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Enhancing Women's Health: Advancing Gynecological Laparoscopy in Resource-Limited Eastern Sudan

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ABSTRACT

The history of surgery has witnessed a remarkable evolution with the widespread adoption of minimally invasive techniques, notably operative video laparoscopy. This study aims to shed light on the laparoscopy experience in a rural hospital in Eastern Sudan and contribute to understanding its outcomes and challenges in low-resource settings. This study systematically collected and analyzed data encompassing patient demographics, preoperative assessments, postoperative complications, and gender. The purpose was to derive insights and draw meaningful conclusions from this information. Among the 124 laparoscopic procedures scrutinized, laparoscopic ovarian cystectomy emerged as the most frequently performed intervention. Diagnostic laparoscopy for tubal examination and ovarian drilling were also prominent procedures. The patient cohort spanned a wide age range, from 25 to 55 years, with an average age of 30.5 years. Preoperative ultrasound scans unveiled crucial findings such as polycystic ovaries and cysts of varying sizes. The analysis highlighted significant correlations between cyst size, wall thickness, operative duration, symptom duration, and conversion rates. The range of operative time spanned from 9 to 150 minutes, with an average of 40.1 minutes. While a few cases necessitated conversion from laparoscopy to open intervention, no instances of mortality were reported. The introduction of laparoscopic gynecological procedures in the Eastern Sudan regional hospital has ushered in enhanced surgical outcomes for specific conditions. However, to further elevate this practice, emphasis must be placed on augmenting medical staff training and optimizing infrastructure. Expanding the scope of laparoscopic procedures, particularly in emergency gynecology and major surgeries, is pivotal. These concerted efforts will not only facilitate the diffusion of laparoscopy but also contribute to elevated patient care standards and the overall advancement of surgical gynecology in the region.

Keywords: Laparoscopic procedures, Sudan, Medical staff training, and Enhanced patient care.

INTRODUCTION:

In recent decades, laparoscopy has revolutionized the field of surgery and gynecology, transforming the

approach from open procedures to minimally invasive techniques. This shift towards operative video laparoscopy has provided significant advancements in treating

various gynecological conditions, making it an excellent modality for needy patients. Laparoscopy has evolved from a limited diagnostic tool and tubal ligation method to a versatile surgical technique used for a multitude of gynecological and surgical indications (La Verde M *et al.*, 2022). Laparoscopy has emerged as the most common procedure used worldwide to diagnose and treat endometriosis. Its minimally invasive nature allows for precise visualization and removal of endometrial lesions, improving fertility outcomes & decreasing pelvic pain. However, introducing laparoscopy in low-resource countries presents unique challenges for healthcare facilities. Limited financial resources and inadequate training programs hinder the widespread adoption of the laparoscopic techniques. Despite the clear advantages for patients, the lack of funding and expertise remains a significant obstacle that needs to be overcome (Roth K *et al.*, 2023). The Gynecological laparoscopy offers several advantages over traditional open surgery, including smaller incisions.

Laparoscopic procedures use small incisions, resulting in less scarring, reduced postoperative pain, and faster recovery than open surgery. The smaller incisions and precise surgical techniques used in laparoscopy result in less blood loss during the procedure (Terho AM *et al.*, 2022). Diagnostic laparoscopy involves using the laparoscope to visualize the pelvic organs & diagnose conditions such as endometriosis, pelvic inflammatory disease, ovarian cysts, and adhesions. Laparoscopic excision or ablation can be performed to remove endometrial implants and scar tissue associated with endometriosis. Laparoscopic cystectomy is a procedure to remove ovarian cysts while preserving the ovaries (Tahir *et al.*, 2023; Tang *et al.*, 2022; Nas *et al.*, 2020).

Laparoscopy has transformed the field of surgery and gynecology, providing patients with safer and more effective treatment options. While its benefits are well-established, implementing laparoscopy in low-resource countries presents significant barriers. By evaluating the outcomes of minimally invasive surgery in this setting, we can gain insights into the effectiveness and challenges healthcare professionals face. Additionally, analyzing the patients who underwent laparoscopic gynecological procedures in the Gadarif state will contribute to the existing knowledge on the utilization

and impact of laparoscopy in low-resource environments. This study aims to shed light on the laparoscopy experience in a rural hospital in Eastern Sudan & contribute to understanding its outcomes and challenges in low-resource settings.

