

Full length Research Article

Duodenal Obstruction: Etiology, Morbidity and Mortality among Edo State Children, Nigeria

Osifo O. D.

*Paediatric Surgery Unit, Department of Surgery,
University of Benin Teaching Hospital, Benin City, Nigeria*

ABSTRACT: Duodenal obstruction in children is associated with poor outcome which has improved in developed but remained poor in developing countries. The objective of this study was to ascertain the etiology, morbidity, mortality and factors that contributed to poor outcome in a developing country. Retrospective analysis of pediatric duodenal obstruction treated at the University of Benin Teaching Hospital, Benin City, Nigeria, between January, 1998 and December, 2007 was carried out. Sixty-three children aged 2 days and 12 years (mean 1.5 years \pm 2.7) comprising 41 males and 22 females with male/female ratio 1.9:1 were treated. This accounted for 0.8% pediatric operations but contributed 15.3% to total pediatric surgical mortality. Congenital anomalies (atresia, webs, malrotation, complex abdominal mass and annular pancreas) were the major etiologies, while preoperative sepsis, hypoglycaemia, hypothermia, fluid/electrolytes derangement as well as post operative wound infection, burst abdomen, inanition, respiratory insufficiency, aspiration and anastomotic leakage, were the morbidities that culminated in 24 (38.1%) mortality. This was compounded by non availability of organized neonatal intensive care unit, pediatric ventilator, total parenteral nutrition and functional incubators. Majority presented as neonates delivered to low socioeconomic rural dwellers that sought medical attention late. Therefore, an extremely significant statistical difference was observed when the outcome was compared with children delivered in hospital and had prompt medical attention ($P < 0.0012$). Poor outcome was due to preventable causes and there is need to increase health awareness campaign, provision of basic pediatric surgical facilities and improvement in government policies which will allow children have access to free medical treatment

Key Words: Duodenal obstruction, Etiology, Morbidity, Mortality, Children

INTRODUCTION

Duodenal obstruction is a common cause of intestinal obstruction in children worldwide, although the exact incidence in Nigeria is not known (Chirdan et al, 2004; Escobar et al, 2004). Unlike in adults, the causes are usually benign lesions, despite the high

associated morbidity and mortality. The unfavorable outcome has been attributed to the fact that majority of affected children present during neonatal period as the causes are predominantly congenital anomalies (Ameh and Ameh, 2003; Faponle, 2004; Sowande, 2007). Also, the high incidence of associated malformations with the congenital causes and the clinical effects of upper gastrointestinal obstruction in children, especially neonates, which are poorly tolerated contribute to poor outcome. In developed countries and some sophisticated centers in Africa, advances in pediatric anaesthesia, pediatric intensive care and improvements in technology have led greatly to improved outcome of pediatric surgery including surgery on duodenal obstruction even among preterm neonates (Rowe, 1998; Lester, 2002; Osifo, 2008). However, in many parts of sub-Tropical Africa, treatment of duodenal obstruction in children continues to pose wide-ranging challenges with consequent

Manuscript received: March 2009; Accepted: August 2009

Correspondence:

E-mail: Leadekso@yahoo.com; Tel: 234-8033380188.

steady increase in the already high morbidity and mortality (Ameh and Nmadu, 2000; Chirdan et al, 2004).

Literatures (Chirdan et al, 2004; Ameh and Nmadu, 2000; Adeyemi, 1986) in this subregion on duodenal obstruction though scanty, have not reported encouraging results, particularly in rural hospitals where there is urgent need for improvement. In spite of this, factors contributing to this poor outcome in Nigeria and Edo State in particular have not been known. The importance of studies designed at improving outcome of duodenal obstruction in this subregion, therefore, cannot be overemphasized. In the immediate past decade, this center treated many children with duodenal obstruction. The aim of this research is to determine the etiology, morbidity, mortality and the factors that may have contributed to the poor outcome of treatment in order to make suggestions that may lead to improved results.

