ORIGINAL ARTICLE

The evolution and impact of laparoscopic surgery in Africa: The Nigeria Perspective

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ABSTRACT

Background: laparoscopic surgery has undergone revolutionary advancement over the past decades in various surgical specialties by offering a minimally invasive alternative to traditional open surgeries, thereby significantly reducing trauma from surgery and associated morbidity.

Objectives: This article reviews the epidemiological advancement of laparoscopic surgery in Africa, especially in Nigeria. It discusses its benefits and contributions to surgical practice while highlighting challenges associated with its advancement and how they can be addressed.

Methods: We carried out a narrative review of available published articles that evaluated the utilization of laparoscopic surgery in Africa, with data obtained via the use of online search engines, including PubMed and Google Scholar, using the keywords; Laparoscopy, Minimal Access Surgery and Africa

Results: Laparoscopic surgery has grown significantly in Africa over the past decade, with countries like South Africa and Egypt taking the lead, however, challenges related to laparoscopic access and training still persists, especially in countries like Nigeria, Kenya, and Ghana, where progress is occurring at a rather relatively slower pace. Study has shown that the utilization of laparoscopic surgery among surgical trainees is more prevalent in upper-middle and lower-middle-income countries such as South Africa and Kenya, at 2.7% and 0.8% respectively compared with lower-income countries such as Tanzania and Zimbabwe, with a utilization rate of 0.5%. Also, private hospitals have shown greater laparoscopy utilization (1.6%) than public hospitals (0.5%) in Africa. This is similar to the Nigeria experience where there is an

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Keywords: Laparoscopy, Minimal Access Surgery, Africa.

This article is available online at: http://www.mjz.co.zm, http://ajol.info/index.php/mjz, doi: https://doi.org/10.55320/mjz.52.1.590

The Medical Journal of Zambia, ISSN 0047-651X, is published by the Zambia Medical Association

uneven distribution in the utilization of laparoscopic surgery between the public and private healthcare sector, in which majority of minimally invasive procedures including laparoscopic surgeries are carried out in private hospitals, with less than 5% being carried out in government owned facilities.

Conclusion: The continued expansion of laparoscopic surgery in Africa promises to improve surgical care delivery, reduce complications, and enhance patient outcome, however, further efforts are needed to ensure equitable access to laparoscopic surgery in Nigeria and across Africa. These challenges can be adequately addressed through appropriate government policies on healthcare funding and surgeons training on laparoscopic skills.

INTRODUCTION

Laparoscopic surgery is a form of Minimally Access Surgery (MAS) that involves performing operations in the abdomen or pelvis using small incisions of about 2cm, with the aid of a laparoscope (camera).[1,2] The laparoscope aids diagnosis or therapeutic interventions with a few tiny cuts in the abdomen.

The first laparoscopic surgery was a laparoscopic cholecystectomy performed in 1987 by Dr Philippe Mouret of France[3], making a significant landmark in minimally access surgeries. Among the earliest reported laparoscopic surgery in Africa was a laparoscopic cholecystectomy performed in South Africa, in the year 1991, and over the years, the interest and practise of laparoscopic surgery has increased significantly across several African countries including Nigeria, with significant advancement in its scope and application.[4]

As expected, perioperative morbidity is directly proportional to the extent of tissue trauma and surgical dissection. The shift toward minimizing tissue dissection and prolonged retraction has been generally associated with earlier mobilization, reduced bleeding, and generally reduced morbidity compared to traditional open techniques.[5] The advances in surgical technology, particularly in the light source and smaller cameras, allowed the use of smaller incisions and the adoption of minimal access surgery in the various surgical disciplines. Laparoscopic surgery has revolutionized various medical specialities by offering a minimally invasive alternative to traditional open surgeries.[6] It has applications in general surgery, with procedures like colectomy, cholecystectomy, appendectomy, and hernia repair, performed laparoscopically, leading to shorter hospital stays, less postoperative pain, and faster recovery. It has also been used in bariatric surgery involving gastric bypass and sleeve gastrectomy for weight loss. In gynaecological practise; ovarian cyst removal, hysterectomy, tubal ligation, and myomectomy, amongst others, can be performed laparoscopically. Similarly, in urology; procedures such as nephrectomy for partial or complete nephrectomy, prostatectomy, and pyeloplasty can be done laparoscopically.

