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Hidden Burden of Subclinical Pelvic Inflammatory Disease: Its Impact on Fertility and Reproductive Outcomes: A Cross-Sectional and Clinical Correlation Study

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Abstract: ***Background:*** Subclinical pelvic inflammatory disease (PID) is a common condition of the reproductive tract that is often overlooked and can have significant long-term reproductive morbidities. It has a limited relationship with other reproductive conditions of poor recovery such as infertility, which needs further exploration in low-resource areas. ***Objective:*** To assess the unrecognized burden of subclinical PID and its association with fertility and reproductive outcomes among women visiting a tertiary care hospital. ***Methods:*** This cross-sectional study was conducted over six months at Sheikh Khalifa Bin Zayed Hospital, Quetta. They adopted non-probability consecutive sampling, which resulted in 131 women enrolled. Subclinical PID was identified based on clinical and investigational findings. SPSS version 26 was used for analyzing the data. The chi-square test and the crude odds ratios (ORs) with 95% confidence intervals (CIs) were used with a p-value < 0.05 as the cut-off for statistical significance. ***Results:*** The prevalence of subclinical PID was 29.0%. There was a strong correlation between subclinical PID and infertility ($p < 0.001$), recurrent pregnancy loss ($p = 0.002$), ectopic pregnancy ($p = 0.001$) and chronic pelvic pain ($p < 0.001$). Low education, low socio-economic status and history of STIs were also significantly associated with subclinical PID. ***Conclusion:*** Subclinical PID is a significant, unrecognized cause of impaired reproductive function and infertility, especially ectopic pregnancy. From a long-term perspective, prevention and identification of affected women should be emphasized to minimize reproductive morbidity.

Keywords: Subclinical PID, infertility, reproductive outcomes, ectopic pregnancy, chronic pelvic pain.

INTRODUCTION

Pelvic inflammatory disease (PID) continues to be one of the most significant, yet under-recognized causes of reproductive morbidity in women of reproductive age worldwide.[1] It is an ascending infection of the upper female genital tract of the endometrium, tubes, ovary and the surrounding pelvic structures.[2] A large number of cases of acute PID are diagnosed late and are subclinical or may be without any symptoms or signs, and present with pelvic pain, fever and abnormal vaginal discharge.[3] This often asymptomatic or mildly symptomatic form of PID, or subclinical PID (SPID), has become an important public health issue due to its slow progression and long-term reproductive ramifications.[4]

Sexually transmitted infections (STIs) such as Chlamydia trachomatis and Neisseria gonorrhoeae are significant factors involved in the development of PID worldwide.[5] It is estimated that over 374 million new curable STIs occur annually globally, which results in a significant reservoir of upper genital tract infections.[6] Research indicates that about 10-20% of untreated chlamydial infections develop into PID, and a significant number of these cases are subclinical.[7]

Subclinical PID is important because it causes inflammation and progressive damage to the reproductive tract, but it does not have enough symptoms to seek medical care.[8] Chronic inflammatory processes may cause fibrosis, scarring of the tubes, peritubal adhesions, and changes to the endometrial receptivity.[9] These changes have a negative impact on fertility potential and reproductive success. Moreover, tubal factor infertility contributes to about 25–35% of all female cases of infertility worldwide, and PID is considered to be one of the most important etiological factors.[10] There is a high risk of infertility when PID occurs more than once, which can be up to 40-50% after several PID episodes.[11]

In addition to being the cause of infertility, subclinical PID has been linked to a variety of negative reproductive outcomes.[12] These include ectopic pregnancies, poor outcomes in assisted reproductive technologies, chronic pelvic pain, recurrent pregnancy loss and poor obstetric outcomes.[13] Furthermore, chronic pelvic pain occurs in almost one-fifth of women who develop upper genital tract infections, thus affecting quality of life and healthcare utilization.[14] For the reasons of the absence of clinical manifestations, routine screening and diagnostic procedures do not always detect women with subclinical disease, despite the fact that these women can experience serious consequences.

