Burden of Infertility and Its Risk Factors in Al-Muthanna Province: A Cross-Sectional Study

Reyam Hamed Hussein Al-Kafagy [1], Rehab Athem Brahee Al-Hassany [2]

1. MBChB., DGO. (Obstetrics and Gynecology), Al-Rumaytha General Hospital, Al-Muthanna, Iraq.
2. MBChB., DGO. (Obstetrics and Gynecology), Al-Rumaytha General Hospital, Al-Muthanna, Iraq.

***Abstract*:** Infertility is a growing public health concern in Iraq, with significant medical, psychological, and social implications. This cross-sectional study aimed to assess the prevalence and risk factors of infertility among couples in Al-Muthanna Province and to evaluate its underlying causes and impact. The study was conducted from January to December 2024 and included 150 couples with a history of infertility, defined as the failure to conceive after 12 months of regular unprotected intercourse. Participants were categorized into two groups: primary and secondary infertility. Data were collected via structured interviews, clinical examinations, hormonal assessments, pelvic ultrasounds for women, and semen analyses for men. The mean age of female participants was 28.9 years and of males was 31.9 years. Urban residency, low socioeconomic status, and smoking were common features among participants. Primary infertility was found in 59.3% of couples, while 40.7% had secondary infertility. A significant association was observed between secondary infertility and longer duration of marriage, prior contraceptive use, and obesity. Female obesity was significantly more prevalent among those with secondary infertility ($p=0.003$). Regarding etiologies, female causes accounted for 49.3% of infertility cases, male causes for 40%, and combined causes for 10.7%. The most common female diagnoses included ovulation dysfunction and tubal obstruction, with the latter being significantly more associated with secondary infertility ($p<0.001$). Among males, abnormal semen analysis and varicocele were the leading causes. Uterine abnormalities were significantly more common among women with primary infertility ($p=0.02$). This study highlights the multifactorial nature of infertility in Iraq, emphasizing the roles of obesity, reproductive history, and modifiable lifestyle factors. Early screening, education, and tailored interventions are essential to reduce the burden of infertility, improve access to fertility care, and address the associated psychosocial challenges in affected couples.

***Index Terms*:** Infertility, Primary and Secondary Infertility, Risk Factors, Reproductive Health, Iraq

INTRODUCTION

Infertility is a significant global health concern, affecting millions of couples and posing serious emotional, social, and economic challenges. The World Health Organization (WHO) defines infertility as the inability to conceive after 12 months or more of regular, unprotected sexual intercourse (1). It can be classified into primary infertility, where a couple has never achieved pregnancy, and secondary infertility, where conception has occurred in the past but is no longer possible (2). Infertility affects both men and women, with various underlying medical, environmental, and lifestyle factors contributing to its increasing prevalence. In Iraq, infertility is a growing public health issue, with sociocultural, economic, and healthcare-related challenges exacerbating its burden. Despite the high importance of fertility in Iraqi society, infertility remains a sensitive and often stigmatized subject, impacting not only the affected individuals but also their families and communities (3).

Studies indicate that environmental pollution, conflict-related stress, poor healthcare access, and high rates of consanguineous marriages may contribute to an increasing trend in infertility cases. Additionally, factors such as reproductive health disorders, infections, and metabolic diseases like obesity and diabetes further

complicate the reproductive health landscape. Political instability and war-related factors have also played a role in declining fertility rates, as exposure to toxins, malnutrition, and psychological stress significantly impact reproductive health in both men and women (4, 5).

Several risk factors are associated with infertility in Iraq, including medical, environmental, genetic, and lifestyle influences. Among women, polycystic ovary syndrome (PCOS), endometriosis, tubal factor infertility, and uterine abnormalities are leading causes of reproductive dysfunction. PCOS, in particular, is highly prevalent in Iraq and is one of the primary contributors to anovulatory infertility (3).