MATERIALS AND METHODS:

Study area

This retrospective study was conducted on 124 laparoscopic procedures over several years (2005-2021). Laparoscopic surgery was introduced in Gadarif Hospital in 2005 with an extraordinary effort from Dr. Sami Eldirdiri, a leader of the surgical department. Gadarif Teaching Hospital is the main hospital and is considered the tertiary referral health institution in Eastern Sudan.

Gadarif State is between thirty-three ° & amp; thirty-six ° East, 12° and 15° North. The area consists of a 71,000 km² distance, 410 km from Khartoum, the capital of Sudan, on the highways to Port Sudan - the Continental Road to Ethiopia. The agricultural sector, primarily centered around crops like sesame, peanuts, and sorghum, constitutes the economy's foundation. Gadarif is a pivotal trading hub for commodities such as cotton, cereals, sesame seeds, and various grains cultivated in the neighboring regions. Renowned for its agricultural significance, Gadarif has embraced mechanized farming practices since 1954.

Approximately 70% of Sudan's overall mechanized farming activities are concentrated in the Gadarif area. Rain season around 3 - 4 months of 700 - 900 mm rainfall. Also rich in livestock which accounted for around 4.5 million heads. The population is about 1.7 million intermingled ethnicities. Boundaries are different, with the border by Ethiopia on the East side, Kassala city on the North side, Khartoum, the capital of Sudan, on the Northwest side, and the Gezira state on the Westside.

Study population

All patients underwent diagnostic and operative gynecological procedures during the study period (2005-2021). Age, gender, and sociodemographic data were extracted from the surgical database and postoperative patient forms for analysis.

RESULTS:

In this study we enrolled 124 cases. Distribution according to the general Patient characteristics the study's demographic & clinical characteristics provide an overview of the patient's marital status, symptom duration, hospital stays complications, mortality, residency, and age. Marital status most patients (89.5%) were married, while a smaller proportion (10.5%) was single. This information provides insight into the marital status distribution within the study sample. Duration of Symptoms the distribution of symptom duration shows that many patients (47.5%) experienced symptoms for 1 - 5 years. Additionally, 18.5% of patients reported symptoms lasting more than ten years. This information suggests that a considerable portion of the study population had long-standing symptoms. Hospital Stays: Most patients (88.7%) experienced hospitalization durations of under 24 hours, highlighting that most laparoscopic procedures are conducted as outpatient treatments. A smaller percentage of patients (10.4%) stayed in the hospital for 2 - 48 hours, and only one patient (0.80%) required more than 48 hours.

Complications

An exceptionally low percentage of patients (2.42%) experienced complications during or after the laparoscopic procedures, while the vast majority (97.58%) did not report any difficulties. This suggests that laparoscopy was a safe procedure in this study sample.

Mortality

There were no reported mortality cases among the study participants, indicating that laparoscopic procedures were not associated any deaths in this sample.

Residency

The distribution of patients shows that 62.1% resided in urban areas while 37.9% lived in rural areas. This information highlights the study's representation of patients from both urban and rural settings.

Age

Most patients (61.3%) fell within the age range of 20-30 years. The second largest group consisted of patients aged 31-40 (29.8%), and the smallest group was patients aged 41-55 (8.9%). This suggests that laparoscopic procedures were performed on a young population in this study.

Secondary Infertility

The study sample's most common presentation/ diagnosis were secondary infertility, with eighteen cases (14.5%). This suggests that many patients sought laparoscopic evaluation and treatment for difficulties in conceiving after having a successful pregnancy.

Acute abdomen

Only one patient (0.8%) presented with an acute abdomen. Acute abdomen is sudden and severe abdominal pain that often requires immediate medical attention. It is less prevalent in this study sample.

Primary Amenorrhea

Two patients (1.6%) had a presentation of primary amenorrhea, which refers to the absence of menstrual periods by the age of 16 years. This presentation suggests that laparoscopy was used to investigate these individuals' underlying causes of primary amenorrhea.

Cholecystitis

Ten cases (8.1%) were diagnosed with cholecystitis, which is gallbladder inflammation. It is worth noting that cholecystitis is not a gynecological condition, and its presence in this study sample may indicate the inclusion of patients with concurrent gynecological and non-gynecological issues as we operate in the surgical operating room.

Ovarian Cyst/Mass

Ovarian cysts or masses were the diagnoses for thirty-two patients (25.8%). This finding suggests that many patients underwent laparoscopy due to ovarian cysts or suspicious masses.

