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THE BURDEN OF POST-CAESAREAN SECTION WOUND COMPLICATIONS IN A TEACHING HOSPITAL IN SOUTHEAST NIGERIA

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ABSTRACT

Background: **Childbirth is a joyful and pleasurable experience for women particularly if the delivery was via the vaginal route. This feeling may be attenuated when delivery is by caesarean section.**
The situation can be compounded when complications arise most frequently post-operative wound complications. However, there are no studies on the burden of wound complication after caesarean section in our environment.

Objective: **We aimed to evaluate the burden of wound complications after caesarean section.**

Methods: **The study was a prospective longitudinal study on the outcome of post-caesarean section wounds in a Teaching Hospital in South-East Nigeria. Ethical approval was obtained from the Hospital's Research Ethics Committee while written informed consent was obtained from the patients. The information obtained included the socio-demographic data, and post-operative wound characteristics assessed with a modified ASEPSIS wound score. The cost of treatment was obtained from the hospital bills, and estimates of other related purchases. Data generated was analysed using Statistical Package for Social Sciences (SPSS) version 29.**

Results: **Seventeen percent of women had wound infections. The AEPSIS wound score and grades (outcome) were significantly influenced by the body mass index (BMI). Pre-operative anaemia and intra-operative blood loss had a statistically significant association with wound complications. The outcome significantly affected the period of hospital stay (P = <.001). The mean estimated cost of treatment of patients who had wound infection was 2.37 times that of those without wound infection.**

Conclusions: **Wound complications were a burden after caesarean section and efforts should be made to control the factors that were responsible.**

Keywords: Burden, Caesarean section, Wound complication

INTRODUCTION

Childbirth is often a joyful and pleasurable experience for women particularly if delivery was via the vaginal route. With the birth of their baby, women described relief, joy at meeting their baby and a sense of transformation. There is a feeling of pride and a sense of unparalleled achievement at being able to give birth.[1] This feeling may be attenuated when delivery is by caesarean section. It has been found that a substantial proportion of women report a negative experience, even traumatic, impacting on their willingness to have further children. This is most especially true if delivery is by emergency caesarean section.[2,3]

The situation can be compounded when complications arise after caesarean section. These are frequently post-operative wound complications that may include surgical site infections (SSI), haematoma, and wound dehiscence, among others.[4,5,6] In our setting, post-operative wound complications are among the commonest reasons for consults to the Plastic Surgery units from the Department of Obstetrics and Gynaecology. These complications often result in increased morbidity, prolonged hospital stay, need for re-admission, increased cost of care and in some cases, mortality.[4,5,7] It has also been shown that post operative wound complications particularly surgical site infection (SSI) impact negatively on patients health related quality of life (HRQoL).[7,8]

Generally, patients without wound complications do better and spend less than those who had wound complications. However, to the best of our knowledge, there has not been any study assessing the burden of post operative wound complication after caesarean section in Nigeria. The aim of this study was to evaluate the burden of post operative wound complications

after caesarean section by comparing the length of hospital stay and cost of treatment between patients that had wound complications and those that did not.

MATERIALS AND METHODS

The study was a prospective longitudinal study on the outcome of post caesarean section wounds in a Teaching Hospital in South-East Nigeria. The study covered a period of 6 months: September 2022 to February 2023. The sample size was 113 and was derived from the formula for prevalence studies ($N = Z_{1-\alpha/2}^2 PQ/.D^2$), where N is the sample size, $Z_{1-\alpha/2}^2$ is the critical value at 95% confidence interval and = 1.96, P is prevalence which was obtained from a study on the prevalence of caesarean-section in the state[9] and = 7.2%, Q = 1-P, while D is precision and = 5% giving 103 with a 10% attrition value of 10 added.

The ethical approval was obtained from the Medical Research Ethics Committee of the Teaching Hospital for the conduct of the research while written informed consent was obtained from the patients before data collection. The information obtained included the socio-demographic data, post-operative wound characteristics assessed with modified ASEPSIS wound score, which is an acronym for **A**dditional treatment, presence of **S**erous discharge, **E**rythema, **P**urulent discharge, **S**eparation of tissues, **I**solation of bacteria, duration of post-operative hospital **S**tay in days. Others include the period of re-admission if applicable and the duration of follow-up. The scoring system assigns numerical values to the presence and effects of various wound characteristics as above. Wounds were assessed on two separate post-operative days (2nd to 7th and/ or 8th to 14th) which accommodated days of wound inspection by different units. Scores obtained were summed up to grade the wound healing status. The total score indicates the wound healing outcome, and the severity of infection as follows: 0 - 5 = satisfactory healing, 6 - 10 = disturbance of healing, 11 - 15 = minor wound infection, 16 - 21 = moderate wound infection and > 21 = severe wound infection.

