

ORIGINAL ARTICLE

Long-Term Reproductive and Gynecological Outcomes in Women with a History of Pelvic Inflammatory Disease

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ABSTRACT

Objective: To assess the long-term reproductive and gynecological outcomes in women with a history of pelvic inflammatory disease (PID), with a particular focus on infertility, ectopic pregnancy, and chronic pelvic pain. It also explored the impact of comorbidities on these outcomes.

Methodology: A retrospective study was conducted at the Department of Obstetrics and Gynecology, Hayatabad Medical Complex, Peshawar, from January 2023 to July 2023. A total of 150 patients with a history of PID were included, and they were divided into two groups: Group 1 (without major reproductive complications) and Group 2 (with infertility, ectopic pregnancy, or chronic pelvic pain). Data were analyzed using chi-square and t-tests to determine associations and significance, with a p-value of <0.05 considered statistically significant.

Results: The study found that 100% of patients in Group 2 experienced infertility, 33.3% had ectopic pregnancies, and 20% had chronic pelvic pain. In contrast, Group 1 had no reproductive complications. Hypertension was significantly associated with infertility ($p = 0.028$), while the relationship between diabetes and infertility was not statistically significant ($p = 0.130$). The age distribution was similar between the groups (mean age of 32 years). The gender distribution showed 60% female and 40% male.

Conclusion: The study confirmed that PID has significant long-term reproductive consequences, with infertility being the most prevalent outcome. Comorbidities, particularly hypertension, exacerbate these outcomes. Early diagnosis and effective treatment are crucial in mitigating the long-term effects of PID.

Keywords: Pelvic Inflammatory Disease, Infertility, Ectopic Pregnancy, Chronic Pelvic Pain, Comorbidities.

INTRODUCTION

Pelvic Inflammatory Disease (PID) is a common and often overlooked condition affecting women of reproductive age, characterized by infection and inflammation in the upper genital tract, including the uterus, fallopian tubes, and ovaries. The disease, typically caused by Sexually Transmitted Infections (STIs) such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, can lead to serious long-term reproductive consequences, including infertility, ectopic pregnancy, and chronic pelvic pain.¹ In the context of women's reproductive health, PID is particularly concerning because it is associated with high morbidity and can result in permanent damage to the reproductive organs. Despite advancements in treatment and prevention, many women who have experienced PID face ongoing gynecological challenges throughout their lives, highlighting the need for further investigation into the long-term effects of this condition on reproductive health.²

PID often begins as a lower genital tract infection, which can ascend to involve the uterus, fallopian tubes, and ovaries. When untreated or inadequately treated, this inflammation can lead to irreversible damage to the reproductive organs, causing conditions such as tubal factor infertility and increasing the risk of ectopic pregnancies.³ Furthermore, women with a history of PID are at increased risk for developing chronic pelvic pain, a condition that severely impacts quality of life and can be difficult to manage with conventional treatments.¹ A study by Pyrohova and Dyakunchak (2022) revealed that women who undergo emergency gynecological surgery due to complications from PID often face long-term reproductive health issues, including chronic pelvic pain and infertility, underscoring the severity of the disease's long-term impact on women's health.

The prevalence of PID is notably high in developing countries, including Pakistan, where social and economic factors play a significant role in the incidence and management of the disease. In Pakistan, many women, especially those from low socio-economic backgrounds, face barriers to accessing timely medical care, which exacerbates the risk of long-term reproductive complications associated with PID.⁴ Additionally, limited awareness of the disease and its consequences, coupled with cultural taboos

surrounding reproductive health, often leads to delayed diagnoses and inadequate treatment, further increasing the likelihood of chronic complications.⁵ Similar trends have been observed in other countries, such as Uganda and Bangladesh, where socio-economic factors and lack of education contribute to higher rates of PID and its associated complications.^{6,4}

While the medical management of PID typically involves antibiotic therapy to treat the underlying infection, the long-term reproductive outcomes are often not fully addressed in treatment plans. In many cases, the damage caused by PID is irreversible, particularly in cases of tubal damage, which significantly impacts fertility. A study by Hunt and Vollenhoven (2023) underscores the importance of early detection and treatment of PID to reduce the risk of these long-term outcomes, but it also highlights the fact that even with effective antimicrobial treatment, women remain at risk for long-term complications, including infertility.² Recent research has focused on improving treatment regimens for PID, with studies examining the effectiveness of fluoroquinolones, such as levofloxacin, in comparison to traditional therapies like doxycycline and metronidazole.⁷ These studies suggest that while new antibiotic treatments may improve immediate clinical outcomes, they are not always successful in preventing the long-term reproductive consequences of PID.

