Magnetic Resonance Imaging (MRI) in the Comprehensive Evaluation of Pelvic Endometriosis: A Retrospective Study in a Tertiary Hospital

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ABSTRACT

Introduction: Endometriosis is the presence of endometrial-like tissue outside the uterus and is a leading cause of pelvic pain, dysmenorrhea, and infertility. Magnetic Resonance Imaging (MRI) is a valuable non-invasive diagnostic tool for evaluating pelvic endometriosis. The objective of this study was to evaluate the MRI findings of pelvic endometriosis as well as its prevalance.

Methods: This retrospective study, conducted at Nepal APF Hospital from December 2022 to December 2024, among 54 cases of patients with MRI features of endometriosis. Study population included 54 female patients of reproductive age group referred for MRI examination due to various reasons and had imaging features suggestive of endometriosis and adenomyosis. Consecutive sampling was done of all female patients with MRI features of pelvic endometriosis. MRI features were documented and organ wise involvement was assessed.

Results: Most of the patients with endometriosis were referred for evaluation of already diagnosed conditions. Pelvic pain as the major symptom for referral after it. The most common MRI finding was endometrioma in unilateral or bilateral ovaries, seen in 39 patients. Fallopian tube findings were seen in 17 cases in the form of hematosalpinx and hydrosalpinx. Uterine findings were seen in 35 patients with most cases (n=28) comprising of adenomyosis (focal or diffuse thickening of junctional zone), and scar endometriosis was seen in 2 patients.

Conclusion: Endometriosis occurs primarily in women of reproductive age group, with pelvic pain being the common symptom. MRI is required for the better visualization of endometriosis in specific locations with accuracy which might be missed by other imaging tools.

Keywords: Deep Pelvic Endometriosis, Endometriosis, Hematosalpinx,MRI.

INTRODUCTION

Endometriosis is characterized by the presence of endometrial-like tissue outside the uterus, commonly affecting the pelvic cavity[1], affecting about 2-18% females of reproductive age group and is a leading cause of pelvic pain, dysmenorrhea, and infertility. [2,3]

The diagnosis of endometriosis often requires procedures like laparoscopy for definitive confirmation.[4] But they are invasive and may delay diagnosis because of need for surgical approach which requires a significant waiting time before diagnosis. Moreover, laparoscopy is considered less sensitive for evaluation of deep pelvic endometriosis and adenomyosis which is considered as a different phenotypic manifestation of endometriosis itself.[5] Non-invasive imaging modality like MRI has emerged as a valuable diagnostic tool for evaluating pelvic endometriosis, offering superior soft tissue contrast and multi-planar imaging capabilities.[6,7]

The objective of this study was to evaluate the MRI findings of pelvic endometriosis, with prevalence of ovarian involvement, deep infiltrating endometriosis (DIE), tubal and uterine manifestations, and extra-pelvic involvement.

METHODS

This retrospective observational study was conducted in Nepal Armed Police Force (APF) Hospital, Balambu, Kathmandu, including patients diagnosed with endometriosis on MRI scans from December 2022 to December 2024. Institutional review board approval was obtained (ref no.: NAPFH-20/2024), and relevant data were collected with informed consent. Study population included 54 female patients of reproductive age group (15-49 years) referred for MRI examination due to various reasons and had imaging features suggestive of endometriosis and adenomyosis. Consecutive sampling was done of all female patients with MRI features of pelvic endometriosis who meet inclusion criteria. The exclusion criteria included the patients with recent or previous pelvic surgeries, females using OCP's or any other contraceptive devices that can alter the disease course or progression, and patients with incomplete clinical details. Data were collected in designed performa and were entered and analysed using Microsoft Excel Ver. 2016

RESULTS

Our study comprised of female patients of reproductive age group (15-49 years) with variety of clinical presentations. A total of 54 females were evaluated for the study. The distribution of age in our study sample was not even with average age being 36.1 years and majority of the patients (i.e.16) being in the age group of 35-39 years (29.6%) followed by 11 patients (20.4%) in the age group of 30-34 years and 45-49 years each (Table 1).

