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Laparoscopic Assessment and Occurrence of Endometriosis in Women Experiencing Infertility: A Forward-Looking Study

Pemeriksaan Laparoscopi dan Kejadian Endometriosis pada Wanita yang Mengalami Infertilitas: Sebuah Studi Berwawasan ke Depan

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Abstract

Background: Endometriosis is characterized by the presence of endometrial tissue outside the uterus. There are no definitive signs or symptoms associated with endometriosis, and its presentation can be different based on the affected areas. It is a prevalent cause of various degrees of infertility among younger women. The management approach of endometriosis may involve both medical and surgical therapy. Laparoscopic procedures have shown promising results in enhancing fertility prospects for young women suffering from endometriosis. **Methods:** This study included women diagnosed with endometriosis after experiencing infertility. A comprehensive history was taken, focusing on symptom duration, any additional co-morbidities, and the length of infertility. All patients underwent diagnostic laparoscopy. Based on the site and severity of the endometriosis, procedures such as adhesiolysis, excision, and ablation of endometrial lesions were performed. Patients were monitored, and instances of successful pregnancies (both spontaneous and those resulting from assisted reproductive techniques) were documented. **Results:** Among the 100 cases studied, endometriosis was identified in 12 patients (11.5%). The most frequently affected age group was 26-30 years (47.83%). A total of 9 patients (78.26%) had primary infertility, while the remaining 5 patients (21.74%) experienced secondary infertility. The ovaries were the most commonly affected site, involved in all cases. Surgical interventions performed included cystectomy (30.43%), endometrioma drainage and fulguration (13.04%), and adhesiolysis (34.78%). Of the 9 patients who achieved successful ovulation following laparoscopic surgery, 6 (66.66%) went on to complete their pregnancies successfully. **Conclusions:** Laparoscopic procedures for infertility provide both diagnostic and therapeutic benefits and yield favorable outcomes concerning successful pregnancies.

Highlights:

Endometriosis impacts fertility: Laparoscopy is crucial for diagnosis and treatment.

Surgical interventions: Enhance fertility by addressing endometrial lesions.

Study focus: Infertile women, ages 18-40, with laparoscopy-confirmed endometriosis.