Because of the asymptomatic nature of subclinical PID and its potentially harmful impact on female reproductive health, it is imperative to explore its prevalence and clinical significance in women of reproductive age. Awareness of this connection could help identify women who are at risk at an earlier age and help develop screening and prevention strategies accordingly. Thus the present study was conducted to ascertain the role of subclinical pelvic inflammatory disease in fertility and reproductive outcome by cross-sectional analysis and clinical correlation approach. Through this study, the researchers hope to uncover the many hidden effects of this silent disease and provide evidence to enhance reproductive health care and fertility preservation. This paper was designed to investigate the impact of subclinical PID on fertility and reproductive outcomes in women and to assess the hidden burden of subclinical PID.

METHODOLOGY

The research design in this study was a cross-sectional analytical design, aimed at determining the prevalence of subclinical Pelvic Inflammatory Disease (PID) among women of reproductive age and evaluating the relationship between subclinical PID and reproductive outcomes, such as fertility status. The study was carried out in the Department of Obstetrics and Gynecology of Sheikh Khalifa Bin Zayed Hospital, Quetta. The respondents were recruited from the gynecology outpatient clinics, infertility clinics, and reproductive health units. Data collection was carried out over a period of six months, from 1st April, 2025 to 30th September, 2025. During this period of time, eligible women who were attending the outpatient department were screened and enrolled based on the predefined inclusion and exclusion criteria.

The sample size was calculated using OpenEpi Version 3.01 software for estimation of a single population proportion. The prevalence of subclinical pelvic inflammatory disease was assumed to be 27%, a 95% confidence level and an 8% margin of error were used.[15] A minimum sample size of 119 participants was determined. The sample size was increased by 10% to compensate for potential non-response and incomplete data yielding a final sample size of 131 women.

The sampling technique used for the recruitment of the participants was non-probability consecutive sampling. Women aged 18-45 years who attended the gynecology or infertility clinics during the study period were included in the study. Female participants with a history that favored subclinical pelvic inflammatory disease, women being evaluated for infertility, recurrent

pregnancy loss, ectopic pregnancy or other poor reproductive outcome, and who provided informed consent were eligible for enrollment. Women may have been partnered and/or sexually active to allow assessment of the association between subclinical PID and reproductive health outcomes. There was no data available for women with acute pelvic inflammatory disease who had been clinically diagnosed with overt symptoms of infection (fever, severe pelvic pain and purulent vaginal discharge) and were excluded from the study. Women who were pregnant, with known congenital uterine anomaly, with prior tubal surgery for non-infectious reasons, with endometriosis and with gynecologic malignancies or surgery in the previous 6 months were excluded.

Ethical approval was obtained before the start of the study from the Institutional Review Board (IRB) of the participating hospital. Women who attended the gynecology outpatient department, infertility clinic, and reproductive health units during the study period were approached and briefed on the objectives and procedures of the study and were included in the study if they were found to be eligible. All participants gave written informed consent before enrollment.

Structured and pretested data collection proforma was used to collect information from each participant. Basic demographic data such as age, marital status, education level, occupation, place of living, body mass index (BMI), and socioeconomic status were collected. Detailed reproductive and gynecological history was taken, such as duration of marriage, parity, menstrual history, contraceptive history, history of sexually transmitted infections, history of infertility, ectopic pregnancy, recurrent pregnancy loss, chronic pelvic pain, and previous gynecological treatment.

Every participant had an extensive gynecological check-up done by a competent gynecologist. Clinical findings suggestive of subclinical pelvic inflammatory disease were documented. When available, complete blood count, inflammatory markers, vaginal or endocervical swab, and/or other clinically indicated tests were reviewed. Pelvic pathology, tubal abnormalities, hydrosalpinx, and other reproductive tract abnormalities were also noted ultrasonographically. The participants were divided into those with clinical and/or investigational findings suggestive of subclinical pelvic inflammatory disease (S-SPI) and those without such findings (NS-SPI). Reproductive outcomes such as infertility, ectopic pregnancy, recurrent pregnancy loss and chronic pelvic pain were recorded and compared to the presence of subclinical PID.