Table 1: Age distribution of patients

Age group	Number of patients	Percentage(%)
15-19	1	1.8
20-24	4	7.4
25-29	5	9.2
30-34	11	20.3
35-39	16	29.6
40-44	6	11.1
45-49	11	20.3
Total	**54**	**100**

Most of the cases (n=28, 51.9%) with endometriosis were sent for MRI with previously established diagnosis on different imaging modalities like USG or MRI (e.g. endometriosis, fibroid, adenomyosis, adnexal cyst etc.) and were asked to follow up for MRI pelvis examination. This was followed by pelvic pain (chronic lower abdominal pain, low back pain and dysmenorrhea) (n=11, 20.1%), abnormal uterine bleeding (n=4, 7.4%) and subfertility (n=3, 5.6%). Eight cases presented with unusual complaints like per-rectal bleeding during menses (n=4, 7.4%), abdominal swelling (n=2, 3.7%), and blind vagina/ cervix on clinical examination (n=2, 3.7%). On the basis of patients presenting with clinical signs and symptoms, pelvic pain comprised the top spot with 42.3% cases, followed by abnormal uterine bleeding and per-rectal bleeding during menses with each cases comprising 15.4% of the symptomatology (Figure 1).

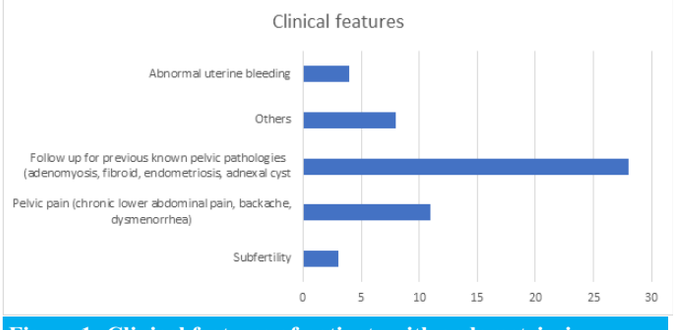

Figure 1: Clinical features of patients with endometriosis

Ovarian findings:

39 patients showed features of endometrioma in one or both ovaries. Among them, 20 cases had bilateral endometrioma, followed by right-sided endometrioma in 10 cases and left sided endometrioma in 9 cases. Ovarian hemorrhagic cyst was present in 2 cases and 1 showed features of dermoid cyst. 12 patients had normal bilateral ovaries (Figure 2). T2 shading was seen in all the patient with finding of endometriomas.

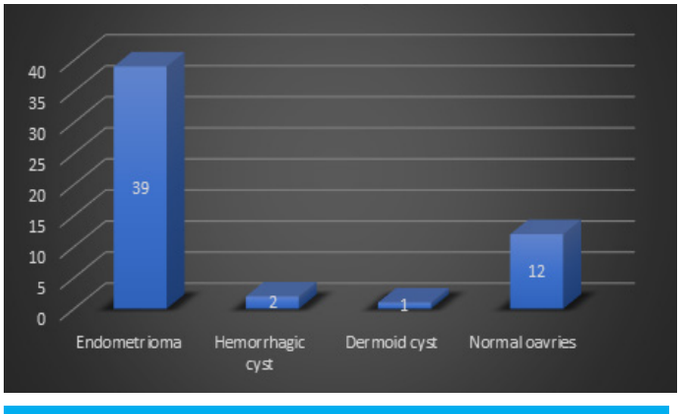

Figure 2: Ovarian findings in patient with endometriosis

Fallopian tube findings

Fallopian tube abnormalities were seen among 17 cases (31.5%). Among them, 9 had either left, right or bilateral hematosalpinx. 4 had either left or bilateral hydrosalpinx. 4 of them had combination of right hematosalpinx and left hydrosalpinx (Figure 3). None of the patient had right hydrosalpinx.

