

Incisional Hernia Following Laparotomy among Women in Enugu, Nigeria: A Ten-year Review

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Abstract

An incisional hernia may occur in women following laparotomy. Obesity has become an increasing non-communicable public health problem in middle and low-income countries. Also, the caesarean section has been on the increase even among obese women. The study aimed to evaluate the outcome of care and determine the association between caesarean section and obesity in the development of incisional hernias among women who underwent laparotomy for various indications in Enugu, Nigeria. A retrospective study of women who underwent incisional hernia repair between January 2010 and December 2020 at the 2 tertiary hospitals in Enugu, Nigeria, was carried out. The following parameters were assessed; age, predisposing factors, presence and absence of obesity and the class of obesity, comorbidity, presenting symptoms, duration of symptoms before presentation, the interval between presentation and intervention, intra-operative finding, the definitive operative procedure performed, complications of treatment, and outcome of treatment. A total of 46 patients were evaluated. Their mean age was 44 years. Caesarean section and obesity were the most frequently performed laparotomy (31/46, 67.5%) and most common comorbidity (41/46, 89.2%) respectively among the participants. The majority of the patients (44/46, 95.7%) had mesh repair of the incisional hernia, and most had no post-operative complications. There was no significant relationship between incisional hernia and obesity, $p = 0.446$. There was no mortality. In conclusion, caesarean section, a frequently performed laparotomy, and obesity as comorbidity were frequently associated with the occurrence of incisional hernia among the participants. The use of appropriate mesh and techniques were associated with good results and reduced recurrence.

Keywords: Caesarean section, Incisional hernia, Laparotomy, Obesity, Women.

Introduction

Incisional hernias are abnormal abdominal wall gaps located at post-operative scars, perceptible or palpable by clinical examination or imaging [1]. Incisional hernia is a well-known complication of abdominal surgery [2-4]. Incisional hernias result from the weakening of abdominal fascial covering [5]. Generally, incisional hernias result from failure of proper wound healing, which may result from obesity, wound infections, midline incisions, anaemia,

poor nutritional status, and smoking [3, 6, 7].

Obesity is a medico-social problem that has been on the increase [8, 9]. More so, the incidence of obesity in pregnancy is getting alarming [10-14]. Obesity in pregnancy has specific effects on maternal health (antepartum, intrapartum, and postpartum) [11-13]. There are also fetal effects of obesity [11, 13]. Caesarean deliveries have been on the increase [15, 16], with incidences doubling as reported by the World Health Organization (WHO) [17].

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Occasionally, caesarean deliveries need to be performed on obese patients and there lie the risks, including anaesthetic and surgical complications, which may be immediate or late [14, 18-21]. One of the late complications may be the development of incisional hernias as reported by other researchers [2-4, 7, 19].

The study aimed to evaluate the outcome of care and determine the association between caesarean section and obesity in the development of incisional hernias among women who underwent laparotomy for various indications in Enugu, Nigeria. This study will provide the needed evidence that will help in advising surgeons that carry out laparotomy in women in Enugu, Nigeria. This will help in reducing the morbidities and occasional mortalities that may follow incisional hernia repair among women.

Methods

Study Design and Setting

This was a retrospective study of women who underwent repair of their incisional hernia between January 2010 and December 2020 at the 2 tertiary hospitals in Enugu, Nigeria. The tertiary hospitals are Enugu State University Teaching Hospital (ESUTH) and the University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria. The 2 tertiary hospitals serve the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km². The hospitals also receive referrals from their neighbouring states.

Participants and Sample Selection

All the women who had an incisional hernia from previous laparotomies and were managed at the centres were eligible for this research work.

