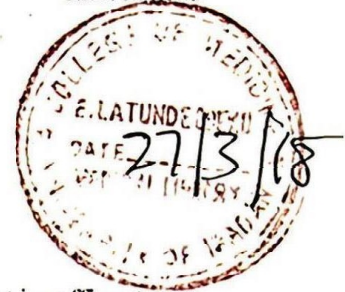


Neonatal surgery in Sub Saharan Africa: challenges and solutions

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Abstract

Background: The last two decades have witnessed a gradual attempt at solving the manpower problems facing neonatal surgical care in many parts of Sub-Saharan Africa (SSA). Unfortunately this has not translated to a reduction in the very high morbidity and mortality facing neonatal surgical care as there are other challenges bedeviling the practice of neonatal surgery in the region.

Purpose: This review examined these challenges which include poor obstetric care leading to late presentation, lack of appropriate equipment and facilities, poor funding and lack of awareness about availability of neonatal surgical services as well as proffer solutions to overcome the challenges in order to minimize the high morbidity and mortality.

Conclusion: Adequate funding should be provided by the government and other funding agencies for proper training of professionals involved in the care of the surgical neonate, provision of requisite equipment and facilities, good obstetric care and advocacy to improve awareness as well as encourage early presentation.

Keywords: *Surgical neonate, care, challenges, Sub Saharan Africa, mortality*

Résumé

Contexte: Les deux dernières décennies ont été témoins d'une tentative progressive à résoudre les problèmes de main-d'œuvre rencontrés dans les soins chirurgicaux néonataux dans de nombreuses régions de l'Afrique subsaharienne (ASS).

Malheureusement, cela ne s'est pas traduit à une réduction de morbidité et de mortalité très élevées auxquelles sont confrontés les soins chirurgicaux néonataux, vu qu'il existe d'autres défis qui endommagent la pratique de la chirurgie néonatale dans la région.

Objectif: Cette revue a examiné ces défis qui incluent des soins obstétricaux pitoyables conduisant à une présentation tardive, un manque de matériel et de

facilités appropriés, un financement insuffisant et un manque de sensibilisation à la disponibilité des services chirurgicaux néonataux ainsi que des solutions proposées pour surmonter les défis afin de minimiser la morbidité et la mortalité élevée.

Conclusion: Un financement adéquat devrait être fourni par le gouvernement et autres agences de financement pour la formation appropriée des professionnels impliqués dans le soin chirurgical des nouveau-nés, la fourniture d'équipements et de facilités nécessaires, de bons soins obstétricaux et défense pour améliorer la sensibilisation et encourager une présentation précoc.

Mots-clés: *Chirurgie néonatale, soins, défis, Afrique subsaharienne, mortalité*

Introduction

The understanding of the fact that "children are not small adults" has impacted on the care of children with surgical problems with consequent improvement in their survival. The consequences of paediatric surgical conditions may be life long since they affect children at critical times during development. Thus, they present with lifelong burden both in human and financial terms [1,2]. Among children, neonates develop distinct surgical conditions, present unique anaesthetic challenges and have special perioperative needs that may interfere with their survival [1]. The recognition of these challenges and significant advances in neonatal surgical care have resulted in improved survival with children that had many types of congenital malformations that were once considered lethal and incompatible with life are now living normally [1,3].

In the developed world, improvement in obstetric care, neonatal anaesthesia, well organized neonatal intensive care unit, surgical techniques, availability of facilities for perinatal support, perinatal pathological diagnoses and appropriate management of associated abnormalities have all contributed to improved survival of the surgical neonate [3-5]. Interhospital transfer, a current practice in neonatal surgical care in the developed countries is often hazardous and may result in the clinical deterioration of critically ill neonates. This has

necessitated the development of transport medicine as a subspecialty by neonatologists, anaesthetists and intensivists in order to reduce the mortality associated with transfer of these neonates [6,7].

There are still major gaps in the surgical care of children in developing countries and indeed sub-Saharan Africa (SSA). The care is often regarded as too expensive and, as such, unnecessary [1]. The outcome of neonatal surgery is still very poor [6,8,9] with unacceptably high morbidity and mortality rates as up to 98% of all neonatal deaths worldwide occur in the developing countries and this is not unconnected with poor interhospital transfer, delay in making diagnosis, exclusion of paediatric surgery from most child health programmes in these countries and defective healthcare financing system.

