

Challenges of Minimally Invasive Surgery in a Southern Nigerian State: Issues for Discussion

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Abstract

Background: The beauty of modern surgical practice is the achievement of same surgical objective with technology-based techniques eliciting minimal body responses. Minimally invasive surgery has been one of the most important revolutions in surgical technique since the early 1900, but the pace of growth in this mode of treatment has not been uniform across the world or indeed Nigeria. The aim of this study was to explore the issues relating to personnel, equipment, and other associated challenges in minimally invasive surgery practice in Port Harcourt, Rivers State, Southern Nigeria.

Materials and Methods: This is a multi-specialty, cross-sectional descriptive study carried out in Port Harcourt, Rivers State Nigeria, among minimally invasive surgeons from February 2020 to April 2021. The snowball sampling and contact tracing methods were used to recruit 35 respondents using self-administered questionnaire.

Results: Twenty-five of the respondents (71.5%) were above 45years of age, and 26 (74.3%) practice minimally invasive surgery in private health facilities. Twenty-three (65.7%) out of the total trained personnel were not actively practicing minimally invasive surgery, due to several reasons dominated by equipment / instrument issue. There was dearth of minimally invasive surgery equipment and instruments for service in the different specialties of surgery.

Conclusion: Most of the personnel were unable to procure and service needed equipment for their practice without external support. Establishment of regional centers for minimally invasive surgery training and practice, will address these issues for the overall good of the public.

Keywords: *Minimally Invasive Surgery; Challenges; Discussion; Port Harcourt; Nigeria*

1. Introduction

Modern surgical practice achieves same or better surgical objective with technology-based techniques ensuring stimulation of minimal body responses. This is akin to what happens in other disciplines outside medicine where present-day technology has impacted positively on practice with resultant improvement in outcome [1-3]. Minimally invasive surgery has been one of the most important revolutions in surgical technique since the early 1900 [4]. However, this mode of treatment popularized by Erich Muhe in laparoscopic cholecystectomy [5], which has found favor across surgical disciplines, has not been uniform in growth across the world [6].

In a scientific conference of surgeons from 14 African countries in 2019, only a minority of surgeons were noted to use laparoscopy in their practice [7]. The reported challenges encountered in minimally invasive surgery (laparoscopic surgery) were lack of access to training equipment, lack of mentors, lack of laparoscopic equipment, issues of equipment maintenance, issues of access to consumable supplies and cost. In Nigeria, pioneering efforts to carry out minimally invasive surgical procedures were reported. In South-Western Nigeria, a report of 12 patients who had laparoscopic surgery from April to December 2008 in Ile-Ife was documented in 2009 [8], and 2011 [9]. In South-Eastern Nigeria, a three-year retrospective study of pioneering laparoscopic surgery was reported in 2012 [10]. In South-South Nigeria, a four-year experience of minimally invasive urologic procedures carried out from 2007 to 2011 was reported in Port Harcourt, Rivers State in 2013 [11]. A pilot study of laparoscopic procedures carried out between 2011 and 2012 was also reported in 2014 [12]. Laparoscopic cholecystectomy for giant gallstone was report in Port Harcourt [13], along with other reports in Port Harcourt [14-16]. In Northern Nigeria, laparoscopic surgical operations were performed in Kano from October 2005 to October 2013 and reported in 2014 [17]. Other reports of minimally invasive procedures in Nigeria are also available [18-20].

The issue of equipment and personnel is central to the development of this technology-based surgical technique, and hence hinders its uptake [21,22]. Nigeria has been reported to have issues of brain drain (partly from poor job satisfaction) [23-26], and capital flight from foreign medical tourism [27,28]. Do we have enough personnel and equipment necessary for this modern surgical technique in the competitive world? What are the issues and the challenges? This study aims to explore and establish the status of personnel and equipment challenges for minimally invasive surgery practice in Rivers State, Nigeria in year the 2020 / 2021, and also discuss these issues as it affects the region.

2. Materials and Methods

A multispecialty cross-sectional descriptive study was carried out in Port Harcourt among surgeons (of all specialties) involved in minimally invasive surgical procedures and those surgeons who have had some official training on minimal invasive surgery.

