

# Analysis of Infertility in Basra Governorate, Iraq

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## ABSTRACT

**Background:** Infertility represents an escalating health and social concern in developing countries.

**Objective:** This study aimed to investigate the medical and demographic factors contributing to infertility among couples attending the Infertility Center in Basra Governorate.

**Methods:** A case-control study was conducted on one hundred couples suffering from infertility. Semen samples were collected from men, while vaginal swabs were obtained from women. Bacterial isolates were then diagnosed microscopically and in vitro, and biochemical tests were performed, such as the oxidase test, catalase test on mannitol, Simmons citrate agar, and Klegar Iron Agar test.

**Results:** Medical evaluation showed that polycystic ovary syndrome (PCOS) was the most frequently identified cause of female infertility (44%). Among males, prostatitis was reported in 28% of cases. Other contributing conditions included pelvic inflammatory disease (20%), hypertension (20%), diabetes mellitus (14%), genetic disorders (10%), and hypothyroidism (3%). Microbiological analysis revealed that *Escherichia coli* was isolated in 15.65% of samples, followed by *Staphylococcus haemolyticus* (30.43%), *Staphylococcus aureus* and *Klebsiella pneumoniae* (8.69% each), and *Proteus mirabilis* (8.69%). The prevalence of smoking among infertile males was notably high (90%), while no female smokers were recorded.

**Conclusion:** These findings highlight the multifactorial nature of infertility, with significant influence from both behavioral factors—such as smoking—and medical conditions, including infections and hormonal disorders. The study emphasizes the importance of comprehensive reproductive health strategies that incorporate early diagnosis, infection control, and lifestyle interventions.

**Keywords:** Male infertility, female infertility, primary infertility, secondary infertility, bacterial pathogens

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## INTRODUCTION

It is defined as the inability to conceive after one year of regular unprotected intercourse. It may be caused by various reasons, including genetic, hormonal, environmental, or other factors [1]. According to the World Health Organization, achieving gender equality is an essential component of the human rights approach to healthcare at all levels [2]. Infertility is categorized into primary infertility—the inability to achieve any pregnancy—and secondary infertility—the inability to conceive after a previous successful pregnancy [3]. Globally, around 10–15% of couples are affected by infertility, with approximately one-third of the cases attributed to male factors, one-third to female factors, and the remaining third to unexplained causes [4]. Male infertility is a medical, social, and economic problem that affects a man's life. Erection is not the only cause of infertility [5]. In women, it includes disorders that occur in the female reproductive system, including problems in the uterus, blocked fallopian tubes, progesterone deficiency, menstrual disorders, and problems with the ovulation process [6]. Common causes for both men and women include aging, obesity, and exposure to chemicals, pesticides, and radiation. Drug use and alcohol consumption negatively affect couples' fertility. Shared risk factors between men and women include age, obesity, environmental exposures to chemicals or radiation, smoking, alcohol use, and poor nutrition [7]. Exposure to microorganisms can cause problems that negatively impact fertility in women, microbes can cause pelvic inflammatory disease and blockage of the fallopian tubes [8]. Microbial infections are also implicated in infertility, especially when they cause pelvic inflammatory disease (PID) in women or impair sperm quality in men [9]. The following bacteria are some of the most common bacterial causes of infertility: *Neisseria gonorrhoeae*, *Ureaplasma urealyticum*, *Chlamydia trachomatis*, *Pseudomonas aeruginosa*, *Candida albicans*, *Mycoplasma genitalium*, *Mycobacterium tuberculosis*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* [10]. The current study aimed to study infertile couples, the most important causes of infertility, and the effect of microorganisms on the fertility of couples.