The participants were retrospectively selected by reviewing the case notes of all patients managed for incisional hernia in the two centres

within the study period. Patients without complete data and those that didn't complete their care at these healthcare facilities were excluded from the study. Information was extracted from the case notes, operation notes, operation register, and admission-discharge records. The information extracted included the age, predisposing factors, presence and absence of obesity and the class of obesity, comorbidity, presenting symptoms, duration of symptoms before presentation, the interval between presentation and intervention, intra-operative finding, the definitive operative procedure performed, complications of treatment, duration of hospital stay and outcome of treatment. Diagnosis of incisional hernia was made based on clinical and radiological findings. The data were collected and analysed as a group without revealing the identities of the individual patients. All the participants that met the study criteria were analysed.

Outcome Measures

The primary outcome variable was the proportion of women with an incisional hernia that were both obese and had cesarean sections among the participants. The secondary outcome was the association between obesity/cesarean section and the development of incisional hernia among the participants and the outcome of their management.

Ethical Considerations

Ethical approval was obtained from The Ethics and Research Committee of the Enugu State University Teaching Hospital, Parklane, Enugu, with ethical approval number ESUTHP/C-MAC/RA/034/VOL.2/175.

Statistical Analysis

Statistical Package for Social Science (SPSS) version 21 (manufactured by IBM Corporation Chicago, Illinois) was used for data entry and analysis. Data were expressed as percentages, median, mean, and range. The Chi-square test or student's t-test was used to test for significance.

P-value < 0.05 was considered statistically significant.

Results

Demographic Profile of the Participants

A total of 55 patients were recruited into the study, and only 46 patients had complete records and formed the basis of this report. The details of the recruitment of the participants are shown in Figure 1.

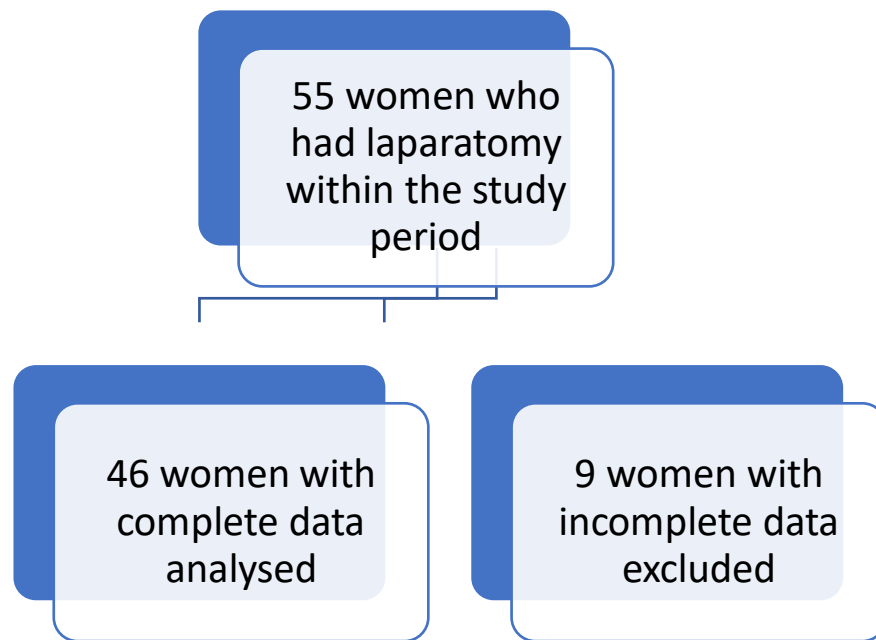


Figure 1. Flow Chart showing the number of Women Recruited and the number of Participants whose Data were Analyzed

The Basic Characteristics of the Participants

tribe and were Christians. Other details are Shown in Table 1.