Port Harcourt is the capital city of Rivers State, in the Southern part of Nigeria where crude oil exploration is carried out by multinational oil companies. Total population was aimed in recruiting the surgeons, using the snowball sampling and contact tracing methods were used to distribute semi-structured questionnaires to all surgeons who gave consent for inclusion. A total of 36 self-administered semi-structured questionnaires for the study were distributed from February 2020 and February 2021, and 35 were retrieved. Information on socio-demographic characteristics; status of practice of minimally invasive surgery; availability of instruments / equipment, readiness for medical tourism in Port Harcourt; and challenges encountered were collated and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0.

3. Results

A total of thirty-five (35) respondents were recruited for the study. The demographic characteristics of the respondents are summarized in TABLE 1. There were 24 males (68.6%), and 11 females (31.4%). Twenty-five of the respondents (71.5%) were 45 years and above, and all of them were above 35 years. Nine respondents (25.7%) practiced minimally invasive surgery in public health facility while 23 (65.7%) practice in both public and private facility. There were 13 gynecologists (37.1%), 7 Urologists (20.0%), 4 ENT Surgeons (11.4%), 3 General Surgeons (8.6%), 2 (5.7%) neurosurgeons, among others (see TABLE 1).

TABLE 1. Socio-demographic characteristics of respondents.

Variables	Numbers	Percentage
Sex	35	100
Male	24	68.6
Female	11	31.4
Age	35	100
35 - 44 years	10	28.6
45 - 54 years	19	54.3
55 - 64 years	5	14.3
> 64 years	1	2.9
Place of practice	35	100
Public	9	25.7
Private	3	8.6
Both Public & Private	23	65.7
Area of Specialty	35	100
General Surgery	3	8.6
Gynecology	13	37.1
Urology	7	20.0

Orthopedics	3	8.6
Neurosurgery	2	5.7
Cardiothoracic/Vascular surgery	3	8.6
ENT surgery	4	11.4

Across all specialties, only 10 (28.6%) out of the total trained personnel were actively practicing minimal invasive surgery (see TABLE 2). Even though 33 (94.3%) were still interested in the practice of minimally invasive surgery, 29 (82.8%) respondents had challenges in furthering their skills and knowledge through training and conference attendance, getting sponsorship, acquisition of instrument, sustenance and maintenance of equipment, and patient flow to justify return on investment.

TABLE 2. Practice Status and Reasons for Non-Practice Minimally Invasive Surgery.

Variables	Numbers	Percentage
Actively Practicing Minimally Invasive Surgery	35	100
Yes	10	28.6
No	23	65.7
Not relevant	2	5.7
Reason for practicing minimally invasive surgery	35	100
Frustration leading to "Inertia"	4	11.4
Patients' inability to pay for the surgery	2	5.7
Absence of Instruments and Equipment	16	45.7
Poor institutional support	5	14.3
Lack of interest	2	5.7
All of the above	6	17.1
Still interested in practicing minimally invasive surgery	35	100
Yes	33	94.3
No	2	5.7

Most of the respondents expressed their opinion on involvement in medical tourism in minimally invasive surgery in Port Harcourt in areas of acquiring further skill through training and retraining, ensuring suitable environment, ensuring patient satisfaction (see TABLE 3). However, readiness in equipment procurement for medical tourism recorded the highest in the negative (not ready) as asserted by 15 (42.9%) respondents (see TABLE 3). Twenty-nine (82.9%) respondents encountered challenges in going for further training and conference attendance (see TABLE 3). These challenges include getting sponsorship to attend Conferences, getting sponsorship to attend update courses in minimally invasive surgery. Additionally, 17 (48.6%) asserted that they had challenges in having a good market for the services offered in minimally invasive surgery (see TABLE 3).

TABLE 3. Readiness for medical tourism in Port Harcourt.