Pelvic inflammatory diseases (PID), untreated sexually transmitted infections (STIs), and postpartum complications also increase the risk of infertility by causing tubal damage and uterine scarring. In men, low sperm count, poor sperm motility, and abnormal morphology due to hormonal imbalances, infections, and genetic factors are primary causes of male infertility. Additionally, varicocele, a condition characterized by the enlargement of veins within the scrotum, is a common male infertility factor in the Iraqi population (6, 7).

Beyond medical conditions, environmental and occupational hazards significantly contribute to infertility in Iraq. Exposure to heavy metals, pesticides, radiation, and air pollution has been linked to hormonal disruptions and reproductive toxicity. The long-term impact of war-related chemical exposures, including depleted uranium and other environmental contaminants, remains a major concern. Additionally, poor nutrition, vitamin deficiencies, and lack of access to quality healthcare further exacerbate reproductive health issues (8).

Lifestyle factors also play a crucial role in infertility prevalence. Obesity, smoking, excessive alcohol consumption, and high levels of psychological stress are known to impair fertility in both men and women. Obesity, in particular, is associated with hormonal imbalances, insulin resistance, and ovulatory dysfunction in women, while in men, it affects sperm quality and testosterone levels. Smoking and substance abuse, which have increased in conflict-affected regions, contribute to poor sperm health, reduced ovarian reserve, and higher rates of miscarriage. Moreover, delayed childbearing due to socio-economic factors and the increasing use of contraception among younger populations are contributing to changing fertility patterns in Iraq (9, 10).

Addressing infertility in Iraq requires a multi-faceted approach that includes improving reproductive healthcare services, increasing awareness, and reducing environmental and lifestyle risk factors. Public health interventions aimed at early diagnosis, fertility preservation, and assisted reproductive technologies (ART), such as in-vitro fertilization (IVF), are essential to managing infertility cases. Additionally, reducing stigma and psychological distress associated with infertility through counseling and support programs is crucial in a society where fertility is deeply valued (10).

This study aimed to estimate the prevalence of infertility among couples in Al-Muthanna Province, to identify common risk factors, including age, lifestyle, hormonal imbalances, infections, and environmental exposures, and to evaluate the psychological and social impact of infertility on affected couples.

METHODS

This cross-sectional study was conducted in Al-Muthanna Province to assess the prevalence of risk factors for infertility. The study was conducted for the duration between the 1st of January 2024 and till 31st of December 2024.

The study included 150 couples who complained of infertility. Married couples aged 16-45 years with a history of infertility which is defined as failure to conceive after 12 months of regular unprotected intercourse were included in the study.

The couple were divided into two groups:

1. Primary Infertility which applied to women who have never been pregnant and have no children or terminated pregnancies.

2. Secondary Infertility applies to women who have not given birth in the last two years but have previously had at least one child or a terminated pregnancy. These women are not lactating and have a desire for another child.

The couples who refused to participate and those with known infertility causes diagnosed before marriage were excluded from the study.

The data was collected from participants through direct interviews asking them about the following aspects:

- Demographic characteristics: women's age, women's education, husband's education, residency, socioeconomic level and smoking.
- Reproductive characteristics: duration of marriage, parity, history of contraception usage, duration of infertility
- Female for menstrual irregularities, previous pelvic infections, PCOS, and endometriosis.
- Male for history of varicocele, and previous infection

Then both males and females were examined, and BMI was calculated. Then women are sent for a hormonal profile (FSH, LH, TSH, prolactin and testosterone) and pelvic ultrasound to detect any abnormalities. The husband was sent for semen fluid analysis.

The data was analyzed using the SPSS program version 26. And the p-value of 0.05 and less was set as significant.

RESULTS

One hundred fifty couples who complained of infertility were included in this study. The women's mean age was 28.9 years while the male mean age was 31.9 years. 59.3% of them lived in urban areas. Regarding women's education, 33.3% of them had secondary education and 36.7% of husbands had secondary education. 44% of patients had a low socioeconomic level. 52.7% of husbands were smokers and 26.7% of women were passive smokers. All these data are presented in Table 1.

