Vol 02 Issue 04 | Oct- Dec -2024 | ISSN Print: 2960-2580 | ISSN Online: 2960-2599

ORIGINAL ARTICLE

SOCIODEMOGRAPHIC PROFILE OF FEMALES WITH IN VITRO FERTILIZATION FAILURE

Shamroz Aslam

Medical officer MI room, Marala Cantt Sialkot
Corresponding author
Dr. Shamroz Aslam, Medical officer, MI room, Marala Cantt Sialkot, shamrose_82@yahoo.com

ABSTRACT

Background: Infertility affects many of the couples worldwide, bringing along enormous psychological, and physical, challenges for individuals facing it. In vitro fertilization (IVF) stands out as the most popular form of treatment available, yet the success rates of IVF depend on various factors. **Objective**: To explore sociodemographic profile of females with IVF failure. **Methods**: We designed a retrospective cohort study with the aim to identify the sociodemographic profile of females associated with pregnancy failure in infertile patients undergoing IVF. A total of 50 women patients who had unsuccessful IVF cycles were enrolled via non-probability consecutive sampling. **Results**: The mean age was 34.5 years with a standard deviation of 7.6 years. The mean height and weight were 156.9 cm with a standard deviation of 7.6 cm., 62.4 kg with a standard deviation of 9.2 kg, respectively. The mean BMI (kg/m²) and monthly household income (Pkr) were 23.6 kg/m² and 130,000 PKR; having standard deviation of 5.3 kg/m² and 79,600 PKR, respectively. 55% of participants were housewives, and 45% were employed in various jobs. 56.2% of participants resided in urban areas, while 43.8% lived in rural areas. Lastly, 43.8% of participants have education up to primary or matriculation level, 30% have an intermediate or undergraduate education, 13.8% hold a master's or PhD degree, and 12.5% are uneducated. **Conclusion**: The study concluded that factors like maternal age, BMI, educational level, occupation, household income, and place of residence have significant implications for the success of IVF. These factors must be taken into consideration before planning a successful IVF and avoid unexpected failure. **Keywords**: Socioeconomic Factors, Age Factors, Educational Status, Marital Status, Employment, Ethnicity

INTRODUCTION

Infertility, defined as the inability to conceive after one year of unprotected intercourse, affects around 20% of couples globally and 25% of couples in developing nations. It impacts several dimensions of infertile couples' life (mental, physical, sexual, and social) and thus necessitates suitable therapies [1]. Understanding the primary cause of infertility and selecting an appropriate treatment strategy within the patient's financial and logistical constraints is crucial for developing effective treatment strategies and programs[2]. The World Health Organization acknowledges infertility therapy and the assessment of fertility-related variables as vital for advancing reproductive health[3].

In vitro fertilization (IVF) is a primary option widely used to address fertility issues. Assisted reproductive technology (ART) denotes the external fusion of sperm and eggs by medical intervention. In vitro fertilization (IVF) is a component of assisted reproductive technology (ART) that plays a crucial role in addressing infertility issues. Prior research has shown more than eight million successful IVF instances since many years[4].

Pakistan, although being one of the most densely populated countries worldwide with a population growth rate of around 2%, also has a significant infertility rate of 21.9%, including 3.5% primary infertility and 18.4% secondary infertility[5]. Since the birth of the first in vitro fertilization (IVF) baby, several expectations about the efficacy of IVF have emerged; nevertheless, the success rates of IVF and intracytoplasmic sperm injection (ICSI) remain below the anticipated standard [6].

Unrealistic expectations of success may result in heightened psychological suffering after a failed treatment cycle, leaving both the therapist and patient questioning if this failure should have been anticipated earlier [7]. In a study examining the expectations of IVF patients, researchers discovered that several individuals had excessively optimistic outcome expectations [8]. The clinical pregnancy rate associated with this procedure, quantified as the pregnancy rate per embryo transfer, is around 33.8%[9].

