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Original Research Article

Practice of Pediatric Anesthesia in an Adult Operating Theater in Sub-Saharan Africa: Experience of the Essos Hospital Center in Yaounde (Cameroon)

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Abstract: ***Background:*** The aim of this study was to evaluate the practice of pediatric anesthesia in an adult operating theater in sub-Saharan Africa. ***Patients and Methods:*** This was an observational, prospective descriptive study that took place over a period of 12 months in the anesthesiology department of the Essos hospital center in Yaounde (Cameroon). Children <15 years old, seen in anesthesia consultation and operated on for scheduled surgery during the above- mentioned period were included in the study. The variables studied were the variables studied were: the characteristics of the study population, the anesthetic and surgical data, as well as the patient's postoperative itinerary. ***Results****:* During the study period, 162 patients were included out of a total of 1205 patients operated on during the same period. The median age was 5 years, the sex ratio 1.8. ASA class 1 was the most represented (98.1%). The combination midazolam and atropine was the premedication of choice (87.1%). General anesthesia was the most practiced technique (96.3%). Induction of general anesthesia was inhalation in 69% of cases, sevoflurane was the hypnotic used in this indication. General anesthesia was performed by a senior anesthesiologist in 67.3% of children. The majority of surgical procedures belonged to otolaryngology surgery (57%). The electrocardiogram (ECG), blood pressure, SpO2 and heart rate constituted the main part of the intraoperative monitoring. ***Conclusion****:* In low-income countries, pediatric anesthesia is still performed by personnel who are not specialized in pediatric anesthesia. In order to improve the safety of children in the operating room, health policies must encourage training and specialization in this highly delicate area, which will make it possible to reduce perioperative infant morbidity and mortality.

Keywords: Pediatric Anesthesia, Adult Operating Room, Sub-Saharan Africa.

INTRODUCTION

Pediatric anesthesia is a medical discipline that requires special skill and in-depth knowledge [1]. In industrialized countries, the practice of pediatric anesthesia is the responsibility of the specialist [2]. Children and adolescents are intended to be cared for, whenever possible, by a doctor specializing in children and paramedical staff with experience and know-how in reception and care children [1-3]. In sub-Saharan Africa, the low socio-economic level, the geographical distribution of hospital structures and the lack of specialized personnel generally impose the practice of pediatric anesthesia in an unfavorable environment. This practice is the source of many questions about the anesthetic safety of children. Our objective is to present our experience on the practice of pediatric anesthesia in an adult environment at the Essos hospital center in Yaounde (Cameroon).

PATIENTS AND METHODS

This was an observational, prospective study with a descriptive aim which took place over a period of

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12 months (from January 2021 to December 2022) in the anesthesiology department of the Essos hospital center in Yaounde (Cameroon). This is a high reference hospital, located in the political capital of Cameroon, which occasionally performs pediatric surgery. After approval by the ethics committee, the data was collected anonymously and used for exclusively scientific purposes. Children whose age was <15 years old, seen in anesthesia consultation for scheduled surgery and operated on during the above-mentioned period were included in the study. The variables studied were: characteristics of the study population (age, gender, American Society of Anesthesiology (ASA) classification and mortality rate), anesthetic data (qualification of the anesthetist, type of induction, products used for anesthetic induction, airway control, monitoring); surgical data (surgical specialty, operative indication), and the patient's postoperative itinerary. The data collected were grouped and analyzed using the statistical analysis software Epi-infos 7 and SPSS 28.0. The Chi-square test was used for the comparison of variables. The probability *p* less than 0.05 were considered significant.

RESULTS

During the study period, 162 patients met our inclusion criteria out of a total of 1,205 patients operated on at the Essos-Yaoundé hospital center during the same period, i.e. a frequency of 13.4%. The characteristics of the study population are shown in Table 1. The median age was 5 years with extremes ranging from 6 months to 14 years. The age group ranging from 2 to 4 years was the most represented in our sample (51.2%). The sex ratio was 1.8 in favor of the male gender. Anesthesia consultation was performed for all study participants. The study population was mainly made up of children belonging to ASA class 1 (98.1%). Pharmacological premedication was performed on the operating table in all cases. It consisted of an IV injection of midazolam associated with atropine (87.1%), or atropine only (12.9%). Midazolam was systematically associated with atropine from the age of 2 years. General anesthesia was the most practiced technique (96.3%), followed by spinal anesthesia (3.7%). Induction of general anesthesia was inhalation in 69% of cases (n=112), and IV for the rest of this particular population. Sevoflurane was the only inhalant hypnotic for anesthetic induction. The products used for anesthetic induction are shown in Table 2.

