

# Isolation and identification of pathogens in patients with pelvic inflammatory disease in Duhok, Kurdistan of Iraq

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**Objective:** The present study aims to isolate and identify pathogens associated with pelvic inflammatory disease (PID) among female patients attending hospitals in Duhok province, Kurdistan region of Iraq.

**Methods:** The present study included 150 women who attend different private clinics in Duhok province, Kurdistan region of Iraq and were screened for PIDs based on the clinical features. Endocervical swab taken from each patient to detect of pathogens based on cultural and biochemical characterization tests.

**Results:** The results revealed that about 55.4% of cultures were positive for the infection pathogens. There were three microorganisms isolated with *Staphylococcus aureus* as the most commonly isolated organism in 52.27% of cases followed by *Streptococcus epidermidis* (15.90%), and *Candida* species (18.18%). The age group most affected falls within the group ranged 25–30 years that comprised 38.64% of patients.

**Conclusion:** The results of our study concluded that PID is a major health problem in our country. The microorganisms frequently responsible for acute PID were genital tract *Staphylococcus aureus*, whose identification should be included among routine tests for women with suspected acute PID in the hospitals.

**Keywords:** Pelvic inflammatory, endocervical, endometritis, salpingitis, dyspareunia.

## Introduction

Pelvic inflammatory disease (PID) refers to any infection in the female lower reproductive tract that spreads to the upper reproductive tract especially vagina and cervix causing endometritis, parametritis, salpingitis, oophoritis, tuboovarian abscess, and pelvic peritonitis.<sup>1</sup>

PID is a common disease in all ages of women but mostly occur in young women who are sexually active and have multiple partners or have past history of sexually transmitted infections.<sup>2</sup>

The PID may be symptomatic or asymptomatic. Clinical symptoms and signs lack sensitivity and specificity. There are many common physical signs and clinical symptoms accompanying patients who suffer from PID and suggestive diagnosis of PID included lower abdominal pain, deep dyspareunia, abnormal cervical, or vaginal discharge with abdominal tenderness, fever (>38°C).<sup>3</sup>

The acute PID defines as symptoms for fewer than 30 days. The infections in this phase can be due to a wide range of pathogens, often including, but limited to, *Neisseria gonorrhoeae* and *Chlamydia trachomatis* while chronic PID lasts its symptoms for more than 30 days. It is usually associated with infection caused by *Mycobacterium tuberculosis* or *Actinomyces* species.<sup>4</sup>

PID is a vague and unclear term that can refer numerous pathogens such as viral, fungal, parasitic, and most commonly bacterial infections. The bacteriology of acute PID is polymicrobial in nature and multiple bacteria have been identified as causative agents.<sup>5</sup>

Broad spectrum antibiotic therapy is required to cover possible pathogens. This is often associated with a more severe clinical presentation, poor response to therapy, increased risk for more chronic pelvic pain, ectopic pregnancy, and infertility.<sup>6</sup>

Sexually transmitted organisms have been implicated in many cases of PID especially *Neisseria gonorrhoea* and *Chlamydia trachomatis*. In one study, *N. gonorrhoea* isolated in 40 (60%) women with acute salpingitis, It was noted that 10 (40%) untreated women with *N. gonorrhoea* developed PID. Also *C. trachomatis* is estimated to be the cause in about 60% of cases of salpingitis, among which 20 (40%) women infected with *C. trachomatis* developed PID.<sup>7</sup>

However, several other microorganisms such as: *Gardnerella vaginalis*, *Haemophilus influenzae*, enteric Gram-negative rods that comprise the vagina flora also have been reported as causative agent of PID. *Staphylococcus aureus* and *Streptococcus agalactiae* also have been associated with PID.<sup>8</sup>

Some reports also suggest that *Cytomegalovirus*, *Mycoplasma hominis*, *Mycoplasma genitalium*, and *Ureaplasma urealyticum* may be within the etiologic agents in some cases of PID.<sup>9</sup>

Doing local studies on risk factors responsible for PID in Kurdistan region of Iraq is essential because these risk factors may be clearly different than those existing in the west and this may need a different treatment strategy and appropriate planning can be done to reduce future complications and consequences. Therefore, the present study aimed to isolate and identify pathogens associated with PID among female patients attending hospitals in Duhok province, Kurdistan region of Iraq (Fig. 1).