## METHODS

This study was a case-control study conducted on one hundred couples suffering from infertility visiting the Infertility Center, Basra Hospital for Obstetrics and Gynecology, Basra Governorate. Samples were collected over a six-month period from November 1, 2024, to May 1, 2025. Semen samples were collected from men using clean, sterile plastic containers. For women, vaginal swabs were obtained by inserting a sterile swab for one minute into the vaginal canal under aseptic conditions. Patients were divided into two groups depending on the type of infertility, whether primary or secondary, and a structured questionnaire was administered, collecting data on sociodemographic factors (name, gender, age, residence, education), medical history (genetic disorders, previous surgeries), and lifestyle (smoking). Samples were stored in refrigerated boxes and transported promptly to the laboratory on culture media such as blood agar and MacConkey agar. Bacterial isolates were then diagnosed microscopically and in vitro, and biochemical tests were performed, such as the oxidase test, catalase test on mannitol, Simmons citrate agar, and Klegar Iron Agar test [11].

### *Ethical Approval*

The Iraqi Ministry of Health/Basra Health Department/Training and Human Development Association, No. 709 dated November 7, 2024, granted ethical approval for this study. In addition, authorization was secured from the administration of the Infertility Center in Basra Governorate to collect clinical samples from patients for scientific research purposes. Before sample collection, all participants were informed about the study's objectives and procedures, and verbal consent was obtained. The study was conducted in compliance with established ethical guidelines, ensuring strict confidentiality and protection of participant privacy throughout the research process.

### *Statistical Analysis*

Statistical analysis was performed using SPSS version 20. Descriptive statistics were used to summarize data. The chi-square ( $\chi^2$ ) test was used to assess associations between categorical variables. A p-value  $\leq 0.05$  was considered statistically significant.



## RESULTS

Hundred infertility patients who visited the infertility center in Basra Governorate were divided according to gender: 50 male and 50 female, female patients

were further categorized by infertility type: 23 (46%) with primary infertility and 27 (54%) with secondary infertility (Figure 1).

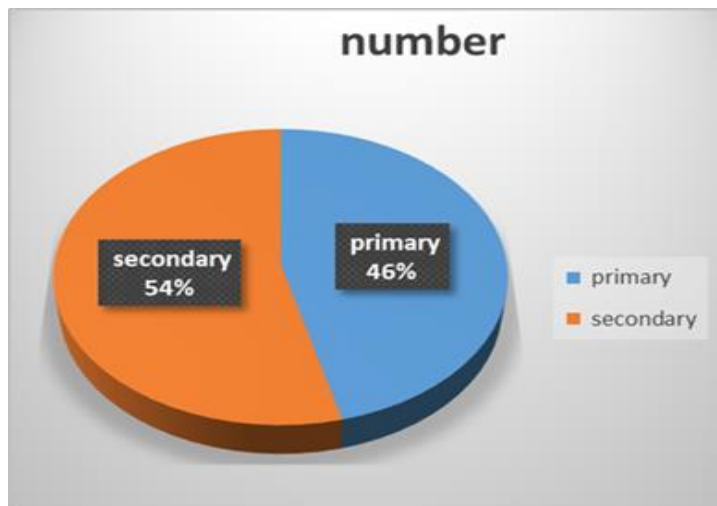


Figure 1: Types of infertility

The results showed that the chi-square value was ( $p \leq 0.05$   $\chi^2 = 20.57$ ) and the probability value was ( $p$ -value  $< 0.001$ ), indicating that there were statistically significant differences in the age distribution among the participants, as the age group 19–30 years

constituted 45%, followed by 31–40 years at 43%, while the 41–50 group accounted for 12%, as in Table (1).

Table 1: The distribution of study samples according to age groups

Age groups	Frequency	Percentage
19-30	45	45%
31-40	43	43%
41-50	12	12%

( $p \leq 0.05$   $\chi^2 = 20.57$ )

The study results showed that the educational level of spouses (males and females) was distributed unevenly, as 10% were uneducated, 26% had primary education, 18% had intermediate education, 30% completed preparatory education, 15% were university graduates, and 1% held postgraduate degrees. By conducting the chi-square test to verify the presence of significant differences between the actual distribution of educational levels and the expected (hypothetical equal) distribution, the calculated chi-square value ( $\chi^2$ ) was 34.63 at a significance level of 0.05, indicating the presence of statistically significant differences in educational levels within the studied sample, meaning that the educational distribution is heterogeneous. These

results reflect a decline in the percentage of higher education among sample members, with the largest percentage concentrated in the preparatory and primary educational levels, as in Table (2). As for the classification of the monthly income of spouses, 25% of the participants had middle income, 15% had high income, and 10% had low income, as in Figure (2).

