



## The Practice of Antibiotic Prophylaxis for Caesarean Delivery among Obstetricians and Trainee Obstetricians in Nigeria

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### Authors' contributions

This work was carried out in collaboration among all authors. Author AEO designed the study, wrote the protocol and performed the statistical analysis. Author BOO wrote the first draft of the introduction and managed the literature search. Authors ASA and IGO managed the analyses of the study and literature searches. All authors contributed to the final draft.

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### ABSTRACT

**Aims:** Antibiotic prophylaxis is a recognized measure for preventing post-operative infection after Caesarean delivery and it is expedient that Obstetricians be aware and practice recommended regimen. This study aimed at ascertaining the knowledge and practice of antibiotic prophylaxis, and reason(s) behind any deviation from established standard among Nigerian Obstetricians.

**Study Design:** This is a cross-sectional study.

**Place and Duration of Study:** The study was conducted at the annual conference of the Society of Gynaecology and Obstetrics of Nigeria (SOGON) held in November, 2015 at Abuja, Nigeria.

**Methodology:** A total of 191 consecutive residents and consultant Obstetricians returned correctly filled questionnaires during the survey carried out at the annual conference of the Society of

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Gynaecology and Obstetrics of Nigeria (SOGON) held in November, 2015. The respondent's demographic characteristics, practice of prophylactic antibiotics, awareness of evidenced-based regimen and reason for respondent's regimen were obtained. The data was analyzed using Epi info version 3.5.4 (CDC, Atlanta, Georgia, USA).

**Results:** Most of the respondents were consultants [153(80.1%)], and all the respondents [191(100%)] were aware of antibiotic prophylaxis during Caesarean delivery. Nevertheless, only 124 knew about an evidence-based regimen, out of which 30(24.2%) practice it, while 94(75.8%) did not for fear of increased risk of post-operative sepsis that might result from poor aseptic techniques in the theatre.

**Conclusion:** Despite high awareness, there is non-conformity in observance of standard practice of antibiotic prophylaxis among Nigerian resident and consultant Obstetricians during Caesarean section.

*Keywords: Prophylaxis; antibiotic; Caesarian delivery; obstetrician; Nigeria.*

## 1. INTRODUCTION

Infection prevention is one of the major principles that underpin the success of surgery in any field of medical specialty and this applies also to Obstetrics [1,2]. Post-operative infection is associated with poor surgical outcomes, high risk of morbidity and mortality. Caesarean section is the commonest surgery performed in Obstetrics and often associated with risk of surgical morbidities including infections [3]. The increased risk of infection after caesarean section has been estimated to be between five to twenty fold compared with a vaginal birth [2].

Surgical infections after Caesarean delivery could be localized at the operation site resulting in endometritis and wound infection, or become widespread leading to abdominopelvic abscess, septicaemia and sometimes septic shock [2,3]. Consequently, there is increased antibiotic usage, increase use of other hospital consumables, long hospital stay and increased cost [4]. Furthermore, besides limiting the success of the operative intervention, there is increased morbidity and possible mortality. Postpartum maternal sepsis is the third commonest direct cause of maternal mortality in Nigeria; a country where maternal mortality is still unacceptably high [5]. Therefore, measures to prevent post-operative infection are desirable and some of these include aseptic techniques, surgical expertise and surgical antibiotic prophylaxis [6].

Surgical antibiotic prophylaxis is defined as the use of antibiotics to prevent infections at the surgical site [7]. The principle is to achieve adequate antibiotic tissue concentration prior to possible bacterial wound contamination, and to ensure adequate antibiotic levels throughout the

operative procedure in order to prevent subsequent bacterial growth if already contaminated [8]. Although the evidence that surgical antibiotic prophylaxis prevents postoperative surgical site infection is now indisputable, there are still concerns about the duration of antibiotic use for this purpose [9,10,11]. It has been estimated that about 30-50% of antibiotic use in hospitals is for surgical prophylaxis and that a substantial proportion of this is inappropriate either in the timing or duration of use [12]. Similarly, in Nigeria, anecdotal evidence suggests that there is no uniformity in adherence to evidence-based practice among Obstetricians performing Caesarean section in terms of the timing and duration of prophylaxis. The recommended regimen of prophylactic antibiotic during Caesarean section is a single dose of cephalosporin and metronidazole (or gentamycin) given within 0 to 60 minutes before skin incision [13-19]. Prolonged and inappropriate use of antibiotics for prevention of surgical site infection has been shown to be associated with emergence of antibiotic resistance and increase health care cost [4,11].