Keywords: Endometriosis, Infertility, Laparoscopy, Reproductive Health, Surgical

Intervention

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Introduction

Endometriosis can be comprehensively characterized as the pathological condition in which endometrial tissue, which is normally confined to the inner lining of the uterus, is aberrantly situated in various anatomical locations outside of the uterine cavity itself. The clinical manifestations of endometriosis do not adhere to a singular set of identifiable signs and symptoms; rather, they exhibit a considerable degree of variability that is contingent upon the specific anatomical sites that are affected by this condition. [1] The disorder may present itself through a range of symptoms including but not limited to dysmenorrhea, which is characterized by severe menstrual cramps, irregularities in menstrual bleeding patterns, nonspecific pain in the lower back, discomfort during sexual intercourse known as dyspareunia, as well as abdominal pain and a variety of urinary issues. A particularly significant aspect of endometriosis in the female population is its association with infertility, with studies indicating that over 25% of women diagnosed with this condition may experience either infertility or subfertility, highlighting the profound impact this disorder can have on reproductive health. The ectopic endometrial tissue can be located in various sites, which include, but are not exclusively confined to, the ovaries, cervix, vagina, fallopian tubes, and the ligaments that support the uterus [2], underscoring the complex and multifocal nature of this disease process. The rare and atypical sites where endometriosis can be found extend beyond the conventional reproductive organs, encompassing a range of visceral organs that notably include the spleen, lungs, and kidneys, as well as other unexpected locations such as the nasal mucosa, stomach lining, and pleura. The manifestation of endometriosis in these unconventional areas can lead to the emergence of peculiar yet distinctly recognizable signs and symptoms, which may present as cyclic epistaxis—characterized by recurrent nosebleeds—or cyclic hemoptysis, which entails the expectoration of blood from the respiratory tract, both of which often coincide with the timing of a woman's menstrual cycle. [3] The underlying cause of endometriosis remains a perplexing mystery that continues to challenge researchers and medical professionals alike, as the precise etiology of this condition has not yet been definitively elucidated. A variety of hypotheses have been proposed in an attempt to explain the origins of endometriosis; however, none of these theories have been conclusively validated through rigorous scientific investigation. Among the most widely accepted theories are those that suggest the possibility of metaplastic transformation of epithelial tissues, as well as the hematogenous or lymphatic dissemination of endometrial epithelial cells from their original site within the endometrial cavity to ectopic locations throughout the body. Regardless of the specific cause, it is important to recognize that certain risk factors have been identified that may increase the likelihood of developing endometriosis, including having a family history of the condition, experiencing early onset of menarche, as well as having low parity or being nulliparous. [4] While it has been reported that approximately 5 to 10 percent of women are affected by endometriosis, accurately estimating the true prevalence of this disorder proves to be a complex endeavor, primarily because a definitive diagnosis necessitates the identification of endometrial tissue located in ectopic areas, which typically requires invasive diagnostic procedures such as biopsy, laparoscopy, or laparotomy to confirm. [5] There exists a multitude of pathways through which endometriosis can detrimentally influence the reproductive capabilities of women, thereby contributing to a complex landscape of infertility. The various pathophysiological mechanisms that have been identified as contributing factors to subfertility in these circumstances encompass, but are not limited to, the impaired release of oocytes as a direct consequence of the presence of endometriosis within the reproductive system. Additionally, the phenomenon of tubal obstruction, coupled with compromised tubal transport mechanisms arising from the pathological changes associated with tubal endometriosis, along with the disruption of sperm migration, collectively exacerbate the challenge of achieving successful conception. The therapeutic management strategies for individuals who have received a diagnosis of both infertility and endometriosis may encompass a spectrum of interventions that include both medical therapies and surgical procedures. [6] with a significant number of cases necessitating an integrative approach that combines these two modalities for optimal outcomes. Imaging studies play a crucial role in the initial suspicion and subsequent confirmation of the diagnosis of endometriosis, serving as an essential tool in the diagnostic arsenal of clinicians. In clinical practice, ultrasonography is frequently utilized for these patients, as it can reveal the existence of homogeneous, focal lesions characterized by low-level echoes and a notable absence of vascularity when assessed through Doppler scanning techniques. Furthermore, in certain instances, advanced imaging modalities such as magnetic resonance imaging may provide invaluable insights into the extent and severity of the disease, thereby aiding in the formulation of a comprehensive treatment plan [7]. Despite the advancements offered by these imaging techniques, it is noteworthy that many women experiencing infertility related to endometriosis are ultimately advised to undergo laparoscopy. Although this procedure is considered invasive, it is recognized as the gold standard for achieving a definitive diagnosis and for implementing effective management strategies for infertility that is associated with endometriosis. Moreover, laparoscopy may facilitate the surgical excision of macroscopic endometriotic lesions, thereby offering a therapeutic avenue for the management of this condition. In recent years, there has been a notable shift in clinical practice towards the laparoscopic evaluation of patients with endometriosis, with laparoscopic interventions increasingly favored over traditional laparotomy approaches, primarily due to the significant advantages that laparoscopic techniques provide, including minimal trauma to surrounding healthy tissues, expedited recovery times, enhanced early mobilization of patients, and a reduction in the duration of hospital stays. Additionally, laparoscopic interventions possess the distinct benefit of magnification, which is particularly advantageous in instances where small foci of endometriosis may be present, allowing for precise identification and surgical management of these lesions. [8]

Methods

This research investigation was designed as a prospective cohort study, meticulously conducted within the specialized department of obstetrics and gynecology at Baghdad Teaching Hospital, Iraq, from July 1, 2020, to December 30, 2022. The study encompassed a comprehensive selection of all patients who were experiencing infertility, and who were subsequently diagnosed with endometriosis, which was carried out according to a meticulously predefined set of inclusion and exclusion criteria that were established prior to the commencement of the study to ensure the validity of the findings. It was imperative to document extensive demographic information, inclusive of variables such as

- 1-the patients' age.
- 2- body weight.
- 3- socioeconomic status.