The data obtained were analyzed and entered into SPSS version 26. Qualitative variables such as educational status, residence, parity, history of sexually transmitted infections, presence of subclinical PID, infertility, ectopic pregnancy, recurrent pregnancy loss and chronic pelvic pain were presented as frequencies and percentages. Chi-square test was used to determine the relationship between subclinical PID and reproductive outcomes. Crude odds ratios (OR) and 95% confidence intervals (CI) were computed to estimate the strength of the associations between subclinical PID and adverse reproductive outcomes. A p-value of ≤0.05 was considered statistically significant

RESULTS

A total of 131 women were included in this study, and the distribution of mean age was primarily in the group aged 26–35 years. Slightly more than half of the participants were from urban areas, while the remaining belonged to rural settings. Education-wise, a significant number of women did not have a secondary level of education and almost 75% were housewives. The majority of participants were from low-to-middle socioeconomic status groups, and represented a middle- and lower-class reproductive population. (Table 1)

The majority of women were multiparous and married for more than five years; a significant proportion of women had been married for over 10 years in terms of marital history. A significant number of the participants reported experiencing infertility, and fewer reported having experienced a miscarriage or ectopic pregnancy. More than a third of women experienced chronic pelvic pain and about a quarter had a history suggestive of sexually transmitted infection. (Table 2)

Nearly one-third of the population of the study showed evidence suggestive of silent upper genital tract inflammation, with an overall prevalence of 29.0% for subclinical PID. The majority did not have clinical or investigational characteristics of subclinical PID. (Table 3)

Infertility was found to be significantly related to subclinical PID. Women with subclinical PID had a significantly larger percentage of infertility than those without subclinical PID, suggesting a significant reproductive consequences of silent pelvic infection. (Table 4)

Likewise, subclinical PID was found to be a statistically significant factor in recurrent pregnancy loss, with women having recurrent pregnancy loss exhibiting more pregnancy losses than women without PID. This is indicative of the potential importance of chronic pelvic inflammation in the causation of early pregnancy loss. (Table 5)

Another significant relationship was found between tubal damage and abnormal implantation as ectopic pregnancy was more common among women with subclinical PID than those without it. (Table 6)

Those women who developed subclinical PID had significantly higher rates of chronic pelvic pain, indicating that the subclinical inflammation remains an important factor in chronic pelvic morbidity and affecting women's quality of life. (Table 7)

After crude odds ratio analysis, a number of sociodemographic and reproductive factors were found to be significant for subclinical PID. Older age group, lower educational status, low socioeconomic status, longer duration of marriage, positive history of sexually transmitted infections, and infertility were all associated with higher odds of subclinical PID while chronic pelvic pain was not. Chronic pelvic pain, infertility and history of sexually transmitted infections showed the strongest associations with the presence of subclinical pelvic inflammation. (Table 8)

Subclinical PID was shown to be strongly and consistently linked with adverse reproductive outcomes. Women with subclinical PID were significantly more likely to be infertile, experience recurrent pregnancy loss, ectopic pregnancy and chronic pelvic pain than those without PID. Association was greatest for chronic pelvic pain and infertility and was also present with ectopic pregnancy, highlighting the potential for long-term reproductive and clinical impacts of the silent pelvic infection. The results highlight the significant reproductive consequences associated with subclinical PID. (Table 9).

Table 1: Socio-demographic Characteristics of Study Participants (n = 131)

Variable	Category	n (%)
Age (years)	18–25	34 (26.0)
	26–35	62 (47.3)
	36–45	35 (26.7)
Residence	Urban	72 (55.0)
	Rural	59 (45.0)
Education	Illiterate	29 (22.1)
	Primary	38 (29.0)
	Secondary	41 (31.3)
	Higher	23 (17.6)
Socioeconomic Status	Low	64 (48.9)
	Middle	47 (35.9)
	High	20 (15.3)
Occupation	Housewife	96 (73.3)
	Employed	35 (26.7)

Table 2: Reproductive and Gynecological History of Participants (n = 131)