Distribution of spouses according to residential area: The highest percentage was in the Qibla area (20%), followed by the Al-Zubair and Umm Qasr areas with an equal percentage of 16% for each, then Abu Al-Khaseeb and Al-Qurna with a rate of 14% for each, while the percentage of the population in Shatt Al-Arab was 10%, followed by Al-Tawaisa (6%), and finally the Safwan area (4%). The statistical analysis



indicated the presence of significant differences in the distribution of individuals according to residential area ( $p \leq 0.05$ ,  $\chi^2 = 29.12$ ), as in Table (3).

Table 2: The distribution of study samples according to the educational level of males and females

Academic level	Frequency	Percentage
Uneducated	10	10%
Primary	26	26%
Medium	18	18%
Preparatory	30	30%
Graduate	15	15%
Postgraduate studies	1	1%
<b>Total</b>	<b>100</b>	<b>100</b>

( $p \leq 0.05$   $\chi^2 = 34.36$ )

Table 3: The distribution of study samples according to place of residence

Place of residence	Frequency	Percentage
Al-Zubair	8	16%
Al-Qurna	7	14%
Abu Al-Khaseeb	7	14%
Umm Qasr	8	16%
The Qiblah	10	20%
Shatt al-Arab	5	10%
Safwan	2	4%
Al-Tuwaisa	3	6%
<b>Total</b>	<b>50</b>	<b>-</b>

( $p \leq 0.05$   $\chi^2 = 29.12$ )

The study results showed a significant difference in the prevalence of some diseases between males and females within the studied sample. Polycystic ovary syndrome (PCOS), which affected 44% of female patients (prostatitis in 28% of males), (hypertension in 20%), (pelvic inflammatory disease in 20%), (diabetes mellitus in 14%), (genetic disorders in 10%), and (hypothyroidism in 3%). In Figure (2),

40% of infertile women had normal weight, 34% were obese, and 26% were underweight. About 90% of male participants reported smoking, while no female smokers were recorded. The statistical analysis indicated that there is a highly significant difference between males and females in terms of smoking, as males smoke significantly more ( $P \leq 0.05$ ,  $\chi^2 = 81.8$ ), as shown in Table (4).

Table 4: The diseases that infertility patients suffer from

Diseases	Frequency	Percentage	Affected Gender
Prostatitis	14	28%	Male only
Pelvic inflammatory disease	10	20%	Female only
Polycystic ovary syndrome	22	22%	Female only
Diabetes	11	11%	Male / Female
The pressure	20	20%	Male / Female
Hypotgyroidism	3	3%	Male / Female
Genetic diseases	10	10%	Male / Female
<b>Total</b>	<b>90</b>	<b>-</b>	<b>-</b>

( $P \leq 0.05$   $\chi^2 = 18.00$ )