Consequently, it is essential to examine the variables that negatively influence the effectiveness of IVF and their possible processes. The success of IVF is affected by both physical and physiological factors. Physical factors, such as uterine contractions, can cause the embryo to be expelled from the uterus. Conversely, physiological factors, including the female patient's age, duration of infertility, quality of the transplanted embryo, and hormone secretion, can significantly impact the pregnancy rate[10].

Given the influence of these factors, it is crucial to evaluate them before predicting IVF success. As no study has been done in the area so far, this study aims to evaluate the factors influencing IVF outcomes in our population, filling a critical gap in the existing literature. This study also intended towards personalized treatment approaches addressing these risk factors could improve ART outcomes and enhance the chances of successful pregnancies.

MATERIALS AND METHODS

Setting: The study was done at university of Lahore by taking data from Midcity Hospital Lahore

Study design: Retrospective cohort study

Duration of study: 9 months

Sampling technique: Non-probability consecutive sampling

Sample selection criteria

Inclusion Criteria

- Women of 18–45 years and men of 18-59 years
- Absence of intestinal sub-occlusive symptoms or ureteral stenosis
- Females who had IVF failure

Exclusion Criteria

- Involving donor oocytes or semen
- Cycles involving donor gametes or embryos were excluded
- Preimplantation genetic testing

Sample size: data from 50 females were analyzed

Data collection procedure

Data was collected for this retrospective cohort study conducted at the University of Lahore, utilizing records from Midcity Hospital Lahore over a period of 9 months. The sampling technique employed was non-probability consecutive sampling. The inclusion criteria encompassed women aged 18–45 years and men aged 18–59 years, with the absence of intestinal sub-occlusive symptoms or ureteral stenosis, specifically focusing on females who had experienced IVF failure. Exclusion criteria involved cycles with donor oocytes, semen, gametes, embryos, or those that underwent preimplantation genetic testing. Data from 50 females were analyzed, including variables such as age, height, weight, BMI, monthly household income, occupation, location (rural/urban), and education level.

Statistical analysis

With SPSS version 25.0, data was tabulated and assessed. The findings were shown as expressive and inferential statistics. The means and standard deviations for the quantitative data, such as age, BMI, etc., were reported. To evaluate the qualitative factors, such as gender, frequency, and percentages were used.

RESULTS

For Age, the mean is 34.5 years with a standard deviation of 7.6 years. The majority of participants fall within the 31-40 years category (50%), followed by those in the >40 years group (28.8%) and 20-30 years (21.2%). For Height (cm), the average height is 156.9 cm with a standard deviation of 7.6 cm. The largest group is within the 151-160 cm range (47.5%), followed by those taller than 160 cm (35%) and those shorter than 150 cm (17.5%). Regarding Weight (kg), the mean is 62.4 kg with a standard deviation of 9.2 kg. A significant portion of participants fall within the 51-70 kg weight range (66.2%), while 16.2% are under 50 kg, and 17.5% weigh more than 70 kg. For BMI (kg/m²), the mean is 23.6 kg/m² with a standard deviation of 5.3 kg/m². The majority of individuals (57.5%) fall within the 18.5-25 kg/m² range, followed by 30% in the 25-30 kg/m² category and 11.2% with a BMI greater than 30 kg/m².

In terms of Monthly Household Income (Pkr), the mean is 130,000 PKR with a standard deviation of 79,600 PKR. The largest group falls within the 101-150k PKR range (37.5%), followed by the 151-200k range (31.2%) and 1-100k PKR (26.2%). For Occupation, 55% of participants are housewives, and 45% are employed in various jobs. In Location, 56.2% of participants reside in urban areas, while 43.8% live in rural areas. Lastly, for Education Level, 43.8% of participants have education up to primary or matriculation level, 30% have an intermediate or undergraduate education, 13.8% hold a master's or PhD degree, and 12.5% are uneducated.