Table 1: Socio-demographic characteristics of the study population

Variables	Number (n)	Percentage (%)
Gender		
Male	105	64,8
Female	57	35,2
Total	**162**	**100**
Age group		
<29 days	-	-
[29 days to 6 months]	-	-
[6 months to 2 years]	21	12,9
[2 years to 4 years]	84	51,8
[4 years to 10 years]	42	25,9
[10 years to 14 years]	15	9,3
Total	**162**	**100**
ASA Classification		
ASA 1	159	98,1
ASA 2	3	1,9
Total	**162**	**100**
Anesthetic technique		
General anesthesia	156	96,3
Spinal anesthesia	6	3,7
Total	**162**	**100**

Table 2: **Distribution of participants according to the pharmacological agents used for anesthetic induction**

Pharmacological agent	Number (n)	Percentage (%)
Inhalation Induction		
Halothane	-	-
Sevoflurane	105	64.8
IV Induction		
Propofol	51	31.5
Ketamine	-	-
Thiopental	-	-
Fentanyl	51	31.5
Vecuronium	31	19.1

Ear, nose and throat surgery (ENT) was the most practiced surgical specialty (65.4%), tonsillectomy represented 82.1% of this activity (table 3). All the parents of children declared having received oral explanations relating to the instructions of the young preoperative during the preanaesthetic consultation.

Table 3: **Distribution of children according to surgical indication**

Indication of surgery	**Number (n)**	**Percentage (%)**
Enlargement of the tonsils and adenoids/Obstructive Sleep Apnea	87	53,7
Inguinal hernia	12	7,4
Inguino-scrotal hernia	12	7,4
Esophageal foreign body	9	5,5
Cryptorchidism	6	3,7
Superinfected parotid cyst	6	3,7
Acute cholecystitis	5	3,1
Umbilical hernia	6	2,4
Flanges of the base of the tongue	4	2,5
Forearm scar correction	1	1,9
Left femur fracture	3	1,9
Right humeral fracture	3	1,9
Lateral ventral hernia	3	1,9
Malformative hydrocephalus	2	1,2
Bilateral seromucous otitis	2	1,2
Shortening of the right Achilles tendon	1	0,6
TOTAL	**162**	**100**

Tracheal intubation and mechanical ventilation were the principle for all surgical procedures under general anesthesia. Midazolam sedation was associated with all cases of spinal anesthesia. Intraoperative monitoring concerned all children. The parameters automatically monitored in all children were ECG, heart rate (HR), noninvasive blood pressure (NIBP) and pulsed oxygen saturation (SPO_2). Expired carbon dioxide (CO_2) was monitored in all patients under general anesthesia. Awakening from general anesthesia systematically took place in the operating room. All the children were transferred to the pediatrics department for postoperative management, after the stage of awakening from anesthesia. General anesthesia was performed by a senior anesthesiologist in more than half of the cases (67.3%), by a nurse specialized in anesthesia in the remaining cases (32.7%) (Table 4). Intraoperative mortality was nil.

Table 4: **Distribution of children according to the qualification of the anesthetist**

Qualification of the anesthetist	**Number (n)**	**Percentage (%)**
Senior anesthesiologist	105	67.3
Nurse anesthesiologist	51	32.7
Pediatric anesthesiologist	-	-
Total	**156**	**100**

DICUSSION

Sub-Saharan Africa represents this part of the continent where the strong demography contrasts with the low level of development, the extreme poverty of the populations and the lack of medical resources [4]. In sub-Saharan Africa, the majority of operating theaters are suitable for adults, architecturally and operationally [5]. Practicing pediatric anesthesia in this environment amounts to functionally transforming an adult operating theater into a pediatric one. The constraints related to the practice of pediatric anesthesia in a non-specialized environment are the subject of many controversies, especially with regard to the safety of children and the competence of practitioners [1, 2]. In Cameroon, as in most countries of sub-Saharan Africa, there are no specific regulatory constraints on operational pediatric anesthesia throughout the country. Pediatric anesthesia is a specialty that requires special equipment, well-trained and experienced personnel [6-8]. In our study, pediatric anesthesia accounted for 13.4% of all anesthetic procedures performed at Essos Hospital. Nze obiang *et al.,* [9], Akodjenou *et al.,* [10], find similar frequencies in their various works carried out on the practice of pediatric anesthesia in non-specialized settings, respectively in Gabon and Benin. Pediatric anesthesia, on the other hand, represents a significant volume of activity in developed countries. In France, 23% of anesthesia procedures concern children under 18 [2], in Morocco (23%) [11] and in Tunisia (20%) [11]. The low frequency of anesthetic activity in our study could be explained by two main arguments: The Essos hospital center is a hospital that occasionally practices pediatric surgery on the one hand, on the other

