

Analysis of determinants of infertility among women at *in vitro* fertilization clinic in Surabaya

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Abstract

In social life and global health, infertility is common. History of abdominal surgery, body mass index (BMI), endometriosis, menstrual history, and polycystic ovarian syndrome (PCOS) have not been fully explained as female infertility factors. This study examined infertility causes at ASHA *in vitro* fertilization Primasatya Husada Citra (PHC) Hospital Surabaya. This quantitative study was cross-sectional. In May-July 2023, 82 childbearing-age women with infertility issues visited the hospital and completed questionnaires. Description and analysis were performed using the Wilcoxon rank test to evaluate menstrual history, BMI, PCOS, endometriosis, and abdominal surgery history in relation to infertility. Infertility was statistically associated with abdominal surgery history ($P=0.008$), BMI ($P=0.000$), endometriosis diagnosis ($P=0.000$), and PCOS ($P=0.000$). Women with abdominal surgery, endometriosis, and PCOS had significant infertility. Women's infertility can be caused by ovulation disorders, tubal and pelvic disorders, or uterine disorders, but one-third of cases are unexplained. Infertility treatment may benefit from addressing abdominal surgery history, BMI, endometriosis, and PCOS. Early intervention and targeted care based on these determinants may improve fertility outcomes and reduce unexplained infertility.

Introduction

Infertility significantly impacts the psychology of married couples, causing feelings of depression, worry, and guilt. It also affects their social lives, making them reluctant to engage with others, yet it does not deter them from maintaining their household.^{1,2} The incidence of primary infertility is 62%, while secondary infertility, defined as the inability to have or maintain a pregnancy, stands at 38%.² Research shows that 10-15% of the 39.8 million couples in Indonesia experience infertility, with 4-6 million couples requiring treatment to conceive.³ Basic health research data from 2018 indicates a rise in overweight (13.6%) and obesity (21.8%) among adults, correlating with a 31% increase in central obesity in those over 15 years old.⁴ The stress related to infertility negatively affects the quality of life, with family coherence mediating this stress impact.⁵

Infertility necessitates medical attention and treatment and is a significant life event affecting personal, relational, and social dimensions.⁶ It reveals intense stress and psychological vulnerability, sometimes leading to decreased marital satisfaction and family estrangement.⁷ Causes of female infertility are classified into ovulation disorders [e.g., polycystic ovarian syndrome (PCOS), menstrual cycle disorders, primary ovarian insufficiency], tubal and pelvic disorders, and uterine disorders (e.g., submu-

cous myoma, endometrial polyps, leiomyomas, Asherman’s syndrome).^{8,9} Factors contributing to infertility include occupational factors (e.g., shift work, stress, radiation, chemicals), lifestyle factors (e.g., age, nutrition, exercise, obesity, psychological stress, smoking, alcohol consumption), and environmental pollution.¹⁰⁻¹³ Smoking and alcohol consumption also significantly impact male reproduction.^{7,14,15}

Hormonal changes due to PCOS, such as increased luteinizing hormones and progesterone levels, are linked with higher body mass index (BMI), increasing the risk of PCOS.¹⁶ Despite its status as a global health issue, research has not fully explained determinants of infertility like menstrual history, BMI, PCOS, endometriosis, and history of abdominal surgery. This study aimed to analyze the determinant factors causing infertility at ASHA *in vitro* fertilization (IVF) Primasatya Husada Citra (PHC) Hospital Surabaya.

Materials and Methods

Research design

The research design employed was a quantitative descriptive study with a cross-sectional approach. This research aimed to analyze the determinant factors causing infertility (menstrual history, BMI, PCOS, endometriosis, history of abdominal surgery) at ASHA IVF at PHC Hospital Surabaya.

Study participants

The sample consisted of all new patients of childbearing age (17-49 years) who experienced infertility problems. These patients were visited from May to July 2023, totaling 82 respondents selected using a simple random sampling technique. The respondents were women of childbearing age with infertility problems, and their names were medically registered at the ASHA IVF PHC Hospital. Data was obtained directly through interviews and questionnaires diagnosing the causes of infertility experienced by respondents.