In paediatric surgery, laparoscopy is increasingly used for procedures in children, in the correction of congenital disorders like pyloric stenosis and imperforate anus and ovarian and testicular Torsion for detorsion and possible removal, decreasing pain and scarring, enabling a quicker return to normal activities. Finally, in solid organ transplantation, such as kidney and liver transplants, laparoscopy helps reduce donor and recipient complications, promoting faster healing.[5,6]

This article aims to review the epidemiological advancement of laparoscopic surgery in Africa, especially in Nigeria, discussing its benefits and contributions to surgical practise. It also highlights the various challenges associated with its advancement and suggestions on how they can be mitigated.

METHODOLOGY

We carried a narrative review through the critical appraisal of available published articles, using the PRISMA guideline (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

Search strategy

A detailed and broad literature search was conducted via the use of online search engines, including PubMed and Google Scholar in October 2023 for primary studies in English, without limitation of publication date. A subsequent search was performed in 2024 to include emerging literature. The key words used were. Laparoscopy, Minimal Access Surgery, and Africa

Eligibility criteria

The inclusion criteria included all primary studies that evaluated the use of laparoscopic surgery in Africa. Observational studies regarding laparoscopy in Africa, were included. Editorials, reviews, opinion-based articles, case reports, and abstracts without available full-text were excluded. Studies evaluating laparoscopic surgery outside of Africa and those published in other languages aside English were excluded from this review.

Screening and study selection

To mitigate against bias, two reviewers independently screened the titles, abstracts, and full texts of the results. Duplicated studies were manually removed, and the remaining full-text articles were assessed based on selection criteria. Selected articles were then used for data extraction, in carrying out a narrative review by the various authors.

DISCUSSION

Over the past decade, laparoscopic surgery has gained momentum in Africa, albeit at varying rates across different countries.[7] In this narrative review, we explore the evolution of laparoscopic surgery in some Africa countries, comparing countries that have made significant strides with those that are still in the process of adopting and expanding this technology. South Africa has emerged as a leader in laparoscopic surgery within the African continent. The country has invested significantly in training healthcare professionals and equipping healthcare facilities with the necessary technology and infrastructure to support minimally invasive surgery.[8] As a result, South African surgeons regularly perform a more comprehensive range of laparoscopic procedures, including cholecystectomy, appendectomy, colectomy, therapeutic and diagnostic laparoscopy in penetrating thoracoabdominal injuries, and Bariatric surgeries.[9-13] This trend reflects South African surgeons' growing confidence and expertise in laparoscopic techniques.[13] South Africa has also witnessed the establishment of specialized laparoscopic centres of excellence, which serve as hubs for training and research in minimally invasive surgery. These centres contribute to the advancement of laparoscopic surgery not only within South Africa but also in neighbouring African countries.[16,17] However, there appears to be a low level of exposure to laparoscopic surgery among surgical trainees in South Africa and other regions as well, showing a deficiency in the surgical training programmes.[14] A Study conducted among surgical trainees in East, Central, and Southern Africa on the utilization of laparoscopic surgery showed that only 0.9% of their procedures were laparoscopic procedures, majorly on cholecystectomies, appendectomies and hernia repairs. Interestingly, laparoscopic usage was more prevalent in upper-middle and lower-middle-income countries with 2.7% and 0.8% utilization rate respectively, compared with lower-income countries with a utilization rate of 0.5%. Also, private hospitals and faith-based hospitals showed greater laparoscopy utilization of 1.6% and 1.5% respectively, than public hospitals, with 0.5% utilization rate.[15]

