REVIEW ARTICLE

The Challenges and Adaptations of Laparoscopy for Abdominal Pathologies in Nigeria: A Systematic Review

Saburi O Oyewale[1], Azeezat O Ariwoola[2]

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Abstract

Background: Even though, laparoscopy has evolved as the gold standard of treatment for abdominal surgical pathologies, a lot of problems and challenges are still associated with its routine use in the treatment of such patients in Nigeria. The hurdles involved in the use of laparoscopy are still pervasive even though most of the procedures performed are not advanced. This study aims to enumerate, via a qualitative synthesis performed on the selected studies, the challenges of laparoscopy in Nigeria.

Methodology: We assessed articles, written in English language in the last 20 years, from PubMed, African Index Medicus and Scopus. A few were also manually added from bibliography and references of articles. The search terms were "challenges," "laparoscopy," and "Nigeria." The inclusion criteria were studies on laparoscopy in Nigeria whose content could be assessed. The challenges and adaptations and reason for converting to open surgery were subsequently noted. The exclusion criteria included studies on gynecologic laparoscopy, case reports, articles with fragmented data and articles not discussing the challenges that were encountered. PRISMA guideline for systematic review was followed.

Results: The search yielded 226 papers. Seventeen papers which met the inclusion criteria were studied in-depth. The challenges identified included incessant power outages during surgery, staff apathy, high cost of set-up and incessant strikes. The adaptive strategies noted include the use of uninterrupted power system (UPS), training of support staff, re-use of disposable instruments. The reasons for conversion to open surgery varied from excessive bleeding to difficult anatomy.

Conclusion: The challenges facing the laparoscopic surgeon in Nigeria are peculiar and likely to snowball in the future. In order to ensure its sustainability, policymakers should solve the highlighted challenges and also provide enabling environment. This might promote the adoption of laparoscopy for treating patients with abdominal pathology in the future.

Keywords: Adaptations, Challenges, Conversion, Laparoscopy.

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Introduction

Surgical care, in the sub-Saharan Africa, has been associated with poor funding and non-availability of health insurance.[1] About 33 million people, in 2010, experienced catastrophic spending as a result of payments for surgical care and the majority of these patients were living in the sub-Saharan Africa.[2]

Despite the benefits of laparoscopy for treating abdominal disease and the recent advances in the techniques of minimally invasive surgery, its adoption in the treatment of abdominal pathology in Nigeria continues to be slow.[3–8] In several low-income and medium-income countries (LMIC), the laparoscopic procedures performed by the surgeons are still basic and associated with various hurdles many of which could be frustrating. Moreover, several senior surgeons have developed apathy toward minimally invasive surgeries and this might not be unconnected to the challenges encountered during the process of minimally invasive surgery.[7] The adoption of laparoscopy is associated with steep learning curve, need for specialized training and a high cost of set-up, especially in a low-resource setting like Nigeria.

Gynecologic laparoscopy has been carried out steadily, in Nigeria, in the last 50 years due to donation of instruments by charitable organizations.[4,5,9] The procedures done were limited to diagnostic laparoscopy and bilateral tubal sterilization.[10] This was due to decay in infrastructural in most government hospitals in Nigeria.[11] Despite this, a few private hospitals in the country still managed to have gynecologic laparoscopy in their services.[10] Due to the special tertiary healthcare intervention by former President Olusegun Obasanjo (1999–2007), the use of minimally invasive surgeries for abdominal pathologies became common in Nigeria.[11]

Several challenges of minimally invasive surgery in the LMIC have been enumerated.[4] Those challenges associated with laparoscopy for abdominal pathology in Nigeria have not been properly outlined in a structured review. Since the problems of the healthcare industries in Nigeria are peculiar, we believe that a review would help to highlight the various hurdles encountered. Perhaps, this might help in the drafting and implementation of appropriate policies. Furthermore, these might assist in aiding the increased adoption of laparoscopy in the treatment of abdominal pathology if these impediments are solved. This study aims to highlight the problems and challenges associated with laparoscopic

[1]Department of Surgery, University of Ilorin Teaching Hospital, Ilorin, Kwara, Nigeria

[2]LaSante Health Center, Brooklyn, New Jersey, United States of America

Corresponding Author: Saburi O Oyewale, Department of Surgery, University of Ilorin Teaching Hospital, Ilorin, Kwara, Nigeria, Phone: +08059469657, e-mail: saburioyewale@yahoo.com

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surgeries for abdominal pathology in Nigeria. We also made some recommendations to bypass some of these enumerated problems.