This study was therefore carried out to determine the knowledge and practice of the use of prophylactic antibiotic in a cross-section of Nigerian Obstetricians and to ascertain any reason(s) justifying other regimen not backed up by evidence they are practicing.

## 2. MATERIALS AND METHODS

This was a cross-sectional study carried out among Nigerian Obstetricians in November 2015 at the Society of Gynaecology and Obstetrics of Nigeria (SOGON) 49<sup>th</sup> conference held in Abuja. The conference was attended by resident

doctors in Obstetrics and Gynaecology specialty, Consultant Obstetricians and Gynaecologists, Nurses, representatives of government and non-governmental organizations (NGO), and the media.

The study population comprised of consecutive resident doctors or Consultant Obstetricians who are actively practicing in any hospital or Organization. Retired Consultants or Professors were excluded. A minimum sample size of 162 was calculated using the formula:  $n = Z^2 P(1-P)/d^2$  and a non-compliance (Prevalence) rate of 88% from the European center for disease prevention and control (ECDC) technical report [20]. With an assumption of 20% attrition rate (from questionnaires that may be improperly filled or not returned), an additional 32 respondents were added to give a sample size of 194, so 200 questionnaires were printed.

A questionnaire was administered to each eligible doctor who consented to participate in the study to get information on the respondent's demographic characteristics, practice of prophylactic antibiotics, awareness of evidenced-based regimen and reason for respondent's regimen. The information obtained from the respondents were entered into a pre-designed program in the Epi info version 3.5.4 (CDC, Atlanta, Georgia, USA) and analyzed.

### 3. RESULTS

A total of 200 questionnaires were distributed to the eligible participant at the national conference of the Society of Gynaecology and Obstetrics (SOGON) held in Abuja in November, 2015. One hundred and ninety one (191) of these were returned completely and correctly filled.

Table 1 shows the demographic characteristics of the 191 Obstetricians who responded. One hundred and fifty three (80.1%) were consultants of which 137 (71.7%) were males while 54 (28.3%) were females. Most of them 103 (53.9%) were between the ages of 40-49 years.

All the respondents were aware of and use prophylactic antibiotics for their patients undergoing Caesarean delivery. However, only 142 (74.3%) knew about an evidenced-based regimen for their practice (Table 2). Although 124 of the respondents were aware of single dose antibiotic regimen, only 30 (24.2%) of this number of respondents practice it as prophylaxis during elective Caesarean sections. The reasons

given by the remaining 94 (75.8%) participants for not practicing the single dose antibiotic regimen were all related to concerns about poor aseptic techniques in the theatre and possible increased risk of sepsis postoperatively. Table 3 shows that Ceftriaxone was the most frequently used antibiotic as a single agent by 18 (9.4%) respondents, while 32 (16.8%) practice multiple dose regimen with this antibiotic. Only 2 respondents gave combination of antibiotics as a single dose for prophylaxis: one administered ceftriaxone and metronidazole, while the other combined ampicillin/cloxacillin and gentamycin.

**Table 1. Characteristics of the respondents**

Variable	Total (N=191)	Percent (%)
<b>Age group (years)</b>		
30-39	40	20.9
40-49	103	53.9
50-59	40	20.9
≥60	8	4.2
<b>Gender</b>		
Male	137	71.7
Female	54	28.3
<b>Cadre</b>		
Registrar	3	1.6
Senior Registrar	22	11.5
Consultant	153	80.1
Professor	13	6.8
<b>Type of practice</b>		
Government	147	77.0
Private	21	11.0
Mission	5	2.6
Others <sup>a</sup>	18	9.4

<sup>a</sup> Others: Non-governmental organization, combination of government and Private practice, combination of government and mission

**Table 2. Awareness of evidence-based regimen**

Evidence	Number (frequency)	Percentage %
Single dose	124	87.3
Multiple doses	18	12.7
<b>Total</b>	<b>142</b>	<b>100</b>

Out of the 30 that practice single dose antibiotic regimen, 22 (73.3%) administer at induction of anaesthesia, while 7 (23.3%) administer it after cord clamping (Fig. 1). The reasons advanced for their practices are as shown in Fig. 3. Similarly, out of the 161 that practice multiple dosing, most of them [107 (66.5%)], administer the first dose

at induction of anaesthesia, while 36 (22.4%) give the same dose after cord clamping (Fig. 2). The reasons these respondents disclosed for their practice are depicted in Fig. 3.