MATERIALS AND METHODS

University of Benin Teaching Hospital is a tertiary hospital located in Benin City, Edo State, in the South-South Geopolitical Zone of Nigeria. It is a referral pediatric surgical center and children are referred from primary and secondary health institutions in the state. Analysis of cases of duodenal obstruction treated at the center between January, 1998 and December, 2007 was done. The case files of the children were retrieved from medical records department and have been analyzed. Data collected were age, sex, place of birth, clinical state on presentation, diagnosis, associated anomaly, treatment, etiology (intraoperative findings), morbidity, outcome and contributory factors to poor outcome. Also, the socioeconomic status of parents, their level of education and family history were noted. One child on whom sufficient data was not available was excluded from the study.

Statistical analysis: The data obtained were analyzed using SPSS and presented as count, frequency and percentage. Continuous data were expressed as mean/standard deviation while categorical data were analyzed using Chi-square test and where necessary *p*-values less than 0.05 and greater than 0.05 were regarded as significant and non-significant respectively.

RESULTS

Sixty-three children aged 2 days and 12 years (mean 1.5 years \pm 2.7) comprising 41 males and 22 females with male/female ratio 1.9:1 were treated during the period. This accounted for 0.8% of total 8456 pediatric

operations and 6.8% of 930 gastrointestinal operations but contributed 15.3% to the 157 total pediatric surgical mortality and 22.6% of 106 mortality following gastrointestinal operations. Forty-six (70.3%) children were treated as neonates with 22 (47.8%) mortality, while all the mortality recorded were among the 56 children operated on emergency with no mortality among those operated on elective after the neonatal period ($P < 0.0001$). The etiology was mainly congenital anomaly, 59 (93.7%), ranging from duodenal atresia in 12 (19.1%) to preduodenal portal vein 1 (1.6%), while only 4 (6.3%) occurred following migration of feeding gastrostomy tube as acquired cause with no mortality (Table 1). Down's syndrome recorded in three children and polysplenia syndrome in one child, were the associated congenital anomaly but these did not influence mortality. No positive family history of duodenal obstruction was recorded, but two low socioeconomic rural dweller parents gave history of unconfirmed similar episodes of one child each who died as neonates. Although majority presented as neonates, 31 (67.4%) of the 46 neonates were delivered to low socioeconomic rural dwellers who presented very late and in poor clinical state from overwhelming sepsis, nutritional and fluid/electrolytes derangement. Most of these parents were not able to afford the initial treatment deposit as there was no free medical treatment for children during the period. Therefore, an extremely significant statistical difference was observed when mortality was compared between these neonates and those delivered in hospital that received prompt attention ($P < 0.0012$). Late presentation and financial constraints was also recorded among low socioeconomic children treated as infant but this did not influence outcome in this age group.

Except the 4 children who had gastrostomy tube migration, diagnoses were confirmed intraoperatively in 59 (93.7%) children. Plain abdominal x-rays and ultrasound scan showed features of duodenal obstruction in all, but the exact causes of the obstruction were known at laparotomy because there was non availability of sophisticated facilities to diagnose the causes preoperatively. Treatment of duodenal obstruction was associated with unacceptably high morbidity, many of which were preventable complications (Table 2). Surgical options were based on the lesions and included the classical diamond duodenoduodenostomy, duodenoplasty, duodenotomy with excision of mucosal webs and retrieval of migrated feeding gastrostomy tubes. Of the 46 neonates delivered outside the hospital, 41 (61.5%) had fluid/electrolytes derangement with 17 (27.0%) in hypovolemic shock on arrival. Although this was protracted, they responded to active resuscitation.

Duodenal obstruction in children

Fluid/electrolytes problems were not encountered among children that presented after neonatal period because their obstructions were partial with recurrent episodes of colicky abdominal pains. Moreover, majority of the neonates (35) required more than three weeks to achieve adequate bowels functions after operation which necessitated total parental nutrition and all (46) needed to be nursed in a thermo-neutral environment, while others (15) needed respiratory support. These were however not feasible as total parenteral nutrition was not available and neonatal surgical intensive care unit was poorly organized with no functional pediatric ventilator and incubator during the period. Therefore, affected neonates were managed with dextrose water, electrolytes and multivitamins and were all nursed in an open pediatric surgical ward with respiratory support and warmth provided using ambu-bag and warm water packs when necessary. They subsequently developed progressive weight loss,