hand there are two hospitals in Cameroon of reference who have an exclusively pediatric surgical activity, one is located in Yaounde and the other in Douala. These two large hospitals absorb a large part of the pediatric anesthetic activity. Furthermore, it is important to point out that several hospitals in Cameroon also have an occasional pediatric anesthetic activity. The average age of our study population was 5 years with a male predominance. Many African authors [9-12] find the same age group in their publications with a male predominance as well. The male predominance could be explained by the frequency of male surgical pathologies, particularly urological in this age group (testicular lowering surgery, inguinoscrotal hernia and circumcision). The children belonged primarily to the ASA1 class as in most African series [9, 13-15]. Our study essentially focused on elective surgery and could justify this trend. The principle of safety in anesthesia is to bring the patient as stable as possible on the operating table.

General anesthesia was the main anesthetic technique practiced in our series; induction was inhalation in more than half of the cases, sevoflurane the only halogen used in this context. For many authors [5, 9-14], general anesthesia is safer in pediatrics compared to locoregional anesthesia. Even when there are indications for locoregional anesthesia, this is generally associated with sedation for the child's operating comfort. The strong predominance of general anesthesia in our research work could be explained by the high representativeness of ENT surgery in our sample. ENT surgery is surgery of the cephalic extremity which takes place under general anesthesia. Inhalation induction remains the most commonly used induction technique in children [10]. Sevoflurane is a pleasant-smelling, non-irritating airway agent suitable for this indication [10, 16]. Tracheal intubation is the technique of choice for securing the upper airway, as well as mechanical ventilation. In our sample, all the children who were operated on under general anesthesia benefited from tracheal intubation associated with mechanical ventilation. Several studies carried out on the African continent [10, 14, 17, 18], particularly in Africa south of the Sahara, find the same trend, with a very high rate of intubated and ventilated patients in pediatric surgery. The limit of certain studies [14], which find a low incidence of patients under general anesthesia, not ventilated, lies in the low level of equipment in operating rooms with mechanical ventilation devices adapted to the age and weight of children.

Premedication on the operating table, still qualified by some authors as anesthetic pre-induction, is an old practice that remains current among many anesthesiologists in Africa. The premedication of the child aims to reduce preoperative anxiety, to facilitate the separation of the child from his parents, to improve the conditions of induction of anesthesia [19, 20]. Midazolam is currently the reference drug in pediatric anesthesia in this indication [19, 20]. Its administration should not be systematic. Non-drug premedication techniques such as the presence of parents at the induction distraction by video games, electronic tablets must be tested. Distraction techniques have proven their effectiveness in reducing preoperative anxiety, as well as the length of stay in the postoperative monitoring room, pain and postoperative behavioral problems in children [21].

Intraoperative monitoring involved all children and systematically focused on ECG, blood pressure, heart rate, oxygen saturation (SpO2) and exhaled CO2. The standards, methods and devices required for monitoring in pediatric anesthesia have been described by several learned societies [1, 22-27]. ECG monitoring requires having electrodes adapted to the size of the child [1, 22, 23, 26]. Capnography monitoring is essential [1, 23, 26]. Analysis of the O2 concentration delivered is mandatory as well as continuous analysis of halogenated gases [1, 23]. Temperature monitoring using a thermal probe is also mandatory [1, 23, 26].

The anesthetic awakening took place on the operating table; the patients were transferred directly to the hospitalization room, in the pediatric department. Akodjènou *et al.*, [10] report a direct transfer rate to the hospital ward of 15.65%. This difference could be explained by the absence of a recovery room adapted to the postoperative monitoring of children at the Essos hospital center. The postoperative period requires continuous monitoring of the parameters during recovery (in case of general anesthesia) or recovery (in case of locoregional anesthesia) [28-30]. The purpose of this monitoring is to prevent or treat possible anesthetic and surgical complications. Their existence has contributed to the significant reduction in anesthetic risk [21, 28, 30]. They are operated by state-certified nurses, specially trained for this position, working under the medical responsibility of the anesthesiologists [28, 29].

All anesthesia acts were performed by staff who had no specific training in child anesthesia. The same observation is made by the majority of authors who have worked on this subject in Sub-Saharan Africa. Public health policies should focus on specialized training in pediatric anesthesia to fill this great void and improve the anesthetic safety of children. Perioperative mortality was nil, specialized training and equipping operating rooms with specific equipment could consolidate this achievement.