The cost of treatment was obtained from the hospital bills, the cost of investigations, the cost of wound dressings, and estimates of other related purchases made while on admission. Data generated was analysed using Statistical Package for the Social Sciences (SPSS) version 29. Chi-square (X^2), linear-to-linear association and correlation were used to determine the significance of relationships and P value ≤ 0.05 was considered statistically significant

RESULTS

Out of the 132 patients studied, 23 representing 17.4% had various categories of wound infection (Table I). These were from the grading of the ASEPSIS scores which had a mean of 4.82 ± 8.96 with a range of 0 to 44 and a median of 1.

The ASEPSIS wound score and grades (outcome) were significantly influenced by the body mass index (BMI) and classes of BMI. The linear-to-linear association and correlation between the ASEPSIS score

Table 1: Distribution of ASEPSIS score grades

Score category	Frequency	Percentage
Satisfactory healing (1 – 5)	104	78.8
Disturbance in healing (6 - 10)	5	3.8
Mild infection (11 – 15)	7	5.3
Moderate infection (16 – 21)	6	4.5
Severe infection (> 21)	10	7.6
Total	132	100

Foot note:
***ASEPSIS** = **A**dditional treatment, presence of **S**erous discharge, **E**rythema, **P**urulent discharge, **S**eparation of tissues, **I**solation of bacteria, duration of post-operative hospital **S**tay in days*

Table 2: Distribution of groups of estimated cost of treatment

Amount (NGN)		Frequency	Percentage
	100,000 – 149,999	101	76.5
	150,000 – 199,999	7	5.3
	200,000 – 249,999	9	6.8
	250,000 – 299,999	3	2.3
	300,000 – 349,999	2	1.5
	350,000 – 399,999	5	3.8
	≥ 400,000	3	2.3
	Total	130	98.5
Missing system		2	1.5
Total		132	100

Foot note: NGN = Nigerian Naira

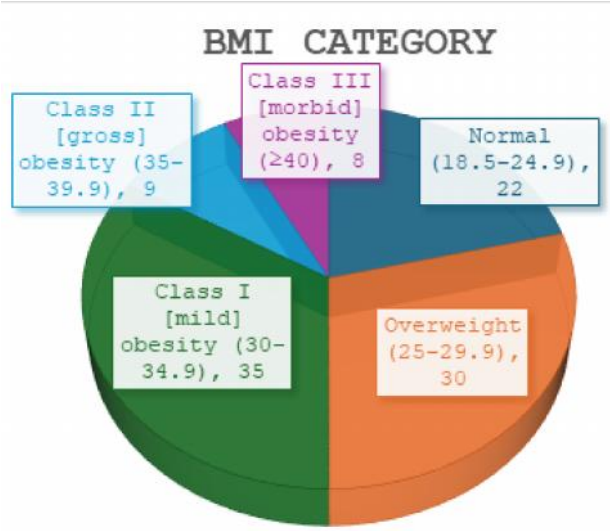

Figure 1: Distribution of BMI category/class of obesity

and BMI were 0.003 and 0.002 respectively while the X^2 value of the outcome and BMI /class of obesity was 0.029. The highest category of BMI was class I obesity which constituted 26.5% (Figure 1) with an average of 30.33 kg/m^2 ± 6.31 kg/m^2 (SD), a range of 18.30 kg/m^2 to 48.44 kg/m^2 and a median of 33.22 kg/m^2.

The haematocrit value also had a significant effect on the ASEPSIS score (P < .001) and there was a statistically significant association between the degree of anaemia and outcome (P = 0.048)

More than half of the caesarean sections, 73 (55.3%) were done as emergency cases while 59 (44.7%) were elective. A higher percentage of wound complication particularly severe infection were associated with emergency caesarean section. However, the association between the type of surgery (elective or emergency) and the ASEPSIS score category was not statistically significant.

All the patients except 1 constituting 99.2% received prophylactic antibiotics in the form of ceftriaxone administered during the administration of anaesthesia. Antibiotics were extended for a period of 1 week post-operatively in all cases. Beyond this, antibiotic therapy was further extended based of signs of infection or wound microscopy culture and sensitivity, in 16 patients representing 12.1%.

Nine-two surgeries representing 69.7% were performed by senior registrars while 40 which is 30.6% of the surgeries were done by the consultants. About 8.6% of patients who were operated by senior registrars had severe wound infection as against 5.1% of those operated by the consultants. However, overall wound challenges were encountered in 21.5% and 20.5% respectively. Thus, the association between the rank of the surgeon and the ASEPSIS score category was not statistically significant.