#### 4. DISCUSSION

The study showed that all the respondents were aware and practice antibiotic prophylaxis during Caesarean delivery. This is not unexpected considering the fact that 86.9% of them are specialist in women's health, and the remaining proportion being residents who managed patients under the care of the former. However, this knowledge may not be sufficient for this cadre of respondents except their practice of antibiotic prophylaxis during Caesarean delivery conform to evidence-based standard.

Practice is influenced by evidence-based information; the fact that only 142 (74.3%) were aware of an evidence-based regimen for their practice indicates the incorrect approach some of them have towards this recommended practice. This finding was also reported by Ansari F et al. [21] in a study carried out in 2006 in 20 European hospitals on the surveillance of antimicrobial consumption where they found that 57.3% of the patients received prophylactic antibiotics in an inappropriate manner in all surgical specialties including Obstetrics and Gynaecology. Similarly, in a study conducted in the Obstetrics and Gynaecology department of Khartoum Teaching Hospital, Sudan, the authors reported very high levels of inappropriate use of antibiotics [22]. The recommended regimen of prophylactic antibiotic during Caesarean section is a single dose given within 0 to 60 minutes before skin incision to enable adequate tissue levels [13-16]. In practical terms, this can be given at induction of anaesthesia or after administration of spinal anaesthesia. Subsequent doses are only required depending on the duration of the procedure, the half-life of the antibiotics and if significant blood loss occurs during the surgery; otherwise, the antibiotic prophylaxis is discontinued after the surgery [20].

Furthermore, this study showed that only 30 (24.2%) of the respondents practice administration of single dose of antibiotics during Caesarean section. This is in keeping with the finding from a multicentre study in Germany involving 14 hospitals where the researchers found that adherence to prophylactic antibiotic guidelines was within the range of 5-85% [23]. Although in that study the finding was not specific

for Caesarean section, it reflected the inconsistencies among surgeons, including Obstetricians, even in developed Countries towards the use of prophylactic antibiotics during surgeries. Huskins WC and his colleagues published their findings from 50 consecutive caesarean sections in 5 countries, and showed discrepancies in the use of prophylactic antibiotics among the Surgeons [24].

Although most [22 (73.3%)] of those who administer single dose antibiotic do so at induction of anaesthesia, some still believe it should be given after cord clamping. It was previously considered that giving antibiotics after cord clamping prevents interference with neonatal culture results and the development of antibiotic resistance in neonates [2,25]. However, current evidence supports the use of pre-incision antibiotics in preventing post caesarean infections compared with post- cord clamping without prejudice to neonatal infectious morbidity [13-16]. Therefore, the reason given in this study by about half [15 (50%)] of those who administer single dose regimen at induction of anaesthesia that it is based on evidence, is appropriate. The other reasons given by those who practice single dose regimen at induction of anaesthesia were based on either clinical experiences or established traditions in their hospitals or units. One respondent practices single dose of antibiotic 4 hours before taking the patient to theatre based on tradition in his hospital. These discrepant reasons for variation in practice even among those giving single dose regimens reflect the need for more enlightenment among Obstetricians about the available evidence for this practice.