Variables	Numbers	Percentage
Readiness in training for medical tourism in minimal access surgery in Port Harcourt	35	100
Not ready	11	31.4
Ready	12	34.3
Very Ready	12	34.3
Readiness in equipment procurement for medical tourism in minimal access surgery in Port Harcourt	35	100
Not ready	15	42.9
Ready	12	34.3
Very Ready	8	22.9
Readiness in ensuring suitable environment for medical tourism in minimal access surgery	35	100
Not ready	8	22.9
Ready	19	54.3
Very Ready	8	22.9
Readiness in ensuring patient satisfaction for medical tourism in minimally invasive surgery	35	100
Not ready	11	31.4
Ready	14	40
Very Ready	10	28.6

TABLE 4 shows specific available equipment and instruments for involvement in medical tourism in minimally invasive surgery. Twenty-two (62.9%) respondents asserted to availability of special minimally invasive surgery instruments, while 24 (68.6%) respondents affirmed positively to availability of Diathermy for minimally invasive surgery. However, majority asserted in the negative to availability of laser equipment (33=94.3%), harmonic equipment (26=74.3%), ENSEAL equipment (30=85.7%), and Ligasure Equipment (32=91.4%). All the respondents affirmed that there was no Robotic Equipment/Da Vinci (35=100%) in Port Harcourt.

TABLE 4. Specific Available Equipment and Instruments for Readiness in Medical Tourism.

Detail Responses on Available Equipment and Instruments	YES		NO	
	Freq	(%)	Freq	(%)
Special minimal invasive surgery instruments	22	62.9	13	37.1
Diathermy	24	68.6	11	31.4
Laser Equipment	2	5.7	33	94.3
Harmonic Equipment	9	25.7	26	74.3
ENSEAL Equipment	5	14.3	30	85.7
Ligasure	3	8.6	32	91.4

Autocon	0	0.0	35	100.0
Robotic (Da Vinci or others) installation	0	0.0	35	100.0

TABLE 5 shows the opinion of respondents on the availability of specialist equipment and instruments for minimally invasive surgery, for which most affirmed in the negative. Twenty-nine (82.9%) respondents were of the opinion that they have challenges in getting sponsorship to attend update course and conferences on minimally invasive surgery, while 17 (48.6%) asserted to not having a good market for services offered in minimally invasive surgery (see TABLE 6).

TABLE 5. Availability of Minimally Invasive Surgery Equipment / Instruments in Surgical Specialties.

Variables	Frequency	Percentage
Minimally invasive neurosurgical instrument availability	35	100
Yes	4	11.4
No	19	54.3
Not all	3	8.6
Does not apply (I don't know =not my field)	9	25.7
Minimally invasive orthopedic instrument availability	35	100
Yes	3	8.6
No	15	42.9
Does not apply (I don't know =not my field)	17	48.6
Minimally invasive cardiothoracic instrument availability	35	100
No	20	57.1
Not all	1	2.9
Does not apply (I don't know =not my field)	14	40.0
Minimally invasive ENT surgery instrument availability	35	100
Yes	2	5.7
No	17	48.6
Not all	1	2.9
Does not apply (I don't know =not my field)	15	42.8

TABLE 6. None-Equipment-Based Challenges Encountered.

Training-based/conferences challenges encountered in the practice of minimally invasive surgery in PH	35	100
Yes	29	82.9
No	4	11.4
Not relevant	2	5.7
Challenge in good market for the services offered in minimally invasive surgery	35	100
Yes	17	48.6
No	9	25.7
Not relevant	9	25.7

FIG. 1 shows that 22 (62.8%) respondents were of the opinion that there were no intensive care units dedicated to specialties in their hospitals of practice. Some of other challenges encountered and positively asserted by respondents include procuring needed equipment/instruments in minimally invasive surgery (32=88.6%); financing the servicing of equipment in minimal

invasive surgery (29=82.9%); getting dedicated staff to man the equipment (26=74.3%); getting sponsorship to attend update courses (25=71.4%); and getting sponsorship to attend Conferences (28=80%). These are highlighted in FIG. 2.