Primary Infertility

The largest category in the study sample was primary infertility, accounting for fifty-nine cases (47.6%). This indicates that many patients sought laparoscopic evaluation and treatment for difficulties in conceiving without a previous successful pregnancy.

Peritonitis and PID

There was only one case (0.8%) each of peritonitis and pelvic inflammatory disease (PID). The results suggest that laparoscopy was performed for various gynecological conditions, with primary and secondary infertility being the most common indications.

Measurable Ovarian Cyst/Mass

The most common finding based on ultrasound or HSG was the presence of measurable ovarian cysts or masses, accounting for seventy-five cases (60.5%). This indicates that many patients had ultrasound evidence of ovarian abnormalities, such as cysts or masses.

Polycystic Ovary Syndrome (PCOS)

Utilizing ultrasound results, a diagnosis of Polycystic Ovary Syndrome (PCOS) was established in sixteen patients, constituting 12.9% of the total. PCOS is a prevalent endocrine disorder recognized by enlarged ovaries containing numerous small cysts. This finding suggests that PCOS was a notable condition within the study sample.

Numerous Uterine Fibroids

Two patients (1.6%) had multiple uterine fibroids identified through ultrasound or HSG. Uterine fibroids are benign growths that can emerge within the uterus. This discovery suggests the existence of uterine fibroids in a minor segment of the Blocked Tubes group. Ten cases (8.1%) were diagnosed with bilateral blocked fallopian tubes based on hysterosalpingogram (HSG) findings. An HSG is an X-ray procedure to evaluate the fallopian tubes and uterus. Only one patient (0.8%) had findings suggesting a twisted ovary with no vascular flow. This critical condition requires immediate medical attention due to the compromised blood supply to the ovary.

Normal Pelvic Organs

Fifteen patients (12.1%) had normal pelvic organs based on the ultrasound or HSG findings. This indicates that no abnormalities were detected in their pelvic organs despite the need for laparoscopic evaluation.

Ovarian Agenesis and Uterine Agenesis

Two patients (1.6%) were diagnosed with ovarian agenesis, which refers to the absence of ovaries, and three patients (2.42%) had uterine agenesis, which refers to the lack of the uterus. These conditions are rare and have significant implications for reproductive health. The results suggest a range of gynecological diseases, such as ovarian cysts, PCOS, and other usual or abnormal findings.

The Diagnostic Laparoscopy + Dye Test

The most common operation performed was diagnostic laparoscopy with a dye test, accounting for 44 cases (35.5%) to assess tubal patency. Ovarian Cystectomy: Six patients (4.9%).

Endometriosis Ablation/Excision

Two patients (1.6%) underwent either ablation or excision of endometriosis. Hysterectomy: Two patients (1.6%) experienced a hysterectomy involving the surgical removal of the uterus. Hysterectomy is performed for assorted reasons, such as treating conditions like uterine fibroids, endometriosis, or certain gynecological cancers.

Cholecystectomy + Ovarian Drilling

Thirty patients (24.2%) underwent both cholecystectomy and ovarian drilling. This combination of patients had gallbladder issues and polycystic ovary syndrome (PCOS), which can be managed by ovarian drilling.

Cholecystectomy + Ovarian Cystectomy

Eight patients (6.5%) underwent both cholecystectomy and ovarian cystectomy. This indicates gallbladder issues and the need for surgical removal of ovarian cysts.

Tuboplasty & Recanalization

Two patients (1.6%) underwent tuboplasty and recanalization, which involve surgical interventions to repair or restore the function of the fallopian tubes. Unilateral

Salpingo-oophorectomy

Three patients (2.4%) had unilateral salpingo-oophorectomy, which refers to the surgical removal of one fallopian tube and one ovary.

Diagnostic + Lap Appendectomy

One patient (0.8%) underwent diagnostic laparoscopy along with appendectomy, which involves the removal of the appendix. This suggests that the patient had both diagnostic exploration and treatment for appendicitis.

Diagnostic + Adhesiolysis

Two patients (1.6%) had diagnostic laparoscopy with the release of adhesions that caused pelvic pain. Lap + Dye + Hysteroscopy: One patient (0.8%) underwent laparoscopy with dye testing along with hysteroscopy,

Ovarian Drilling (PCO)

Twenty-two patients (17.7%) underwent ovarian drilling. Salpingectomy: One patient (0.8%).