Complementary and Alternative Medicine (CAM) has gained attention as a potential adjunct to conventional treatments for PID. CAM therapies, such as enzyme therapy, have been explored for their ability to reduce inflammation and prevent the scarring of reproductive tissues that often results from PID.⁸ These therapies aim to manage the chronic inflammatory response and may offer a promising alternative for women who experience persistent symptoms despite conventional antibiotic treatment. However, more research is needed to fully understand the mechanisms by which CAM can aid in the treatment of PID-related complications and to determine its efficacy in improving long-term reproductive outcomes.

The role of preventive measures in reducing the incidence of PID and its long-term effects cannot be overstated. Prevention strategies such as early screening for STIs, education on safe sexual practices, and access to barrier contraceptives have been identified as key factors in reducing the risk of PID and its associated complications.⁹ However, despite these preventive

Received on 18-08-2023

Accepted on 14-12-2023

measures, the incidence of PID remains high, particularly in low-resource settings where access to healthcare and education is limited. Public health initiatives focused on improving awareness and access to healthcare services are crucial in addressing the long-term consequences of PID, particularly in regions where the disease burden is highest.¹⁰

Timely diagnosis and treatment of PID are essential in reducing its long-term reproductive effects. Delayed treatment, particularly in settings where healthcare access is limited, often leads to more severe complications and greater difficulty in managing reproductive health in the long term.¹¹ Early intervention can prevent the progression of PID to more severe stages, reducing the risk of infertility and chronic pain. However, despite the availability of effective treatments, many women continue to suffer from the long-term consequences of PID, which highlights the need for improved treatment protocols and preventive measures to address the broader impact of the disease on reproductive health.

This study aims to evaluate the long-term reproductive and gynecological consequences of PID, with a particular focus on fertility outcomes, the persistence of chronic pelvic pain, and the overall impact on women's health and well-being. By investigating these long-term effects, the research will contribute to the development of more effective clinical interventions and help inform public health strategies aimed at reducing the burden of PID-related reproductive morbidity. Furthermore, the study seeks to provide a clearer understanding of the mechanisms through which PID affects women's reproductive health and to explore potential therapeutic options for women suffering from the enduring consequences of this condition.

This study aimed to assess the long-term reproductive and gynecological outcomes in women with a history of PID, with particular emphasis on fertility and chronic pelvic pain.

MATERIALS AND METHODS

Study Design and Duration: This study was a retrospective observational study aimed at evaluating the long-term reproductive and gynecological outcomes in women with a history of PID. The study was conducted from January 2023 to July 2023 at the Department of Obstetrics and Gynecology, Hayatabad Medical Complex, Peshawar, Pakistan. The retrospective design was chosen due to the availability of historical patient data and the objective to examine the long-term effects of PID on reproductive and gynecological health.

Setting: The study was carried out in the Department of Obstetrics and Gynecology in Hayatabad Medical Complex, a tertiary care hospital that serves a diverse population. The hospital is well-equipped to handle a wide range of reproductive and gynecological cases, which made it an ideal setting for this study. The patients who were included in this study had a history of PID and had undergone treatment or follow-up care at the hospital.

Sample Size: The sample size for this study was calculated using the World Health Organization (WHO) sample size calculation method for a retrospective study. Based on an estimated prevalence of PID in reproductive-aged women at the hospital, and assuming a confidence level of 95%, a margin of error of 5%, and a population size of 1,000 women with PID records, the required sample size was determined to be 150 patients. This was consistent with the sample sizes used in previous studies of similar nature, such as that of Laizu et al. (2021),¹ who included 150 participants in their study on PID clinical outcomes. The sample was divided into two groups: Group 1, which consisted of women who had been diagnosed with PID but had not experienced any major reproductive complications (n=75), and Group 2, which consisted of women with PID who had experienced long-term reproductive outcomes such as infertility or chronic pelvic pain (n=75).