hypothermia, hypotonia, lethargy and weak respiratory efforts which progressed to mortality. Delayed presentation also resulted in overwhelming sepsis that did not respond to available antibiotics resulting in endotoxic shock and mortality. Also, wound infections was high, 3 children developed incisional hernias after the wound had healed, but 4 children that developed burst abdomen as well as the 2 that had anastomotic leakage succumbed within a week after operation. Two intraoperative deaths following aspiration during difficult intubation in children with distended stomach were recorded and this was responsible for the mortality recorded among those operated on emergency after neonatal period. Overall, 43 (62.3%) morbidity and 24 (38.1%) mortality were recorded which were mainly among neonates operated on emergency and no long term complications was recorded among those that survived.

Table 1:
Etiology of duodenal obstruction

Aetiology	Number (%)	Mean age	Morbidity	Mortality
Duodena atresia	12 (19.1)	8 days \pm 1.4	12	7
Malrotation	11 (17.5)	2.1 years \pm 3.5	7	6
Ladd's bands	8 (12.7)	1.2 years \pm 0.5	4	1
Mucosal web	8 (12.7)	22 days \pm 2.1	3	0
Complex abdominal mass	7 (11.1)	6 days \pm 4.8	7	7
Duodenal stenosis	5 (7.9)	15 days \pm 0.2	5	2
Annular pancreas	5 (7.9)	15 days \pm 0.2	5	1
Gastrostomy feeding tube migration	4 (6.3)	3 years \pm 0.5	0	0
Duodenal duplication cyst	1 (1.6)	2.5 months	0	0
Pancreatic cysts	1 (1.6)	12 years	0	0
Predoduodenal portal vein	1 (1.6)	5 months	0	0
Total	63 (100)	-	43 (62.3%)	24 (38.1%)

The Frequency/percentage of etiologies of duodenal obstruction, mean age/standard deviation at presentation, morbidities and mortalities among Edo State children (n=63) in ten years.

Table 2:
Morbidity from duodenal obstruction

Morbidity	Frequency	Percentage	Outcome
Fluid/electrolytes	41	65.1	Protracted but corrected
Nutritional problems/hypothermia	35	55.6	10 died from inanition
Sepsis	34	54.0	6 died from endotoxic shock
Pre/post operative aspirations	15	23.8	2 intraoperative deaths
Wound infection	10	15.9	Healed on dressing, 3 incisional hernias
Burst abdomen	4	6.3	All died
Associated congenital anomaly	4	6.3	All survived, referred to paediatricians
Anastomotic leakage	2	3.2	All died
Persistent post operative vomiting	1	1.6	Resolved on follow-up

Relative frequency of morbidities consequent on duodenal obstruction and the outcome among Edo State children (n=63) treated in ten years.

DISCUSSION

Although duodenal obstruction accounted for a very small percentage of total pediatric operations during the period, it contributed significantly to the overall pediatric surgical morbidity and mortality. These tally with earlier reports in this subregion but at variance with reports in more sophisticated centers [Chirdan et al, 2004; Escobar et al, 2004; Ameh and Nmadu, 2000; Adeyemi, 1986; Ozturk et al, 2007]. Of the 63 children treated, 43 (62.3%) morbidity and 24 (38.1%) mortality were recorded mainly among the children that presented as neonates and were operated on emergency; because majority of the causes were congenital anomaly as reported by previous workers [Escobar et al, 2004; Rowe, 1998; Adeyemi, 1986]. Moreover, majority of the neonates were delivered to low socioeconomic rural dwellers who sought medical attention late. The neonates were in poor clinical states which required active resuscitation and the parents had difficulty in affording the cost of treatment. Therefore, an extremely significant statistical difference was observed when the outcome was compared with children delivered in hospital and had prompt medical attention and this agrees with previous reports (Ameh and Ameh, 2003; Faponle, 2004; Osifo, 2008).