Intra-operative blood loss ranged from 100ml to 1000 ml with a mean of 426.45ml ±165.09 (SD). Blood loss had statistically significant association with outcome (P =.004). Fifteen patients (11.3%) had varying percentage of superficial dehiscence while 5

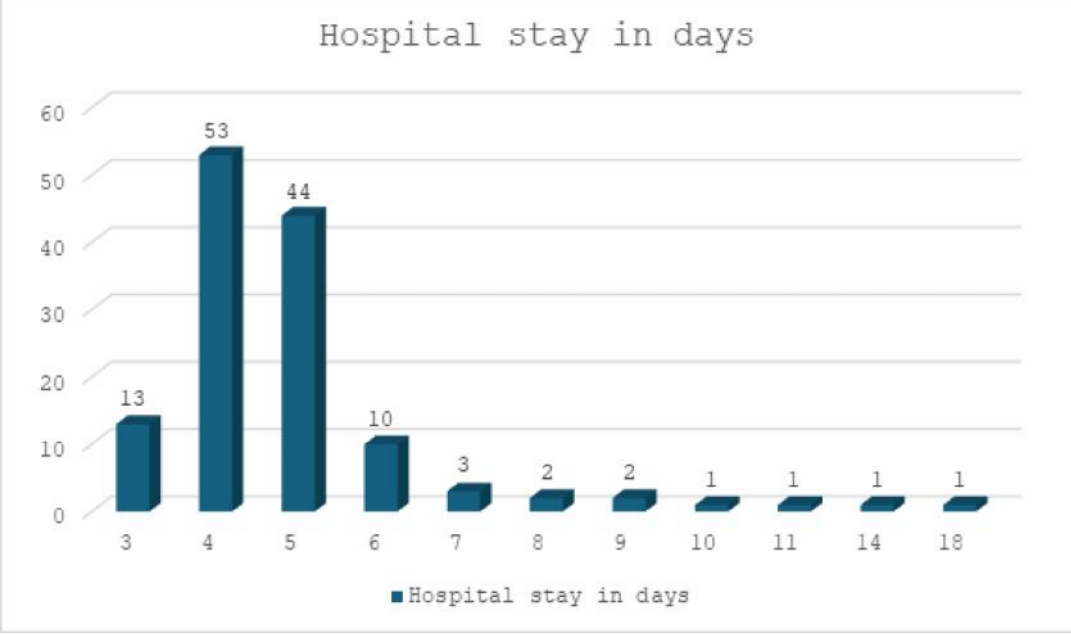

Figure 2: Distribution of period of hospital in days

representing 3.8% had deep separation and all were associated with mild to severe infection. Thus, there was a statistically significant association between wound dehiscence and outcome.

The average period of hospital stay was 4.88 days ±1.93 days with a range of 3 to 18 days and a median of 4.0 days (Figure 2). Some of the patients who had wound complications continued care beyond the period of admission either on an outpatient basis or at home for up to 3 months. The outcome significantly affected the period of hospital stay. (P = <.001) The average period of hospital-stay for those that had satisfactory healing was 4.4 days with a range of 3 to 7 days. The average period of hospital stay for those who had various degrees of wound infection was 5.83 days with a range of 4 to 18 days.

Six of the patients representing 4.5% required readmission based on the severity of wound complication but only 2 accepted and 1 eventually had wound debridement and secondary surgical wound closure. The need for readmission was significantly influenced by the outcome (P = .002).

The estimated cost of treatment ranged from 105,000.00 Nigerian naira (NGN) to 430,158.00 NGN with a mean of 153,358.02 NGN ± 70,985.02 NGN (SD) and a median of 120,220.00 NGN. These are presented in groups of 50,000 NGN (Table 2). While the hospital bill showed marginal differences between the patients, other sources of expenses showed marked variation between those who had SSI and those who did not. The relationship between the outcome and the estimated cost of treatment groups was statistically significant. (P = < .001) The mean estimated treatment cost of those that had satisfactory healing was 118,363.43 NGN ± 10,608.05 NGN with a median of 118,600.00 NGN and a range of 105,000.00 NGN to 197,000.00 NGN. In comparison, the average estimated cost of treatment of those who had wound healing challenges that ranged from disturbance in healing to severe infection was 280,641.89 NGN ± 89,313.27 NGN with a median of 264,585.50 NGN and a range of 158,094.00 NGN to 430,158.00 NGN. This shows that the mean estimated cost of treatment of patients who had wound healing challenges was 2.37 times the cost of treatment of those who did not have any wound healing challenges.