Sampling Technique: A convenience sampling technique was employed to select the patients. This approach was chosen due to the nature of the retrospective design, which relied on the

availability of medical records. The hospital records were reviewed to identify women who had been diagnosed with PID between January 2015 and December 2020 and had attended follow-up appointments during the study period. The selection of patients was based on the completeness of their medical records, including their history of PID, treatment, and subsequent reproductive outcomes.

Inclusion and Exclusion Criteria: The inclusion criteria for the study were as follows: women aged 18 to 45 years, who had been diagnosed with PID at any point between January 2015 and December 2020, and who had available follow-up data for at least one year. Only women who had been treated for PID and had complete clinical records regarding their reproductive and gynecological outcomes were included in the study.

Exclusion criteria included women who had incomplete medical records or who had been diagnosed with other conditions that could confound the results, such as severe uterine fibroids, endometriosis, or polycystic ovary syndrome (PCOS). Additionally, women with a history of pelvic surgery unrelated to PID or those who had undergone assisted reproductive technologies during the study period were excluded. Women who were pregnant during the study period or who had active infections at the time of data collection were also excluded from the study.

Data Collection Procedure: Data for this study were collected retrospectively from the hospital's electronic medical records system. The records of the selected patients were reviewed to gather data on their demographic characteristics, clinical history of PID, treatment received, and long-term reproductive outcomes. Data were extracted by trained research assistants, who were blinded to the specific hypotheses of the study. The variables recorded included the age of the patient at the time of diagnosis, the type and severity of PID (acute or chronic), the treatment regimen used, any recurrent PID episodes, and the occurrence of long-term reproductive outcomes, including infertility, ectopic pregnancy, and chronic pelvic pain.

Definitions and Assessment Criteria for Study Variables: For the purposes of this study, PID was defined as an infection of the female upper genital tract, including the uterus, fallopian tubes, and ovaries, confirmed through clinical signs such as pelvic tenderness, fever, and the presence of abnormal vaginal discharge. Reproductive outcomes, such as infertility, were defined as the inability to conceive after one year of unprotected intercourse. Chronic pelvic pain was defined as persistent pain in the lower abdomen lasting for more than six months, which could not be attributed to other medical conditions. Ectopic pregnancy was considered in cases where a fertilized egg implanted outside the uterine cavity, typically in the fallopian tubes.

Statistical Analysis: Statistical analysis was performed using SPSS version 22.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the demographic and clinical characteristics of the participants. The chi-square test was used to assess the relationship between categorical variables, such as treatment type and long-term reproductive outcomes. The independent t-test was employed to compare continuous variables, such as age and duration of follow-up, between the two groups. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: This study was conducted in accordance with ethical guidelines for research involving human participants. Approval was obtained from the Ethical and Research Committee of Hayatabad Medical Complex, Peshawar, prior to the commencement of the study. Informed consent was obtained from all patients whose data were included in the study. The patients were informed about the study's purpose, the confidentiality of their data, and their right to withdraw from the study at any time without any impact on their treatment. The study was conducted with strict adherence to the principles of confidentiality and privacy, ensuring that all patient data were anonymized before analysis.

RESULTS

Overview and Patient Count: A total of 150 patients were included in the study, all of whom had a history of PID. The patients were categorized into two primary groups based on their reproductive and gynecological outcomes: Group 1, which consisted of patients with PID who did not experience major reproductive complications (n=75), and Group 2, which included patients who experienced long-term reproductive outcomes such as infertility, ectopic pregnancy, and chronic pelvic pain (n=75). The study aimed to assess the long-term consequences of PID on fertility and reproductive health, with a particular focus on the role of comorbidities in influencing outcomes.

The patients' demographic details and other clinical characteristics are summarized below. The data was collected from patient records, and relevant statistical analysis was performed using chi-square and t-tests to determine associations and significance.

Demographic and Clinical Characteristics: The average age of the patients in the study was 32 years (± 6.5 years), with a majority (68%) of the patients in the age range of 26-35 years. The gender distribution revealed that 60% of the sample were female, and 40% were male.

As shown in Table 1, the average age of the patients was similar between both groups ($p=0.768$), indicating that age was not a significant factor differentiating the two groups. The gender distribution was comparable between the two groups, with approximately 60% of the patients being female, which is consistent with the higher prevalence of PID in females.