Methodology

The research question was "what are the challenges of laparoscopy in Nigeria?" The PubMed, African Index Medicus, and Scopus were assessed for articles written in English Language published in the last 30 years. In accordance with PRISMA guidelines (Fig. 1), this review was registered on the PROSPERO registry for systematic review with identification number: CRD42022367935.[12] The complete search terms were as follows: ("Challenges"[Text Word] OR "Problems"[Text Word]) AND (("laparoscope*"[Text Word] OR "Minimally invasive"[Text Word]) AND "laparoscopy"[MeSH Terms]) AND ("Nigeria"[MeSH Terms] OR "Nigeria"[All Fields] OR "Nigeria"[All Fields]). The last search was conducted on the 26th of November, 2022.

The inclusion criteria were original articles or primary research studies on laparoscopy which were published in the last 30 years, whose content could be assessed. The concept included the problems encountered at surgery and adaptations for successful laparoscopic surgery. The context was laparoscopy for abdominal pathologies in Nigeria.

The exclusion criteria included studies on gynecologic laparoscopy, case reports, commentaries, case series, articles with fragmented data and articles not discussing the challenges that were encountered. A qualitative synthesis was performed on the selected studies.

Article screening and selection were done in a multistage process. The first stage involved skimming the titles and abstracts of identified articles for inclusion. The second stage involved another screening of the titles and abstracts by the second author to minimize the chances of excluding potentially useful articles and vice versa. At the final stage, the full texts were assessed for relevance before inclusion in the final cohort.

Results

The search was done from 28/10/2022 to 26/11/2022 and it yielded 226 papers. Seventeen papers which met the inclusion criteria were studied in-depth (Table 1). The articles included patients recruited between 2005 and 2019.

The challenges encountered during laparoscopic surgeries were divided into equipment/technical, systemic, patients and technical factors (Table 2). The most common challenges identified were incessant power outages during surgery and lack of trained support staff.[13–19] Abdur-Rahman et al. noted that there was a need to train camera operator on the job.[19]

Staff apathy is another challenge noted as theater staff were not tolerant of long procedure and hence, not willing to set-up instruments for laparoscopy, especially emergency procedures.[19–21] Several staff also had poor mindset about laparoscopy.[21]

The absence or failure of electrosurgical equipment, high cost of set-up, incessant strikes by healthcare workers and limited intra-operative radiologic imaging were among the other challenges noted (Table 2).[9,13,15,16,19,22–24]

The adaptive strategies used during laparoscopic surgeries included the re-use of disposable instruments, using disposable tube drapes for camera and re-training of support staff.[9,16] The other adaptive strategies were the use of adult instruments for pediatrics, sourcing for donations from pharmaceutical companies, the use of uninterrupted power system (UPS) to overcome power outages during procedures and the use of latex gloves as retriever bag (Box 1).[19,25,26]

Seven studies discussed the reasons for conversion to open surgery.[9,16,20,22,23,26,27] The most common reasons for converting

