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Factors Influencing Outcome of In Vitro Fertilization Treatment of Couples Attending the HOPE and Lab Aid IVF Clinic, Dhaka

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ABSTRACT

Background & objective: Infertility affects approximately one in every six couples in Bangladesh. While in vitro fertilization (IVF) is a highly successful treatment, comprehensive localized data on factors influencing its outcome is scarce. This study aimed to determine the demographic, clinical, and procedural factors significantly associated with conception following IVF treatment among couples in Dhaka, Bangladesh.

Methods: This was a hospital-based cross-sectional analytical study conducted at the HOPE and Lab Aid IVF Clinics in Dhaka between January and December 2024. A total of 126 infertile women (aged 20 to 47 years) undergoing IVF were enrolled. The primary dependent variable was IVF outcome, defined as conception (clinical pregnancy confirmed by ultrasound), while the secondary dependent variable was live-birth. Univariate analysis utilizing independent samples t-tests and Chi-square tests was performed to assess associations between independent variables and the outcome, with a significance level set at $p < 0.05$.

Results: The overall clinical conception rate was 37.3% (47 out of 126 women). Procedural and embryological factors demonstrated the strongest association with success ($p < 0.001$). Specifically, women who conceived were significantly more likely to have received more than 2 embryos transferred and to have had 3–4 oocytes transferred. Counter-intuitively, conception was also positively associated with increased female age ($p = 0.026$), age at starting IVF ($p = 0.021$), and longer duration of infertility ($p = 0.021$). Factors such as BMI, systemic diseases (hypothyroidism, diabetes mellitus), and the type of infertility were not significantly associated with the outcome.

Conclusion: In this clinical setting, procedural factors, particularly the quantity of embryos transferred, are the strongest predictors of IVF success. The unexpected positive association between advanced age or duration of infertility and conception suggests unique selection biases within the local private healthcare system that warrant further, controlled investigation via multivariate analysis. This data is crucial for refining patient counseling and optimizing treatment protocols locally.

Key Words: Outcome, IVF treatment, infertile couples etc.

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INTRODUCTION:

Infertility is a pervasive global reproductive health issue, affecting an estimated 60 to 80 million couples worldwide and constituting a significant social and public health concern, according to the World Health Organization (WHO).[1,2] In South Asia, estimates indicate a high prevalence, with about 15% of couples in Bangladesh experiencing infertility.[3] Infertility treatment often involves Assisted Reproductive Technologies (ARTs), with in vitro fertilization (IVF) being a highly successful method. IVF involves controlled ovarian stimulation, oocyte retrieval, fertilization, and subsequent embryo transfer. Despite

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its therapeutic success, IVF is associated with heightened risks of adverse obstetric and perinatal outcomes, including hypertensive disorders of pregnancy, preterm labor, and low birth weight.[4-8] This underscores the critical need for optimizing IVF protocols and patient selection to maximize success while mitigating risks.

While understanding the demographic and clinical characteristics of couples seeking IVF is a necessary first step, identifying the specific factors that influence treatment outcomes is essential for enhancing success rates and improving patient counseling. Numerous studies have demonstrated that achieving a successful pregnancy through in vitro fertilization and embryo transfer (IVF-ET) is contingent upon several variables including the maternal age, body mass index (BMI), number of previous pregnancies, the length and origin of infertility, endometrial thickness at the time of human chorionic gonadotropin (HCG) administration, the quantity of oocytes retrieved, the number of embryos transferred, and the measured levels of luteinizing hormone (LH), estradiol (E2), and progesterone (P).[9-11] Furthermore, separate research indicates that both the quality of the embryo and the conditions within the uterine cavity are linked to the resulting clinical pregnancy rate.[12] Evidence consistently shows that refining clinical practices based on strong localized data can lead to improved live birth rates.[13]

Although IVF services have been available in Bangladesh since the mid-1980s, there remains a notable absence of comprehensive national data on the demographic and clinical profiles of couples undergoing IVF. Currently, a limited number of ART centers primarily operate in the private sector, and there is no national registry to systematically document and analyze ART outcomes and factors associated with those outcomes.

A prior descriptive study conducted at the HOPE and Lab Aid IVF Clinics in Dhaka City established the baseline demographic profile and overall conception rates in this population.[14] However, a significant research gap remains in determining which specific patient or procedural factors are associated with conception in the context of our population. Understanding which maternal, clinical, or procedural variables are associated with a higher likelihood of conception is crucial for refining patient selection, optimizing stimulation protocols, and improving overall IVF outcomes in the local context. Therefore, this analytical study aims to investigate and determine the demographic, clinical, and procedural factors significantly associated with the outcome of IVF treatment (conception) among couples attending the HOPE and Lab Aid IVF Clinics in Dhaka, Bangladesh.

