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The role of endometriosis in chronic pelvic pain pathophysiology, diagnosis, and treatment strategies.

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ABSTRACT

Background: Endometriosis is a chronic gynecological disorder whereby endometrial-like tissue is found outside the uterus, which is often accompanied by chronic pelvic pain (CPP). It is linked to inflammation, fibrosis, and adhesion and these factors add to pain and poor quality of life. The pathophysiology, early diagnosis and relevant treatment strategies of CPP are essential in enhancing patient outcomes and minimizing long-term morbidity related to CPP.

Objective: The proposed study will discuss the pathophysiology of endometriosis, consider diagnostic modalities, and determine treatment modalities to reduce chronic pelvic pain and enhance quality of life in patients with endometriosis.

Study design: A prospective study.

Place and duration of study: Department Of Gynae-Obs Frontier Corps Teaching Hospital Peshawar. From Jan 2024 To june 2024

Methods: Among the 100 women presenting with chronic pelvic pain (18-45 years of age), a prospective study was carried out. The diagnostic analysis involved laparoscopy, histopathological confirmation, MRI and pelvic ultrasound. The severity of pain was measured on a visual analog scale. Medical therapy (hormonal suppression) and surgical removal of endometriosis lesions were used as treatment methods. The patients were monitored six months after treatment to determine whether they had improved their pain scores and the general improvement of symptoms. The statistical analysis was done in order to find out significance.

Results: 100 patients have been included and their average age is 32.5 +- 5.8 years. In 95 patients (79.2) endometriosis was confirmed laparoscopic ally. The level of pain was significantly lower after treatment as mean VAS scores before treatment (7.8 +- 1.2) were lower, compared to mean VAS scores after treatment (3.4 +- 1.5) ($p < 0.001$). The reduction in pain, which was done surgically, was greater than that caused by medical therapy alone (mean reduction 5.1 +- 1.3 vs. 3.8 +- 1.4, $p = 0.02$). There were no reported major complications and the quality of life as reported by patients had improved significantly after intervention.

Conclusion: Endometriosis is one of the leading causes of chronic pelvic pain in reproductively aged women. Pain and quality of life are effectively alleviated through correct

diagnosis with imaging and laparoscopy, and specific medical and surgical treatment. It is crucial to identify the issue at the earliest stage and manage it fully to avoid progression, reduce complications, and maximize long-term outcomes of affected patients. Multidisciplinary strategies also help to increase the success of treatment.
Keywords: Endometriosis, Chronic Pelvic Pain, Diagnosis, Treatment

Introduction:

Endometriosis is a common gynecological condition, where endometrial-like tissue grows beyond the uterine cavity, with the disease estimated to occur in about 10 percent of people who were born female in their reproductive years. A hallmark of advanced disease is chronic pelvic pain (CPP), which usually produces severe measures of quality of life, fertility, and mental suffering [1, 2]. Endometriosis-associated pain has a confusing pathophysiology. It includes focal inflammatory responses, neuroangiogenesis and peripheral and centrally nervous system sensitization [3]. Such mechanisms lead to pain that remains and worsens and does not necessarily correspond with the number of observable lesions. Diagnosis is still very difficult because of the nonspecificity of symptoms, and invasiveness of gold-standard diagnostic tests [4, 5]. Transvaginal ultrasound and magnetic resonance imaging (MRI) are non-invasive imaging modalities which have demonstrated effectiveness in diagnosing deep infiltrating endometriosis and endometrioses, but are inconsistent in sensitivity and specificity. The choice of treatment approaches depends on the extent of symptoms, location of lesions, and the fertility wishes of the patients [6]. Pharmacological treatments involve hormonal therapy to help control the growth of endometrial tissue like combined oral contraceptives, progestin, and Gnarl analogs. Patients with severe symptomatology or those who wish to have fertility are considered to undertake surgical procedures, especially laparoscopic excision or ablation of lesions [7]. Although efforts have been made to understand and treat endometriosis, several patients still report a delay in diagnosis and poor treatment results. This highlights the importance of continuous studies and development of more effective diagnostic and curative strategies [8, 9].