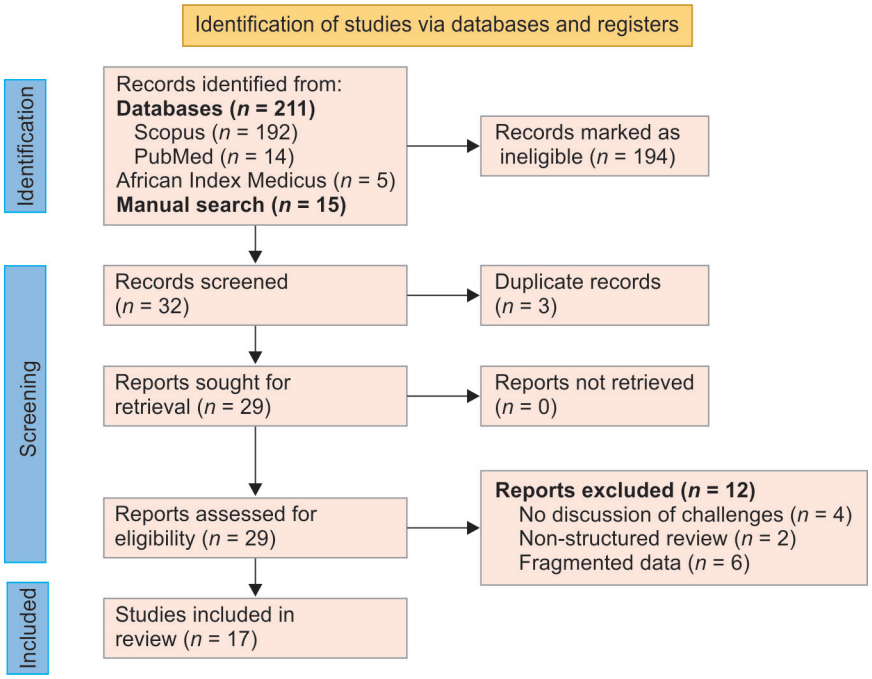

Fig. 1: PRISMA flow diagram

Table 1: A summary of the included studies

Author of study	*Center*	*Year*	*Type of study*	*Number of patients*	*Duration of study*
Sheshe et al.[27]	AKTH Kano	2013	Retrospective	42	2005–2013
Adisa et al.[9]	OAUTHC IFE	2013	Retrospective	175	2009–2012
Ray-Offor et al.[14]	Port Harcourt	2014	Retrospective	15	2011–2012
Ekwunife et al.[15]	NAUTH and FMC Owerri	2012	Retrospective	20	2006–2009
Balogun et al.[16]	LUTH	2020	Retrospective	137	2015–2019
Ismaila et al.[17]	JUTH	2013	Retrospective	21	2011–2012
Afuwape et al.[25]	UCH	2012	Retrospective	13	2009–2011
Misauno et al.[23]	Multicenter	2012	Retrospective	21	2008–2011
Ekwunife and Nwobe[20]	FMC Owerri	2014	Retrospective	100	2007–2013
Obonna et al.[13]	Multicenter	2020	Retrospective	181	2009–2018
Mba et al.[18]	GOMBE	2018	Retrospective	22	2012–2016
Olajide et al.[24]	LUTH	2020	Retrospective	32	2014–2018
Ayandipo et al.[26]	UCH	2013	Retrospective	42	2011–2013
Ekwunife et al.[21]	NAUTH	2017	Retrospective	15	2014–2016
Igwe et al.[22]	OAUTHC	2020	Retrospective	114	2011–2019
Abdur-Rahman et al.[19]	UITH	2016	Retrospective	73	2009–2014
Takure et al.[28]	UCH	2021	Retrospective	12	2015– 2019

Table 2: Showing the various challenges experienced by the laparoscopic surgeons in Nigeria

Equipment and infrastructure	*Systemic*	*Patient*	*Technical*
Gas leakage[17]	Delay in other cases (long waiting list)[27]	Delay in presentation[21,28]	Spillage of gallstone[15]
Absence or failure of electrosurgical device[13,15,22]	High cost of set-up[9,23]		Excessive bleeding[9,15]
No laparoscopy clip[17,27]	Lack of trained support staff[14,16,18,19]		
No knot pusher[17]	Incessant strikes[16,19]		
Unavailable spare parts[16,19]	Staff apathy[19–21]		
Inadequate laparoscopy tower[18]			
Instrument failure[25]	Poor record-keeping[18]		
Limited intraoperative radiologic imaging[24]	Long duration to set-up equipment[19]		
Inappropriate instrument[18,22]			
Poor maintenance[21]			
Incessant power outage during surgery[13–17]			
No capnograph[14]			

Box 1: Showing the various adaptations by different surgeons

Using latex gloves as specimen retriever bag[9,26]	Establishment of surgical skill dry lab[22]
Extracorporeal suture ligation[9,14]	Training and re-training of support staff[16]
Use of reloadable clip[9]	Sourcing for donations from pharmaceutical companies[19]
Use of disposable tube drapes for camera[9]	
Re-use of disposable instruments[9,22]	
Use of uninterrupted power system (UPS)[19]	
Using adult instrument for pediatrics[19]	

Box 2: Reasons for converting to open surgery

Abnormal anatomy[9,26,22]
Bleeding[22,23,27]
Faulty cable with loss of view[9]
Dense adhesions[22]
Cardiac arrhythmias[16]
Appendix mass[16]
Intraoperative bladder injury[16]
Gallbladder mass[20]
Difficulty in assessing tumor resectability[20]
Edematous rectum during laparoscopic rectopexy[20]
Gross spillage of gallstones[26]
Autolyzed appendix not found[22]
Equipment failure[9]

to open surgeries were excessive bleeding and difficult anatomy (Box 2).[9,22,23,26,27]

Discussion

Laparoscopy has evolved as the gold standard of treatment for abdominal surgical pathologies due to associated benefits and recent advances in technology as it helps to reduce the rate of surgical site infection and hospital stay; significant improvement in postoperative pain control; reduced the incidence of unnecessary laparotomy; enhanced clinical diagnosis and achieved histopathological confirmation of intra-abdominal tumors.[3,4,6–8,29]

The studies reviewed were on subjects treated in the public hospitals several of which were beneficiaries of the healthcare intervention program by the former President Olusegun Obasanjo.[11] Only five of the studies were located in the northern part of the country. Several hospital managers kept the costs of laparoscopic procedures comparable to those of open surgeries during the initial phase.[17–20,23,27,30] Udwadia in a retrospective study involving 1,084 patients who had laparoscopic cholecystectomy found that the cost per case was $20 due to the various adaptations used intra-operatively.[31] Also, Bendinelli et al. found that laparoscopy was cost-effective as patients had shorter hospital stay hence, reduced total hospital costs.[32]