METHODS

This was a hospital-based cross-sectional analytical study conducted to evaluate the factors influencing IVF outcomes. The study was carried out at two private facilities in Dhaka, Bangladesh: the HOPE IVF Clinic and the Lab Aid IVF Center, both of which provide modern Assisted Reproductive Technology (ART) services. The study population included couples undergoing IVF treatment at the aforementioned centers between January and December 2024. A total of 126 infertile women aged 20 to 47 years were enrolled based on the estimated prevalence of infertility in Bangladesh and the anticipated number of IVF cycles performed at the clinics. The research was conducted in compliance with the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of the HOPE IVF Clinic and the Lab Aid IVF Center. Informed consent was secured from all participants prior to data collection, ensuring their full understanding of the study's purpose and procedures.

Eligible participants comprised male and female partners aged 18 to 45 years seeking IVF treatment for primary or secondary infertility. Inclusion necessitated an infertility duration of at least one year, or six months if the female partner was aged 35 years or older, along with the completion of essential preliminary assessments (e.g., hormonal tests, semen analysis). Exclusion criteria included couples diagnosed with anatomical abnormalities requiring surgical intervention, those with a history of previous IVF treatment at another facility, or individuals with significant, uncontrolled medical comorbidities (e.g., severe uncontrolled endocrine disorders, serious

cardiovascular/respiratory diseases), autoimmune disorders affecting fertility or pregnancy, psychological issues impacting treatment adherence, and a history of substance abuse affecting fertility treatment or pregnancy outcomes.

Data were collected using a structured questionnaire and retrospective review of patient medical records, cycle charts, and embryology laboratory reports. The primary dependent variable was IVF outcome, defined as conception (Yes/No), based on confirmation of a clinical pregnancy (presence of a gestational sac with or without a fetal heartbeat confirmed by ultrasound). Data pertaining to independent variables covered Socio-demographic Factors [age, educational background, occupation, socioeconomic status, duration of marriage, body mass index, duration of infertility, and age at starting IVF treatment], Clinical Factors [type of infertility (primary or secondary), causes of infertility (female factor, male factor, combined, unexplained), systemic diseases (hypothyroidism, diabetes mellitus, hormonal imbalance), and Anti-Müllerian Hormone (AMH) level] and Procedural/Embryological Factors [number of oocytes/embryos transferred, and endometrial thickness on the day of human chorionic gonadotropin (HCG) administration or progesterone start].

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 25.0). Continuous data were summarized as means and standard deviations (Mean ± SD), while categorical data were presented as frequencies and percentages. The association between the independent variables and the IVF outcome (conception) was assessed using independent samples t-tests for continuous variables (e.g., age, duration of infertility) and the Chi-square (χ^2) or Fisher's Exact Test (as appropriate) for categorical variables (e.g., BMI categories, presence of systemic disease, number of embryos transferred) across the outcome groups. The level of significance was set at 5%, and p-values < 0.05 were considered statistically significant for all associations.

RESULTS:

Of the 126 infertile women enrolled in the study, 47(37.3%) achieved conception and 79(62.7%) did not conceive. The univariate analysis comparing baseline characteristics between women who conceived and those who did not revealed several significant associations ($p < 0.05$). The mean age of patients who conceived ($p = 0.026$) and the age at starting IVF treatment ($p = 0.021$) were both significantly higher in the successful group. Furthermore, longer duration of marriage ($p = 0.040$) and longer duration of infertility ($p = 0.021$) were also associated with a higher rate of conception. Body Mass Index (BMI) was not found to be a significant factor ($p = 0.960$). While the duration of infertility treatment was numerically higher in the conception group, this difference did not reach statistical significance ($p = 0.089$ (Table I).

Systemic diseases, including hypothyroidism ($p=0.371$), diabetes mellitus ($p = 0.638$), and hormonal imbalance ($p = 0.609$), were not significantly associated with the outcome of IVF treatment (Table II). Furthermore, the type of infertility (primary versus secondary) showed no significant difference between the conceived and non-conceived groups ($p = 0.560$) (Table III). Neither male factor infertility (like severe oligospermia, azospermia obstructive, azospermia hypogonadism and oligoaesthenoteratozospermia) nor unexplained infertility was associated with IVF outcome ($p=0.218$, $p=0.627$, $p=0.627$, $p=0.364$ & $p=0.796$ respectively) (Table IV).