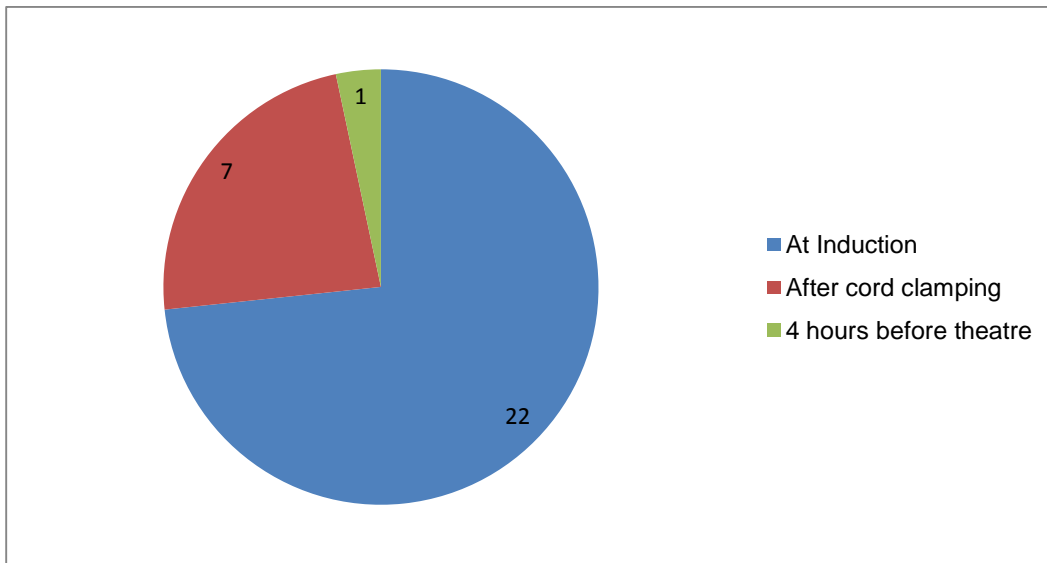
As regards the choice of antibiotics, only 2 respondents who practice single dose antibiotic regimen do so as combination of antibiotics: one administers ceftriaxone and metronidazole, while the other combines ampicillin/cloxacillin and gentamycin. Available evidence favours the use of combination of antibiotics (cephalosporin and metronidazole or gentamycin) in a single dose to extend the spectrum of coverage [16-19].

Finding from this study also revealed that 94 (75.8%) of the respondents who were aware of the use of evidence-based single dose regimen were not practicing it due to concerns about the fear of increased risk of post-operative infection among their patients. This reason, however, does not stand up to scrutiny as the administration of prophylactic antibiotics is not

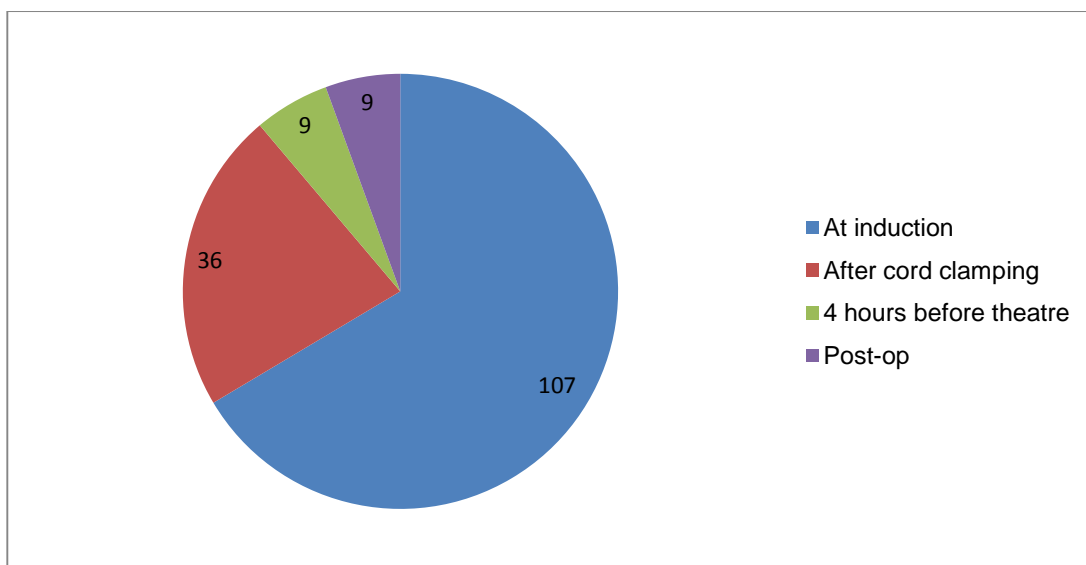
meant to sterilize tissues but to act as adjunct in reducing intra-operative microbial load to a level that can be managed by the host innate and adaptive immune responses [24,26,27]. Therefore, the proper processes for sterilizing and preparing operating theatres before surgeries should be the key to settle that concern. This cornerstone of surgical practice can be undermined with a mindset that prophylactic use of extended doses of antibiotics is what is required. Once due preparation of operating area has been carried out, evidence-based administration of antibiotics should be

followed without fear of added adverse outcome to the patient.