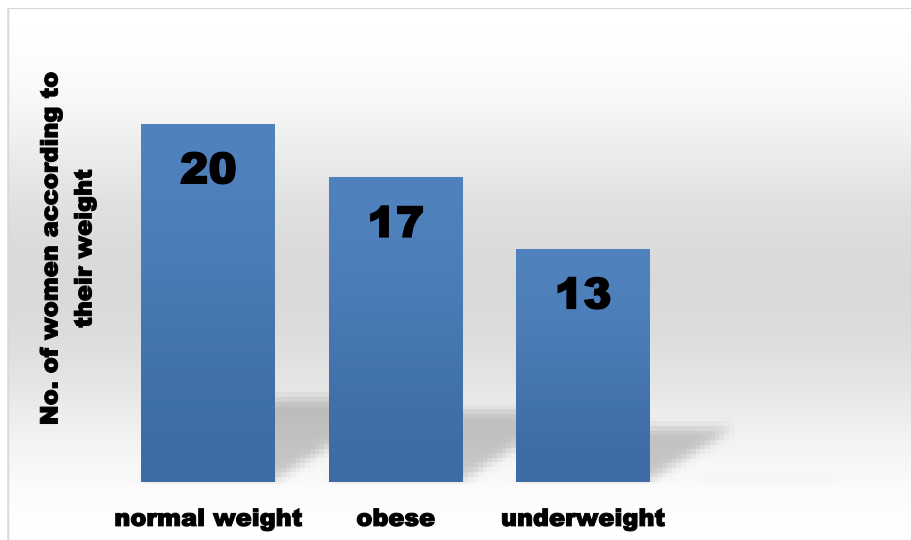


Figure 2: The weight of infertile women

Table 5: The percentage of smoking for sterile husbands

Sex	Redundant	Percentage
Male	45	90%
Female	0	0

( $P \leq 0.05$   $\chi^2 = 81.8$ )

Bacterial identification in this study began with blood agar and MacConkey agar. MacConkey agar, a selective and differential medium, is commonly used to isolate and differentiate Gram-negative bacteria. Initial identification was based on phenotypic characteristics such as colony morphology, odor, consistency, and viscosity. This preliminary diagnosis

was followed by a series of biochemical tests, including the oxidase, catalase, mannitol fermentation, citrate, and triple sugar iron (TSI) tests. Selective media such as Mannitol Salt Agar and Eosin Methylene Blue (EMB) were also used, as well as Triple Sugar Iron (TSI) agar, as shown in (Figure 3).

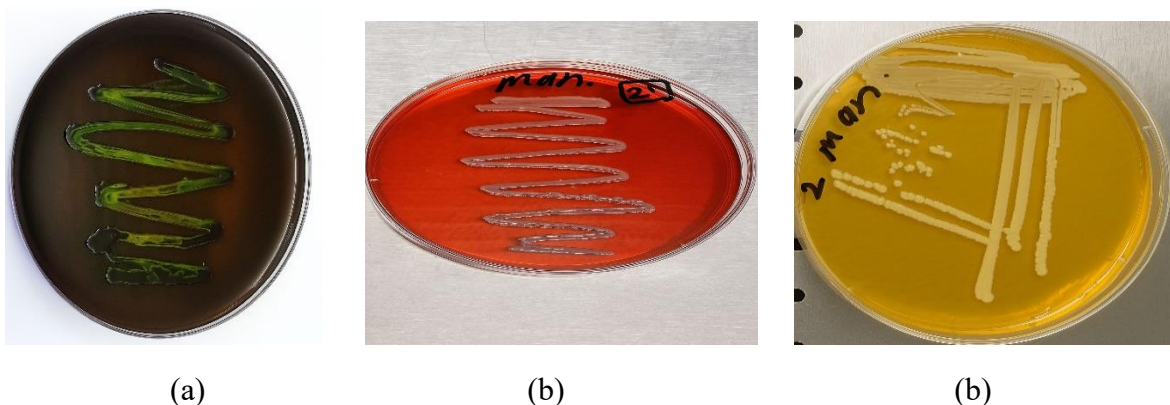


Figure 3: Culture media used in bacterial diagnosis: (a) EMB, (b) Mannitol agar

The bacterial isolates identified in both male and female patients were as follows: (Staphylococcus haemolyticus: 30.43%) (Escherichia coli: 15.65%) (Staphylococcus epidermidis: 13.04%)

(Staphylococcus aureus: 8.69%) (Klebsiella pneumoniae: 8.69%) (Proteus mirabilis: 8.69%) (Figure 4).