Procedural factors related to the embryo transfer and ovarian response demonstrated the strongest associations with conception. Majority of those who conceived (87.2%) have had 3-4 oocytes transferred, while majority of those who did not conceive (94.9%) have had < 3 oocytes transferred ($p < 0.001$). Nearly three-quarters (72.3%) of the women who conceived had favourable endometrial thickness (7-9 mm) as compared to 59.5% of those who did not conceive ($p=0.146$). The incidence of > 2 embryos transferred was staggeringly greater (53.2%) in women who had favourable IVF outcome than those who had unfavourable outcome ($p < 0.001$). The level of AMH < 2 ng/ml was much higher in women who conceived compared to the women who did not conceive ($p=0.164$) (Table V).

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Table I: Association between sociodemographic factors and conception status

Socio-demographic factors	IVF Outcome		p-value
	Conceived (n = 47)	Not conceived (n = 79)	
Age* (years)	34.3 ± 6.6	31.5 ± 6.8	0.026
Duration of marriage* (years)	11.6 ± 5.4	9.5 ± 5.3	0.040
Duration of infertility* (years)	10.1 ± 4.8	8.2 ± 4.0	0.021
BMI* (kg/m2)	34.3 ± 6.6	31.5 ± 6.8	0.960
Starting age IVF treatment* (years)	34.2 ± 6.5	31.4 ± 6.7	0.021
Years of infertility treatment*	8.4 ± 3.3	7.3 ± 3.4	0.089

Data were analyzed using **Unpaired t-Test*** and were presented as **mean ± SD.**

Table II: Association between systemic diseases and IVF outcome

Systemic diseases	IVF Outcome		p-value
	Conceived (n = 47)	Not conceived (n = 79)	
Hypothyroidism*	8(17.0)	9(11.4)	0.371
Diabetes mellitus*	8(17.0)	11(13.9)	0.638
Hormonal factor**	1(2.1)	1(1.3)	0.609

Data were analyzed using **Chi-squared (χ^2) Test*;** data were analyzed using **Fisher's Exact Test**.** figures in the parentheses denote corresponding percentage.

Table III: Association between type of infertility and conception status

Type of infertility	IVF Outcome		p-value
	Conceived (n = 47)	Not conceived (n = 79)	
Primary	35(74.5)	55(69.6)	0.560
Secondary	12(25.5)	24(30.4)	

Data were analyzed using Chi-squared (χ^2) Test*; figures in the parentheses denote corresponding percentage

Table IV: Association between male factor infertility and IVF outcome

infertility factor	IVF Outcome		p-value
	Conceived (n = 47)	Not conceived (n = 79)	
Male factor			
Severe oligospermia*	8(17.0)	21(26.6)	0.218
Azospermia obstructive**	0(0.0)	1(1.3)	0.627
Azospermia hypogonadism**	0(0.0)	1(1.3)	0.627
Oligoaesthenoteratozospermia* (OATS)	4(8.5)	11(13.9)	0.364
Unexplained infertility*	5(10.6)	6(7.6)	0.796

Data were analyzed using **Chi-squared (χ^2) Test*;** data were analyzed using **Fisher's Exact Test**.** figures in the parentheses denote corresponding percentage.

Table V: . Association between reproductive and IVF outcome

Reproductive & IVF treatment factors	IVF Outcome		p-value
	Conceived (n = 47)	Not conceived (n = 79)	
Number oocytes transferred			
< 3	6(12.8)	75(94.9)	< 0.001
3 – 4	41(87.2)	4(5.1)	
Serum E2 (ng/ml)			
< 50	23(48.9)	40(50.6)	0.854
≥ 50	24(51.1)	39(49.4)	
AMH (ng/ml)			
< 2	14(39.8)	15(19.0)	0.164
2 – 4	33(70.2)	64(81.0)	
Endometrial thickness (mm)			
< 7	13(27.7)	32(40.5)	0.146
7 – 9	34(72.3)	47(59.5)	
Number of embryos transferred			
≤ 2	22(46.8)	74(93.7)	< 0.001
> 2	25(53.2)	5(6.3)	

Data were analyzed using Chi-squared (χ^2) Test*; figures in the parentheses denote corresponding percentage

DISCUSSION:

This study aimed to determine the demographic, clinical, and procedural factors associated with conception following in vitro fertilization (IVF) treatment among couples attending two major private clinics in Dhaka, Bangladesh. The overall clinical conception rate observed in this cohort of 126 infertile women was 37.3%. The overall clinical conception rate for in vitro fertilization (IVF) is approximately 15% to 25% per embryo transfer, but it varies significantly based on factors like age, with success rates being higher for women under 30.[15] The cumulative rate after multiple cycles can be much higher, with one study showing a cumulative pregnancy rate of around 65% after three cycles for those under 30, and others reporting cumulative live birth rates of over 50% after several cycles.[16] While global and regional data vary significantly, this rate compares favorably to some established reports, particularly given the lack of a standardized national registry for ART outcomes in Bangladesh. The findings highlight both consistency with international IVF success predictors.[17-20] and notable, counter-intuitive differences.[17,21] likely driven by local patient selection and clinical practice patterns.