All of which were systematically recorded to facilitate a nuanced understanding of the study population. Furthermore, a thorough and detailed medical history was meticulously taken from each participant, with particular attention directed towards the duration of their symptoms, the presence of any additional co-morbidities, as well as the overall duration of their infertility, all of which were pivotal in understanding the individual patient profiles. A comprehensive clinical examination was performed on every patient enrolled in the study, ensuring that a holistic assessment of their health status was achieved. In order to establish a baseline understanding of the participants' health, all patients underwent a series of fundamental investigations, which included a complete blood count, assessments of renal and hepatic function, evaluations of random blood sugar levels, and analyses of bleeding and clotting times, all of which are essential to rule out any underlying health issues. Additionally, ultrasonography was conducted for every case included in the study, providing valuable imaging data to further inform the clinical judgments made. Importantly, diagnostic laparoscopy was performed on all participants as a critical step in the evaluation process, allowing for direct visualization of the pelvic anatomy and the extent of endometriosis present. Based on the specific location and severity of the endometriosis that was identified during the laparoscopic procedure, appropriate surgical interventions were carried out, which included adhesiolysis, excision, and ablation of endometrial lesions, tailored to the individual needs of each patient. After the laparoscopic interventions, patients were subjected to both clinical assessments and ultrasonographic evaluations to monitor their recovery and any subsequent changes in their condition. Following the surgical procedures, patients were closely followed up over a designated period to track their progress, and any successful pregnancies that occurred, whether spontaneous or facilitated through assisted reproductive techniques, were meticulously documented as part of the study's outcomes. In cases deemed appropriate, interventions such as cystectomy and fulguration were performed to address specific pathological findings, thereby enhancing the overall management of endometriosis within the patient population studied. The staging of endometriosis was meticulously conducted utilizing the Revised American Fertility Society (R-AFS) classification score, which serves as a systematic framework for categorizing the severity of this complex condition. Specifically, scores ranging from 1 to 5 were designated as indicative of endometriosis stage 1, which is characterized as minimal in nature, while scores falling between 6 and 15 were classified as representative of stage 2 endometriosis, which is described as mild. Furthermore, scores that span from 16 to 40, which exhibit minimal adhesions, were categorized as stage 3 endometriosis, denoting a moderate level of severity, whereas scores that exceed 40 were classified as stage 4 endometriosis, which is acknowledged as severe in its manifestation and impact on the individual's health and fertility. In terms of the

inclusion criteria for the study

- 1-it was imperative that patients presented with infertility, defined as the inability to conceive after a period of 12 months of unprotected sexual intercourse.
- 2- aged between 18 and 40 years old.
- 3-Additionally, it was essential that the diagnosis of endometriosis was confirmed through the method of laparoscopy, which is considered a gold standard in such evaluations.
- 4- participants provided informed written consent to actively partake in the research study being conducted. Conversely,

the exclusion criteria

- 1- Individuals who declined to provide consent.
- 2- Those with identified male factors contributing to infertility.
- 3- Individuals suffering from severe co-morbid conditions that could complicate the study outcomes.
- 4- patients older than 40 years of age were systematically excluded from participation in order to ensure the integrity and validity of the research findings.

Result and Discussion

Result

In this comprehensive investigation, a total of 100 individuals experiencing infertility were meticulously selected to participate in this study, conducted in accordance with a rigorously established set of inclusion and exclusion criteria to ensure the validity and reliability of the findings. Among the cohort of 100 patients, a diagnosis of endometriosis was confirmed in 12 individuals, representing a notable percentage of 11.5%. Upon conducting a detailed analysis of the participants categorized by their age demographics, it became evident that the age group most significantly impacted by infertility was that ranging from 26 to 30 years, accounting for a substantial 47.83% of the total population studied, while the subsequent age bracket of 31 to 35 years comprised 30.43% of the subjects. In contrast, a comparatively smaller proportion of patients, specifically 13.04%, were found to be younger than 25 years, and an even lesser percentage of 8.70% were identified as being over the age of 35 (as delineated in Table 1). The stratification of the patient population according to the modified Kuppuswamy socio-economic scale revealed that a significant majority, amounting to 52.17%, were classified within the lower socio-economic class, which was followed by those in the lower middle class at 30.43%, and a smaller segment of 13.04% identified within the middle class category (as represented in Table 2).

In the comprehensive evaluation of a cohort comprising 12 patients who were diagnosed with the medical condition known as endometriosis, it was observed that a significant majority, specifically 9 patients, representing a percentage of 78.26, were afflicted with primary infertility, while the remaining 3 patients, which accounts for 21.74 percent, were identified as experiencing secondary infertility, as illustrated in detail in Table 3. Upon conducting a meticulous analysis of the patient population diagnosed with endometriosis, it became evident that among the total of 12 patients evaluated, a noteworthy 5 individuals, or approximately 47.83 percent, were found to possess co-morbid conditions that accompanied their endometriosis diagnosis.

Age	Percentage
18-25 years	13.04%
26-30 years	47.83%
31-35 years	30.43%
36-40 years	8.70%

Table 1. Demographic Age distribution of the examined subjects.