In spite of the predominant congenital lesions as a cause of duodenal obstruction, the mean age at presentation in this study was 1.5 years \pm 2.7 which is a reflection of the level of awareness in this subregion, because except there was absolute intestinal obstruction, medical attention was not sought and this significantly affected the outcome. Therefore, children with duodenal atresia, duodenal webs/diaphragm, annular pancreas and acute volvulus following malrotation were the major groups that presented as neonates while others with partial or recurrent intestinal obstruction presented at varying periods (Mordehai et al, 2002; Pathak and Sarin, 2006; Doletskii et al, 1994). Nevertheless, associated congenital malformations recorded in 4 (6.3%) which was mainly Down's syndrome, 3 (4.8%), were sporadic with no identified familial predisposition and this corresponds with other reports [Rowe, 1998; Ozturk et al, 2007; Al-Salam, 2007], but the associated congenital anomalies did not influence mortality contrary to findings in previous studies (Akel et al, 1998; Gluer et al, 2002; Zhang et al, 2005).

Preoperative morbidity due to late presentation contributed significantly to the poor outcome because of the consequential fluid/electrolytes, blood glucose and temperature derangement as well as allowing overwhelming resistant sepsis to become established

(Ameh and Ameh, 2003; Faponle, 2004). This was compounded by the poorly organized neonatal surgical intensive care units, non availability of functional incubators and financial constraints. The neonates were more affected than older children as previous workers in this subregion also reported (Ameh and Ameh, 2003; Faponle, 2004; Sowande, 2007; Osifo, 2008). These inappropriately optimized children did poorly post operatively and responded violently to the stress of surgery. Inability to confirm the exact cause of duodenal obstruction preoperatively due to the non availability/affordability of sophisticated diagnostic facilities contributed to the rush in operating on poorly prepared children since the suspicion of volvulus with complete bowels gangrene which has hundred percent mortality in our setting was high. Many had poor respiratory functions before and after surgery following aspiration with two intraoperative deaths. Those that required ventilatory supports were manually ventilated due to non availability of pediatric ventilator and this worsened the pulmonary status as also reported by others (Ameh and Ameh, 2003; Faponle, 2004; Sowande, 2007). Moreover, children who presented late with sepsis and had compromise of their clinical states had more incidences of wound infection, burst abdomen, protracted fluid and electrolytes problems and inanition. These were compounded by the non availability of total parenteral nutrition and facilities required for adequate neonatal surgery during the period. Even among neonates with adequate bowel length, satisfactory bowel functions were not achieved for up to three weeks after surgery. Therefore, managing them with dextrose water, electrolytes, multivitamins, ambu-bagging and nursing them in an open ward were inadequate and these resulted in majority of them developing progressive weight loss, hypothermia, hypotonia, lethargy and weak respiratory efforts culminating in mortality (Chistensen et al, 2002; Suri, 2003; Wades 2003; Spigland and Yazbeck, 1990). The older children had less morbidity after operation and nutritional problems were easier to manage and this partly explains while more mortality was recorded among the neonates.

In conclusion, the treatment of duodenal obstruction was associated with unacceptably high morbidity/mortality and it contributed significantly to the overall pediatric surgical mortality even though it accounted for a small fraction of pediatric operations in this hospital during the period. The lesions were mainly congenital anomalies with many children presenting as neonates who tolerated duodenal obstruction poorly. These were compounded by delayed presentation, lack of nutritional support, poorly equipped pediatric

intensive care units, lack of awareness/financial constraints of the rural dwellers, exposure to high risk infections and non availability of free medical services to children. Early presentation to hospital, provision of basic facilities needed to manage children who require surgery particularly pediatric ventilators, total parenteral nutrition, functional intensive care units with monitors and adequate resuscitation before surgery are necessary. Improved health awareness campaign as well as improvement in government policies which will allow children have access to free medical treatment should be adopted. There is need for international collaboration and more researches to improve outcome of treatment of duodenal obstruction in this subregion.