## Materials and methods

The current study was performed according to the cross-sectional descriptive study design. A total of 150 women ranged 18–50 years and complaining of lower abdominal pain, vaginal discharge, and having adnexal as well as cervical motion tenderness on bimanual examination who visited private

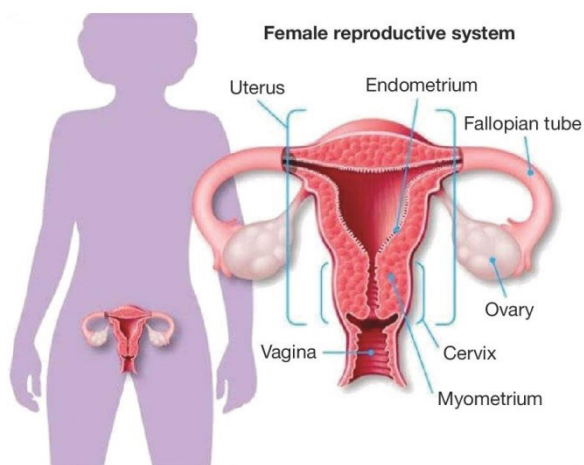


Fig. 1 Organs of female reproductive system infected by PID.

gynecological clinics were collected from Duhok city from March 2018 to November 2018.

All the cases were assessed and subjected to a comprehensive history taking; a questionnaire form was filled for each one that included sociodemographic characteristics, obstetrics history, sexual behavior, and infertility.

After full clinical examination, laboratory examinations were performed for each individual at the Department of Microbiology, College of Medicine, University of Duhok.

Before working, permission of Ethics Committee and permission from all children' parents had been taken.

The endocervical specimens are respectively cultivated on Blood agar media and incubated aerobically at 37°C for 24 h, the Chocolate agar culture was additionally incubated with increased (10%) CO<sub>2</sub>. Additional Blood agar cultures of specimens are subjected to anaerobic incubation at the same temperature and time as the aerobic cultures for possible detection of the presence of obligate anaerobes.

The prevalence of microbial infections is determined in frequency and percentage. The possible association is examined using Chi-square tests. The statistical calculations are performed by Statistical Package for Social Sciences 24:00 (SPSS 24:00; IBM).

## Results

All 150 female patients included in this study were cytogenetically confirmed cases with a clinical diagnosis of PID. The age of the enrolled patients ranged from day 18 to 50 years with a median age of 33.1 years (mean 32.3±7 years).

In the present study, 150 endocervical samples were cultured to isolate and identify different pathogens. Fig. 2 shows that 88 (58.7%) samples had positive cultures and 62 (41.3%) samples had negative cultures and had no growth.

In the present study, five clinical pathogens were isolated and further identified. Table 1 shows the distribution and percentage of isolated pathogens according to positive cultures as follows: *Staphylococcus aureus* (52.27%), *Staphylococcus epidermidis* (15.90%), *Streptococcus pyogenes* (9.09%), *Streptococcus agalactiae* (4.54%), and *Candida* species (18.18%).

Table 2 shows the distribution of isolated pathogens according to age of enrolled patients. Frequency of occurrence was predominant with the age group 26–30 years (38.64%).

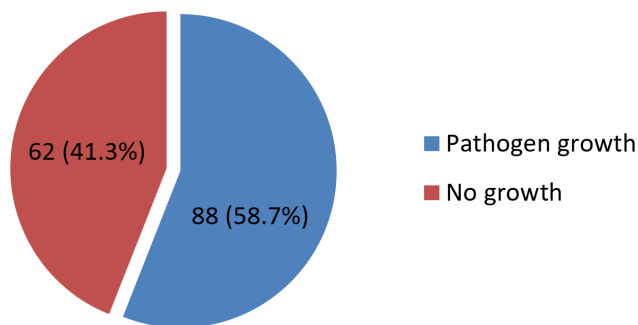


Fig. 2 Positive and negative cultures for the infection pathogens.

Table 1. Distribution of the different pathogens isolated from patients.

Organism isolated	Total no. of isolates	Percentage
<i>Staphylococcus aureus</i>	46	52.27%
<i>Staphylococcus epidermidis</i>	14	15.90%
<i>Streptococcus pyogenes</i>	8	9.09%
<i>Streptococcus agalactiae</i>	4	4.54%
<i>Candida</i> sp.	16	18.18%
Total	88	100%

Table 2. Distribution of pathogens according to age of patients.