Going further, Egypt has also shown substantial progress in the field of laparoscopic surgery. Egyptian surgeons have embraced laparoscopy for various procedures cutting across various subspecialties of surgery. Extensive research and reviews have been done into the efficacy and use of laparoscopy in Bariatric Surgery.[18,19] Data from Egypt indicates a significant increase in laparoscopic bariatric surgeries. This reflects the increasing prevalence of obesity and the demand for

weight loss surgeries in the country.[20] The availability of laparoscopic options has improved the quality of life for many obese individuals in Egypt, and this trend is expected to continue.[19]

Laparoscopy has also been adapted for routine use in colectomies, donor nephrectomies, and urological surgeries.[21, 22, 23] Its application extends even further to gynaecological procedures, where it is utilized for diagnostic evaluations in cases of infertility.[24] The country has developed robust training programs and collaborations with international experts to drive the adoption of minimally invasive techniques.[8] In Egypt, the introduction of robotic-assisted surgeries for a wide range of procedures, including colectomies, appendectomies, and radical hysterectomies, is about to emerge.[22,25]

Nigeria is a Lower Middle-Income Country (LMIC), and the most populous country in Africa.[26] This unique status positions Nigeria as an ideal setting for examining the trend of laparoscopy and surgical infrastructure in Africa. In Nigeria, laparoscopy is gaining traction primarily in urban areas and tertiary healthcare institutions, where tailored enhancements have been crucial in establishing and maintaining this advanced technology.[27-30] Surgeons are increasingly performing laparoscopic appendectomies, cholecystectomies, colectomies, Laparoscopic biopsies of intra-abdominal masses and some gynaecological procedures.[6,31,32,33]

However, the adoption of laparoscopic surgery in Nigeria remains uneven, with rural areas and smaller hospitals facing barriers related to infrastructure, training, and equipment availability.[28,29] Access to laparoscopic surgery is limited for many Nigerians. Data shows that the number of laparoscopic procedures in Nigeria is growing but is not yet commensurate with the country's healthcare needs.[28,34,35]

Kenya has also made notable progress in laparoscopic surgery, particularly in its capital, Nairobi. Kenyan surgeons have embraced laparoscopy for various procedures, including appendectomies, Ventral hernia repairs, cholecystectomies, and numerous laparoscopic gynaecological procedures including myomectomies.[36,37,38,39,40] The establishment of laparoscopic training programs and partnerships with international organizations has contributed to Kenya's advancements in minimally invasive surgery. Data from Kenya demonstrates an increasing number of laparoscopic surgeries[38], suggesting that these procedures are becoming standard practice in urban areas.[36,37] However, like in Nigeria, access to laparoscopic surgery remains limited in rural regions, emphasizing the need for further expansion and training to address this disparity.[35,41]

Finally, Ghana; another African country that has made progress in laparoscopic surgery, albeit at a comparatively slower rate.[42] Surgeons in Ghana have adopted laparoscopy for various procedures, including hernia repairs, cholecystectomies, and for extensive use in diagnosis in gynaecology.[43] Nevertheless, it seems that Ghanaian surgeons have yet to widely adopt laparoscopic appendectomy.[44] The government has been actively promoting the expansion of laparoscopic surgery by offering training opportunities and acquiring laparoscopic equipment through collaborations with international organizations. Ghanaian surgeons are gaining increasing expertise in minimally invasive techniques.[45] The emergence of laparoscopic surgical options has resulted in shorter hospital stays and improved patient recovery. Nevertheless, data indicates a lack of awareness among patients regarding laparoscopic procedures.[46]