Lack of trained staff and incessant power outages were among the most common challenges encountered during laparoscopy. A sustainable laparoscopy program requires a well-funded training program for a variety of staff, including nurses and other support staff.[33,34] This may involve travelling to another city or overseas.[35] Hence, establishment and sustainability of such training is expensive.[20] The hierarchical nature of the Nigerian society means that residents and junior surgeons will sparingly push their seniors for training opportunities. In addition, lack of interest and the conservative attitude of older surgeons to new technologies have led to a slow adoption of laparoscopic surgery in Nigeria.

A total of 25 countries are still experiencing power cuts in one form or the other sub-Saharan Africa.[36] In a retrospective study by Apenteng et al., there was increased mortality by 43% for each day in which the power cut lasted more than 2 hours.[36] The flip-flop nature and associated surge of the power supply was found to cause damages to equipment.[37] The proposed solutions are upgrade of power generation and distribution system, employment of competent staff, and the use of energy conservation techniques.

Incessant strikes in the health sector is also a major challenge noted by different studies. The major causes of industrial strike actions, according to Oleribe et al., were poor staff welfare, poor hospital infrastructure, and inter-professional rivalry.[38] This led to disruptions in service delivery, loss of confidence in the system, and consequent fall in the number of patients presenting in the hospitals. The Nigerian Federal Government has been charged with the improvement in welfare; improved leadership training to physicians; and ensure implementation of the National Health Act.

Staff apathy is a major challenge to the practice of laparoscopic surgeries in Nigeria. Kroposki et al. found that healthcare workers with much role conflict and role ambiguity had less organizational commitment.[39] The essential criteria of good teamwork include close communication, team philosophy, and good interpersonal relationships.[40] The absence of clear goals, tasks, and role delegation is associated with poor teamwork and hence, reduced output.

The laparoscopy tower was incomplete in some of studies due to the high cost of set-up. In other developing countries, the various adaptions that have been done include the use of sigmoidoscope air pump, incorporating a surgical blade between bipolar diathermy to form a tripolar forceps, and the use of sunlight as a light source.[18,31,41,42] The conversion of disposable to re-usable instruments led to significant cost savings and such instruments could be used for up to 18 years.[43] However, the use of glutaraldehyde for chemical sterilization of such instruments[32] has led to an increased rate of surgical site infection by atypical mycobacterium species.[44] Hence, ethylene oxide has been recommended as sterilization of laparoscopic instruments. Adisa et al. and Igwe et al. noted that the conversion of disposable instruments to re-usable ones but the mode of sterilization and the incidence of atypical *mycobacterium* surgical site infection were not discussed.[9,22] The unavailability of retrieval bags has led to a lot of adaptations like the use condoms, nasogastric tube covers, and sterile gloves. However, the use of adapted retriever bag led to a spillage of gallstones on attempt at retrieval during a laparoscopic cholecystectomy.[15]

We hereby make the following recommendations for adaptations:

- Provision of a universal healthcare insurance in order to make laparoscopic procedures affordable. A public private partnership with encouragement of pharmaceutical companies and non-Governmental organizations to donate laparoscopic equipment to hospitals. The use of equipment leasing in the public hospitals.
- The manufacturing of re-usable equipment and spare parts in the country to ensure a reduction in the pressure exerted on the foreign exchange reserve.
- Equipment modifications like using solar powered laparoscopic devices, insufflation with air, abdominal lift device, using sunlight as light source and using condoms as endopouches.
- Revision and re-structuring of the curriculum of the post-graduate training in surgery. Using appropriate methodology, training could be done by teleproctoring and the use of immersive reality technology. There should be gradual exposure, accumulation of skills and repetition. There should be establishment of dry labs and use of animal models to promote improvement in skills acquisition.

- To reduce staff apathy, the hospital managements should set goals for the theatre staff, ensure clarification of the visions, promote positive mindset, and build a reward system. The use of mentoring to promote good behavior and positive mindset should also be explored.

Conclusion

Despite the successes recorded, the challenges facing the laparoscopic surgeon in Nigeria, though surmountable, are peculiar and enormous. We believe that staff in various hospitals in Nigeria would need to be adequately trained in changing the prevalent apathy and to promote the routine use of laparoscopy. Hence, to ensure improvement and sustainability of laparoscopic surgery in Nigeria, there must be a teamwork between surgeons, policy makers, and manufacturers to overcome limitations to the adoption and implementation of laparoscopic surgery in Nigeria.

Orcid

Saburi O Oyewale https://orcid.org/0000-0003-4040-6446

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