Socio economic status	Patients with endometriosis
Upper class 0 1	0.00%
Upper middle class	4.35%
Middle class	13.04%
Lower middle class	30.43%
Lower class	52.17%

Table 2. Socio-economic standing of the analyzed subjects.

t constitutes approximately 69.57% of the sample population, exhibited patent bilateral fallopian tubes, thereby indicating an unobstructed pathway for potential reproductive processes. Conversely, a notable occurrence of unilateral and bilateral tubal blockage was identified in one patients, representing 17.39% of the cohort, as well as in one patients, accounting for 13.04%, respectively, as illustrated in Table 5. During the laparoscopic interventions, patient were subjected to various surgical procedures, including but not limited to cystectomy, which was performed on 30.43% of the patients, alongside endometrioma drainage and fulguration in 13.04% of cases, and adhesiolysis was conducted in 34.78% of the participants. In instances where deep-seated endometriosis was diagnosed, a procedure involving deep cauterization was undertaken in 21.74% of the patients.

Type of infertility	Percentage
Primary	18 78.26%
Secondary	5 21.74%

Table 3. Type of infertility in studied cases

Socio economic status	Patients with endometriosis Percentage
Ovaries Right	21.74%
Left	30.43%
Both	47.83%
Uterine walls	13.04%

Uterine ligaments	8.70%
POD	39.13%

Table 4. Sites of endometriosis seen

Subsequent to these interventions, the patients were meticulously monitored for their fertility outcomes to ascertain the efficacy of the laparoscopic procedures. Out of a total of 12 patients who underwent laparoscopic surgical intervention, ovulation was observed either through the administration of ovulation induction protocols or occurred spontaneously in 9 patients, which accounts for an impressive 78.26% of the individuals studied. Among these 9 patients, intrauterine insemination was performed on 5 patients, resulting in successful conception for 4 of these individuals. Furthermore, a total of 3 patients opted for in vitro fertilization (IVF), and out of these, 3 patients achieved successful conception, while an additional 2 patients conceived without any medical intervention. Notably, pregnancy was documented within a one-year follow-up period for 7 patients, highlighting a significant outcome of the interventions provided. Of the 7 patients who experienced pregnancy, it is noteworthy to mention that one patient suffered a spontaneous abortion during the first trimester, however, the remaining 6 patients successfully completed their pregnancies without complications. This comprehensive study ultimately determined that out of the 9 patients who demonstrated successful ovulation following the laparoscopic intervention, a remarkable 6 patients, representing 66.66%, successfully carried their pregnancies to completion.

Discussion

Endometriosis represents a significant and prevalent etiology contributing to infertility and subfertility, particularly among young females in their reproductive years. In the context of the current investigation, it is noteworthy that a substantial proportion of the patients, specifically 47.83%, were identified as belonging to the age demographic encompassing 25 to 30 years. Numerous scholarly articles and studies have corroborated the assertion that women are predominantly affected by endometriosis during this particular age range. In a qualitative descriptive research endeavor conducted by Moradi M et al, a semi-structured focus group discussion methodology was employed, engaging a cohort of 35 Australian women who had been diagnosed with endometriosis [9]. Within the parameters of this study, the mean age of the participants was determined to be 31.1 years, with a standard deviation of 10.4 years, and the age range of the participants fluctuated between 17 and 53 years. Moreover, the investigation revealed that the ovaries emerged as the most frequently implicated anatomical site in cases of endometriosis, being affected in every single case analyzed. Additionally, other notable sites of involvement included the pouch of Douglas (POD), which was affected in 5 instances, representing 39.13% of the cases examined. Furthermore, the uterine walls and uterine ligaments were found to be involved in 2 (13.04%) and one patient (8.70%) patients, respectively, highlighting the diverse locations where endometriosis can manifest. In a separate yet related prospective study executed by Valson H et al, a comprehensive examination of women presenting with symptoms indicative of endometriosis was conducted [10]. This particular study involved a total of 100 patients who exhibited clinical manifestations such as dysmenorrhea, dyspareunia, and chronic pelvic pain, with or without concurrent infertility issues. Diagnostic and operative laparoscopy procedures were performed on 38 of these patients, leading to the identification of endometriosis through laparoscopic techniques in 25 cases, which was subsequently verified through histopathological analysis. Consistent with previous findings, this study also identified the ovaries as one of the most common sites for endometriosis, accounting for nearly one-third of all cases diagnosed. Moreover, similar research efforts undertaken by Macer ML et al has further substantiated the assertion that the ovaries are prevalent sites for the manifestation of endometriosis, thereby reinforcing the critical understanding of this condition within the medical community. [11]