Epidemiological advancement of laparoscopic surgery in Nigeria

Laparoscopic surgery has made significant advancements in Nigeria over the past decade, with various states exhibiting varying levels of progress. This minimal-access surgical technique has revolutionized healthcare in the country, offering patients reduced postoperative pain, shorter hospital

stays, and faster recovery time.[47] Studies have shown that states like Port Harcourt, Lagos, and Abuja have made substantial progress in laparoscopic surgery, with increased numbers and types of procedures performed.[47] For instance, laparoscopic cholecystectomies have become a standard procedure in Lagos State, with many successful cases reported.[48] Similarly, Abuja has seen a significant increase in laparoscopic hysterectomies, with improved patient outcomes.[49] However, other less metropolitan states like Kano and Kaduna still lag behind in terms of laparoscopic surgery adoption and outcomes.[48] Surgeons face challenges in these states, including inadequate equipment, lack of training, and limited access to resources. Despite these challenges, efforts are being made to improve laparoscopic surgery in Nigeria.[50] There has been over 20% increase in the utilization of laparoscopic surgeries in Nigeria over the past decade[51,52], with some facilities recording up to 90% increase.[32]

However, Findings show a higher utilization of minimal access surgeries viz-a-viz laparoscopic surgeries in the private healthcare sector compared to the public sector, as some private hospitals have invested heavily in state-of-the-art equipment and personnel to offer high-quality laparoscopic surgery services. A study revealed that just 92 (1.57%) of the 5,845 minimally invasive procedures including laparoscopy performed across a metropolitan city of Nigeria, were carried out in government-owned hospitals.[47] There has however, been an increase in awareness campaigns and public education programs to inform patients about the benefits of laparoscopic surgery. As a result, more patients opt for minimally invasive surgery, leading to better health outcomes and improved quality of life.

Benefits of laparoscopic surgery in Nigeria

The benefits of laparoscopy in surgical care delivery in Nigeria cannot be overemphasized. There are numerous benefits, which will be highlighted. It creates minimal postoperative morbidity.[52] Prior to the advent of the use of endoscopy, all surgical procedures were done with the knife-on-the-skin approach, which brought about complications like heavy blood loss, delayed wound healing, postoperative wound infection, and sometimes wound dehiscence. In addition, laparoscopy has made surgical trainers stand on their feet to compete with the best global standards. Some surgeons comfortably teach laparoscopy, even to medical undergraduates, for example, medical students across various universities are now being exposed to laparoscopy in their clinic skills simulation lab.[53,54]

Furthermore, surgeons in Nigeria have so far recorded excellent and speedy recovery with minimal length of stay from their patients who underwent keyhole surgery compared to those who had to do the open surgery approach.[54] The total length of post operative hospital-stay for laparoscopic surgery has been found to be significantly shorter compared to similar open procedures with an average of 5 and 12 days respectively.[6,54] This has helped patients resume their daily activities with few or no complications as soon as possible. It has been shown that most patients who are planning elective surgeries now prefer the use of laparoscopy.

Limitations and challenges in the advancement of laparoscopic surgery in Nigeria

Severe factors have hindered this advancement in the field of surgery in Nigeria. One major debilitating factor is the lack of limited training facilities and personnel.[55] Most trainees who develop an interest in knowing more about laparoscopy have had to travel out of the country to learn from experts in their fields, while some schools are yet to expose their students to laparoscopy. Furthermore, laparoscopy machines have been met with financial meltdowns as most machines are expensive and difficult to maintain. Coupled with the recurrent inflation rates of goods and services in the country at unfavourable rates, these machines are purchased abroad at very high prices. Thus, the high purchase and maintenance cost discourages using the machines. To benefit maximally from laparoscopic surgery, there is a need for constant availability of

electric power supply, a feat that is yet to be attained in many healthcare facilities in Nigeria.[55,56] Laparoscopy procedures have been shown to consume more time than the old surgical approach because the surgeon has to take each step with caution to achieve a good end result, especially during the initial learning curve.[56]