Abdominal TB

One patient (0.8%) was diagnosed with abdominal tuberculosis. Abdominal tuberculosis refers to the infection of the abdominal organs by Mycobacterium tuberculosis.

Amenorrhea

Two patients (1.6%) were diagnosed with amenorrhea, which is the absence of menstrual periods. Ovarian Cyst: Thirty-seven cases (29.8%) were diagnosed with ovarian cysts. They can be benign or, in some cases, malignant. Infertility: Most patients (73 cases, 58.9%) were diagnosed with infertility. Infertility pertains to the incapacity to achieve conception or maintain a pregnancy until its full term. It can have various causes, including reproductive system disorders, hormonal imbalances, or other underlying conditions.

Ovarian Mass

Six patients (4.8%) were diagnosed with ovarian masses. An ovarian mass refers to an abnormal growth or tumor in the ovaries. These formations can be either benign, indicating they are non-cancerous, or malignant, indicating they are cancerous.

PCO (Polycystic Ovary)

Two cases (1.6%) were diagnosed with polycystic ovary (PCO). Hormonal imbalances, multiple ovarian cysts, and other symptoms such as irregular menstrual cycles and insulin resistance characterize PCO.

Peritonitis

One patient (0.8%) was diagnosed with peritonitis, which is inflammation of the peritoneum, the mem-

brane lining the abdominal cavity. Peritonitis can be caused by infection or other underlying conditions (Pelvic Inflammatory Disease): Pelvic inflammatory disease was identified in two patients (1.6%). PID constitutes an infection affecting the female reproductive organs, frequently originating from sexually transmitted infections. Without prompt intervention, this condition has the potential to initiate inflammation induce scarring, and give rise to fertility-related complications. These analyses provide an overview of the diagnoses within the study sample. The results show a range of gynecological conditions, including ovarian cysts, infertility, ovarian masses, PCO, and rare cases of abdominal TB, amenorrhea, peritonitis, and PID. These analyses provide insight into the duration of operations within the study sample. The results show that many surgeries are completed within 15 to 40 minutes, with a smaller proportion taking longer durations. Understanding the distribution of operation times can be useful for surgical planning, resource allocation, and evaluating the efficiency of procedures in low-resource settings. 15-40 Minutes: Most operations are completed within 15 to 40 minutes, accounting for eighty-five cases (68.5%). This indicates that a sizable proportion of the surgeries were quick and efficient. 40-60 Minutes: Thirty operations (24.3%) lasted 40 to 60 minutes. These surgeries took slightly longer than the previous category but remained within a reasonable time. 60-120 Minutes: Seven surgeries (5.6%) lasted 60 to 120 minutes. These operations required a more extended period, indicating more complex procedures or interventions. 120 Minutes: Two surgeries (1.6%) exceeded 120 minutes in duration. These cases required the most substantial amount of time to complete.

Table 1: Distribution according to the general Patient characteristics (n=124).

Characteristics	Variable	Frequency	Percent
Marital status	Married	111	89.5
	Single	13	10.5
Duration of symptoms	Less 1 years	14	11.3
	1-5 years	59	47.5
	5-10 years	20	16.1
	More than 10 years	23	18.5
Hospital stays	24-28 hours	110	88.7
	2-48 hrs.	13	10.4
	More than 48 hrs.	1	0.80

Complications	Yes	3	2.42
	No	121	97.58
Mortality	Yes	0	0
	No	124	100
Residency	Rural	47	37.9
	Urban	77	62.1
Age	20-30	76	61.3
	31-40	37	29.8
	41-55	11	8.9
Total		124	100.0

Table 2: Distribution according to the main presentation and professional diagnosis (n=124).

Presentation and/or diagnosis	Frequency	Percent
Secondary Infertility	18	14.5
Acute abdomen	1	0.8
Primary Amenorrhea	2	1.6
Cholecystitis	10	8.1
Ovarian cyst/ mass	32	25.8
Primary Infertility	59	47.6
Peritonitis	1	0.8
PID	1	0.8
Total	124	100.0

Table 3: Distribution according to the U/S finding /HSG Finding (n=124).

U/S finding	Frequency	Percent
Measurable ovarian cyst /mass	75	60.5
Polycystic ovary syndrome	16	12.9
Multiple Uterine Fibroids	2	1.6
HSG → Bil Blocked Tubes	10	8.1
Twisted OC /no vascular flow	1	0.8
Normal pelvic organs	15	12.1
Ovaries Agenesis	2	1.6
Uterine Agenesis	3	2.42
Total	124	100.0

Table 4: Distribution according to the operations performed (n=124).