Numerous scholarly investigations have substantiated the assertion that laparoscopic surgical procedures are instrumental not only in the diagnosis but also in the effective management and treatment of infertility that is associated with endometriosis, a condition that significantly impairs reproductive functionality. Among the various surgical techniques that can be employed to address infertility linked to endometriosis, a comprehensive range of procedures exists, including but not limited to cystectomy, the drainage of endometriomas, and the processes of fulguration or adhesiolysis, each of which serves a specific purpose in alleviating the adverse effects of the disease. In scenarios where endometriosis is particularly severe and involves deep-seated lesions, the approach generally involves deep cauterization, a technique designed to effectively eradicate the problematic tissue while minimizing damage to surrounding structures. A multitude of research studies have collectively arrived at the conclusion that laparoscopic surgical interventions demonstrate a high degree of efficacy in the treatment of both mild and moderate forms of endometriosis, thereby providing a viable option for patients suffering from this condition. These laparoscopic procedures have been shown to significantly alleviate overall pain levels experienced by patients and concurrently enhance the rates of live births and ongoing pregnancies, offering hope to those struggling with infertility. In the context of this particular study, it is noteworthy that out of a cohort of 9 patients who successfully achieved ovulation following the laparoscopic intervention, an impressive 6 patients were able to carry their pregnancies to successful completion, highlighting the potential benefits of such surgical approaches. The favorable outcomes associated with laparoscopic interventions are corroborated by findings from numerous other researchers in the field, further reinforcing the validity of these techniques. In a notable study conducted by Duffy JM et al., the researchers meticulously evaluated the effectiveness and safety of laparoscopic surgery specifically aimed at alleviating the painful symptoms and subfertility that are commonly associated with endometriosis. [12]. To ensure the robustness of their findings, they meticulously selected randomized controlled trials for their

analysis, whereby the effectiveness and safety of laparoscopic surgical techniques used to address pain or subfertility related to endometriosis were juxtaposed against other forms of laparoscopic or robotic interventions, holistic treatment modalities, medical therapies, or even diagnostic laparoscopy conducted in isolation. Such a comprehensive approach to research highlights the commitment to establishing a thorough understanding of the comparative effectiveness of various treatment strategies in the management of this complex condition. Ultimately, the evidence emerging from these studies contributes significantly to the growing body of literature advocating for the use of laparoscopic interventions as a cornerstone in the management of endometriosis-related infertility, thereby enhancing the quality of care provided to affected individuals.

The comprehensive investigation revealed that laparoscopic surgical procedures were significantly correlated with an enhancement in both the rates of live births and the occurrence of ongoing pregnancies, as well as a notable increase in the rate of clinical pregnancies. Furthermore, two distinct studies meticulously gathered and analyzed data pertaining to adverse events, which encompassed a range of complications including but not limited to infections, vascular and visceral injuries, as well as the necessity to convert to an open laparotomy, and both studies ultimately reported a complete absence of such adverse events in either of the treatment groups under consideration. However, it is noteworthy that other studies conducted within this research framework did not provide any information regarding this specific adverse outcome. Based on the findings derived from the analysis, the authors reached the conclusion that there exists a moderate quality of evidence indicating that laparoscopic surgical interventions aimed at managing mild to moderate endometriosis are effective in alleviating overall pain levels while simultaneously enhancing the rates of live births and ongoing pregnancies. Moreover, the authors referenced similar improvements in fertility outcomes following laparoscopic surgical interventions, a finding that was corroborated by the works of other researchers such as Rizk B et al. and Lee HJ et al., whose studies also demonstrated comparable enhancements in fertility following such surgical procedures. It is imperative to acknowledge that these findings collectively contribute to the growing body of literature that supports the efficacy of laparoscopic surgery in the treatment of endometriosis, thereby advocating for its consideration as a viable option in clinical practice. Overall, the convergence of evidence from various studies underscores the potential benefits associated with laparoscopic interventions, warranting further exploration and validation in future research endeavors. [13]

Conclusion

In the realm of reproductive health, endometriosis emerges as a prevalent and significant contributor to the challenges of infertility experienced by a considerable number of young women navigating their reproductive years. While imaging techniques can serve as valuable tools in the preliminary identification and assessment of this condition, the definitive diagnosis of endometriosis often necessitates the utilization of laparoscopic procedures, which allow for direct visualization and intervention. Furthermore, it is noteworthy that laparoscopy not only facilitates the accurate diagnosis of endometriosis but also possesses a dual therapeutic function, demonstrating promising outcomes in the management and treatment of infertility and subfertility issues that affect women suffering from this complex disorder. Consequently, the integration of laparoscopic intervention not only aids in confirming the presence of endometriosis but also offers a glimmer of hope for those seeking to overcome the barriers to conception associated with this debilitating condition.

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