All the participants were females, of the Ibo

Table 1. Basic characteristics of the participants (n=46)

Variable	Subgroups	Frequency	Percent
Age	<20	1	2.2
	21-30	7	15.2
	31-40	13	28.3
	41-50	12	26.1
	51-60	5	10.9
	61-70	5	10.9
	>70	3	6.5
Mean age = 45±14 years			
Sex	females	46	100
	males	0	0
Tribe	Igbo	46	100
	Others	0	0
Religion	Christianity	46	100
	Others	0	0

Presenting Symptoms before Surgery among the Participants

All the patients presented with a protruding swelling at the area of the previous surgery. In addition to the swelling, 12 (26.1%) patients had pain at the site. The mean duration of symptoms before presentation was 9 months (3-24). The median interval between presentation and

intervention was 3 months (1-8). The median duration of hospital stay was 10 days (7-22).

Predisposing Surgeries to Incisional Hernia among the Participants

The initial surgery the patients had before the development of the incisional hernia is shown in Table 2.

Table 2. Predisposing Surgeries to Incisional Hernia among the Participants

Initial surgery	Number of patients (n = 46)	Percent
Caesarian section	31	67.5
Myomectomy	10	21.7
Laparotomy for a gunshot injury	3	6.5
Laparotomy for other indications	2	4.3

Comorbidities among the Participants

The commonest comorbidities recorded in the

participants was obesity. Other details are represented in Table 3.

Table 3. Comorbidities among the Participants

Comorbidities	Number of patients	Percent
Obesity	41	89.2
Hypertension	3	6.5
Diabetes mellitus	2	4.3

Analysis of the Relationship between the Occurrence of Incisional Hernia and Obesity

Further evaluation of the obesity factor showed that 80.4% of the participants were

obese and in the morbidly obese class range (56.8%). Other details are shown in Table 4. Table 5 showed that the participants that had cesarean sections were not significantly obese compared to those that performed other surgeries.

Table 4. Analysis of the Relationship between the Occurrence of Incisional Hernia and Obesity

Variable	Sub-category	Number of patients with incisional hernia	Percent	p-value
Non-obese		9	19.6	0.004
Obese		37	80.4	
Obese BMI groups	30 to <35 (class 1)	11	29.7	
	35 to <40 (class 2)	5	13.5	
	> 40 (class 3)	21	56.8	

Table 5. The Relationship between Obesity and Surgery Performed among the Participants

variable	Sub-groups	predisposing factor groups		χ^2	P-value
		No cesarean section	Cesarean section		
BMI groups	Non-obese <30	6	2	0.869	0.446
	Obese ≥30	20	15		

Intra-operative Finding and Definitive Operative Procedure Performed for the Participants

Intra-operatively, all the patients had a fascial defect in the anterior abdominal wall at the area of the previous surgical scar. It is from this defect that abdominal contents herniated. A total of 40 participants had hernia defects of <10cm (20/46, 43.5%) and 10-15cm (20/46, 43.5%) while 6 (13%) participants had giants hernia defects of size > 15cm. Forty-four (95.7%) patients had their incisional hernia repaired using a mesh (polypropylene) material, whereas 2 (4.3%) patients had primary fascial repair without the use of mesh.

Complications of Treatment among the Participants

Twenty-nine (63.0%) patients had no complications. Hematoma/seroma collection occurred in 6 (13.0%) patients. Other complications include surgical site infection 5 (10.7%), unusual bleeding 3 (6.5%), bowel contusion 2 (4.3%) and recurrence in 1 (2.2%).

The outcome of Treatment among the Participants

All the patients achieved full recovery and were discharged home. There was no mortality.

Discussion

The study aimed to evaluate the outcome of care and determine the association between caesarean section and obesity in the development of incisional hernias among women who underwent laparotomy for various indications in Enugu, Nigeria, between January 2010 and December 2020. Major findings

showed that Caesarean section and obesity were the most frequently performed laparotomy and most common comorbidity, respectively. The majority of the patients had mesh repair of the incisional hernia, and most had no post-operative complications. There was no significant association between incisional hernia and obesity in developing incisional hernias.