Variable, instrument and data collection

Independent variables included factors influencing infertility (history of abdominal surgery, BMI, endometriosis, menstrual history, PCOS). The dependent variable was the infertility rate. The research instrument was a questionnaire developed by the authors containing questions on general data (age, height, weight to determine BMI, categorized as underweight, normal, overweight, and obesity) and specific data (menstrual history measured as regular or irregular, PCOS, uterine endometriosis, history of abdominal surgery, and diagnosis of the cause of infertility). This data was obtained from secondary sources such as medical resumes. Data tabulation and analysis were conducted after collection.

Table 2. Statistical test result.

Statistical testa

	Infertile – history of abdominal surgery	Infertile – menstrual cycle	Infertile – BMI	Infertile – diagnosis	Infertile – menstrual pain levels
	-2.661 ^b	-1.067 ^c	-7.057 ^b	-6.611 ^b	-1.384 ^b
p	0.008	0.286	0.000	0.000	0.166

BMI, body mass index; ^aWilcoxon signed ranks test; ^bbased on positive ranks; ^cbased on negative ranks.

Data analysis

The analysis aimed to determine the determinant factors (menstrual history, BMI, PCOS, endometriosis, history of abdominal surgery) causing infertility at ASHA IVF PHC Surabaya Hospital using the Wilcoxon rank test (P<0.05).

Ethical clearance

The research procedure received an ethical approval letter from the Health Research Ethics Committee at Nahdlatul Ulama University, Surabaya (No. 0274/EC/KEPK/UNUSA/2023). During the research, the researcher adhered to ethical principles including informed consent, respect for human rights, beneficence, and non-maleficence.

Table 1. Distribution of respondents by characteristics (N=82).

Characteristics	Data distribution	
	Frequency	%
Age group		
Late teens (17-25 years)	1	1.2
Early adulthood (26-35 years)	49	59.8
Late adult (36-45 years)	31	37.8
Early elderly (46-55 years)	1	1.2
History of abdominal surgery		
Has a history of abdominal surgery	37	45.1
No history of abdominal surgery	45	54.9
Menstrual cycle		
Regular	63	76.8
Irregular	19	23.2
Menstrual pain		
No pain	21	25.6
Light	24	29.3
Currently	14	17.1
Heavy	23	28.0
BMI		
Less	2	2.4
Normal	44	53.7
Overweight	23	28.0
Obesity	13	15.9
Diagnosis		
Endometriosis	22	26.8
Uterine myoma	5	6.1
PCOS	17	20.7
POF	5	6.1
Endometrial polyp	8	9.8
Adenomyosis	3	3.7
Tuba non-paten	6	7.3
Obesity	1	1.2
Hydrosalpinx	4	4.9
An explanation	10	12.2
Uterus bicornue	1	1.2

BMI, body mass index; PCOS, polycystic ovarian syndrome; POF, premature ovarian failure.

Results

There were 82 respondents in this research, selected using the simple random sampling method. Table 1 shows that the characteristics of women in this study according to age reveal that the majority (59.8%) were in early adulthood (26-35 years). Regarding the history of abdominal surgery, the majority (54.9%) had no history of abdominal surgery. Based on the menstrual cycle, the majority (76.8%) of women had regular cycles. According to complaints of menstrual pain, almost a third of the respondents (29.3%) experienced mild pain. Respondent characteristics based on BMI results showed that most women (53.7%) had a normal BMI. The diagnosis results indicated that some female respondents (26.8%) had endometriosis and others (20.7%) had PCOS.

Based on the Wilcoxon signed-rank test results in Table 2, several factors influence infertility, including a history of abdominal surgery ($P=0.008$), BMI ($P=0.000$), a diagnosis of endometriosis ($P=0.000$), and a diagnosis of PCOS ($P=0.000$). In contrast, factors that do not affect infertility are the menstrual cycle ($P=0.286$) and the level of menstrual pain ($P=0.166$).