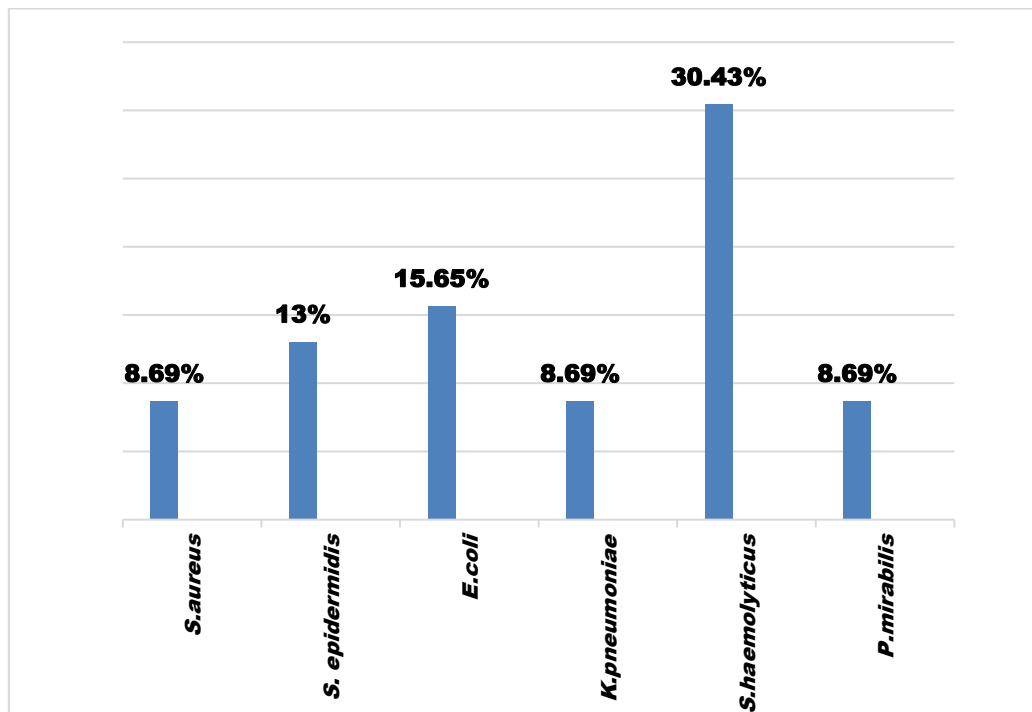


Figure 4: Types of bacterial pathogens isolated from infertility patients

## DISCUSSION

Infertility is a common health and social problem affecting a large percentage of couples of reproductive age. It is defined as failure to conceive after one year of regular unprotected intercourse. Studies have shown that infertility poses a significant psychological and social burden, especially in societies that place high importance on fertility. In Iraq, data indicate a clear prevalence of infertility. A study conducted in Basra Governorate showed that approximately 68.9% of infertile women suffered from depression, related to the type and duration of infertility. Depression was more common among women with primary infertility [12]. Secondary infertility was more common at 54%, while primary infertility was 46%. This indicates that most couples had previously given birth and subsequently encountered difficulties conceiving. These results are consistent with regional data.

A national study in Iran published in BMC Public Health in 2025 showed that the prevalence of secondary infertility over 12 months was 15.7%, compared to 11.8% for primary infertility. These rates decreased to 9.0% for secondary infertility and 6.9% for primary infertility over 24 months [13]. On the other hand, a study in Duhok Governorate

showed that primary infertility was the most common, at 77.2%, compared to 22.8% for secondary infertility, reflecting geographic and perhaps social and health variations between Iraqi governorates [14]. According to the World Health Organization, an estimated 17.5% of adults globally experience infertility at some point in their lives. Of these cases, 9.6% are classified as primary infertility—defined as the inability to achieve pregnancy at all—while 6.5% represent secondary infertility, which occurs when individuals are unable to conceive after having at least one previous successful pregnancy. Although the overall prevalence of primary infertility is slightly higher, secondary infertility is particularly widespread in certain regions, especially where high rates of reproductive tract infections and complications following childbirth are common [15]. The results of the current study showed that the age group of infertility patients between 19 and 30 years (45%) are the most frequent visitors to the infertility center, followed by the age group between 31 and 43 years (43%), compared to patients visiting between 41 and 50 years (12%), who are the least. A study carried out at Al-Alawiya Hospital in Baghdad Governorate showed that women aged 25-40 are the age group most frequently visiting the hospital. This



is consistent with the results of the current study [16]. The World Health Organization [15] showed that reproductive capacity and fertility in males and females begin to decline at the age of 32. Another study showed that about 85% of the causes of infertility in the world fall within the age group of less than 50, especially in areas suffering from malnutrition, poor health care, and lack of treatment [17].