Table -1: Sociodemographic profile of females with IVF failures (n=50)

Variable	Category	Frequency (n)	Percent (%)	Mean ± S.D
Age (n=50)	20-30 years	11	22.0	34.5 ± 7.6
	31-40 years	25	50.0	
	>40 years	14	28.0	
Height (cm) (n=50)	<150 cm	9	18.0	156.9 ± 7.6
	151-160 cm	24	48.0	
	>160 cm	17	34.0	
Weight (kg) (n=50)	<50kg	8	16.0	62.4 ± 9.2
	51-70kg	33	66.0	
	>70kg	9	18.0	
BMI (kg/m²) (n=50)	<18.5 kg/m²	1	2.0	23.6 ± 5.3
	18.5-25 kg/m²	29	58.0	
	25-30 kg/m²	15	30.0	
	>30 kg/m²	5	10.0	
Monthly Household Income (Pkr) (n=50)	1-100k	13	26.0	130 ± 79.6 k
	101-150k	19	38.0	
	151-200k	16	32.0	

	201-250k	1	2.0	
	251-300k	1	2.0	
Occupation (n=50)	Housewife	28	56.0	
	Jobians	22	44.0	
Location (Rural/Urban) (n=50)	Rural	22	44.0	
	Urban	28	56.0	
Education Level (n=50)	Uneducated	6	12.0	
	Primary to Matric	22	44.0	
	Inter to Undergraduate	15	30.0	
	Master/PhD	7	14.0	

DISCUSSION

Similar to natural fertility, several variables may influence pregnancy rates (PRs) in in vitro fertilization (IVF). The primary prognostic variables influencing successful IVF are the woman's age, body mass index, and lifestyle choices [11]. In accordance with the medical literature, we see that age is a significant factor influencing IVF success. As patients advance in age, the likelihood of successful IVF deliveries diminishes. The average age is 34.5 years, with a standard variation of 7.6 years in our research. A local research conducted by Yousaf et al. including around 85 patients indicated that those suffering pregnancy failure had a higher mean age of 36.2 years, in contrast to 33.2 years for those without pregnancy failure [12]. Another research also indicated that the sociodemographic profile of women experiencing IVF failure often included those aged between 30 and 34 years. The findings of these research align with our study results [13]. The results of these studies are in coherence with our study result.

Similarly, elevated BMI substantially heightened the probability of pregnancy failure in infertile individuals having IVF. Kumar et al. indicated in their research that the mean body mass index (BMI) was considerably lower in females with a favorable IVF result compared to those with a negative outcome. Logistic regression indicated a significant association between maternal BMI (P=0.034) and IVF outcomes. The success rate of IVF was around 31.8 percent, and BMI was much lower in females with good outcomes [14]. Furthermore, another research indicated that the mean BMI was elevated in the pregnancy failure group (26.0 kg/m²) compared to the no pregnancy failure group (23.8 kg/m² [12]. We observed that the mean BMI (kg/m²), is 23.6 kg/m² with a standard deviation of 5.3 kg/m². The majority of individuals (57.5%) fall within the 18.5-25 kg/m² range, followed by 30% in the 25-30 kg/m² category and 11.2% with a BMI greater than 30 kg/m².

Measuring educational gaps in IVF success is essential. Couples with greater incomes and college education were much more inclined to use many rounds of advanced fertility therapy. An independent correlation exists between possessing a college degree and enhanced probabilities of pregnancy [15]. A separate research revealed that women with a college degree are around 24% more likely to have a live birth in the first cycle compared to high school dropouts, while women with a high school diploma exhibit comparable outcomes, being 16% more likely to experience a

successful pregnancy than high school dropouts. There exists a substantial and extremely significant educational gradient in IVF success. Our research indicated that the majority of candidates with unsuccessful IVF had just a basic level of education. 43.8% of participants possess education up to elementary or matriculation level, 30% have intermediate or undergraduate qualifications, 13.8% have a master's or PhD degree, and 12.5% are uneducated. The findings of our investigation are similar to those of the research conducted by Groes et al [16]. Our study showed that majority of candidate with failed IVF has only basic level of education. 43.8% of participants have education up to primary or matriculation level, 30% have an intermediate or undergraduate education, 13.8% hold a master's or PhD degree, and 12.5% are uneducated. The results of our study are comparable with the study results performed by Groes et al[16].