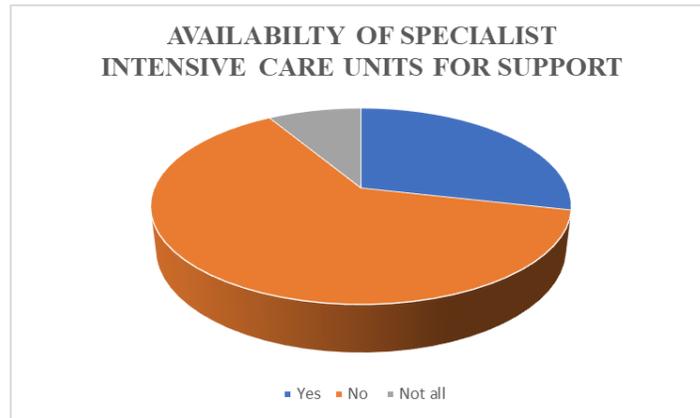


FIG. 1. Availability of Support Facility for Minimally Invasive Surgery.

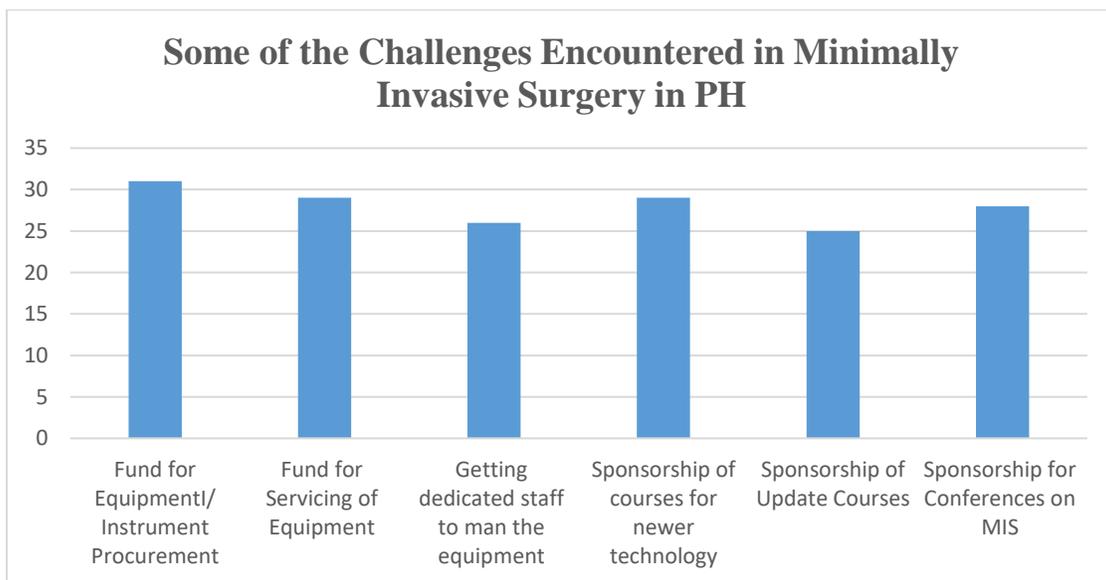


FIG. 2. Some of the Challenges Encountered in Minimally Invasive Surgery in Port Harcourt.

4. Discussion

The demographics of our study show predominance of males, most of whom were 45 years and above in age. Younger age for practitioners of minimal invasive surgery would have been preferable so as to enable them to acquire enough experience in learning curve. This finding further strengthens the need to teach minimally invasive surgery to surgical trainees in residency training, rather than reserve this skill as super-specialization. The finding of male predominance is similar to the reports obtained in other parts of the world [29,30]. However, there is a reported increase in enrolment of women into surgical specialties from the low traditional record over the years [31,32]. The discipline of gynecology stood out as the surgical specialty with the highest number of trained personnel in minimally invasive surgery. This trend may not be unconnected with passion and value society places on women and childbirth issues. Additionally, women and children attend clinics more than others [33,34], and hysteroscopic equipment seem to be easier to acquire and learn.

Most respondents practice in both private and public sector with an overall private sector dominance. The reasons for this disparity are economic motivation in private sector, as practitioners train themselves, bought basic equipment, and maintain them. This is not the case in public sector. The implication of this finding is that the younger trainees are deprived of the opportunity of learning minimally invasive surgery since the public tertiary health facilities which are the training institutions are devoid of these equipment and instruments. The challenges associated with acquisition of needed equipment and instruments, and related work-place challenges in government hospitals may have prompted minimally invasive surgery enthusiast to look the direction of private health facilities to perfect their skills [35,36]. Additional likely explanation for this finding could be the worsening global economic outlook in most low-income countries that has motivated the practitioners to invest their leisure in private practice [37,38]. Poor economy and high cost of newer equipment for advanced minimally invasive surgery are therefore major reasons for the relatively slow development of the practice in our setting.