Table 1: the sociodemographic characteristics

Variables		No.	%
Age	Female	28.9 ± 5.3	
	Male	31.9 ± 4.01	
Residency	Rural	61	40.7
	Urban	89	59.3
Women education	Illiterate	30	20.0
	Primary	45	30.0
	Secondary	50	33.3
	College	25	16.7
Husband education	Illiterate	25	16.7
	Primary	40	26.7
	Secondary	55	36.7
	College	30	20.0
Socioeconomic status	Low	66	44.0
	Middle	64	42.7
	Good	20	13.3
Husband smoking		79	52.7
Female passive smoker		40	26.7

Eighty-nine of the couples had primary infertility and 61 of them had secondary infertility.

Table 2 shows the association between patient-related variables and type of infertility. The mean durations of marriage and infertility were longer among those with secondary infertility and the difference is statistically significant as p-value< 0.05. 60.7% of those with secondary infertility mentioned the use of contraceptives in comparison to 16.9% of those in the primary infertility group. The difference is statistically significant as the p-value< 0.01. Obesity was more prevalent among couples with secondary infertility.

Table 2: the association between patient-related variables and type of infertility

Variables	Primary infertility (n=89)	Secondary infertility (n=61)	p-value
Duration sine marriage	5.21 ± 2.1	8.2 ± 3.4	< 0.01
Duration of infertility	4.5 ± 1.6	5.6 ± 2.2	0.008
Parity	0	1.5 ± 0.8	< 0.01
History of contraceptive usage	15 (16.9)	37 (60.7)	< 0.01
Husband obesity	30 (33.7)	29 (47.5)	0.088
Women obesity	35 (39.3)	39 (63.9)	0.003

Table 3 shows the distribution of causes of infertility among couples in both groups. 40% of couples had male cause infertility 49.3% of them had female causes and 10.7% had combined causes.

Table 3: the association between the cause of infertility and its type

Variables	Primary infertility (n=89)	Secondary infertility (n=61)	Total	p-value
Male cause	35 (39.3)	25 (40.9)	60 (40.0)	0.955
Female cause	44 (49.4)	30 (49.2)	74 (49.3)	
Combined causes	10 (11.2)	6 (9.9)	16 (10.7)	

Table 4 shows the distribution of different diagnoses of infertility among couples in both groups. The most prevalent cause among women with infertility was ovulation dysfunction among 35 women. Uterine abnormalities were more common among women with primary infertility and the difference was of statistically significant p-value= 0.02.

While tubal obstruction was more common among the secondary infertility group and p-value <0.001.

Regarding the male causes, abnormal semen analysis was the most common cause among 51 male patients. Followed by varicocele among 18 patients

Table 4: the association between diagnosis and type of infertility

Diagnosis	Primary infertility (n=89)	Secondary infertility (n=61)	p-value
Female causes			
Endometriosis	15 (16.9)	5 (8.2)	0.125
Uterine abnormalities	10 (11.2)	1 (1.6)	0.02
Ovulation dysfunction	25 (28.1)	10 (16.4)	0.096
Tubal obstruction	3 (3.4)	27 (44.3)	< 0.001
Male causes			
Abnormal semen analysis	30 (33.7)	21 (34.4)	0.927
Varicocele	11 (12.4)	7 (11.5)	0.869

DISCUSSION

Infertility remains a critical yet underexplored public health concern in Iraq, with significant social, psychological, and medical consequences. In a cultural context where childbearing is highly valued, infertility can lead to stigma, marital instability, and psychological distress (11). Despite these impacts, there is a lack of population-based studies addressing the epidemiology and risk factors of infertility in Iraqi provinces. This study aimed to fill that gap by evaluating the prevalence and underlying causes of infertility in Al-Muthanna Province, thereby providing evidence to inform local healthcare strategies and resource allocation.