Residential environmental variables influence IVF failure rates. Urban environments, characterized by elevated pollution, postponed motherhood, and lifestyle-induced stress, correlate with a greater incidence of IVF failure. Langston et al. demonstrated that along the rural-urban continuum of Utah, habitation in a big metropolitan center correlated with elevated rates of successful reproductive outcomes (live births). In a multivariate regression analysis, residing in a wholly rural location was substantially correlated with a reduced probability of achieving a satisfactory fertility result compared to those from urban areas (Hazard Ratio [HR] 0.63, 95% Confidence Interval [CI] 0.44–0.91, n=65)[17]. Couples living in residential areas had a higher proportion of successful IVF results than those living in industrial or agricultural areas [14]. Our research also indicated that 56.2% of unsuccessful IVF participants dwell in urban regions, while 43.8% inhabit rural locations. These results underscore the intricate interaction of environmental and behavioral variables in metropolitan environments. Working women exhibited almost fivefold increased risk of first trimester miscarriage relative to non-working women [adjusted odds ratio (aOR) 4.56, 95% confidence interval (CI): 0.52 to 4.96], after adjusting for age and number of retrieved oocytes [18]. Consistent with these findings, our study reported that 55% of participants are housewives, and 45% are employed in various jobs. Therefore, compared to housewives, working women experience higher levels of stress, which increases their chances of IVF failure.

In accordance with these results, our survey indicated that 55% of participants are housewives, whereas 45% are engaged in diverse occupations. Consequently, working women encounter elevated stress levels relative to housewives, hence augmenting their likelihood of IVF failure. [19]. A 2020 assessment revealed disparities in IVF treatment success based on socioeconomic status, showing that persons with high income were more likely to conceive using assisted reproductive technology compared to those with low income[20]. Our study showed that the mean monthly household income (Pkr) is 130,000 PKR with a standard deviation of 79,600 PKR. The largest group falls within the 101-150k PKR range (37.5%), followed by the 151-200k range (31.2%) and 1-100k PKR (26.2%). Hence, our study and the results of previous studies indicated that the group

with higher household income has a lower chance of IVF failure.

Our results provide a fresh array of research inquiries. While access to IVF technology may postpone parenthood, factors such as age, BMI, education, socioeconomic status, profession, and fertility decisions are likely to be affected by the determinants of IVF success, which are the focus of our research. The presence of significant sociodemographic variations in IVF success may elucidate the likelihood of attaining a successful IVF outcome. Nevertheless, the research had many flaws. The sample size was comparatively modest, perhaps limiting the statistical ability to identify specific relationships. The research was performed at a singular institution, perhaps limiting the applicability of the results to other contexts. Subsequent study using bigger sample sizes and multi-center designs would be advantageous for validating these results and furnishing more substantial proof.

CONCLUSION

In conclusion, sociodemographic factors like maternal age, BMI, educational level, occupation, income of the household, and place of residence have significant impact over success of IVF. All these factors need to be taken into consideration before planning a successful IVF and avoid unexpected failure. In that case, the study result place an emphasis on personalized treatment approaches tailored to address the impairing effects of the aforementioned risk factors on the success of IVF.

Author's contribution

SA: Main author, data collection and write up

REFERENCES

1. Coussa A, Hasan HA, Barber TM. Impact of contraception and IVF hormones on metabolic, endocrine, and inflammatory status. J Assist Reprod Genet. 2020;37(6):1267-72.

2. Friis Wang N, Skouby S, Humaidan P, Andersen C. Response to ovulation trigger is correlated to late follicular phase progesterone levels: a hypothesis explaining reduced reproductive outcomes caused by increased late follicular progesterone rise. Hum Reprod. 2019;34(5):942-8.

3. Organization WH. Infertility prevalence estimates, 1990–2021: World Health Organization; 2023.

4. Ishaq M, Raza S, Rehar H, Abadeen SeZu, Hussain D, Naqvi RA, et al. Assisting the human embryo viability assessment by deep learning for in vitro fertilization. Mathematics. 2023;11(9):2023.

