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ORIGINAL PAPER

Attitudes of Nigerian orthopaedic surgeons to the use of prophylactic antibiotics

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Abstract
Purpose Inappropriate use of prophylactic antibiotics can increase the rates of surgical site wound infections, lead to the development of resistant organisms and to increased health care costs. Despite widespread knowledge of standard antibiotic prophylaxis protocols (SAPs) in implant surgeries, it is thought that many Nigerian surgeons do not comply. The purpose of this study was to determine the awareness of Nigerian orthopaedic surgeons of SAPs in implant surgeries and their compliance.
Methods This was an observational study done using a questionnaire to collect data from orthopaedic surgeons at the National Orthopaedic Association annual conference held at Lokoja, Nigeria in November 2013.
Results There were 66 respondents divided into 56 consultants and ten surgical residents. Most respondents were aware of standard guidelines for the use of prophylactic antibiotics (86.36 %). Many of them (63.63 %) did not know the average rate of infection following implant surgery in their institutions. Compliance with SAPs was found to be 30.3 %. Compliance was worse among surgeons between 41 and 50 years of age and consultants with between six and ten years of practice.
Conclusions Most respondents are aware of standard antibiotic protocols, but do not comply with them. The study also suggests that surgeons with intermediate levels of experience and those between 41 and 50 years of age were most unlikely to comply.

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Keywords Prophylactic antibiotics · Implant surgery · Nigerian surgeons · Attitudes

Introduction

Prophylactic antibiotics are commonly used to reduce the rate of postoperative wound infections [1, 2]. They are typically used in implant surgeries, procedures with a high risk of infection and those procedures in which the consequences of infection are disastrous [1].

These prophylactic antibiotics are based on the expected microbial flora in the local environment and thus is to avoid the undue use of broad-spectrum antibiotics which may create resistant microbes [1, 2]. There may also be a need to avoid using antibiotics such as quinolones in open fractures which have been found to increase infection rates [3]. Quinolones have also been found to have adverse effects on bone healing in animal studies [4].

Prophylaxis is typically given by the intravenous route, but should not exceed 24 hours and is typically a single dose of a narrow-spectrum antibiotic like a first-generation cephalosporin or co-amoxiclav within one hour of skin incision [2]. The dose should be repeated if the procedure is contaminated or in surgeries lasting over three hours, or if there is prolonged blood loss [5].

When considering open fractures some surgeons have adapted the following guidelines. One meta-analysis has determined that giving locally administered antibiotics in addition to the standard intravenous prophylactic antibiotics at the time of surgery reduces infection rates in open tibial fractures treated with intramedullary nailing [6]. Another study on infections in open fractures compared patients who had infections susceptible to the prophylactic antibiotics used against resistant infections. They found no variables that led to the

development of resistant strains in those who developed infection except for the fracture severity [7]. Both of these studies were of level III evidence.

Inappropriate use of antibiotics, e.g. wrong timing or inappropriate choice of antibiotics, can increase the rates of surgical site wound infections or lead to the development of resistant organisms and increased health care costs. [8]. Despite widespread knowledge of standard antibiotic protocols (SAPs), many surgeons do not comply [8, 9]. Orthopaedic surgeons have varied practice in using prophylactic antibiotics [5]. Anecdotally it is believed that many Nigerian orthopaedic surgeons do not comply with standard antibiotic prophylactic guidelines. The objective of this study was to determine the awareness of Nigerian orthopaedic surgeons towards the use of SAPs in implant surgeries and their compliance.

Materials and method

This was an observational study using a questionnaire to collect data from orthopaedic surgeons from different parts of the country at the annual National Orthopaedic Association conference held in November 2013 at Lokoja, Nigeria. These included surgical residents and consultants with varied years of experience

Demographic data were collected along with data pertaining to the respondents' knowledge of the microbial flora in their hospitals, their knowledge of SAPs and compliance. Analyses was done with SPSS version 20. Tests of significance using Fisher's exact tests were used.

Results

Of 109 surgeons, 66 responded (60.5 %). All were male; there were 56 consultants and ten surgical residents. Surgeons ranged in age from 30 to 62 years and were stratified into three age groups of 30–40 years, 41–50 years and above 50 years. The groups had 15 (22.73 %), 33 (50 %) and 18 (27.27 %) respondents, respectively.