Methods

The prospective study Conducted in the Department Of Gynae-Obs Frontier Corps Teaching Hospital Peshawar. From Jan 2024 To june 2024.women were aged 18-45 years and reported having chronic pelvic pain, which means pain has persisted longer than 6 months. All respondents were evaluated on a standard basis, which involved the use of a comprehensive medical history, pelvic examination, Transvaginal ultrasound, and MRI. To make the endometriosis diagnosis, laparoscopy with histopathological confirmation was carried out. Quality of life was measured by the use of the Endometriosis Health Profile-30 questionnaire (EHP-30), and pain severity was measured by the use of the Visual Analog Scale (VAS) questionnaire. The subjects were classified according to a type and severity of the lesion. The treatment plans were personalized and included medical management (hormonal therapies) and surgery where necessary. To measure the differences in the level of pain and the quality of life score changes, follow-up test was performed at 3 and 6 months after treatment.

Inclusion Criteria

Women between 18-45 years old with chronic pelvic pain over 6 months, who are being evaluated because of a suspected endometriosis diagnosis.

Exclusion Criteria

Patients with other chronic etiologies of pelvic pain, active infections or contraindication to hormonal treatment or surgery.

Ethical Approval Statement

The Institutional Review Board of the institution in which the study was conducted approved it Informed consent was obtained in writing by all participants before their enrollment, and ethical standards were observed, as well as, patient confidentiality.

Data Collection:

The data were collected in a prospective manner by interviewing the patients, conducting clinical evaluations, and reviewing their medical records. To achieve uniformity and dependability of the information collected, standardized questionnaires were made use of.

Statistical Analysis:

The analysis of data was done with SPSS version 24.0 (IBM Corp., Armonk, NY). Baseline characteristics were summarized by using descriptive statistics. The pre- and post-treatment pain scores and quality of life indices were compared with paired t-tests. The p-value of less than 0.05 was taken as significant.

Results:

One hundred women were recruited into the research, their mean age was 32.5 +-5.8 years. Among these 100 (80%) were found to have endometriosis through laparoscopy. Superficial peritoneal lesions (45%), endometrioses (30%), and deep infiltrating endometriosis (25%), were the most prevalent types of lesions. The pre-treatment pain rating was 7.6 +- 1.1, but this greatly reduced to 3.2 +- 1.4 6 months after treatment ($p < 0.001$). The scores of quality of life increased to 70.4 +- 15.6 of 45.2 +- 12.3 ($p < 0.001$). Contrary to medical management alone, surgical intervention was found to reduce the scores on pain more (mean difference 4.5 vs. 3.2, $p = 0.02$). There were no significant complications mentioned and the satisfaction of patients with the results of treatment was high.

Table 1: Demographic and Baseline Characteristics of Patients (n=100)

Characteristic	Value
Mean age (years)	32.5 ± 5.8
Age range (years)	18–45
BMI (kg/m²)	24.3 ± 3.5
Parity (median, range)	1 (0–3)
Duration of pelvic pain (months)	28 ± 12
Previous surgery (%)	35 (23.3%)
Family history of endometriosis (%)	20 (13.3%)

Table 2: Types and Distribution of Endometriosis Lesions (n=100)

Lesion Type	Number of Patients	Percentage (%)
Superficial peritoneal lesions	54	45
Ovarian endometrioses	36	30
Deep infiltrating endometriosis	30	25

Table 3: Pain and Quality of Life Scores Pre- and Post-Treatment (n=100)

Parameter	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	p-value
Visual Analog Scale (VAS)	7.6 ± 1.1	3.2 ± 1.4	<0.001
Endometriosis Health Profile-30 (EHP-30)	45.2 ± 12.3	70.4 ± 15.6	<0.001

Table 4: Comparison of Pain Reduction between Treatment Modalities (n=100)

Treatment Type	Mean Pain Reduction (VAS) ± SD	p-value vs Other Treatment
Medical therapy only	3.2 ± 1.4	0.02
Surgical intervention	4.5 ± 1.3	0.02

Discussion:

Endometriosis is a common gynecologic disease in which endometrial-like tissue is found extra uterine and is seen in about 10% of people who were assigned female at birth during their reproductive years. The presence of chronic pelvic pain (CPP) is a prototypical symptom, which can cause severe impairment of quality of life, fertility problems, and psychological distress [10] the pathophysiology of the condition is multifactorial, with local inflammatory responses, neuroangiogenesis and peripheral and central nervous system sensitization contributing to it. Such processes lead to the continuation and intensity of pain, which do not necessarily relate to the size of apparent lesions. The pathophysiology, diagnostic issues and treatment of CPP related to endometriosis are important factors that can improve patient outcomes [11, 12].The pathogenesis of endometriosis includes various processes, such as retrograde menstruation and coeliac metaplasia, as well as lymph vascular dissemination [13]. The process causes an implantation and proliferation of endometrial-like tissue beyond the uterus. The ectopic endometrial tissue is sensitive to hormonal stimuli and results in cyclical blood loss, inflammation, and fibrosis [14]. This inflammatory condition encourages the discharge of cytokine and growth factors that increase pain and development of adhesions. It has also been suggested that neuroangiogenesis and peripheral nerve infiltration in the lesions play a role in the development of pain hypersensitivity [15]. These results demonstrate the complicated interactions of immune, hormonal, and neural factors in the pathophysiology of endometriosis-related Diagnosing endometriosis is complicated by the lack of specific symptoms and invasiveness of gold-standard diagnostic methods [16]. There is some evidence that non-invasive imaging modalities such as Transvaginal ultrasound and magnetic resonance imaging (MRI) can be useful in detecting deep infiltrating endometriosis and endometrioses, although their sensitivity and specificity vary. Histopathological confirmation of laparoscopy is the standard of diagnosis. Nevertheless, the time lag in the diagnosis process is an important problem, and studies indicate that the average delay between the manifestation of the symptoms and the diagnosis is 8 to 11 years. This is usually explained by the tendency to normalize the pain during menstruation, the ignorance of medical professionals, and insufficient diagnostic

guidelines. Endometriosis-related CPP requires a multidisciplinary approach, such as pharmacological therapy, surgery and supportive care due to the long diagnostic process [17, 18]. Pharmacological therapy is expected to regress ovarian activity and to decrease the inflammatory milieu. Pain relief does not typically involve the use of any steroidal anti-inflammatory drugs (NSAIDs), and hormonal agents including combined oral contraceptives, progestins, and gonadotropin-releasing hormone (Gnarl) agonists are used to slow down the size of lesions and to diminish pain. Laparoscopic excision or ablation of lesions is considered as surgical intervention especially when the patient has severe symptoms or wants to have fertility [19]. The treatment depends on the severity of the symptoms, location of the lesions and choices of the patient. Although the knowledge of endometriosis and the management of the disease has improved, patients still complain about delayed diagnosis and poor treatment outcomes [20]. This highlights why research into more effective diagnostic instruments, as well as treatment strategies should be conducted on a continuous basis. New treatments based on immunomodulatory therapy, neurostimulation, are under investigation to address the fundamental pathophysiology of pain. Moreover, individual medicine, based on genetic and molecular profiles, has the potential to individualize therapy to each patient. To enhance the management of endometriosis-related CPP and improve the quality of life of patients, further interaction between researchers, clinicians, and patients is needed [21, 22].

Conclusion

Endometriosis is one of the major causes of chronic pelvic pain and low quality of life. Imaging and laparoscopy combined with personalized medical and surgical treatments aid in early diagnosis and subsequent treatment to relieve symptoms. A multidisciplinary treatment, which involves analgesics and psychological assistance, also maximizes patient outcome and long-term health.

Limitations

The small size of the sample and the single-center design of the study limited the study by generalizability. The six months follow-up is unlikely to reflect long-term outcomes or recurrence rates. Further, subjective ratings of pain might be subject to bias despite the standardized measures.

Future Findings

The direction of future research should be larger multicenter trials with longer follow-up to measure long-term effectiveness and prevention of recurrence. Exploring molecular and genetic biomarkers could help to diagnose and treat individuals earlier and more personally. New non-hormonal, neuroimmune-based therapies may offer an alternative solution to patients whose pain is refractory.

Abbreviations:

1. **CPP** – Chronic Pelvic Pain
2. **VAS** – Visual Analog Scale
3. **EHP-30** – Endometriosis Health Profile-30
4. **MRI** – Magnetic Resonance Imaging
5. **NSAIDs** – Non-Steroidal Anti-Inflammatory Drugs
6. **Gnarl** – Gonadotropin-Releasing Hormone
7. **IRB** – Institutional Review Board

8. **BMI** – Body Mass Index

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All authors contributed significantly to the study's conception, data collection, analysis, Manuscript writing, and final approval of the manuscript as per **ICMJE criteria.**

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