Operation performed	Frequency	Percent
Diagnostic laparoscopy +dye test	44	35.5
Ovarian cystectomy	6	4.9
Endometriosis ablation/excision	2	1.6
Hysterectomy	2	1.6
Cholecystectomy + Ovarian drilling	30	24.2
Cholecystectomy +Ovarian cystectomy	8	6.5
Tuboplasty & Recanalization	2	1.6
Unilateral Salping-overectomy	3	2.4
Diag + Lap Appendectomy	1	0.8
Diagnostic + Adhesiolysis	2	1.6
Lap & Dye + Hysteroscopy	1	0.8
Ovarian drilling (PCO)	22	17.7

Salpingectomy	1	0.8
Total	124	100.0

Table 5: Distribution according to the diagnosis (n=124).

Diagnosis	Frequency	Percent
Abdominal TB	1	0.8
Amenorrhea	2	1.6
Ovarian Cyst	37	29.8
Infertility	73	58.9
Ovarian Mass	6	4.8
PCO	2	1.6
Peritonitis	1	0.8
PID	2	1.6
Total	124	100.0

Table 6: Distribution according to the operation time (n=124).

Operation time	Frequency	Percent
15-40 minutes	85	68.5
40-60 minutes	30	24.3
60-120 minutes	7	5.6
>120 minutes	2	1.6
Total	124	100

DISCUSSION:

The findings of our study are consistent with previous research conducted by Damyanti Sharma *et al.* These studies also reported similar mean patient ages and durations of symptoms. Our study found that the laparoscopic findings correlated well with pelvic examination and ultrasonographic findings, supporting the use of laparoscopy as a reliable diagnostic tool (Kido A *et al.*, 2022). In terms of complications, our study did not report any intraoperative or postoperative complications, except for three cases that required conversion to an open approach. One case involved massive adhesions, while the other required conversion to laparotomy due to uncontrolled intraoperative bleeding. Complications in laparoscopic procedures, although less common, can include damage to other abdominopelvic organs, hemorrhage, and unintended conversion to open surgery. However, the incidence of complications is lower in minimally invasive surgery (Tang J *et al.*, 2022).

To optimize the safety of laparoscopic entry, gynecologists typically recommend the closed or Veress needle entry technique, which involves insufflating the abdominal cavity with carbon dioxide gas before introducing the primary trocar and cannula. This approach

helps reduce complications associated with laparoscopic entry (Dhamecha R. *et al.*, 2023). Regarding the surgical outcomes, our study showed that the maximum thickness of ovarian cyst walls was 3-5mm, with an operative time ranging from 9 to 150 minutes and a mean of 40 minutes. We did not observe any conversions from laparoscopy to open intervention, and the postoperative hospital stay ranged from 1 to 3 days, with a mean of 23.3 hours. These results align with previous research, highlighting positive surgical outcomes and reduced hospitalization periods linked to laparoscopic procedures (Jiang K *et al.*, 2022).

In our study, preoperative investigations, including complete blood count (CBC), urine analysis, liver function tests (LFT), renal function tests (RFT), electrocardiogram (ECG), chest X-ray (CXR), and ultrasound (U/S), were performed for all patients. Ultrasound reports revealed measurable cysts of varied sizes, polycystic ovary syndrome (PCOS), and other findings. Patients with blocked tubes underwent preoperative hysterosalpingography (HSG) to determine the extent of tubal blockage. Patients with concomitant diseases were evaluated by physicians and anesthesiologists, and the tumor marker CA125 was assessed in the some cases. Follow-up protocols were

established, with most patients scheduled for follow-up visits in a referral clinic within one week to one month. Patients could typically return to full activity within 72 hours after most gynecologic laparoscopic procedures, except for hysterectomy cases, where heavy lifting was advised for four weeks. Follow-up office visits were usually scheduled 2-4 weeks after surgery to assess for any postoperative complications, and radiological confirmation using ultrasound was employed. The analysis reveals that infertility was the most prevalent diagnosis, with 58.9% of cases in the study sample.