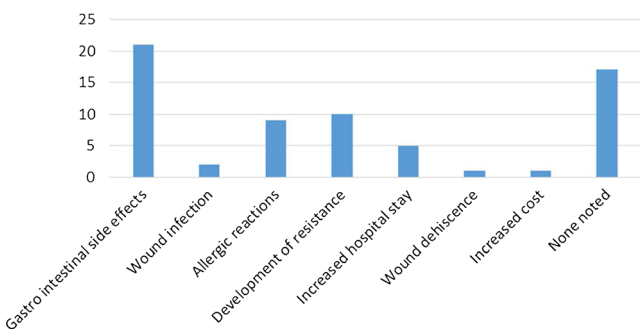

Fig. 1 Adverse effects noted with prophylactic antibiotic use

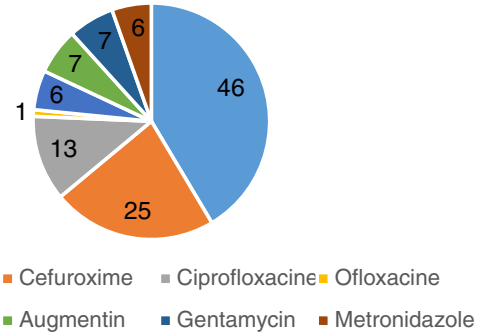

Fig. 2 Type of antibiotics used

Consultant surgeons were classified into subgroups based on their years of practice, as follows: less than six years (20 or 35.71 %), six to ten years (13 or 23.21 %) and above ten years of practice (23 or 41.07 %).

Of the respondents, 57 (86.36 %) were aware of SAPs (86.36 %) and 46 (69.69 %) of them felt the single most important guideline was administering the antibiotic within one hour prior to skin incision. Forty-two respondents (63.63 %) did not know the average rate of infection following implant surgery in their institutions. Forty-nine (74.24 %) respondents experienced some side effects in their patients with the use of antibiotic prophylaxis. Most of these were gastrointestinal side effects (31.81 %, Fig. 1).

Many of the surgeons 44 (66.67 %) admitted to not complying with SAPs. Several reasons were given for noncompliance: 11 (25 %) of them stated that they just followed old practices they learnt in training, 12 (27.27 %) felt that the environments in their hospitals were not clean enough for strict adherence to SAPs and another 12 (27.27 %) said that they were not convinced that proper aseptic techniques were being practised in their hospitals.

The most common reasons in the youngest age group for not complying were the adoption of old practices learnt in their training (44.4 %) and feeling that proper aseptic techniques were not being followed in their hospitals (22.2 %). The older age group followed a similar pattern with 30.77 and 23.08 % choosing the same options as their younger counterparts. The most frequent reasons for noncompliance among the intermediate age group were unclean environments in their hospitals (36.36 %), followed by proper aseptic techniques

Table 1 Ceftriaxone use across the different age groups of the respondents

Age groups	Yes	No	Total	*p* value[a]
30–40 years	11 (73.33 %)	4 (26.67 %)	15	0.026
41–51 years	27 (81.82 %)	6 (18.18 %)	33	
52–62 years	8 (44.44 %)	10 (55.56 %)	18	
Total	46	20	66	

[a] Fisher's exact test was used for analysis due to the small sample size

Table 2 Ceftriaxone use by the consultant orthopaedic surgeons stratified according to their years of experience

Years of experience	Yes	No	Total	*p* value[a]
1–5 years	13 (65 5 %)	7 (35 %)	20	0.046
6–10 years	11 (84.62 %)	2 (15.39 %)	13	
Above 10 years	10 (43.48 %)	13 (56.52 %)	23	
Total	34	22	56	

[a] Fisher's exact test was used for analysis due to the small sample size

were not being followed (31.82 %). These differences were not statistically significant (p=0.601). The third- and second-generation cephalosporins, ceftriazone and cefuroxime were most commonly used (Fig. 2).