CONCLUSION

Pediatric anesthesia is a delicate medical specialty. It is performed in Cameroon by non-specialized personnel without specific training in pediatric anesthesia. The new constraints that regulate pediatric anesthesia are justified by the concern to

reduce the operating risks for children. Many scientific works indicate that the inexperience of the anesthesiologist, the irregular practice in pediatrics is important risk factors for morbidity and mortality in pediatric surgery. The practice of pediatric anesthesia in an adult operating theater requires special organization with a section of the operating theater dedicated to pediatric activity. The aim is to take into account the specific characteristics of child care.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

Author Contribution

All authors contributed to the development and conduction of this manuscript. All authors have read and approved the final version of the manuscript.

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REFERENCES

1. Galante, D., Pedrotti, D., Consani, G., Badii, F., Caruselli, M., Almenrader, N., ... & Scheggi, M. (2017). Recommendations for the minimal requirements necessary to deliver safe anesthetic procedures in neonatal and pediatric age. *Pediatric Anesthesia & Critical Care Journal (PACCJ)*, *5*(2), 111-131. doi:10.14587/paccj.2017.17.
2. Tesoro, S., Marchesini, L., & De Robertis, E. (2019). Pediatric anesthesia. *Translational Medicine@ Unisa*, *20*, 1-3.
3. Circulaire n°517/DHOS/01/DGS/DGAS du 28 octobre 2004 relative à l'élaboration des SROS de l'enfant et de l'adolescent. http://affairesjuridiques.aphp.fr/textes/circulaire-dhoso1dgsdgas-n-2004-517-du-28-octobre-2004-relative-a-lelaboration-des-sros-de-lenfant-et-de-ladolescent/. Consulté le 3 mars 2022.
4. Jacquemot, P. (2012). Health systems in Africa and inequality in healthcare. *Contemporary Africa*, *243* (3), 95-97.
5. Zoumenou, E., Ndoye, MD, Tchaou, BA, Nguessan, YF, Kaboré, F., Diango, D., ... & Brouh, Y. (2015). Practice of anesthesia in children in French-speaking sub-Saharan Africa. State of play and prospects for improvement. *Anesthesia & Resuscitation*, *1*(6), 512-516.
6. Bowman, K. G., Jovic, G., Rangel, S., Berry, W. R., & Gawande, A. A. (2013). Pediatric emergency and essential surgical care in Zambian hospitals: a nationwide study. *Journal of pediatric surgery*, *48*(6), 1363-1370.
7. Adudu, P. (2012). Anesthetic equipment, facilities and services available for pediatric anesthesia in Nigeria. *Nigerian Journal of Clinical Practice*, *15*(1), 75-79.
8. Walker, I. A. (2009). Con: pediatric anesthesia training in developing countries is best achieved by out of country scholarships. *Pediatric Anesthesia*, *19*(1), 45-49.
9. Nze Obiang, P. C., Nzoghe Nguema, P., Ngomas, J. F., Obame, R., Essola, L., & Sima Zue, A. (2019). Evaluation of the security in paediatric anesthesia in a regional Hospital in Gabon. *Bull Med Owendo*, 17, 18-21.
10. Akodjènou, J., Mewanou, S., Ahounou, E., Lalèyè, Y., Zoumenou, E., … & Gbénou, S. A. (2021). Practice of Pediatric Anesthesia in Sub-Saharan Africa: Experience of Two Referral Hospitals in Benin. *American Journal of Pediatrics*, 7, 219-224.
11. Hmamouchi, B., Nejmi, S., Benkhalifa, S., Dehdouh, A., & Chlilek, A. (2009, July). Morbimortality in pediatric anesthesia in the Maghreb. In *French Annals of anesthesia and resuscitation* (Vol. 28, No. 7-8, pp. 671-673). Elsevier Masson.
12. Kabore, F., Bandre, E., Sanou, A., Ouedraogo, I., & Ouedraogo, N. (2008). Prise en charge anesthésique des urgences pédiatriques au Centre Hospitalier Universitaire Pédiatriques Charles de Gaulle de Ouagadougou. *JAMU*, 1, 40.
13. Sima Zué, A., Obame, R., & Kaba, M. M. (2005). Pratique anesthésique en milieu pédiatrique gabonais: état des lieux à l'Hôpital Pédiatrique d'Owendo. *Bull Med Owendo*, 26, 10-3.
14. Otiobanda, G. F., Mahoungoun Guimba, K. C., Odzebe, K. W. S., Nboutol Mandavo, C., Ekouya Boyassa, G., & Kangni-Freitas, N. (2011). Pratique de l'anesthésie pédiatrique au centre hospitalier et universitaire de Brazzaville. *Rev Afr Anesth Med Urg*, *16*(1), 3-6.
15. Brouh, Y., Kouadio, S. A., & Soro, L. (2002). Anesthésie pédiatrique en Afrique : 7 ans d'expérience au CHU de Yopougon, République de Côte d'Ivoire. *Rev Afr Anesth Med Urg*, 7, 8-13.
16. Kabré, Y. B., Traoré, I. S., Kaboré, F. A., Ki, B., Traoré, A. I., Ouédraogo, I., ... & Ouédraogo, N. (2017). Anesthesia for ambulatory pediatric surgery in sub-Saharan Africa: a pilot study in Burkina Faso. *Anesthesia & Analgesia*, *124*(2), 623-626.
17. Mouzou, T., Egbohou, P., Tomta, K., Sama, H., Assenouwe, S., Akala, Y., ... & Randolph, L. (2016). Practice of pediatric anesthesia in a developing country: experience of CHU Sylvanus Olympio of Lomé in Togo. *Age*, *30*, 38-41.
18. Niandou, M., Foumakoye, A., Moustapha, H., Ada, O. A., Bawa, M. B., … & Idrissa, A. (2015). Pratique de l'anesthésie pédiatrique à l'hôpital national Lamordé de Niamey. *Rev Afr Anesthésiol Med Urg*, 20, 1-134.
19. Bengono Bengono, R., Amengle, L., Owono, E., Metogo Mbengono, J., Afane, A., & Ze Minkande, J. (2015). Etude comparative entre le midazolam, hydroxyzine et clonidine en prémédication pour anesthésie pédiatrique. *Revue Africaine de chirurgie et spécialités*, 9, 18-23.
20. Nga nomo, S., Binyom, P., Iroume, C., Kuitchet, A., Essomba, R., … & Chewa, G. (2021). Prévalence de l'anxiété préopératoire chez l'enfant