Discussion

Most respondents fall within the early adulthood age range (26-35 years), comprising 49 individuals (59.8%). Age significantly influences both male and female fertility, with women's age being the primary determinant of conception and healthy pregnancies. While infertility can stem from various factors, it often involves contributions from both partners. Multivariate regression analysis has identified women's age, duration of marriage, and socioeconomic status as predictive factors for reduced reproductive opportunities in cases of secondary infertility.¹⁷ The incidence of infertility increases with age, particularly due to diminished egg quality in older women.¹⁸ Research by Dewi *et al.* revealed that a significant portion of couples seeking fertility treatments had husbands over 35 years old and wives aged 20-35 years, highlighting the importance of female age in fertility treatments. Several factors, including the woman's age, significantly influence the success of IVF procedures.¹⁹

Respondent characteristics based on BMI results showed that the majority of women (53.7%) had a normal BMI. Dag and Dilbaz highlighted the association between overweight and obesity in women of reproductive age and anovulatory infertility.¹⁰ In America, approximately 25% of cases of anovulatory infertility are attributed to being overweight. BMI serves as a straightforward tool for monitoring adult nutritional status, particularly in relation to being underweight or overweight.²⁰ BMI is calculated by dividing a person's weight in kilograms by their height in meters squared (kg/m^2). However, the relative risk of anovulation increases significantly in women with BMI values of 24-31 kg/m^2 and $>32 \text{ kg}/\text{m}^2$ compared to women with normal weight.²¹ Obesity induces three changes that disrupt normal ovulation, which can be corrected through weight loss. Despite having a normal BMI, women still face the risk of primary and secondary infertility, indicating the influence of factors beyond BMI on infertility.^{21,22}

Women diagnosed with endometriosis in this study exhibit a significant association with infertility, as indicated by a P-value of 0.000. Endometriosis, a prevalent condition among women of childbearing age in this study, involves the abnormal growth of endometrial glands and stroma outside the uterus, often forming what is known as a chocolate cyst in the ovaries.²³ Symptoms may

vary, with women experiencing severe pelvic pain even in mild cases, while those with severe endometriosis may exhibit milder symptoms such as dysmenorrhea and dyspareunia.²⁴ Other symptoms include abnormal uterine bleeding and infertility, both primary and secondary. Internal examinations may reveal small lumps in the sacro uterine ligament and a retroflexed uterus or adnexa that are difficult to move. Endometriosis, traditionally defined as the presence of endometrial tissue outside the uterus, has been recognized as a painful condition often requiring surgical intervention.²⁵ This study found that 26.8% of respondents were diagnosed with endometriosis, which significantly impacts fertility, with 30-50% of affected women experiencing infertility. Untreated endometriosis reduces the likelihood of conception compared to the general population, and even mild cases are associated with decreased pregnancy rates compared to unexplained fertility.²⁴ Studies on IVF suggest that advanced endometriosis is linked to poor ovarian reserve, low oocyte and embryo quality, and compromised implantation rates.^{26,27}

Women diagnosed with PCOS account for 20.7% of all respondents in this study. This finding is consistent with research conducted by Riska Mareta in 2018,²⁸ which highlighted the significant relationship between PCOS and infertility. Mareta's research concluded that individuals with PCOS face an 8.5 times greater risk of experiencing infertility. PCOS, one of the most common endocrine abnormalities among women of reproductive age, manifests as a collection of symptoms and signs including hyperandrogenism and anovulation resulting from disorders of the endocrine system.^{29,30} This condition affects approximately 5-10% of women of reproductive age, often without primary diseases in the pituitary or adrenal glands. PCOS is closely associated with chronic inflammatory processes, with sufferers often exhibiting high levels of visceral fat due to insulin resistance mechanisms.^{28,31}

Conclusions

This study reveals several factors that significantly impact infertility, including a history of abdominal surgery, BMI, a diagnosis of endometriosis, and PCOS. Conversely, menstrual cycle factors and menstrual pain levels were found to have no effect on infertility. It is recommended that healthcare professionals increase education about infertility within the community to enhance public awareness. Additionally, society should prioritize factors such as age at marriage, nutritional status, and lifestyle choices to mitigate the incidence of infertility.

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