

## Prophylactic Antibiotics Use in Pediatric Day Case Surgery: Is it Really Necessary?

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**Citation:** Okoloagu N, Chukwubuike KE, Eze TC. Prophylactic Antibiotic Use in Pediatric Day Case Surgery: Is it Really Necessary? *J Integrated Health* 2023;2(3):55-57. DOI: doi.org/10.51219/JIH/Chukwubuike/9

**Received:** 25 August, 2023; **Accepted:** 06 September, 2023; **Published:** 21 September, 2023

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### ABSTRACT

**Background:** The administration of prophylactic antibiotics before day case surgeries in children is a consistent practice among surgeons in developing countries. The aim of this study was to prospectively compare the rates of surgical site infection in children who did not receive prophylactic antibiotics relative to those that received preoperative antibiotics.

#### Materials and Methods:

**Pediatric Surgery Unit:** This was a prospective randomized study on surgical antibiotic prophylaxis of children who underwent day case surgeries at the Pediatric Surgery Unit of a teaching hospital in Enugu, Nigeria. Patients who received prophylactic antibiotics were categorized as Group A whereas Group B patients did not received preoperative antibiotics. This study covered a period of 1 year. The following data were collected and analyzed: patients' age at presentation, gender, duration of symptoms before presentation, predominant presenting symptoms, clinical diagnosis, operative procedure performed, presence/absence of wound infection of the 2 groups of patients.

**Results:** A total of 72 cases of pediatric day case surgeries were carried out during the study period with equal number of patients in each group. There was male predominance and the overall mean age of the patients at presentation was 50 months, with a range of 1 month to 14 years. Hydroceles and hernias were the most common clinical diagnoses. Overall, 15 (20.8%) patients developed post-operative complications and out of this number, equal number of patients (5) in each group developed wound infection. **Conclusion:** Prophylactic use of antibiotics prior to surgical procedures in children may appear routine. However, this randomized controlled study has shown that the rate of surgical site infection is the same whether prophylactic antibiotics were given or not. Therefore, prophylactic antibiotics may not be necessary in pediatric day case surgeries.

**Keywords:** Children, day case surgery, prophylactic antibiotics, prospective, wound infection

### Introduction

Antibiotic given before the commencement of surgery is described as prophylactic antibiotics. These antibiotics are administered to reduce the incidence of postoperative infections and the antibiotics work best when given before contamination occurs<sup>1</sup>. The role of surgical antibacterial prophylaxis is to reduce the burden of contamination from endogenous and exogenous sources<sup>2</sup>. The usefulness of prophylactic antibiotics reduces some hours after bacterial inoculation into the tissues.

This is because adequate concentration of the antibiotics in the tissues is needed before the contamination occurs<sup>3,4</sup>. The choice of surgical prophylactic antibiotics is at the discretion of the surgeon. However, it should be based on sensitivity on prevailing organisms, broad spectrum and have low toxicity<sup>5</sup>. There are evidences supporting the routine use of preoperative antibiotics. When artificial implants are implanted or major surgeries are performed, the use of prophylactic antibiotics is standard<sup>6</sup>. In contaminated surgical procedures, the role of prophylactic antibiotics is clear cut and beneficial because of

the decrease in the rate of wound infections and duration of hospitalization. However, same cannot be said about when prophylactic antibiotic is used in clean surgery.

As at the present, our current practice in our institution is to administer prophylactic antibiotic to all children undergoing surgical procedures including clean surgeries. The aim of this study was to prospectively compare the rates of surgical site infection in children who did not receive prophylactic antibiotics relative to those that received preoperative antibiotics.

## Materials and Methods

### Pediatric Surgery Unit

This was a prospective randomized study on surgical antibiotic prophylaxis of children who underwent day case surgeries at the Pediatric Surgery Unit of Enugu State University Teaching Hospital (ESUTH), Enugu, Nigeria. The day case surgeries were for inguinal hernias, hydroceles and undescended testes. This study covered a period of 1 year, from January 2021 to December 2021. Only children who were operated upon as day cases were recruited; those with comorbidities that required admission and emergency hernia repairs were excluded from the study. Also patients who required further antibiotics due to severe sepsis or immunosuppression were excluded from the study. Consecutive patients who presented during the study period were recruited into the study. However, patients older than 15 years of age were excluded. ESUTH is a tertiary hospital located in Enugu, South East Nigeria. The hospital serves 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/km<sup>2</sup>. The hospital also receives referrals from its neighboring state.

### Pre-operative protocol

On presentation to the pediatric surgical outpatient clinic with hernias, hydroceles and undescended testes, the patients were clinically evaluated. Diagnoses of the pathologies were made based on clinical findings. Counseling was done and informed consent obtained from the patients' caregivers. The patients were sent for hematological and biochemical investigations. The patients were categorized into 2 groups. Patients who received prophylactic antibiotics were categorized as Group A whereas Group B patients did not receive preoperative antibiotics. The patients were randomized into either of the 2 groups. Prophylactic antibiotic (intravenous Amoxicillin) was given at induction of anesthesia at a dose appropriate for weight of the patient. Ethical approval for this study was obtained from the ethics and research committee of ESUTH.

### Operative procedure

Under general anesthesia and endotracheal intubation, access was through an inguinal incision. The appropriate operative procedure was performed accordingly and the surgical incision closed by subcuticular closure using polydactin (Vicryl).