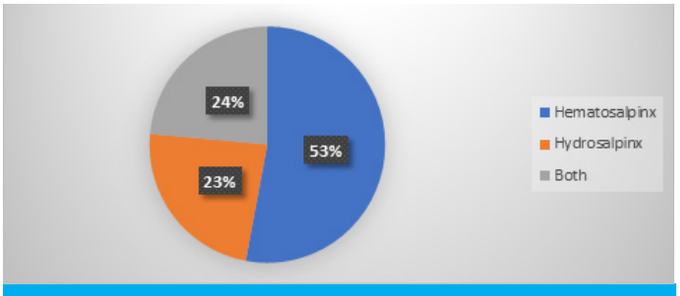

Figure 3: Fallopian tube findings

Uterine findings

35 patients showed uterine findings. Among them, 15 patients showed focal thickening and 13 showed diffuse thickening of junctional zone. Two patients with diffusely thickened junctional zone also showed some cystic changes within the junctional zone. Six patients showed fibroids (sub-serosal and intra-mural) and one patient with normal junctional zone thickness showed endometrial hyperplasia.

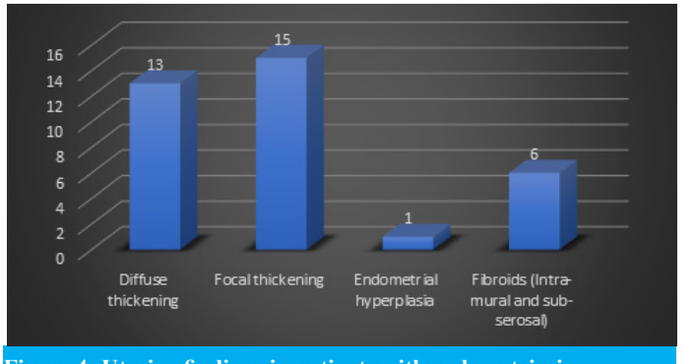

Figure 4: Uterine findings in patients with endometriosis

Findings in deep pelvis and pouch of Douglas:

Three patients showed minimal free fluid collection in deep pelvis or POD. Hypointense bands in POD were seen in four patients. Three patients had presence of hypointense nodular lesions with one them having nodular lesions in meso-rectal fascia and space. Four patients showed involvement of anterior rectal wall. One patient had finding of adhered endometrioma and another had thickened pelvic peritoneum with hemoperitoneum. Abdominal wall was predominantly normal in majority of the patients with the exception of two patients who had presented with complaint of abdominal wall swelling. They had isolated finding of irregular heterogeneously enhancing lesion in right abdominal wall involving rectus sheath on MRI, while the rest of the pelvic organs were normal. It was confirmed to be scar endometriosis on histopathological examination following biopsy. Researcher didnt find out the involvement of urinary bladder, ureters, vaginal vault, ligaments supporting uterus as well as thoracic and upper abdominal cavity in this study population.

DISCUSSION

Endometriosis is one of the commonly encountered gynecological disease, defined as the presence of endometrial tissue outside of the uterine cavity. It has a prevalence of 0.5-5% in fertile and 25-40% in infertile women.[8] Pelvic pain or lower abdominal pain, is common among women with endometriosis which allows the physician to suspect its diagnosis. In addition to that, patient may also give clinical history of infertility, abnormal menstrual bleeding pattern (either by amount or by irregularity), family history, previous pelvic surgery and history of ovarian tumor or cysts.[9] In a study involving 60 patients of endometriosis, the most common presentation was dysmenorrhea, followed by dyspareunia and abnormal uterine bleeding.[3] In our study, pelvic pain (chronic lower abdominal pain, low back pain, and dysmenorrhea) was present in maximum number of cases (42.3%) (on the basis of symptomatology). Likewise abnormal uterine bleeding was present in 15.4% of the cases.

