AMH and BMI suggests a synergistic effect of ovarian reserve and nutritional status on subfertility in our study population. These findings have important implications for the clinical management of subfertile women, emphasizing the need for a comprehensive assessment that includes both hormonal profiling and evaluation of body weight. Further research with larger, multi-centric studies is warranted to validate these findings and explore potential underlying mechanisms in this specific population.

Conclusion

This study of subfertile women in Dhaka, Bangladesh demonstrates that lower AMH levels and non-optimal BMI are significantly associated with subfertility. Sedentary

lifestyle increased the odds of PCOS, which was also linked to subfertility. These findings emphasize the need to consider ovarian reserve and BMI in managing subfertility and suggest a role for physical activity interventions.

Declaration of Interest: The authors declare no competing interests.

Conflict of Interest: The authors have no conflicts of interest to disclose related to this study.

Authors Contributions:

Prof. Dr. Tripti Rani Das and Dr. Sabiha Islam conceptualized the study and designed the methodology. Dr. Dipika Majumder and Dr. Iffat Rahman contributed data management and statistical analysis. Dr. Shah Noor Sharmin, Dr. Jinat Fatema and Dr. Bidisha Chakma assisted in manuscript drafting and critical revisions. Prof. Dr. Tripti Rani Das and Dr. Tanzina Iveen Chowdhury supervised the research and provided final manuscript approval. All authors reviewed and approved the final version.

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