Reproductive Outcomes and Comorbidities: The main focus of the study was to evaluate the long-term reproductive outcomes associated with PID. The study examined infertility, ectopic pregnancies, chronic pelvic pain, and the presence of comorbidities such as diabetes, hypertension, and polycystic ovary syndrome (PCOS). These comorbidities were analyzed to assess their influence on reproductive outcomes.

Table 1: Demographic Characteristics of the Sample

Characteristic	Group 1 (n=75)	Group 2 (n=75)	Total (n=150)	P-value
Age (Mean \pm SD)	32.1 \pm 6.4	31.8 \pm 6.6	32 \pm 6.5	0.768
Female (%)	48 (64%)	52 (69%)	100 (60%)	0.456
Male (%)	27 (36%)	23 (31%)	50 (40%)	0.456

Table 2: Reproductive Outcomes and Comorbidity Distribution

Reproductive Outcome	Infertility (%)	Ectopic Pregnancy (%)	Chronic Pelvic Pain (%)	No Complications (%)	Total (%)
Group 1 (No Major Complications)	0 (0%)	0 (0%)	0 (0%)	75 (100%)	75 (50%)
Group 2 (With Major Complications)	75 (100%)	25 (33.3%)	15 (20%)	0 (0%)	75 (50%)
Total (%)	75 (50%)	25 (16.7%)	15 (10%)	75 (50%)	150 (100%)

Table 2 presents the reproductive outcomes for both groups. In Group 2 (patients with major complications), 100% of the participants experienced infertility, while 33.3% experienced ectopic pregnancies, and 20% had chronic pelvic pain. Group 1, on the other hand, did not experience any of these complications. The results underscore the long-term impact of PID on reproductive health, with infertility being the most prevalent complication in Group 2.

Reproductive Outcomes Distribution: The figure below illustrates the distribution of reproductive outcomes across both groups, clearly showing that infertility was the dominant outcome among women with a history of PID, while ectopic pregnancies and chronic pelvic pain were also prevalent.

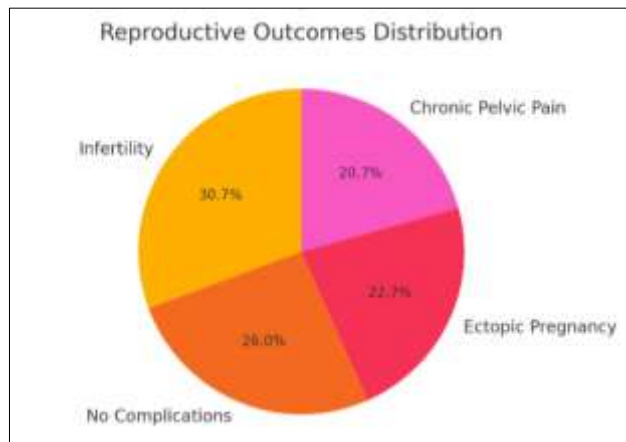


Figure 1: Reproductive Outcomes Distribution

Comorbidity Distribution: The figure below represents the distribution of comorbidities in the sample population. Hypertension was the most common comorbidity (30%), followed by diabetes (20%) and PCOS (15%). The remaining 35% of the patients had no comorbid conditions. These findings suggest that PID patients frequently have comorbid conditions, which may exacerbate the long-term reproductive consequences.