DISCUSSION

Our primary objective in this study was to evaluate the burden of post-operative wound complications after caesarean section. About 17.4% of women had various categories of wound infection after caesarean section. This rate exceeds the rates recorded in many similar studies[10-13] while being lower than some others.[14] There are wide variations in diagnostic criteria for SSI resulting in similar variations in the rates of SSI reported in different studies. Saeed *et al.*[15] reported a lack of uniformity in the definitions of SSI in their protocol for a systematic review and meta-analysis of the incidence of SSI following the caesarean section. Most studies on SSI following caesarean section had no standard criteria or scoring system for data collection while we used the modified ASEPSIS wound scoring system.

The class of obesity (BMI) significantly affected the outcome of our study. Several studies have similarly identified obesity as an independent risk factor for SSI.[13,14,16] Increased soft tissue thickness and subcutaneous fat with poor vascularization resulting from obesity may be the possible link.[17] The association can also result from chronic inflammation and impairment in immune function as a result of obesity.[18]

The degree of pre-operative anaemia and intra-operative blood loss were of statistical significance in their effects on wound complications. These factors result in low post operative haemoglobin concentration as well as deficiency of other essential factors required for wound healing such as albumin, neutrophils and macrophages.[19,20] Reduction in blood supply to the wound area and oxygen carrying capacity of blood as well as deficiency in immune response result from anaemia.[16] Similarly, Jido *et al.*[12] in Kano recorded more blood loss among patients that developed SSI as against those that did not.

The use of prophylactic antibiotics was uniform in our patients and its effect on outcome could not be evaluated. However, several authors have documented the positive impact of use of prophylactic antibiotics before caesarean section.[21-24] The extension of antibiotics for up to one week after surgery as was observed in this study was not evidence based. Prolongation of antibiotic use has been found to be of no benefit and can lead to adverse drug reaction and antimicrobial resistance (AMR) for which it has been strongly discouraged in the WHO global guidelines for the prevention of SSI.[25]

The duration of hospital stay ranged from 3 to 18 days with an average of 4.88 days and a median of 4.0 days. Similar average hospital stay was recorded in some related studies. Marrs *et al.*[26] in Texas, reported an average of 3.2- and 3.5-days of hospital stay for Pfannensteil and vertical midline caesarean sections respectively. Wadhwa *et al.*,[27] reported 5.6 and 10.08 days of hospital stay for day 4 and day 8 dressing removal respectively. The ASEPSIS score significantly

influenced the length of hospital stay. Those who had higher ASEPSIS scores implying wound complications had longer post-operative hospital stay. This aligns with the review on the impact of SSI on healthcare costs and patient's outcome by Badia *et al.*[7]

A statistically significant association was also found between the presence and type of wound dehiscence and the duration of post operative hospital stay. Several studies have reported similar findings. In a review of literature for the determination of the risk factors for surgical wound dehiscence Sandy-Hodgetts *et al.*[28] reported that surgical wound dehiscence of different wound types could result in prolonged stay in the hospital. Mowat *et al.*[29] had reported a doubling in duration of hospital stay as a result of surgical wound dehiscence. Van Ramshorst *et al.*[30] in the development of risk model for abdominal surgical wound dehiscence in adults reported that the period of post-operative hospital stay was significantly longer in patients that had abdominal surgical wound dehiscence than in those who did not have.

The ASEPSIS wound score significantly affected the estimated cost of treatment. The cost of treatment was much higher among those who had wound complications than those that did not. The mean estimated cost of treatment in the presence of SSI was 2.37 times the mean in the absence of SSI. Similarly, Badia *et al.*[7] had demonstrated that SSI represented a strong financial burden in European countries. Jenks *et al.*[31] evaluated the economic burden of surgical site infection in all surgical procedures including caesarean section and reported that the added costs attributable to SSI cuts across all surgical procedures.

The limitations of the study include the fact that HRQoL was not assessed and man-hour loss at jobs, as well as cost of transportation to visit the patient in the hospital were also difficult to quantify. The strength of the study lies in the fact that it is a prospective study and used objective means in the form of ASEPSIS wound scoring system in assessing wound complication. It is also the first of its kind in the country and yielded locally relevant findings to the body of science.

CONCLUSION

The ASEPSIS wound score significantly impacted on the cost of treatment, and the hospital stay. Higher scores were associated with higher cost of treatment and longer hospital stay. Efforts should be made to control the factors that were associated with wound complications.

Among these include the need to maintain appropriate weight for height within the preconception period. This will ensure appropriate BMI during pregnancy especially third trimester. Others include appropriate diet and supplementation with routine drugs to combat anaemia as well as measures to reduce intra-operative blood loss.

Conflict of Interest Statement

The authors affirm that they have no conflict of interests to declare.

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