Our findings revealed that 59.3% of couples had primary infertility, while 40.7% had secondary infertility, a distribution similar to regional patterns observed in Middle Eastern countries

as reported Zegers-Hochschild et al. (2017) (12). The observed predominance of primary infertility contrasts with findings from other conflict-affected areas where secondary infertility is more prevalent due to untreated infections and poor postnatal care as mentioned by Deshpande et al. (2019) (13). However, the higher proportion of secondary infertility in our study may reflect increasing access to antenatal care and changing reproductive behaviours, including delayed childbearing and contraceptive use.

We found a statistically significant association between secondary infertility and prior contraceptive use, longer duration of marriage, and obesity, especially among women. These findings are in line with studies conducted in Iran and Egypt, which highlighted obesity as a significant risk factor due to its effect on ovulatory function and insulin resistanc (14, 15). The metabolic and endocrine disruptions associated with high BMI can impair folliculogenesis and endometrial receptivity, thus compromising fertility (16).

Tubal obstruction was more commonly seen in women with secondary infertility, supporting previous literature that links Pelvic Inflammatory Disease (PID) and sexually transmitted infections (STIs) to tubal damage (I7). Given that many Iraqi women may not have access to early diagnosis or treatment of pelvic infections, this finding calls for stronger reproductive health education and screening programs.

On the male side, abnormal semen analysis was the most common cause, followed by varicocele, consistent with global studies showing these as leading contributors to male factor infertility as reported by Leslie et al. (2024) (18). The prevalence of male infertility reinforces the importance of including men in fertility assessments and dispelling cultural misconceptions that often place blame solely on women.

Uterine abnormalities were significantly more common in women with primary infertility, in line with studies suggesting that congenital anomalies or fibroids may impede implantation in nulliparous women such as the one by Hosseinirad et al. (2021) (19). Conversely, ovulation dysfunction (including PCOS) was prevalent across both groups, consistent with the high burden of PCOS in Middle Eastern populations and its strong association with infertility due to anovulation (20).

Notably, smoking and passive exposure were more frequent among couples with infertility, echoing previous research demonstrating that nicotine exposure adversely affects oocyte quality, sperm parameters, and hormonal profiles (21).

In summary, this study not only confirms known risk factors such as obesity, tubal pathology, and male factor infertility but also reveals a changing pattern of contraceptive use and urban lifestyle influences in Al-Muthanna. The findings highlight the need for comprehensive fertility care, public health education, and early screening programs tailored to Iraq's unique sociocultural and environmental context.

This study was limited by its cross-sectional design, which restricts causal inference. The sample size was relatively small and drawn from a single province, potentially limiting generalizability. Additionally, reliance on self-reported data may have introduced recall or reporting bias.

CONCLUSIONS AND RECOMMENDATIONS

This study highlights the multifactorial nature of infertility among couples in Al-Muthanna Province, with female obesity, tubal obstruction, ovulatory dysfunction, and male semen abnormalities being key contributors. Sociodemographic and lifestyle factors such as low socioeconomic status, smoking, and prior contraceptive use also played a role. Strengthening public awareness, early screening programs, and access to fertility services is crucial. We recommend integrating infertility assessment into primary healthcare and enhancing reproductive health education, particularly in underserved regions. Further longitudinal and multicenter studies are needed to explore causal relationships and improve national infertility management strategies.

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DATA CONFIDENTIALITY AND STORAGE

The data will be processed with a higher degree of confidentiality and privacy.

CONFLICTS OF INTEREST

The researchers did not report any conflicts of interest.

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AUTHORS

Reyam Hamed Hussein Al-Kafagy

MBChB., DGO. (Obstetrics and Gynecology)

Al-Rumaytha General Hospital

Al-Muthanna – Iraq

Rehab Athem Brahee Al-Hassany

MBChB., DGO. (Obstetrics and Gynecology)

Al-Rumaytha General Hospital

Al-Muthanna – Iraq

CORRESPONDING AUTHOR

Reyam Hamed Hussein Al-Kafagy