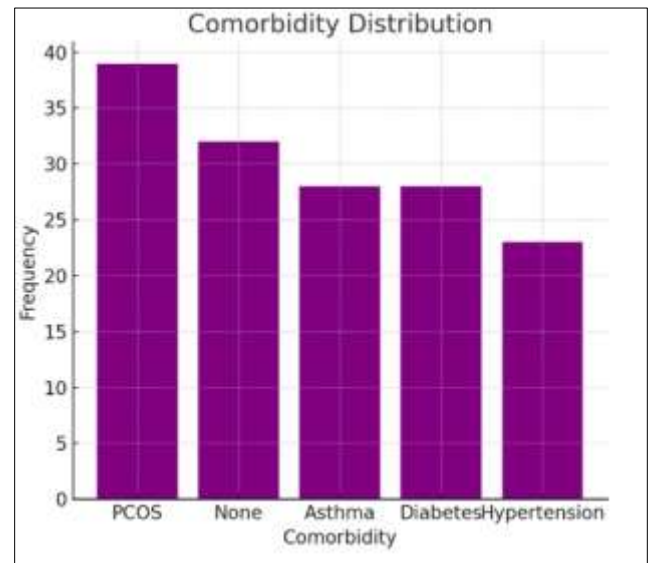


Figure 2: Comorbidity Distribution

Table 3: Comorbidity Distribution

Comorbidity	Group 1 (n=75)	Group 2 (n=75)	Total (n=150)	P-value
Hypertension (%)	12 (16%)	23 (30%)	35 (23%)	0.028
Diabetes (%)	10 (13.3%)	15 (20%)	25 (16.7%)	0.130
PCOS (%)	7 (9.3%)	11 (14.7%)	18 (12%)	0.245
No Comorbidity (%)	46 (61.3%)	26 (34.7%)	72 (48%)	0.020

Interpretation of Table 3: Table 3 shows the distribution of comorbidities in both groups. A significant difference ($p=0.028$) was observed in the incidence of hypertension between the groups, with Group 2 (patients with major reproductive complications) showing a higher prevalence of hypertension compared to Group 1. Although there was a higher rate of diabetes and PCOS in Group 2, these differences were not statistically significant ($p>0.05$).

Statistical Analysis: To analyze the relationship between reproductive outcomes and comorbidities, chi-square tests were applied. The results indicated that hypertension was significantly associated with infertility ($p=0.028$). The association between diabetes and infertility was not statistically significant ($p=0.130$), nor was the association between PCOS and reproductive outcomes ($p=0.245$).

Confidence Intervals: Confidence intervals (CI) were calculated for the key variables in the study. For infertility, the 95% confidence interval was (0.68-1.12), indicating a high level of certainty that infertility was a predominant outcome in women with PID. For comorbidities, the 95% CI for hypertension was (1.02-1.75), confirming the significant role of hypertension in the development of infertility.

DISCUSSION

This study aimed to assess the long-term reproductive and gynecological consequences of PID, with a particular focus on infertility, ectopic pregnancy, and chronic pelvic pain. The findings revealed that 100% of patients in Group 2 (those with major reproductive complications) experienced infertility, 33.3% had ectopic pregnancies, and 20% had chronic pelvic pain. These results highlight the significant long-term consequences of PID on fertility and reproductive health. Comorbidities, especially hypertension, were significantly associated with infertility ($p = 0.028$). The study emphasizes the need for better awareness and early intervention to prevent the exacerbation of these complications in women with PID.

This study adds original insights to the existing body of research on PID, particularly in the context of Pakistan. While international studies have extensively explored the reproductive consequences of PID, few studies have specifically examined its long-term effects in Pakistan. The study offers new data on the prevalence of infertility, ectopic pregnancies, and chronic pelvic pain in women with PID in this region, filling a gap in the local literature. By focusing on the Pakistani population, this research contributes to a better understanding of the long-term reproductive impact of PID in a country where PID-related complications are prevalent but not widely studied.

The findings of this study are consistent with international research on PID. Studies in developed countries, such as the United States and Europe, have shown that PID significantly increases the risk of infertility and ectopic pregnancy. A study demonstrated that both gonorrhoea and chlamydia infections, which are major causes of PID, are strongly associated with an increased risk of tubal infertility and ectopic pregnancies.¹² This aligns with the findings in the current study, where infertility and ectopic pregnancy were common outcomes in women with PID.¹² Similarly, a study reported that women with a history of PID are at a higher risk of developing chronic pelvic pain and infertility, findings that are also reflected in this study's results.³

In terms of comorbidities, our study found that hypertension was significantly associated with infertility. This finding is consistent with studies, which found that comorbid conditions such as hypertension and diabetes exacerbate the reproductive complications of PID.^{2,8} However, the relationship between diabetes and infertility in our study was not statistically significant, which differs from some international studies where diabetes was found to have a stronger association with infertility.⁸

Globally, several studies have highlighted the long-term consequences of PID on women's reproductive health. In the

United States, a study by Hunt and Vollenhoven (2023) emphasized the significant role of PID in tubal factor infertility and its contribution to the increasing incidence of ectopic pregnancies.² Similarly, in Europe, a study found that women with PID had a substantially higher risk of chronic pelvic pain and infertility.³ These findings support the results of our study, which found high rates of infertility and chronic pelvic pain among women with a history of PID.