The intermediate age group used ceftriaxone most and the oldest age group used it least. This was statistically significant (Table 1, p=0.026).

Thirty-four consultants used ceftriaxone for prophylaxis. The intermediate experience level used it most (Table 2, p=0.046).

Awareness of SAPs for antibiotic prophylaxis among the respondents was 80, 75.78 and 77.78 % for the three age groups of all surgeons, respectively (p =1.000). Among the consultants, most respondents were aware of SAPs with 95, 76.92 and 86.96 % in the three respective experience level groups (p=0.395).

Twenty-eight (42.42 %) of all respondents chose the option of giving a single dose only within one hour prior to skin incision as the most important SAP. With regard to knowledge of the best timing to use prophylactic antibiotics, those that chose the option of giving a single dose only within one hour prior to skin incision were lowest in the intermediate age group (Fig. 3, p=0.589). The intermediate experience level group amongst the consultants also chose this option least (Fig. 4, p=0.879).

With regard to actual compliance with SAPs the respondents in the three age groups that answered yes numbered five, ten and seven, respectively. This represents 33.33, 30.3 and 38.89 % of the respective groups. This was not found to be statistically significant (p=0.841). On the other hand, there was a statistically significant difference in compliance with SAPs based on the number of years in practice among consultants, with the intermediate group being the least compliant with the guidelines (Table 3, p=0.037).

Discussion

Most surgeons knew of SAPS for orthopaedic implant surgery. Most of them also knew that the most important of these guidelines was the appropriate timing of administration of the antibiotics [1, 5, 10]. We focused more on the consultants as they lead their individual units and usually would determine policies and practice. Those in the groups with the shortest and longest years of practice were more aware of SAPs, while the intermediate group with between six and ten years in practice was least aware.

This knowledge has not completely correlated however with appropriate use of antibiotics as more than half of the respondents did not know the commonly identified flora of infections seen in their centres. This is important as the health care environment has been identified as one of the reservoirs of nosocomial infections [10, 11]. This could suggest that prophylactic antibiotics chosen in these situations could possibly have been inappropriate.

Many of the respondents noted side effects with the use of prophylactic antibiotics. Adverse effects have also been reported in other studies especially if the antibiotics were not used appropriately [10–13].

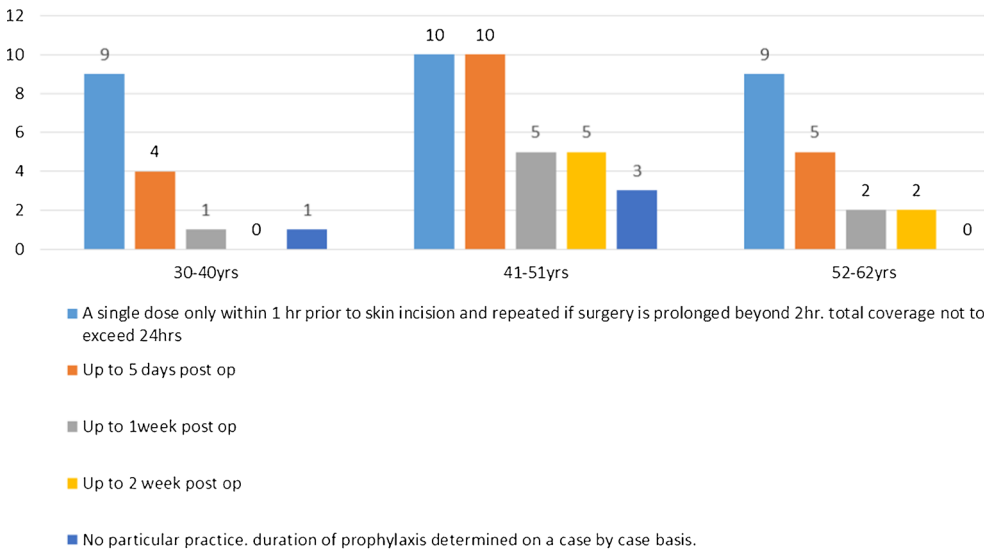

Fig. 3 Age group (years) against duration of prophylaxis (best option)