Incisional hernia is one of the most frequent complications of abdominal surgeries and is more common in patients with obesity, with an estimated rate of 10-20% [22]. Among other factors, obesity has long been recognized as one of the relevant factors predisposing patients to the development of incisional hernia following laparotomy [22]. Obesity results in poor wound healing coming from sometimes poor vascularization of the wound site and wound infections [3, 6, 7]. This study identified obesity as the commonest comorbidity associated with incisional hernia. The adverse effects of obesity on the surgical outcome is reflected in the American Society of Anesthesiologist (ASA) classification of obese patients as ASA III-IV. Obesity is not only a risk factor for developing incisional hernias but may also increase morbidity and recurrence after incisional hernia repair [23].

Caesarean section is one of the most frequently performed abdominal operative procedures, with median caesarean section rates as high as 57% [3]. There is a strong association between maternal caesarian section and incisional hernia [2]. Choice of skin incision may impact on the risk of developing incisional hernia in obese patients [2-4, 7, 19]. This finding was not clear in our research due to the retrospective nature of our data collection and

poor recording keeping, but vertical incisions are known to predispose to incisional hernia, especially in obese patients [3,19]. Recently, low transverse (Pfannenstiel) skin incision is now commonly used for caesarean deliveries, and they are associated with less wound tension and lower rates of wound dehiscence and incisional hernia than vertical skin incisions [24, 25]. Vertical (midline) skin incision has been used in morbidly obese patients to improve visualization and keep incision away from the deep intertriginous skin fold [24]. Vertical skin incisions may also be seen used in dire emergencies and among surgeons traditionally trained on this route for cesarean sections. However, they are associated with a 12-fold risk of wound complications, including incisional hernia [25]. The type of incision used in performing the caesarean section may determine the occurrence of incisional hernia. Incisional hernias tend to be more common in midline incisions [7], possibly due to greater dissection of the rectus sheath. One study from Denmark reported that there was no incisional hernia in 280 caesarean deliveries performed through a transverse incision [26]. In a pilot study by Watton and colleagues on high transverse skin incisions reducing wound complications in obese women having caesarean sections; they found out that there was a trend toward reduced wound complications (seroma, hematoma, dehiscence, or infections all risk factors for incisional hernia) in those having high transverse skin incisions but was not statistically significant ($p=0.2379$) [27]. Aabakke and colleagues studied 57,564 women in a register-based cohort study of incisional hernia after caesarean deliveries over 10 years. These women had a total of 68,271 caesarean deliveries during this period; 134 had a hernia requiring repair. Of these, 68 (51% CI 2-60%) were in a midline incision. The risk of hernia repair was higher during the first three years after the caesarean delivery [26].

The simplest theoretical scenario of hernia development is that a traumatized tissue loses a

portion of its structural integrity, allowing protrusion of an organ or viscera into a region that is not in the normal position. Recurrent trauma of tissues as seen with repeated caesarean deliveries and other surgeries, would cause further weakening to the abdominal wall, further increasing the risk of hernia formation. For obese women, the risk is further increased due to the huge abdominal fat layer. This layer may make appropriate closure of the rectus sheath difficult in the inexperienced; also, there is difficulty in closing the subcutaneous tissue. There is an increased risk of developing wound infections in obese women due to the thick fat pad (panniculus), thereby increasing the risk of incisional hernia formation [7].

A systematic review of incisional hernia after caesarean delivery was carried out by Paulsen and colleagues [3]. Their study included women who had given birth at least once through a caesarean delivery. A total of 5 studies involving 275,878 women with previous Caesarean sections were analyzed. The occurrence of incisional hernia following caesarean section was 0.0-5.6%.

In a population-based study by Shand and co-workers, 642,578 women were involved in the study, out of which 33.9% (217,555) had at least one Caesarean section and 1554 (0.2%) had a subsequent incisional hernia repair.² After controlling for the duration of follow-up and known explanatory variables (for example, other abdominal surgery, parity, and multiple pregnancies), the adjusted hazard ratio (aHR) was 2.73 (95% confidence interval (CI) 2.45-3.06, $P < 0.001$). Incisional hernia repair risk increased with the number of caesarean sections: women with two Caesarean sections had a threefold increased risk of incisional hernia repair, which increased to six-fold after five caesarean sections (aHR = 6.29, 95% CI 3.99-9.93, $P < 0.001$) compared to women with no caesarean delivery.