Although, ultrasonography is the first-line imaging modality for the assessment of pelvic endometriosis because of its easy accessibility, low degree of invasiveness, and cost-effectiveness, it is constrained by limitations such as limited field of view and operator dependence.[10]MRI is recognized as a valuable tool for diagnosis and presurgical planning. MRI has advantages such as being more objective, and the images can cover a large field-of-view with multiplanar evaluation. Although it is more expensive and time consuming, its excellent contrast resolution, the combination of several MR sequences can provide detailed information about the locations and histological characteristics of endometriosis.[11] Laparoscopy with histological confirmation of ectopic endometrial tissue is the gold standard for the diagnosis of endometriosis.[8] However, laparoscopy was not done in any of our study population. The most frequent site of ectopic endometrial implantation is the ovary, where repeated internal hemorrhage leaves a large hemorrhagic cavity.[6] Our study also showed similar finding with 72.2%

(n=39) of the participants having ovarian endometrioma in unilateral or bilateral ovaries. However, this differed with study done by AbdelMaboud et al in which ovarian endometriosis was found on 38.2% of cases among the 34 individuals.[12] In addition to that, the study also showed low signal intensity in T2 weighted images or the "T2 shading sign" among 12 out of 13 patients with endometrioma. Out study also showed similar findings with all patients of endometriomas showing features of T2 shading. Approximately 30% of women with endometriosis have abnormalities of the fallopian tube identified at hysterosalpingogram.[16] Endometriotic implants are most common on the serosal surface, with transmural or mucosal involvement occurring less frequently, resulting in tubal adhesions with secondary luminal obstruction.[13] Involvement of fallopian tubes was also seen in the study by AbdelMaboud et al. with 2 patients having tubal endometriosis.[12] In our study, patients (31.9%) had fallopian tube findings in the form of hematosalpinx or hydrosalpinx or both. In the study by AbdelMaboud et al, they observed focal adenomyosis in 13 (72.2%) and diffuse adenomyosis in 5 (27.7%) among 18 individuals diagnosed with adenomyosis.[12] The findings in our case were consistent with the existing literature with more cases of focal adenomyosis (n=15, 53.6%) than diffuse adenomyosis (n=13, 46.2%).

Histologically, DIE has been defined as endometriosis infiltrating the peritoneum to a depth > 5 mm.[14] As described above, most endometriotic lesions visible on MRI are DIE, because superficial peritoneal implants are usually not visible.[15] According to study by Quesada et al, uterosacral ligaments was the most common site for DIE.[16] However, in our study we did not observe involvement of uterosacral ligaments in any of the patients. Our study showed hypointense bands in deep pelvis and POD in maximum cases (n=4, 25% cases). In contrast, study by AbdelMaboud et al. reported only one case of cul-de-sac endometriosis in which T1 high signal intensity cystic lesion was seen obliterating pouch of Douglas.[12] Intestinal DIE occurs in approximately 8–12 % of patients with endometriosis. Rectum and rectosigmoid endometriosis are considered a severe form of DIE, with evidence suggesting it accounts for 70 % − 93 % of cases of intestinal endometriosis.[17] In our study, we observed involvement of anterior rectal wall in 7.4% (n=4) of the cases who were diagnosed as endometriosis. DIE of the urinary tract is identified in 0.3%–12.0% of women with endometriosis and in at least 14%–20% of women with DIE. The bladder is the most common location of urinary tract DIE.[17] However, there was no involvement of bladder or ureter in any of the patients in our study. But our study showed 2 patients with irregular heterogeneously enhancing lesion in right abdominal wall involving rectus sheath who was finally diagnosed with scar endometriosis.

Being a single center study, the study population might not represent whole population with endometriosis. Subfertility being a common presenting complain of patients with endometriosis, this subset of patients, since they tend to visit infertility centers, could have been less represented in our sample. Laparoscopy with or without Histopathological evaluation were not done in majority of our patients which has traditionally been considered as gold standard for evaluation.

CONCLUSION

Endometriosis is common condition in females of reproductive age and commonly presents with pelvic pain and/or infertility. MRI is an important diagnostic tool in the evaluation of endometriosis. It helps in comprehensive assessment of the pelvic organs involved and their severity. Ovary is the commonest site of involvement of endometriosis, with fallopian tubes, pelvic peritoneum and the Pouch of Douglas being other areas of involvement.

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