Although few trained surgeons were actively practicing minimally invasive surgery, almost every respondent was still interested in minimally invasive surgery. This is worrisome as knowledge gained may depreciate and the learning curve needed for growth in the act of duty may not be achieved. The dominant reason for non-practice of minimally invasive surgery was equipment / instrument-related issue. High cost of equipment, inability to fix faulty equipment, and sometimes flying in technicians from Lagos or Abuja for repairs of faulty equipment are unspoken hinderances. This typifies a most prevalent obstacle in our setting to the practice of minimally invasive surgery [16,17]. Other reasons were poor institutional support; absence of patients to pay for the surgery; frustration leading to "inertia"; and lack of interest. These issues have the potential to reduce work morale and boost the unwanted brain-drain [18,19].

Minimally invasive surgery is still rudimentary with more advanced procedures like robotic surgeries not being available in our setting. Most respondents positively asserted to availability of minimally invasive surgery instruments (including diathermy), however responses as to the availability for others (laser, harmonic, ENSEAL, and Ligasure) needed for advanced procedures were mostly in the negative. It was the opinion of most respondents that there were no available minimally invasive surgery equipment and instruments for service in the different specialties of surgery, in addition to the absence of intensive care units dedicated to specialties in their hospitals of practice. This implies that instruments needed for some basic and advanced minimally invasive procedures were not available to most of the practitioners. This is capable of lowering the drive for implementation of this modern surgical technique among the newly trained personnel. It may also explain why some trained personnel were not actively practicing minimally invasive procedures, an issue which calls for urgent attention of all stakeholders, including the government to avert wastage of resources and further brain drain. Port Harcourt, a cosmopolitan city in Rivers State, should have been endowed with these equipment and instruments than this study suggests.

Readiness for medical tourism among others, is woven around availability of suitable environment, availability of equipment and trained personnel for access by those who find value in the services rendered [39,40]. Although most of the respondents expressed their readiness for involvement in medical tourism in minimally invasive surgery in Port Harcourt, majority encountered challenges in getting sponsorship for further training and conference attendance and having a good market for the services offered in minimally invasive surgery. This concern also calls for attention if minimally invasive surgery will be largely improved upon in our environment. Other challenges encountered in the opinion of most respondents were: procuring needed equipment/instruments; financing the servicing of equipment; getting dedicated staff to man the equipment; getting

sponsorship to attend update course and conferences on minimally invasive surgery; having a good market for services offered in minimally invasive surgery. These issues explored in the “cosmopolitan city of Port Harcourt” may also be the experience in other cities of Nigeria.

5. Limitations of the Study

The sampling technique employed in recruiting respondents in this study was snowball, a non-probability method. This was used as the study population was few and there was no pre-existing study that documented the total number of surgeons trained in or practicing minimally invasive surgery in the region. Some of the respondents were trained but not practicing minimally invasive surgery, hence limited information was extracted from them.

6. Conclusion

Minimally invasive surgery services and training are not available in the public sector. The private sector trained doctors are inundated with challenges of equipment maintenance and upgrades. Sponsorship is not available, the economy is getting worse, the cost of equipment is rising, and interest has been waning. The issue of personnel and equipment for minimally invasive surgical practice is therefore critical to advancement in the acquisition of the much-needed proficiency and availability. The technique is therefore not growing as expected due to highlighted challenges. Available personnel are few, relatively in their middle age, and are economically weak to purchase and maintain needed equipment for their practice.

7. Recommendation

Establishment of regional centers for minimally invasive surgery training and strengthening of existing public tertiary hospitals with needed tools will go a long way to boost the development of this technology-based modern surgical technique, for the overall good of the public. Efforts can be channeled to begin with equipment for diagnostics with gradual progress to therapeutics and advanced minimally invasive surgery. There is need also to sensitize our patients on minimally invasive surgery for improved knowledge and awareness. Collaboration with private and public agencies to host/attend minimally invasive surgery workshops / conferences and sponsorships from equipment manufacturers will be in the greater public interest.