Concerning closure of the abdominal wall, some surgeons recommend mass closure for vertical skin incisions in which all abdominal

wall layers except skin are included along with the fascia in a continuous running fashion using slowly absorbable monofilament suture on these would prevent wound dehiscence, wound infection, or hernia formation [26].

Limitations of the study

The prevalence of incisional hernia among these women could not be determined because of the lack of data on the total number of laparotomies performed during the study period. The small number of patients who had incisional hernias may have affected the results of the analysis of data. A larger number of patients would help in confirming the bivariate and regression results of the data obtained. The incompleteness of some data obtained retrospectively due to poor record storage like lack of records of some confounding variables such as the type of incisions used for the caesarean section and wound complications resulting from the caesarean section were not considered and this may have affected our further analysis on our data.

Conclusion

Caesarean section, a frequently performed laparotomy, and obesity as comorbidity are frequently associated with the occurrence of

incisional hernia among the participants. The use of appropriate mesh and technique was associated with good results and reduces recurrence.

Recommendations

The body mass (BMI) of the patients, type of incision made, and the number of caesarean sections are important considerations in estimating the risk of developing incisional hernia following laparotomies. Obese women should as much as possible reduce their weight before and during pregnancies. Also, transverse incisions should be preferred over the vertical incision and should be used wherever possible (e.g. cesarean sections, laparotomies for ectopic pregnancies) to reduce the occurrence of incisional hernias.

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Conflict of interest

The authors declare no conflict of interest throughout the period of the study.

References

- [1] Muysoms FE, Miserez M, Berrevoet F, Campanelli G, Champault GG, Chelala E, et al. Classification of primary and incisional abdominal wall hernias. *Hernia* [Internet]. 2009 [cited 2021 Oct 27];13(4):407. Available from: <https://pmc/articles/PMC2719726/>.
- [2] Shand AW, Chen JS, Schnitzler M, Roberts CL. Incisional hernia repair after caesarean section: a population-based study. *Aust New Zeal J Obstet Gynaecol*. 2015 Apr;55(2):170–5.
- [3] Paulsen CB, Zetner D, Rosenberg J. Incisional hernia after cesarean section: A systematic review. Vol. 244, *European Journal of Obstetrics and*

Gynecology and Reproductive Biology. Elsevier Ireland Ltd; 2020. p. 128–33.

- [4] Ajlouni MA. The Incidence and Risk Factors of Incisional Hernia in Post Caesarean Sections. *Middle East J Intern Med*. 2013 Mar;6(2):9–12.

[5] Sanders DL, Kingsnorth AN. The modern management of incisional hernias. Vol. 344, *BMJ* (Online). 2012.

- [6] Anaya DA, Dellinger EP. The obese surgical patient: A susceptible host for infection. *Surg Infect* (Larchmt). 2006 Oct;7(5):473–80.

[7] Al-Dahamsheh H. Incisional Hernia of Elective Midline Caesarean Section: Incidence and Risk Factors. Vol. 25, *Bangladesh J Obstet Gynaecol*. 2010.