### Post-operative protocol

The patients were placed on intravenous fluids and analgesics. Oral intake and antibiotics were commenced when the patients recovered from anesthesia. The 2 groups of patients were compared in terms of presence/absence of surgical site infection. Diagnosis of wound infection was based on infection of surgical incision which was evidenced by:

1. Purulent discharge from the wound
2. At least one of pain, tenderness, swelling or redness

## Data collection and analysis

The following data were collected and analyzed: patients' age at presentation, gender, duration of symptoms before presentation, predominant presenting symptoms, clinical diagnosis, operative procedure performed, presence/absence of wound infection and other complications of treatment of the 2 groups of patients.

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, mean, and range. The follow-up period was 30 days.

## Results

### Patients' demographics

A total of 72 cases of day case surgeries were carried out during the study period. Out of this number, 62 (86.1%) were male whereas 10 (13.9%) were females. The overall mean age of the patients at presentation was 50 months, with a range of 1 month to 14 years. Thirty-six (50%) patients received prophylactic antibiotic (group A) while 36 (50%) did not receive prophylactic antibiotics (group B). For the 2 groups of patients, the mean duration of symptoms before presentation to the hospital was 6 weeks and the median interval between presentation and surgical intervention was 2 weeks. All the cases were carried out as day cases.

### Predominant presenting symptoms

The predominant presenting symptoms depended on the pathology. For instance, children with hernias and hydroceles presented with groin and scrotal swellings; children with undescended testis presented with empty scrotum with or without groin swellings.

### Clinical diagnosis

Following clinical evaluation, the clinical diagnoses are depicted in Table 1.

**Table 1:** Clinical diagnosis (n=72)

Clinical diagnosis	Operative procedure performed	Number of patients (%)
Hydrocele	Herniotomy	43 (59.7)
Inguinal hernia	Herniotomy	12 (16.7)
	Herniorrhaphy	10 (13.9)
Undescended testis	Orchidopexy	7 (9.7)

### Post-operative complications

Fifteen (20.8%) patients developed post-operative complications. The distribution of the complications in the 2 groups of patients is illustrated in Table 2.

**Table 2:** Post-operative complication.

Number of patients (%)	Group A	Group B
Wound infection (10)	5 (6.9)	5 (6.9)
Stitch related complication (3)	2 (2.8)	1 (1.4)
Abnormal scars (2)	1 (1.4)	1 (1.4)

## Discussion

Preoperative antibiotics prophylaxis could be defined as the administration of antibiotics prior to performing surgery to help

reduce the risk of postoperative infections particularly surgical site infection. Surgical site infection, a nosocomial infection, is one of the complications of operative procedure<sup>7</sup>. Wound infection is a burden with regards to morbidity, mortality and healthcare costs<sup>8</sup>.

Historically, in 1910, Salvarsan, the first antibiotic was deployed and this has been documented to have extended the human lifespan by 23 years<sup>9</sup>. In 1928, the discovery of penicillin marked the golden age of natural product antibiotic discovery<sup>9</sup>. Improvements have been reported in antibiotic use in surgery. However, controversies exist when it comes to use of prophylactic antibiotics in clean day case surgeries.

In the present study, more males were recruited into the study. This male predominance recorded could be due to higher incidence of hernias and hydroceles in males. Chukwubuike et al also recorded the increased occurrence of hernias and hydroceles in males<sup>10</sup>. Furthermore, orchidopexy is only performed in males. The overall mean age of the patients at presentation of 50 months is consistent with the report of other series on day case surgeries<sup>11</sup>. However, there are differences in the mean ages of children that underwent day case surgeries. These differences could be due to the cohort of the patients recruited and the subspecialty of surgery involved. The mean duration of symptoms before presentation to the hospital of 6 weeks reflects the delayed presentation of the patients. Late presentation of patients to the hospital is a consistent finding in low/middle income countries like Nigeria. Poverty and ignorance contribute significantly to this late presentation. From presentation, it took an average of 2 weeks before the surgery could be performed. The large number of patients on the waiting list may explain this waiting period. The paucity of pediatric surgeons may also be responsible for the long wait.

The predominant presenting symptoms in the patients are related to the respective pathologies. Inguinal hernias and hydroceles manifest as inguinal and scrotal swellings. Other reports on pediatric day case surgery also reported the prevalence of these inguinal and scrotal swellings<sup>12,13</sup>. Complicated inguinal and scrotal swellings were excluded from the index study because such cases may involve extensive surgeries and bowel resection that are not handled as day cases. Again, empirical antibiotics will be required thereby deviating from the methodology of the index study.

Majority of the patients had hydroceles and hernias. This finding is in line with the results of other researches on day case surgeries<sup>10,13</sup>. Pediatric hydroceles and hernias are developmental anomalies that result from failure of obliteration of the processus vaginalis which is a diverticulum of the peritoneal membrane. Embryologically, hydroceles and hernias are closely related in terms of etiology.

The procedures performed for the patients are relative to the clinical diagnosis and findings at surgery. For instance, hydroceles and hernias are treated by herniotomy. However, intra-operatively, herniorrhaphy can be performed in children when the inguinal ring is wide. But this decision has to be taken intraop.

Regarding post-operative complications, group A and group B patients had almost equal numbers with respect to wound infections. This finding is consistent with the report of a similar studies conducted elsewhere in Nigeria<sup>14,15</sup>. However, it is worthy to note that the outcome of this study is not applicable

to the empirical use of antibiotics when infection is already established. Divan et al reported that minimal dose of antibiotics is better than long term antibiotics therapy<sup>16</sup>.

## Conclusion

Prophylactic use of antibiotics prior to surgical procedures in children may appear routine. However, this randomized controlled study has shown that the rate of surgical site infection is the same whether prophylactic antibiotics were given or not. Therefore, prophylactic antibiotics may not be necessary in pediatric day case surgeries.

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