REFERENCES

1. Naikoo A, Thakur S, Guroo T, et al. Development of society under the modern technology-a review. *Scholedge Int J Bus Policy Gov.* 2018;5(1):1-8.
2. Deb S. Information technology, its impact on society and its future. *Adv Comput.* 2014;4(1):25-9.
3. Popkova EG, Gulzat K. Technological Revolution in the 21st Century: Digital Society vs. Artificial Intelligence. In *Institute of Scientific Communications Conference; 2019 May 23. Cham: Springer.* 339-45 p.
4. Darzi A, Mackay S. Recent advances in minimal access surgery. *BMJ.* 2002;324(7328):31-4.
5. Blum CA, Adams DB. Who did the first laparoscopic cholecystectomy? *J Minim Access Surg.* 2011;7(3):165-8.
6. Alfa-Wali M, Osaghae S. Practice, training and safety of laparoscopic surgery in low and middle-income countries. *World J Gastrointest Surg.* 2017;9(1):13-8.

7. Farrow NE, Commander SJ, Reed CR, et al. Laparoscopic experience and attitudes toward a low-cost laparoscopic system among surgeons in East, Central, and Southern Africa: a survey study. *Surg Endosc.* 2021;35(12): 6539-48.
8. Adisa AO, Arowolo OA, Salako AA, et al. Preliminary experience with laparoscopic surgery in Ile-Ife, Nigeria. *Afr J Med Med Sci.* 2009;38(4):351-6.
9. Adisa AO, Lawal OO, Alatisie OI, Adesunkanmi AR. An audit of laparoscopic surgeries in Ile-Ife, Nigeria. *West African journal of medicine.* 2011;30(4):273-6.
10. Ekwunife CN, Chianakwana GU, Anyanwu SN, et al. Pioneering laparoscopic surgery in South-eastern Nigeria: A two-center general surgery experience. *Niger J Basic Clin Sci.* 2012;9(2):75-8.
11. Aisuodionoe-Shadrach O, Akporiaye L. Outcome of the TURP-TUVP sandwich procedure for minimally invasive surgical treatment of benign prostatic hyperplasia with volume larger than 40cc over a 4-year period in Nigeria. *Afr J Urol.* 2013;19(1):22-5.
12. Ray-Offor E, Okoro P, Gbobo I, et al. Pilot Study on Laparoscopic Surgery in Port-Harcourt, Nigeria. *Niger J Surg.* 2014;20(1):23-5.
13. Igwe PO, Diri ON. Laparoscopic cholecystectomy for giant gall stone: report of two cases. *Int J Surg Case Rep.* 2020;67:207-10.
14. Igwe PO. Laparoscopy in Developing Countries: A Resident-friendly Endo-Lap New Training Device. *World.* 2018;11(1):54-7.
15. Ijah RF, Adeniji FO, Nyengidiki TK. Determinants of Acceptance of Laparoscopic Surgery Among Residents in Port Harcourt, Nigeria. *Niger Health J.* 2021;20(4):123-30.
16. Ijah RF, Manuel AD. Knowledge, attitude and practice of laparoscopic surgery among medical doctors in Port Harcourt, Nigeria. *Int Surg J.* 2020;7(4):970-6.
17. Sheshe AA, Yakubu AA, Alhassan SU, et al. Early experience with laparoscopic surgical operations in Aminu Kano Teaching Hospital, Kano, Northwestern Nigeria. *Arch Int Surg.* 2014;4(1):1-5.
18. Balogun OS, Osinowo AO, Olajide TO, et al. Development and practice of laparoscopic surgery in a Nigerian tertiary hospital. *Niger J Clin Pract.* 2020;23(10):1368-74.
19. Badejoko OO, Ajenifuja KO, Oluborode BO, et al. Total laparoscopic hysterectomy: A case report from ILE-IFE, Nigeria. *Niger Med J.* 2012;53(4):254-6.
20. Oriji VK. Laparoscopic ovarian drilling versus medical treatment in management of clomiphene citrate polycystic ovarian syndrome. *World J Laparoscopic Surg.* 2010;3(2):99-102
21. Muchiri DM, Otieno GO, Okero DC. Factors Influencing the Adoption of Minimally Invasive Surgery. *Ann Afr Surg.* 2016;13(2).
22. McCrory B, LaGrange CA, Hallbeck MS. Quality and safety of minimally invasive surgery: past, present, and future. *Biomed Eng Comput Biol.* 2014;6:1-11.
23. Ojo OD, Ugochukwu NO, Obinna EJ. Understanding the escalation of brain drain in Nigeria from poor leadership point of view. *Mediterr J Soc Sci.* 2011;2(3):434-53.
24. Mba PN, Ekeopara C. Brain drain: Implication for economic growth in Nigeria. *Am J Soc Issues Humanit.* 2012;2(2):41-7.
25. Ogunsuji O, Adebayo O, Olaopa O, et al. Evaluating the relationship between duty hours and quality of life of Nigerian early career doctors. *Hosp Top.* 2020;98(3):118-26.