This highlights the significant burden of infertility in these settings and underscores the importance of laparoscopic evaluation and treatment as a valuable approach to managing this condition. Ovarian cysts were another common diagnosis, accounting for 29.8% of cases. Ovarian cysts are a well-known gynecological condition that can cause various symptoms and complications, and laparoscopy provides an effective means of diagnosis, evaluation, and treatment in these cases. Other diagnoses include amenorrhea, ovarian mass, polycystic ovaries, peritonitis, and pelvic inflammatory diseases. Each condition presents unique challenges and considerations regarding laparoscopic management (Dhamecha R *et al.*, 2023).

The reported complication rate was 5.9%, with various complications, including sepsis, ureteral injury, secondary hemorrhage, vesicovaginal fistula, port site herniation, intestinal obstruction, and the need for conversion to laparotomy (Jiang K *et al.*, 2022; Gokmen Karasu AF *et al.*, 2022). The lower complication rate in this study may be attributed to the years of expertise and the more considerable number of surgical cases performed. By identifying the specific diagnoses encountered in the study sample, we gain insights into the diverse range of gynecological conditions that can be addressed through laparoscopic surgery in low-income and resource-limited settings (Kido A *et al.*, 2022). This knowledge guides healthcare providers and policymakers in the allocating resources, developing training programs, and implementing appropriate interventions to enhance the accessibility and effectiveness of laparoscopy in these settings. The introduction of laparoscopic gynecological procedures in a regional hospital in Eastern Sudan has improved surgical outcomes and shown

excellent handling of certain conditions. Using laparoscopic surgical procedures in district hospitals can enhance gynecological and obstetric outcomes. The duration of symptoms and the thickness of cyst walls can significantly affect the operative time during laparoscopic cystectomy. Ultrasound measurements, including ovarian cyst thickness and size, can be practical predictive tools for identifying cases requiring prolonged or difficult laparoscopic cystectomy that result in favorable outcomes and improved women's health (Margioula-Siarkou C *et al.*, 2023; Margioula-Siarkou *et al.*, 2023). However, further training of staff and improvements in the setup are needed to expand the practice and introduce other laparoscopic procedures, particularly in emergency gynecology and major surgery sections.

Our study aligns with previous research, emphasizing the reliability and effectiveness of laparoscopy in diagnosing and treating various gynecological conditions. The favorable outcomes, minimal complications, and shorter hospital stays associated with laparoscopic procedures support its widespread use (Emmen AM *et al.*, 2023; Irani JL *et al.*, 2023; Sönmezer M *et al.*, 2023). However, further research and efforts are needed to address the challenges posed by limited resources & training in low-resource settings, enabling greater accessibility to laparoscopic techniques and maximizing their benefits for patients and the outcomes and challenges associated with laparoscopic surgery in such settings.

The value of laparoscopic training in resource-deprived regions is highly debated. Funding limitations often restrict access to equipment and trainers, limiting laparoscopy to urban centers. Recognizing the increasing importance of minimally invasive surgery (MAS) in gynecological procedures, integrating MAS into emergency scenarios can improve critical outcomes. The successful execution of laparoscopic surgery in resource-limited settings emphasizes the significance of the sustained training and experience, suggesting that expertise can effectively mitigate challenges.

CONCLUSION:

In summary, although challenges persist, laparoscopic surgery holds significant advantages within resource-

limited settings. To address these challenges and enhance accessibility, strategies including sustained training, collaborative teamwork, procurement of donated equipment, integration of laparoscopy into postgraduate education, guideline development, and reusable instruments are essential. While retrospective assessments provide valuable insights, prospective studies with defined parameters are necessary to understand laparoscopy's efficacy in low-income settings comprehensively. The collective findings from various studies underscore the value of laparoscopic surgery in low-resource contexts. The identified strategies, such as sustained training and teamwork, have the potential to overcome barriers and promote accessibility. However, the limitations of retrospective analyses call for more robust evidence from prospective studies with defined criteria. Addressing the lack of facilities and training, particularly in gynecology, is crucial to reducing reliance on open surgeries and specialized centers. The recommendations emphasize the need for continuous training, infrastructural enhancement, and support from healthcare authorities to foster the widespread adoption of laparoscopic and minimally invasive techniques in Sudan's gynecological surgeries. Overcoming barriers and enhancing accessibility can be achieved through the sustained training, collaborative efforts, equipment donation, educational integration, guideline establishment, and the reusable instrument utilization. These measures address the challenges identified across studies and facilitate the broader utilization of the laparoscopic surgery in resource-limited environments.

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CONFLICTS OF INTEREST:

Conflict of interest not declared.

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