en Afrique sub-saharienne : expérience de l'hôpital central de Yaoundé. *Jaccr*, 5, 18-23.

21. Habre, W., Disma, N., & Virag, K. (2017). Incidence of severe critical events in paediatric anaesthesia (APRICOT): a prospective multicenter observational study in 261 hospitals in Europe. *Lancet Respir Med*, 5, 412-425.
22. Regli, A., Becke, K., & Von Ungern-Sternberg, B. S. (2017). An update on the perioperative management of children with upper respiratory tract infections. *Curr Opin Anesthesiol*, 30, 362-367. https://dx.doi.org/10.1097/ACO.0000000000000460
23. Maxwell, L. G., & Yaster, M. (2000). Peroperative management issues in pediatric patients. *Anesthesiol Clin North Am.*, 18, 601-632.
24. Martin Lizabeth, D., Hoagland Monica, A., Rhodes Erinn, T., Wolfsdorf Joseph, I., & Hamrick Jennifer, L. (2020). Perioperative management of pediatric patients with type 1 diabetes mellitus updates recommendations for anesthesiologist. *Anesthesia and analgesia*, 130, 821-827.
25. Lorinc, A. N., Walters, C. B., Lovejoy, H. K., Crockett, C. J., & Reddy, S. K. (2020). Hot topics in safety for pediatric anesthesia. *Children*, *7*(11), 242. doi:10.3390/children7110242.
26. Walters, C. B., Kynes J. M., Reddy, S. K., Crockett, C. J., Lovejoy, H. K., & Lorinc, A. N. (2020). Pediatric Anesthesia Specialty Societies and Multi-Institutional Collaborations. *Children*, 7, 233. doi: 10.3390/children7110233.
27. Clebone, A., Strupp, K. M., Whitney, G., Anderson, M. R., Hottle, J., Fehr, J., ... & Pedi Crisis Application Working Group. (2019). Development and usability testing of the society for pediatric anesthesia pedi crisis mobile application. *Anesthesia & Analgesia*, *129*(6), 1635-1644.
28. Gilles, O. (2018). Organisation de l'anesthésie pédiatrique : qui peut faire quoi et où peut-il le faire ? *Anesthésie & Réanimation*, 4, 308-314.
29. Wodey, E. (2003). Anesthésie pédiatrique In Kamran SAMII, Anesthésie réanimation Chirurgicale, 3ème édition, Flammarion, 534-574.
30. Murat, I., Constant, I., & Maud'huy, H. (2004). Perioperative anaesthetic morbidity in children: a database of 24,165 anaesthetics over a 30-month period. *Paediatr Anaesth.*, 14, 158-166.

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