- [8] Yatsuya H, Li Y, Hilawe EH, Ota A, Wang C, Chiang C, et al. Global trend in overweight and obesity and its association with cardiovascular disease incidence. Vol. 78, *Circulation Journal. Japanese Circulation Society*; 2014. p. 2807–18.
- [9] Kelly T, Yang W, Chen CS, Reynolds K, He J. Global burden of obesity in 2005 and projections to 2030. *Int J Obes*. 2008 Sep;32(9):1431–7.
- [10] Anzaku AS. Prevalence and Risk Factors for Obesity in a Nigerian Obstetric Population. *Am J Heal Res*. 2014;2(5):229.
- [11] Anzaku A, Idikwu O, Emmanuel O, Kingsley O. Impacts of Obesity on Maternal and Fetal Outcomes in Women with Singleton Pregnancy at a Nigerian Clinical Setting. *Br J Med Med Res*. 2015;6(12):1159–65.
- [12] Chigbu C, Aja L. Obesity in pregnancy in southeast Nigeria. *Ann Med Health Sci Res*. 2011;1(2):135–13540.
- [13] Ezeanochie MC, Ande AB, Olagbuji BN. Maternal obesity in early pregnancy and subsequent pregnancy outcome in a Nigerian population. *Afr J Reprod Health*. 2011;15(4):55–9.
- [14] Ramsey, P. S Schenken RS. Obesity in pregnancy: Complications and maternal management. Up To Date. 2019;1–40.
- [15] Okafor II. Indications for Caesarean Delivery in a State University Teaching Hospital, Enugu, Southeast, Nigeria. *Int J Nurs Healthc*. 2015;1(1):16–21.
- [16] Betrán AP, Ye J, Moller A-B, Zhang J, Gülmezoglu AM, Torloni MR. The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. *PLoS One*. 2016;11(2): e0148343.
- [17] Betran AP, Torloni MR, Zhang JJ, Gülmezoglu A, Zongo A. WHO Statement on Caesarean Section Rates. *BJOG*. 2016; 123:667–70.
- [18] Tipton AM, Cohen SA, Chelmow D. Wound infection in the obese pregnant woman. Vol. 35, *Seminars in Perinatology*. W.B. Saunders; 2011. p. 345–9.
- [19] Kadia BM, Chichom-Mefire A, Halle-Ekane GE. Exploring the role of obesity and overweight in predicting the post-operative outcome of abdominal surgery in a sub-Saharan African setting: a prospective cohort study. *BMC Res Notes*. 2018 Dec;11(1):742.
- [20] Thornburg LL. Antepartum obstetrical complications associated with obesity. Vol. 35, *Seminars in Perinatology*. 2011. p. 317–23.
- [21] Tan T, Sia AT. Anaesthesia considerations in the obese gravida. Vol. 35, *Seminars in Perinatology*. 2011. p. 350–5.
- [22] Cleveland RD, Zitsch RP, Laws HL. Incisional hernia in morbidly obese patients. *The American Surgeon*. 1989; 55(1): 61-63.
- [23] Sauerland S, Korenkov M, Kleinen T, Arndt M, Paul A. Obesity is a risk factor for recurrence after incisional hernia repair. *Hernia*. 2004; 8(1): 42-46.
- [24] Gunatilake RP, Perlow JH. Obesity and pregnancy: Clinical management of the obese gravida. Vol. 204, *American Journal of Obstetrics and Gynecology*. 2011. p. 106–19.
- [25] WALL P. Vertical skin incisions and wound complications in the obese parturient. *Obstet Gynecol*. 2003 Nov;102(5):952–6.
- [26] Ceydeli A, Rucinski J, Wise L. Finding the best abdominal closure: An evidence-based review of the literature. *Curr Surg*. 2005;62(2):220–5.
- [27] Walton RB, Shnaekel KL, Ounpraseuth ST, Napolitano PG, Magann EF. High transverse skin incisions may reduce wound complications in obese women having cesarean sections: a pilot study. *J Matern Neonatal Med*. 2019 Mar;32(5):781–5.
- [28] Aabakke AJM, Krebs L, Ladelund S, Secher NJ. Incidence of incisional hernia after cesarean delivery: A register-based cohort study. *PLoS One*. 2014 Sep;9(9).
- [29] Ayandipo OO, Afuwape OO, Irabor DO, Abdurrazzaq AI. Adult Abdominal Wall Hernia in Ibadan. *Ann Ibadan Postgrad Med [Internet]*. 2015;13(2):94–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27162521>%0A & <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4853882>.