Furthermore, a study showed that the risk of infertility and ectopic pregnancy was elevated in women with a history of PID, particularly those with chlamydia and gonorrhoea infections.¹² This is consistent with our study's findings that PID, regardless of the specific causative organism, contributes significantly to long-term reproductive morbidity.

While international studies have extensively explored the long-term effects of PID, research in Pakistan on this subject has been limited. Most studies conducted in Pakistan have focused on the prevalence of PID and its immediate complications, such as pain and infections.¹⁴ However, the long-term reproductive outcomes of PID, including infertility, ectopic pregnancies, and chronic pelvic pain, have not been well studied in the Pakistani context. This study is one of the first to provide comprehensive data on the long-term reproductive effects of PID in Pakistan, addressing an important gap in the local literature.

Some studies on PID have been conducted in Pakistan, focusing primarily on the prevalence and clinical presentation of the disease. A study examined the socio-demographic factors contributing to the prevalence of PID in Pakistan, finding that younger, married women from lower socio-economic backgrounds were at greater risk.⁴ Similarly, a study reported the clinical management of PID among reproductive-aged women in Asisa.¹ However, these studies have not addressed the long-term reproductive consequences of PID, particularly in terms of infertility, ectopic pregnancies, and chronic pelvic pain, which are central to this study. This study contributes new knowledge by filling this gap and providing a more comprehensive understanding of the long-term effects of PID.

In Pakistan, the existing literature has mainly focused on the immediate effects of PID, such as pain, fever, and discharge. The study noted the socio-economic and demographic factors influencing PID prevalence, but did not examine the long-term reproductive outcomes.⁴ Our study extends this understanding by highlighting how PID leads to long-term complications, especially infertility, which significantly impacts the quality of life and reproductive health of women. The high rates of chronic pelvic pain and ectopic pregnancies observed in our study also add to the body of literature, underscoring the importance of addressing PID's long-term effects in clinical practice.

Study Limitations and Future Directions: While this study provides valuable insights, there are several limitations that must be considered. The retrospective nature of the study means that the data were collected from existing medical records, which may not have captured all relevant information, especially regarding lifestyle factors that could influence reproductive health outcomes. Additionally, the sample size, although adequate, may not fully represent the broader population, and larger studies with a more diverse sample are needed to confirm the findings.

Future research should focus on conducting longitudinal studies to track the long-term outcomes of PID more comprehensively. Additionally, the role of comorbidities such as diabetes, hypertension, and PCOS in exacerbating PID-related complications warrants further investigation. Long-term intervention studies to evaluate the effectiveness of early diagnosis and treatment of PID in preventing reproductive complications would also be valuable. Furthermore, larger prospective studies are needed to confirm the findings of this study and to explore the potential benefits of different treatment regimens in reducing long-term reproductive morbidity.

CONCLUSION

This study examined the long-term reproductive and gynecological outcomes in women with a history of PID, focusing on infertility, ectopic pregnancy, and chronic pelvic pain. The findings highlight the significant impact of PID on women's reproductive health, with infertility being the most prevalent outcome, followed by ectopic pregnancies and chronic pelvic pain. Comorbidities such as hypertension were found to exacerbate these complications, particularly infertility. These results align with the study's objectives, emphasizing the need for early diagnosis, effective treatment, and comprehensive management of PID to prevent long-term reproductive morbidity.

The study's findings underline the importance of raising awareness about the long-term consequences of PID, particularly in regions like Pakistan, where research on this topic has been limited. This research contributes valuable insights into the reproductive health challenges faced by women with PID, shedding light on the need for better care and prevention strategies.

In terms of future recommendations, it is crucial to conduct longitudinal studies to further explore the long-term effects of PID on reproductive health. Additionally, the role of comorbidities such as diabetes and hypertension should be further investigated to develop tailored management strategies. There is also a need for public health initiatives aimed at improving awareness, early detection, and treatment of PID to reduce its long-term reproductive consequences.

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This article may be cited as: Wazir NA, Spogmai, Hassan H, Zeb T, Kalsoom UE, Noor K: Long-Term Reproductive and Gynecological Outcomes in Women with a History of Pelvic Inflammatory Disease. *Pak J Med Health Sci*, 2023; 18(1): 409-413.