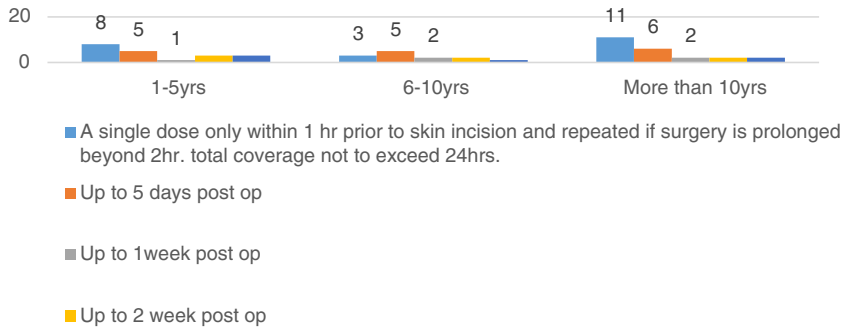

Fig. 4 Years of practice as a consultant orthopaedic surgeon against duration of antibiotics (best option)

Only one third of the respondents admitted to properly following SAPs for the use of prophylactic antibiotics. This is far below what is practised in some other climes with rates of over 60 % compliance [12]. Most of the reasons given centred on the cleanliness of the health care environment in their hospitals and the perception that aseptic techniques were not being practised. These reasons logically will make orthopaedic surgery more infection prone as guidelines from the WHO state that over 90 % of microorganisms are present in visible dirt [11]. Before these assumptions are taken to be true, proper studies of the environments in these hospitals need to be undertaken.

Most respondents used ceftriaxone for antibiotic prophylaxis in their surgeries. The American Academy of Orthopaedic Surgeons (AAOS) advocates cefazolin and cefuroxime as the first choices for antibiotic prophylaxis in orthopaedic procedures [5, 14]. We could not find a corresponding policy by Nigerian orthopaedic surgeons for our practice here.

Most of our respondents felt the most important principle in SAPs was administering a dose of prophylactic antibiotics within one hour of skin incision. This is in agreement with other studies [1, 5, 10, 14]. When cross-tabulated against the various age groups, the middle group (between 41 and 50 years of age) showed the least awareness that this was the most important principle. When cross-tabulated against the various years of experience of the consultants, those with intermediate levels of experience showed the same pattern. This similarity could possibly be because the two groups probably overlap. These differences were not statistically significant, possibly due to the low power of the study.

However, the group of consultants with intermediate level of experience (6–10 years in practice) had much lower compliance with SAPs than the other two groups and this was statistically significant. Those within the middle age group and those in the intermediate levels of years of practice as consultants appear to be the most in breach of SAPs. The reasons for this are not clear and warrant further study. Compliance with SAPs in this environment has also been found to be poor in other local studies, but they did not group their respondents in the manner we did [15–17].

While this study emphasised SAPs in clean implant surgeries, the current practice among Nigerian surgeons when operating on open fractures is the use of therapeutic doses of antibiotics with variable durations. This is similar to practices by other surgeons [7]. Another study observed lower infection rates in open fractures when standard prophylactic antibiotics are augmented with topical antibiotics delivered to the fracture site intraoperatively [6]. Our study did not look at these types of fractures specifically however.

Table 3 Number of years in practice as consultant orthopaedic surgeons stratified according to their compliance with SAPs

No. of years in practice as a consultant orthopaedic surgeon		Do you comply strictly with any standard guidelines?		Total	*p* value[a]
		Yes	No		
	1–5 years	8 42.11 %	11 57.9 %	19	0.037
	6–10 years	1 8.33 %	11 91.67 %	12	
	More than 10 years	13 52 %	12 48 %	25	
Total	22	34	56		

[a] Fisher's exact test was used for analysis due to the small sample size

Conclusion

Knowledge of SAPs and compliance was found to be inadequate amongst respondents. *The study also suggests that surgeons of intermediate age or with intermediate levels of experience were most likely not to comply with SAPs*. Further studies will be needed to objectively ascertain the claims for non-compliance with SAPs by respondents. There is also a need to have national and institutional policies on the use of prophylactic antibiotics in implant surgery, based on microbial flora in our hospitals.

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