REFERENCES

- Chirdan LB, Uba AF, Pam SD (2004).** Intestinal atresia: management problems in a developing country. *Pediatr Surg Int*; 20: 834-837.
- Escobar MA, Ladd AP, Grosfeld JL et al. (2004).** Duodenal atresia and stenosis: long-term follow-up over 30 years. *J Pediatr Surg*; 29: 867-871.
- Ameh EA, Ameh N. (2004).** Providing safe surgery for neonates in sub-Saharan Africa. *Trop Doct* ; 33: 145-147.
- Sowande OA, Ogundoyin OO, Adejuyingbe O (2007).** Pattern and factors affecting management outcome of neonatal emergency surgery in Ile-Ife, Nigeria. *Surg Pract*; 11: 71-75.
- Faponle AF, Sowande OA, Adejuyingbe O (2004).** Anaesthesia for neonatal surgical emergencies in a semi-urban hospital in Nigeria. *East Afr Med J* 2004; 81: 568-573.
- Rowe MI (1998).** The newborn as a surgical patient. In: O'Neill JA, Rowe MI, Grosfeld JL, Fonkalsrud EW, Coran AG Ed. *Pediatric Surgery*. 5th ed. Philadelphia: Mosby year book Inc, 1998; pp 43-55.
- Lester DA (2002):.** Development of a neonatal intensive care unit in Uganda, Africa. *J Perinat Neonatal Nurs* 2002; 16: 84-92.
- Osifo OD, Oriaifo IA (2008):** Pattern and factors affecting management outcome of neonatal surgery in Benin City, Nigeria. *Eur J Pediatr Surg* 2008; In press.
- Ameh EA, Nmadu PT (2000).** Intestinal atresia and stenosis: a retrospective analysis of presentation, morbidity, and mortality in Zaria, Nigeria. *West Afr J Med* 2000; 19: 39-42.
- Adeyemi SD (1986).** Duodenal obstruction in Nigerian newborns and infants. *Scan J Gastroenterol* 1986; 124: 157-161.
- Ozturk H, Ozurt H, Gedik S, Duran H, Onen A. A (2007):** comprehensive analysis of 51 neonates with congenital intestinal atresia. *Saudi Med J* 2007; 28: 1050-1054.
- Mordehai J, Cohen Z, Kurzbart E, Mares AJ. (2002):** Preduodenal portal vein causing duodenal obstruction associated with situs inversus, intestinal malrotation, and polysplenia: a case report. *J Pediatr Surg* 2002; 37 (4): E5.
- Pathak D, Sarin YK. (2006)** Congenital duodenal obstruction due to a preduodenal portal vein. *Indian J Pediatr* 2006; 73: 423-425.
- Doletskii SI, Arapova AV, Zagudaev SA, Reznikova AE (1994).** Duodenal atresia. *Khirurgiia* 1994; 8 25-27.
- Al-Salam AH (2007):.** Congenital pyloric atresia and associated anomalies. *Pediatr Surg Int* 2007; 23: 559-563.
- Akel S, Halabi J, Shawis R (1998):** Abdominal situs Inversus with congenital duodenal stenosis: rare association. *Eur J Pediatr Surg* 1998; 8: 55-57.
- Zhang Q, Chen Y, Hou D, Guo W. An (2005):** Analysis of post operative reoperation for congenital duodenal obstruction. *Asian J Surg* 2005; 28: 38-40.
- Gluer S, Petersen C, Ure BM (2002):.** Simultaneous correction of duodenal atresia due to annular pancreas and malrotation by laparoscopy. *Eur J Pediatr Surg* 2002; 12: 423-425.
- Chistensen AE, Ovist N, Husby S (2002)** Prolong parenteral nutrition after neonatal gastrointestinal surgery. *Dan Med Bull* 2002; 244-247.
- Suri S. (2003):** Early post operative feeding and outcome in neonates. *Nutrition* 2003; 18: 380- 382.
- Wades S (2003).** The importance of high-level training for nutrition scientist in sub-Saharan Africa. *Forum Nutr* 2003; 56: 136-138.
- Spigland N, Yazbeck S (1990):** Complications associated with surgical treatment of congenital intrinsic duodenal obstruction. *J Pediatr Surg* 1990; 25: 1127-1130
- Kimura K, Mukohara N, Nishijima E, Muraji T, Tsugawa C, Matsumoto Y. (1990):** Diamond-shaped anastomosis for duodenal atresia: an experience with 44 patients over 15 years. *J Pediatr Surg*; 25: 977-979.