Age groups (years)	Number with growth	Percentage%
15–20	10	11.36%
21–25	20	22.73%
26–30	34	38.64%
31–35	18	20.45%
36–50	6	6.82%
Total	88	100.00%

## Discussion

PID is a polymicrobial infection that mostly affects female lower reproductive tract that spreads to the upper reproductive tract including the uterus, fallopian tube, ovaries, and the pelvic peritoneum.<sup>11</sup>

The disease is most common in sexually active women characterized by inflammation of the upper genital tract. If left untreated, it results in serious gynecological and reproductive morbidity and increases the risk of chronic pelvic pain, infertility, and ectopic pregnancy.<sup>12</sup>

Multiple pathogens have been identified and reported as causative agents of PID; therefore, a broad spectrum antibiotic and antifungal therapy is required to cover possible pathogens. The choice of an appropriate treatment regimen mostly depends on the specific pathogen that causes this disease.

There are numerous risk factors reported for PID, but these factors differ from one country to another. For example, PID is most frequent in young girls under the age of 20 or in women who have multiple partners. In Kurdistan region of Iraq, there are distinct sexual behavior patterns as well as

religious restrictions and limitations which are clearly different than those existing in the western countries.

In the present study, a total of 150 clinical samples were analyzed for the presence of different pathogens. Totally, 88 clinical pathogens were isolated and further identified as belonging to three different genera: *Staphylococcus*, *Streptococci*, and *Candida* species, respectively. This indicates the involvement of mixed microbial flora in PID.

These findings are in accordance with the results given by other researcher.

The ages of the enrolled patients ranged from 18 to 50 years old, but the most affected participants were in age group between 26 and 30 (38.64%). This finding is in agreement with other similar studies in regional countries such as Iran and Turkey, but this figure is slightly different from many international studies done in western countries.

Seifoleslami and Heidari in 2015<sup>13</sup> reported that almost 49.36% of 1104 cases of PID women in Iran were in the age group of 20–30 years old. Goel and Kumar in 2015<sup>14</sup> reported that out of 100 infected Indian women with PID, 39 (51.31%) were in the age group of 26–30 years old.

Jennings and Krywko in 2019<sup>15</sup> reported that there were more than 750,000 cases of PID in the United States which occurs most frequently in women aged 15–25 years old. In a study by Simms and colleagues in 2006,<sup>16</sup> 77 out of 140 (55%) patients with PID in United Kingdom were in the age group of 16–24 years old.

The reason for the very high occurrence of PID in the age range of 26–35 years and low occurrence in the age range of 15–20 years is not clearly understood. In our country, due to social and regional reasons, it is clear that most girls in age between 15 and 23 years are single either in universities or other institutions of learning and it is not possible to practice sexual relationships even with single or multiple sexual partners. It is very rare that a girl in this age group has sexual partner or has abortion. In age group ranges of 25–30 years, it is familiar in our country that most girls marry in this age; therefore, we can explain the high rate of PID in this age. Most women in their first years of marriage are unaware of sexual relation and regular medical checkups.

The data of current study indicate that *Staphylococcus aureus* had the highest percentage among the aerobic pathogens isolated from endocervical samples that were taken from PID patients. However, it should be noted that other species were also responsible for a significant number of cases.

These results were similar to previous study as recorded by Spencer et al.<sup>6</sup> in Nigeria on 100 women with history and examination suggestive of PID of polymicrobial origins shown to constitute 34%.<sup>17</sup>

We presumed that this pathogen is clinically significant and not a contaminating organism because the patients had clear presentation of PID according to both clinical and laboratory parameters and they were isolated from the actual infection site which is an otherwise sterile region. It is important that women take care and avoid contamination of their private parts with any object since *Staphylococcus aureus* can adhere to objects easily.

Approximately, 35% of cases of PID are polymicrobial in nature but is most often caused by *Chlamydia trachomatis*, but *Neisseria gonorrhoea*. In the present study, we didn't find these two bacteria, while in some other regional research these diseases have been identified. A recent research from Iran reported that prevalence of *Chlamydia trachomatis* among young females in Kashan, Iran was 2.4%. A previous published report from Iran also showed a various prevalence of 2%–11%.<sup>18</sup>

The absence of these two bacteria in current study is not well-understood. These two bacteria are mainly aerobic bacteria and facultative anaerobes and are the most common bacterial sexually transmitted infection in many developed countries.

## Conclusion

This study included that our data indicate a relatively high prevalence of *Staphylococcus* and *Streptococcus* species other than *Chlamydia trachomatis* and *Neisseria gonorrhoea* in cases of PID from different private clinics in Duhok province, Kurdistan region of Iraq. A new study must be carried out to investigate the link between susceptible predisposing factors like smoking, vaginal douche, invasive diagnostic procedures, contraception method, and the emergence of PID.

The ethical approval of the present protocol is taken from the Division of Scientific Research; Department of Planning, Duhok General Directorate of Health/Duhok. The confidentiality of the personal information of the patients is protected throughout the study steps.

## Conflict of Interest

None

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