This article seeks to highlight the challenges of neonatal surgery and examines the various solutions that have been put in place to overcome the various challenges towards providing a well-established paediatric surgical care in SSA.

Burden of the disease

The burden of surgical disease in children in many parts of SSA is unknown and this is worse in the newborns. Population based research and publications are scarce in addition to non-availability of proper epidemiological data and absence of birth defects registry that will provide information on these diseases. The available records are mostly hospital-based which sometimes may not be reliable consequently, this has negatively affected adequate planning and delivery of neonatal surgical services in most SSA countries. Also, the paucity of epidemiological studies on the prevalence of congenital malformations in addition to absence of birth defect registry in these countries often make the job of convincing the government, non-governmental organisations and other stakeholders to provide adequate funding for the care of these neonates a herculean task [8,10,11]. Congenital anomalies account for the majority of the diseases encountered in neonatal surgical practice the management of which is often problematic especially in emergency settings [1,6,12,13]. Of the congenital anomalies, gastrointestinal anomalies causing acute intestinal obstruction account for the majority of the problems in the emergency setting, the management of which is challenging. Sowande *et al* [13] in a 10 year review of the pattern of neonatal emergencies observed that 89% of cases were due to gastrointestinal anomalies. Over the same period, a similar study from northern part of Nigeria [4]

reported that gastrointestinal anomalies accounted for over 50% of cases.

Problems of neonatal surgical care

Neonatal surgical care in SSA is still highly challenging, problematic and associated with high morbidity and mortality. For example, in Nigeria the reported mortality varies between 30.5% and 53.6% [6, 12-14] whereas this has decreased to about 5% in high income countries [15]. This has been due largely to improvements in anaesthesia and neonatal intensive care, advances in technology and availability of more paediatric surgeons [8].

Obstetric issues and late referral

Antenatal or prenatal diagnosis is important and key to reducing morbidity and mortality in neonatal surgery. However, prenatal diagnostic services are restricted to a few centres in most parts of SSA. Ultrasonography is most commonly used in making prenatal diagnosis and the diagnoses are mostly incidental findings during routine ultrasound scanning of pregnant women.

Studies showed that 75%-95% of neonates with congenital anomalies were delivered at home and these are sometimes supervised by traditional birth attendants who may not be able to recognize the congenital anomalies and when they are able to recognize them, they may not be able to appreciate the urgency involved in early referral [12,16]. Also, they are not competent enough to give the initial treatment needed by the patients as they may even be too scared by the sight of the anomaly. Such neonates may develop sepsis, electrolyte and metabolic problems which become worsened by poor transportation to the nearest surgical centre. Similarly, when they are delivered in the hospital, the initial resuscitation and management more often than not are inadequate before they are referred and transported in suboptimal conditions over bad roads to the specialist centres. The problem of late presentation is often made worse by the fact that families have to pay out of pocket to cater for them as the current health insurance policy in the country does not cover the management of congenital malformations and health care delivery services is not free even for children. The consequence of these is that majority of the neonates have developed hypothermia, hypoglycaemia, sepsis and haemodynamic instability. Incidences of complex anomalies requiring more specialized treatment in paediatric surgery centres have been reported to be lower than expected, consequently, most surgical neonates born in Africa and other developing countries of the world may not have access to surgical care [17].

Poor and inadequate facilities

In Nigeria, paediatric surgery specialty has evolved rapidly over the last two decades with the numbers of specialized centres increasing rapidly in all the geopolitical zones of the country. In other parts of SSA, the specialized centres are fewer due to lack of funds consequently most countries depend on foreign aids from high income countries and missionary hospitals who also supply manpower. Unfortunately, the centres have been predominantly located in the major cities, they are poorly funded, ill equipped with no dedicated neonatal intensive care unit. These hospitals were established principally to cater for adult patients even though various governments at the state and national levels have recently tried unsuccessfully to establish Children's hospital to cater for the health needs of the children, this has not enjoyed the goodwill of the people in government as they tend to lose focus and turn these hospitals to another of the various hospitals taking care of adults [16].