Inadequate training facilities and equipment

Inadequate facilities and technical difficulties are barriers to laparoscopy. In a study carried out to assess the challenges of managing patients with surgical jaundice in two teaching hospitals in Nigeria, all the patients had open surgery due to the unavailability of facilities for a laparoscopic procedure.[57] Another study at Obafemi Awolowo University Teaching Hospital shows that of 181 laparoscopic procedures, 4 had to be converted to open laparotomy due to technical difficulties.[58] A recent study among trainee surgeons in Nigerian tertiary health centres shows that trainee surgeons do not have enough experience with unassisted laparoscopic surgeries. In contrast, 4 out of the 26 represented centres have no laparoscopy expertise.[59] Most respondents in a study in Bayelsa state demonstrated low knowledge of laparoscopy.[60] In another study carried out in Lagos, the majority of the respondents have not undergone any structured training in laparoscopy, nor do they have adequate knowledge of the training models in laparoscopy.[61] Aside from insufficient training of the surgeons, the need for adequately trained support staff was one of the challenges experienced in another study.[62]

Unstable electricity supply

Electricity supply to hospitals in Nigeria is unstable. In a survey carried out among primary, secondary, and tertiary hospitals in Nigeria, only about 50% of the hospitals had access to electricity from the national power grid. The majority must rely on an alternate means of power supply.[63] Unstable electricity continues to be another barrier to the effective use of laparoscopy. This can potentially result in a prolonged surgery time or damage to some equipment.[64,65] The erratic power supply was also a challenge in setting up a gynaecological endoscopic unit at a health facility in South-Eastern Nigeria.[66]

Inadequate funding

The prohibitive cost of laparoscopic equipment is one of the challenges mitigating laparoscopy use in Bayelsa state.[60] A study conducted at Aminu Kano Teaching Hospital, Kano, in 2014 revealed that an average laparoscopic surgery costs the patient about $400, thrice the cost of an open surgery. This is attributable to the prohibitive cost of procuring the laparoscopy consumables.[67] The average cost of a laparoscopic cholecystectomy procedure at a specialist hospital in Jos was $1250.[68] The patients bear all these costs. The National Health Insurance Scheme does not cover laparoscopic surgeries, leaving patients with only the option of out-of-pocket payment.[51]

Hierarchical nature of local surgery

In many low- and middle-income countries, local surgical culture has a hierarchical nature, which poses a barrier to the adoption of laparoscopy by some clinicians. Some surgeons prefer open laparotomies over laparoscopic surgeries due to their experiences, clinical expertise, and training, with older surgeons particularly having a reduced uptake rate of laparoscopic surgeries.[69,70]

CONCLUSION

Laparoscopic surgery has witnessed significant growth in Africa over the past decade, with some countries like South Africa and Egypt taking the lead. However, access, training, and equipment challenges persist in countries like Nigeria, Kenya, and Ghana, where progress is occurring at a relatively slower pace. In addition, unstable electricity supply continues to pose a significant barrier to the effective use of laparoscopy, especially in Nigeria. Despite the progress made, there is still need for improvement in laparoscopic surgery in Nigeria. These challenges can be adequately addressed through appropriate government policies on healthcare, specifically through implementation of increased budget allocations to the healthcare sector for the provision and improvement of

laparoscopic equipment and training facilities, which in turn, would allow for adequate training of surgeons on laparoscopic surgical skills.

Furthermore, adequate funding should be channelled into research and training of laparoscopic surgery, through the provision of laparoscopic simulated training modules across various teaching hospitals, to improve the knowledge and skills of laparoscopic surgery for surgical trainees.

In addition, we recommend a fostered surgical training collaboration between private and public healthcare sectors, such that private hospitals with adequate facilities for laparoscopic surgery can provide training to surgeons in the public/tertiary facilities to further improve their laparoscopic surgical skills.

Finally, ensuring electrical stability through provision of alternate power supply at healthcare facilities, such as the use of solar panel, would assist in the advancement laparoscopic surgery in Nigeria through the provision of uninterrupted power supply.

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