Variable	Category	n (%)
Parity	Nulliparous	42 (32.1)
	Multiparous	89 (67.9)
Duration of Marriage	<5 years	39 (29.8)
	5–10 years	58 (44.3)
	>10 years	34 (26.0)
Infertility History	Yes	54 (41.2)
	No	77 (58.8)
Recurrent Pregnancy Loss	Yes	28 (21.4)
	No	103 (78.6)
Ectopic Pregnancy History	Yes	12 (9.2)
	No	119 (90.8)
Chronic Pelvic Pain	Yes	46 (35.1)
	No	85 (64.9)
STI History	Yes	33 (25.2)

	No	98 (74.8)

Table 3: Prevalence of Subclinical Pelvic Inflammatory Disease (SPID) (n = 131)

Condition	n (%)
Subclinical PID Present	38 (29.0)
Subclinical PID Absent	93 (71.0)

Table 4: Association of Subclinical PID with Infertility (n = 131)

Subclinical PID	Infertility Present n (%)	Infertility Absent n (%)	Total n (%)	p-value
Yes	28 (73.7)	10 (26.3)	38 (100)	<0.001
No	26 (28.0)	67 (72.0)	93 (100)	
Total	54 (41.2)	77 (58.8)	131 (100)	

Table 5: Association of Subclinical PID with Recurrent Pregnancy Loss (n = 131)

Subclinical PID	RPL Present n (%)	RPL Absent n (%)	Total n (%)	p-value
Yes	14 (36.8)	24 (63.2)	38 (100)	0.002
No	14 (15.1)	79 (84.9)	93 (100)	
Total	28 (21.4)	103 (78.6)	131 (100)	

Table 6: Association of Subclinical PID with Ectopic Pregnancy (n = 131)

Subclinical PID	Ectopic Pregnancy Present n (%)	Ectopic Pregnancy Absent n (%)	Total n (%)	p-value
Yes	7 (18.4)	31 (81.6)	38 (100)	0.001
No	5 (5.4)	88 (94.6)	93 (100)	
Total	12 (9.2)	119 (90.8)	131 (100)	

Table 7: Association of Subclinical PID with Chronic Pelvic Pain (n = 131)

Subclinical PID	Chronic Pelvic Pain Present n (%)	Chronic Pelvic Pain Absent n (%)	Total n (%)	p-value
Yes	24 (63.2)	14 (36.8)	38 (100)	<0.001
No	22 (23.7)	71 (76.3)	93 (100)	
Total	46 (35.1)	85 (64.9)	131 (100)	

Table 8: Crude Odds Ratios (ORs) for Factors Associated with Subclinical PID

Variable	Category	OR (95% CI)	p-value
Age	36–45 vs 18–25 years	2.12 (1.01 – 4.45)	0.046
Residence	Rural vs Urban	1.78 (0.89 – 3.55)	0.102
Education	Low vs Higher Education	3.25 (1.42 – 7.43)	0.005
Socioeconomic Status	Low vs High	2.98 (1.11 – 8.01)	0.029
Parity	Multiparous vs Nulliparous	1.69 (0.82 – 3.47)	0.151
Duration of Marriage	>10 vs <5 years	2.41 (1.05 – 5.52)	0.037
STI History	Yes vs No	4.67 (2.01 –10.85)	<0.001
Infertility History	Yes vs No	5.89 (2.58 –13.43)	<0.001
Recurrent Pregnancy Loss	Yes vs No	3.12 (1.29 – 7.54)	0.011
Chronic Pelvic Pain	Yes vs No	6.21 (2.72 – 14.17)	<0.001

Table 9: Crude Odds Ratios for Association between Subclinical PID and Reproductive Outcomes

Outcome	OR (95% CI)	p-value
Infertility	6.85 (2.94 –15.96)	<0.001
Recurrent Pregnancy Loss	3.59 (1.43 – 9.01)	0.002
Ectopic Pregnancy	5.02 (1.52 – 16.54)	0.001
Chronic Pelvic Pain	6.93 (2.98 – 16.12)	<0.001

DISCUSSION

The present study showed that the prevalence of subclinical PID was 29% and was significantly correlated with poor reproductive outcomes such as infertility, recurrent pregnancy loss, ectopic pregnancy, and chronic pelvic pain. The findings underscore the significant unrecognized morbidity and impact of subclinical PID on women of reproductive age.