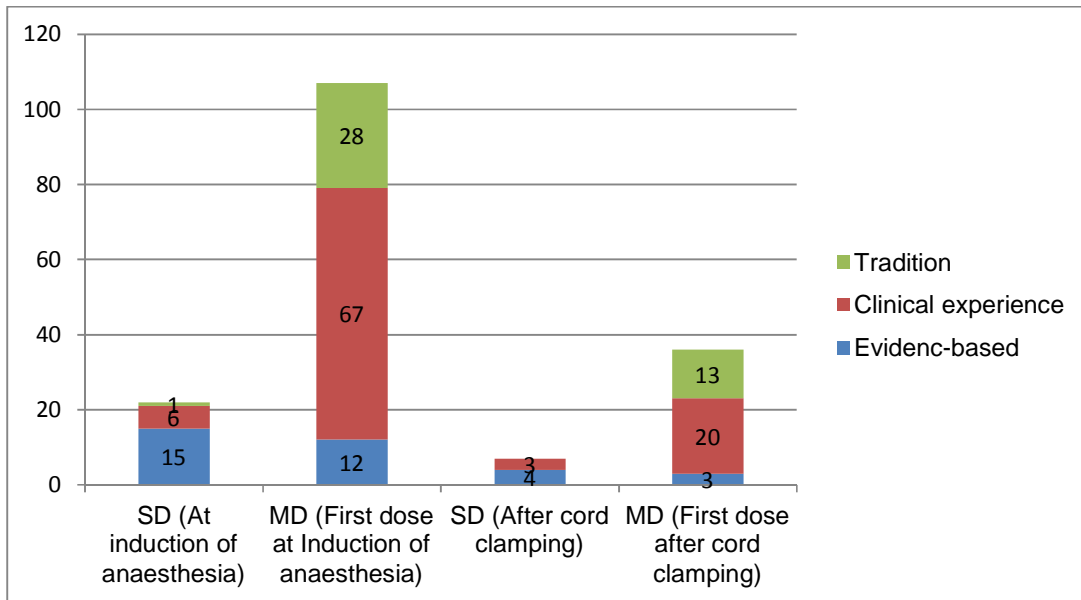
The limitation of the study include the fact that some of the respondent's could have been biased by the desire to be up-to-date in their practice and given an answer that they know is in line with current recommendation while in reality practicing differently. In addition, not all the questionnaires were correctly filled or returned. However, that limitation was taken care of by the assumption of attrition in the sample size calculation.



**Fig. 1. Timing of single dose regimen**



**Fig. 2. Multiple doses (timing of first dose)**



**Fig. 3. Reasons for the timing of antibiotics at induction of anaesthesia and after cord clamping**

\*SD= Single dose antibiotic; \*\*MD= Multiple dose antibiotics

**Table 3. Choice of prophylactic antibiotics**

Antibiotics	Single dose N (%)	Multiple doses N (%)	Total N %
Amoxicillin	0	1	(1) 0.5
Amoxicillin-clavullinic acid	10 (5.2)	24 (12.6)	(34) 17.8
Ceftriaxone	18 (9.4)	32 (16.8)	(50) 26.2
Combination of Antibiotics	2 (1.1)	104 (54.4)	(106) 55.5
<b>Total</b>	<b>30 (15.7)</b>	<b>161 (84.3)</b>	<b>191 (100)</b>

## 5. CONCLUSION

Most Obstetricians in Nigeria practice prophylactic antibiotics during Caesarean delivery, albeit in an inconsistent manner. Although awareness about current evidence-based approach for the practice of prophylactic antibiotics during Caesarean section is high among the respondents, not many practice it due to fear of increase postoperative infection in our environment even when there is no evidence to justify this.

We recommend a randomized controlled trial in our environment to compare the evidence-based recommended single dose regimen with the multiple doses currently practiced by many Obstetricians in Nigeria to refute or otherwise the belief regarding increased risk of post-operative infectious morbidity in our clinical setting.

## ETHICAL APPROVAL

The proposal for the study was presented to the Institutional research and ethical committee of the Dalhatu Araf Specialist Hospital, Lafia, Nigeria and approval was duly obtained for it.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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