The current study showed that patients with intermediate and secondary education levels were more likely to be referred for infertility compared to those with higher education (1%). This indicates an inverse relationship between educational level and infertility, which may be due to increased awareness and a greater desire among infertile patients to become parents. The distribution of infertility patients according to monthly family income showed that people with an average monthly income (25 cases) had the highest percentage, followed by people with high monthly income (15 cases), and then those with low monthly income (10 cases). This indicates that the level of monthly family income is fundamental in bearing the costs and receiving treatment.

A study in Iran showed a significant relationship between education and lower infertility rates [13]. Another study showed that women with a higher educational level showed awareness in understanding the conditions and causes of infertility that they may experience and were more motivated to receive treatment [18, 19]. The level of education among infertility patients is closely related to health behavior. Unhealthy habits such as alcohol consumption and smoking are important causes of infertility.

The results of the current study showed that women suffering from polycystic ovary syndrome are the most frequent cases in the infertility center, as the infection rate constituted 44% compared to other cases. This is consistent with what the WHO [16] stated, that about 25-30% of the causes of infertility in women are due to a defect in the ovulation process. Another study also showed that many cases of infertility in women in Iraq are due to disorders and imbalances in hormones and the ovulation process. In another study in Erbil Governorate, which included 595 women, it was confirmed that there is a

relationship between hormonal and physical causes and an increase in the rate of infertility [20].

The results of the current study also recorded other diseases, including high blood pressure (20%), diabetes (14%), and other genetic diseases (10%). It is consistent with results of other study which showed that genetic factors affect the quality of semen and sperm production and irregularity in the menstrual cycle, which leads to increased rates of infertility and weak fertility in couples [21]. In the current study, the incidence of hypothyroidism was 3%, representing a low rate but with a significant impact on irregular menstruation and ovulation. Women with hypothyroidism suffer from impaired fertility and consequently infertility. An increase in TSH and a decrease in T3 and T4 hormones are related to infertility. Al-Khafaji and Jewad [22] explains that thyroid hormone dysfunction and high prolactin (PRL) negatively affect the ovulation process. Especially in the difference in cases of infection, which is due to a difference in the size of the sample and other characteristics. 90% of the males who came to the center are smokers, while the women have not registered any cases of smoking.

In a study carried out by Lee et al., [23] in South Korea, infertility was 4.9 times more likely among women who smoked than among non-smoking women. Another study performed by Kumar and Singh [24], revealed that smoking negatively affects the production of sperm. In small numbers and abnormal movement when compared to non-smoking men. In the current study, it is consistent with other studies conducted in the world that showed a great relationship between smoking and an increase in the oxidative stress rate on sperm quality, causing DNA damage. It negatively affected fertility. The results of the current study showed that both sexes were infected with *E. coli* (15.65%), *S. haemolyticus* (30.43%), *S. aureus* (8.69%), *K. pneumoniae* (8.69%), *P. mirabilis* (8.69%), and *S. epidermidis* (13.04%), which is consistent with the mechanism of a study conducted by Zuhair et al., [25].

## CONCLUSION

Infertility is a common global health problem, with significant social, psychological, and economic impacts on couples' lives. This study examined the direct and indirect role of microorganisms in influencing reproductive functions in both males and



females. These microorganisms are among the most prominent causes of sexually transmitted diseases, which can lead to impaired fertility or infertility. This study also analyzed the relationship between the type of infertility and some demographic and health factors, such as age, educational level, place of residence, obesity, and smoking, to determine the extent to which these factors affect the likelihood of infertility. The results showed that these variables play an important role in determining the type and severity of infertility, highlighting the importance of comprehensive and integrated screening for infertile couples during diagnosis and treatment.

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### **Conflict of Interest**

The authors declare that there is no conflict of interest.

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