Influence of Procedural & Embryological Factors

The most compelling and clinically significant findings of this study relate to the procedural and embryological factors. We observed an extremely strong association between the quantity of reproductive material involved and the likelihood of conception ($p < 0.001$). Specifically, the majority of women who conceived had 3–4 oocytes transferred and were significantly more likely to have received more than 2 embryos transferred (53.2%) compared to those who did not conceive. Research on the relationship between oocyte retrieval number and pregnancy success yields mixed results. Hunault and associates[22] found a significant association between the number of retrieved oocytes and the likelihood of clinical pregnancy. However, subsequent studies suggested a more complex, non-linear relationship: van der Gaast et al. proposed that retrieving 13 oocytes was optimal, with more than that negatively affecting success, while other findings showed that the live birth rate per IVF cycle peaked around 15 eggs, stabilized until 20, and then dropped off.[23,24]

The local practice, in this context, of transferring a higher number of embryos (more than 2) appears to be a critical determinant of success. While the practice of transferring multiple embryos maximizes conception rates, it also carries the known risks of multiple gestation, including preterm birth and low birth weight.[25] This underscores the need for continuous local evaluation to balance efficacy against safety, especially given the established heightened risks associated with ART pregnancies. Furthermore, although the association was not statistically significant ($p = 0.146$), a favorable endometrial thickness (7–9 mm) was observed in nearly three-quarters (72.3%) of the women who conceived, reinforcing the established clinical importance of uterine receptivity.

Unexpected Influence of Demographic Factors

A surprising and counter-intuitive finding was the positive association between conception and increased female age (mean age, $p = 0.026$), age at starting IVF treatment ($p = 0.021$), duration of marriage ($p = 0.040$), and duration of infertility ($p = 0.021$). These results stand in direct contradiction to decades of global literature, which universally identifies younger female age and shorter duration of infertility as critical positive predictors of IVF outcome. The observed phenomenon may be explained by unique selection biases inherent to the local private healthcare sector, which limits the study's generalizability. Potential hypotheses include:

Socioeconomic Factors: Couples who have managed to endure longer periods of infertility and seek IVF at a later stage may represent a highly motivated, socioeconomically stable group capable of affording and adhering to optimal treatment protocols, potentially compensating for the biological disadvantages of advanced age. The cohort of patients who remain in the system longer or seek IVF later might have less severe or specific infertility etiologies that are more amenable to successful treatment than rapidly progressing, severe cases. These results warrant further investigation, particularly multivariate analysis, to determine if age and duration variables remain independently associated with conception after controlling for confounding socioeconomic or clinical factors, such as the number of embryos transferred.

Non-Significant Clinical Factors

In line with some prior literature, several systemic diseases (hypothyroidism, diabetes mellitus, hormonal imbalance) and key infertility factors (type of infertility, male factor, unexplained infertility) were not found to be significantly associated with the IVF outcome in this study. Similarly, Body Mass Index (BMI) showed no significant difference between the conceived and non-conceived groups ($p = 0.960$). While these findings contrast with studies that report negative effects of extreme BMI or uncontrolled systemic diseases, the lack of association here suggests that the specific cohort receiving treatment at these specialized private clinics may represent well-controlled cases where these comorbidities do not override the influence of procedural variables.

CONCLUSION

This study provides valuable, localized analytical data on IVF outcomes in Dhaka, Bangladesh, revealing a clinical conception rate of 37.3% in the studied cohort. The results emphasize that, within this clinical

setting, procedural factors, specifically the transfer of more than two embryos and the availability of 3–4 oocytes for transfer, are the strongest predictors of conception. Unexpectedly, age and duration of infertility were positively correlated with success, which is likely a reflection of unique local selection and confounding factors that mask the well-established biological impact of age.

The strong positive association with multiple embryo transfer should prompt clinics to continue a careful, case-by-case assessment of the number of embryos transferred, ensuring that patient safety regarding multiple gestation is prioritized alongside maximizing success.

Future research should involve a multivariate analysis to isolate the independent predictors of conception, control for socioeconomic confounders, and ideally extend the primary outcome measure to the live birth rate to better reflect true therapeutic success and risk mitigation.

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