5. Shaheen R, Subhan F, Sultan S, Subhan K, Tahir F. Prevalence of infertility in a cross section of Pakistani population. Pak J Zool. 2010;42(4).

6. Nafees R, Khan HL, Khan YL, Awais A, Farooqi A, Nisar R. Role of endometrial receptivity array for implantation failure in in-vitro fertilization and intracytoplasmic sperm injection. Biomed. 2021;37(4).

7. Jacobs MB, Klonoff-Cohen H, Agarwal S, Kritz-Silverstein D, Lindsay S, Garzo VG. Predictors of treatment failure in young patients

undergoing in vitro fertilization. J Assist Reprod Genet. 2016;33:1001-7.

8. Devroe J, Peeraer K, D'Hooghe T, Boivin J, Laenen A, Vriens J, et al. Great expectations of IVF patients: the role of gender, dispositional optimism and shared IVF prognoses. Hum Reprod. 2022;37(5):997-1006.

9. Reproduction EI-MCftESoH, Embryology, Calhaz-Jorge C, De Geyter C, Kupka M, de Mouzon J, et al. Assisted reproductive technology in Europe, 2012: results generated from European registers by ESHRE. Hum Reprod. 2016;31(8):1638-52.

10. von Wolff M, Schwartz AK, Bitterlich N, Stute P, Fäh M. Only women's age and the duration of infertility are the prognostic factors for the success rate of natural cycle IVF. Arch Gynecol Obstet. 2019;299:883-9.

11. Best D, Bhattacharya S. Obes Fertil. Horm Mol Biol Clin Invest. 2015; 24(1):5-10.

12. Yousaf H, Raziq N, Baloch H, Ahmad S, Tariq MN, Javed F, et al. Risk Factors of Pregnancy Failure in Infertile Patients Undergoing Assisted Reproductive Technology. JHRR. 2024;4(3):1-6.

13. Petkovikj E, Dimceva AH, Rastvorceva RG, Useini S. Sociodemographic characteristics and thrombophilic mutations in women with in vitro fertilization failure–initial results from case control study. Arch Pub Health. 2019;11(2):19-25.

14. Kumar S, Mishra V, Thaker R, Gor M, Perumal S, Joshi P, et al. Role of environmental factors & oxidative stress with respect to in vitro fertilization outcome. Indian J Med Res. 2018;148(Suppl 1):S125-S33.

15. Smith JF, Eisenberg ML, Glidden D, Millstein SG, Cedars M, Walsh TJ, et al. Socioeconomic disparities in the use and success of fertility treatments: analysis of data from a prospective cohort in the United States. Fertil Steril. 2011;96(1):95-101.

16. Groes F, Iorio D, Leung MY, Santaeulalia-Llopis R. Educational Disparities in the Battle Against Infertility: Evidence from IVF Success. Copenhagen Business School, Unpublished Manuscript. 2017.

17. Langston DM, Fendereski K, Halpern JA, Aston KI, Emery BR, Ramsay JM, et al. Fertility outcomes across the rural-urban continuum. Fertil Steril. 2023;120(4):e234-e5.

18. Makhadiyeva D, Ibragimov A, Baikoshkarova S, Terzic MM, Issanov A. Association of working status with clinical pregnancy and miscarriage among women undergoing in vitro fertilization: single-centre cross-sectional study. Int J Fertil Steril. 2024;18(3):215.

19. Imrie R, Ghosh S, Narvekar N, Vigneswaran K, Wang Y, Savvas M. Socioeconomic status and fertility treatment outcomes in high-income countries: a review of the current literature. Hum Fertil (Camb). 2023;26(1):27-37s.

20. Räisänen S, Randell K, Nielsen HS, Gissler M, Kramer MR, Klemetti R, et al. Socioeconomic status affects the prevalence, but not the perinatal outcomes, of in vitro fertilization pregnancies. Hum Reprod. 2013;28(11):3118-25.