26. Adebayo O, Adufe I, Ayanfe O, et al. 'White Coat Drain; A monograph on the Migration of the Nigerian Doctors'. Oladimeji Adebayo & Olusegun Olaopa, editors. Nigeria: National Association of Resident Doctors (NARD); 2019.
27. Constantin A. International Health Tourism. *Int J Responsible Tour.* 2015;4(1):59-72.
28. Yankah C, Fynn-Thompson F, Yuko-Jowi C, et al. Concepts for Regional Referral Cardiac Centers in Sub-Saharan Africa. *Thorac Cardiovasc Surg.* 2017;65(S 01):S1-S110.
29. Kawase K, Nomura K, Tominaga R, et al. Analysis of gender-based differences among surgeons in Japan: results of a survey conducted by the Japan Surgical Society. Part. 2: personal life. *Surg Today.* 2018;48(3):308-19.
30. Morello SL, Colopy SA, Bruckner K, et al. Demographics, measures of professional achievement, and gender differences for diplomates of the American College of Veterinary Surgeons in 2015. *J Am Vet Med Assoc.* 2019;255(11):1270-82.
31. Blakemore LC, Hall JM, Biermann JS. Women in surgical residency training programs. *J Bone Joint Surg Am.* 2003;85(12):2477-80.
32. Davis EC, Risucci DA, Blair PG, et al. Women in surgery residency programs: evolving trends from a national perspective. *J Am Coll Surg.* 2011;212(3):320-6.
33. Bertakis KD, Azari R, Helms LJ, et al. Gender differences in the utilization of health care services. *J Fam Pract.* 2000;49(2):147-52.
34. Redondo-Sendino Á, Guallar-Castillón P, Banegas JR, et al. Gender differences in the utilization of health-care services among the older adult population of Spain. *BMC Public Health.* 2006;6(1):1-9.
35. Adisa AO, Lawal OO, Arowolo OA, et al. Local adaptations aid establishment of laparoscopic surgery in a semiurban Nigerian hospital. *Surg Endosc.* 2013;27(2):390-3.
36. Ogundele BO, Olafimihan HO. Facilities and Equipment as Predictors of Effective Health Care Delivery Services in Selected State Government Hospitals in Oyo State, Nigeria. *Anthropol.* 2009;11(3):181-7.
37. Rosenzweig MR. Labor markets in low-income countries. In: Chenery H & Srinivasan TN, editor. *Handbook of development economics.* Amsterdam: Elsevier Netherlands; 1988. 713-62 p.
38. Rud JP, Trapeznikova I. Job creation and wages in least developed countries: Evidence from Sub-saharan Africa. *Econ J.* 2021;131(635):1331-64.
39. Nilashi M, Samad S, Manaf AA, et al. Factors influencing medical tourism adoption in Malaysia: A DEMATEL-Fuzzy TOPSIS approach. *Comput Ind Eng.* 2019;137:106005.
40. Mishra V, Sharma MG. Framework for Promotion of Medical Tourism: A Case of India. *Int J Glob Bus Competitiveness.* 2021;28:1-9.