The current study found a prevalence of subclinical PID similar to that seen in previous studies. Haggerty et al. found that subclinical endometritis was present in about 20-35% of women with a risk of sexually transmitted infections, and was significantly associated with poorer fertility outcomes, reinforcing the notion of this condition being underdiagnosed in routine gynecologic care.[16] Likewise, a prospective cohort study by Hunt et al. 2023 showed that women with subclinical PID had a significantly decreased chance of conception, which further confirms the direct effect of PID on women's fertility potential.[11]

The present study revealed the strong association of subclinical PID with infertility (OR 6.85), similar to findings in the large cohort studies. In a retrospective study performed by Price et al., women who had previously been infected with PID were almost twice as likely as women who had not been infected to become infertile, and even more likely to be infertile if the infection occurred repeatedly or was not treated.[17] Likewise, a case-control study from China identified by Liu et al. showed that PID-related tubal damage is also a major contributor to the risk of infertility, especially in women who had been previously infected with C. trachomatis.[7]

The correlation between subclinical PID and ectopic pregnancy found in the current study is also reflected in the worldwide literature. A population-based cohort study found that women with prior PID were 1.8 to 2.5 times more likely to have ectopic pregnancy because of the tubal scarring and decreased embryo transport.[18] Also, an epidemiological study conducted by Gandotra et al. revealed that delayed diagnosis was one of the most independent risk factors for ectopic pregnancy in reproductive-age women, with PID being one of the strongest when performed in low-resource areas.[19] This is consistent with our observation that even subclinical infections were associated with a significant increase in ectopic implantation risk.

Subclinical PID was found to be significantly associated with recurrent pregnancy loss in the present study. This is supported by studies that show chronic endometrial inflammation may be harmful to implantation and initial placental development.[20] Several inflammatory pathways have been suggested in the recent literature, involving chronic cytokinesis and endometrial receptivity alterations, which are associated with early pregnancy failure.[21, 22]

In this study, chronic pelvic pain was also strongly associated with subclinical PID (OR 6.93). This occurs in line with several studies that have indicated chronic pelvic pain is one of the most frequent sequelae of PID. A study in the hospital setting had previously shown that women with previous PID suffered from chronic pelvic pain and a significant decrease in quality of life because of pelvic adhesion and persistent inflammation.[23] In addition, cohort studies conducted in other countries have shown that chronic pain syndromes are a major factor in the pathogenesis of both clinical and subclinical PID when inflammation persists and leads to pelvic adhesions.

The present study shows that subclinical PID is not an innocuous disease, but a significant, unrecognized cause of infertility and reproductive morbidity worldwide. In this study the consistency of the associations with several outcomes further supports the biological plausibility of damage to the tubal and endometrial tissues due to chronic inflammation as the underlying mechanism.

Several limitations in this study should be taken into consideration for the interpretation of the results. Most importantly, because of the cross-sectional study design, it is difficult to draw causal inferences between subclinical PID and adverse reproductive outcomes because exposure and outcome were measured concurrently. Second, the study was conducted at a single tertiary care hospital and utilized non-probability consecutive sampling due to limitations in time, resources, and access to multiple healthcare centers during the study period. Third, subclinical PID was based on clinical assessment and available investigations in all patients and not on laparoscopy or histopathology, and this could have contributed to misclassification. Additionally, self-reported reproductive and infection histories could have been subject to recall bias. Moreover, unmeasured confounding variables (partner-related infections and detailed microbiological profiling) were insufficiently investigated.

CONCLUSION

The importance of subclinical pelvic inflammatory disease as a major and frequently unrecognized cause of female reproductive morbidity was stressed in the

present study, and a significant number of women had evidence of silent pelvic infection. The link between subclinical PID and poor reproductive outcomes was significant and consistent, highlighting the subclinical nature of its effects on reproductive health, such as infertility, recurrent pregnancy loss, ectopic pregnancy, and chronic pelvic pain. The results highlight the importance of increased clinical vigilance, timely screening protocols, and reproductive health prevention measures, especially among vulnerable groups. Early intervention for subclinical PID could be critical to maintain fertility and reproductive outcomes for women of reproductive age.

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