Neonates with surgical problems are often nursed in uncontrolled environments in most centres in the country because of non-availability of Neonatal intensive care unit (NICU) and its basic facilities like incubators, monitoring equipment, mechanical ventilators for neonates and facilities for parenteral nutrition. The consequence of this is that the requisite ventilatory support and cardiopulmonary monitoring often required postoperatively following neonatal surgery in some clinical conditions like oesophageal atresia and anterior abdominal wall defect are usually not available as these children are often nursed in adult intensive care units with inappropriate equipment. Also, neonatal surgical procedures are made difficult and inept with prolongation of the operating time because paediatric surgeons in most of these centres are made to use inappropriate and improvised instruments that are unduly big on these relatively small sized surgical neonates [8].

Anaesthetic challenges

The peculiar anatomic, physiologic and pharmacologic features of the neonate pose serious challenges to providing safe anaesthesia for the neonates. This is made worse by the fact that they tend to present with life threatening anomalies that often require emergency surgery [18]. Additionally, prematurity a commonly encountered condition among the neonates may predispose them to hypoglycaemia, hypothermia, bleeding problems and frequent apnoeic attacks requiring special attention to the airway perioperatively. The care of these requires special knowledge and great skills for

successful surgical outcome. Gaining vascular access is often difficult in the neonate requiring establishment of arterial and central venous cannulation which require special skills. Unfortunately, these are not performed regularly in most centres in SSA and Nigeria because of non-availability of materials to carry out the procedure.

Consequently, most anaesthetists do not have this skill because of lack of opportunity and infrequency of practice. The relatively large head in relation to the rest of the baby's body, the presence of high hanging epiglottis and the presence of cranio-facial abnormalities may cause difficult or failed intubation in the neonate even in the hands of experienced anaesthetists [19]. Regional anaesthetic techniques such as caudal anaesthesia which can be used to provide intra-operative as well as postoperative analgesia are not practiced widely. This is due to lack of experience and the frequent shortages of local anaesthetic drugs. This situation means that the anaesthetists and the trainees do not acquire these necessary skills [19].

Trained anaesthetists are in short supply in SSA, and worse still, those with training, experience, and interest in neonatal/paediatric anaesthesia are very few [20]. General anaesthesia for the sick newborn is often turbulent, prolonged, and practiced in a state of lack of appropriate anaesthetic equipment, inappropriate drugs, and by inexperienced non-physician anaesthetists in most centres in Africa. Hence, most of these neonates fail to recover adequately or end up with brain damage from prolonged hypoxia [11].

Shortage of manpower

Chirdan *et al* [11] observed that there is acute shortage of health manpower all over Africa with SSA being the worst hit. This shortage cuts across all cadres of health workers. The total care of the surgical neonate requires input and support from the paediatric surgeon, neonatologist, the neonatal anaesthetist and the neonatal intensivists. These specialists are not readily available in most centres for consultation and participation in the team approach to the management of these neonates [19]. The paediatric surgical manpower need has been calculated for some African countries, which showed serious deficit in most of these countries, and in one center, there was only one paediatric surgeon to a population of more than 13 million people [21]. For instance, Amponsah in 2010, reported that there were only seven paediatric surgeons in Ghana with a population of over 20 million [19] whereas a ratio of one paediatric surgeon per 2.2 million population

was reported in Nigeria in 2006 [22]. This is a clear improvement in the earlier report from Nigeria in which there were only 26 paediatric surgeons to a population of about 120 million people [8]. Some other African countries have fewer or none. Similarly, there is dearth of anaesthetists in most countries in SSA and most anaesthetics are provided by non-physicians, sometimes under the direct supervision of the surgeon [23]. Also, the few paediatric surgeons available are located in tertiary hospitals and many neonates with surgical problems are treated by general surgeons, or worse still, general duty doctors or 'quacks' without the support of skilled and experienced anaesthetist in referral and other peripheral centres [8,19]. The consequence of this inadequate health manpower is an unduly high postoperative morbidity and mortality observed in the surgical management of the neonate in these countries.

Inadequate documentation and research/ Lack of Awareness

The awareness level of neonatal surgical problems is generally low. This low awareness may be attributed to lack of adequate information about the epidemiology of congenital malformations and other neonatal surgical problems in the region. This gives an erroneous impression that neonatal surgical problems are not common and significant enough as a public health problem. Thus, the funding agencies and the government do not pay adequate attention and support for neonatal surgical management and research. A typical situation is the exclusion of congenital malformations as one of the diseases that most health insurance organizations treat in Nigeria.

Lack of awareness of the care of neonatal surgical problems may also be responsible for delayed presentation in the hospital and high rate of infanticide in the region [1]. Culturally, the presence of any anomaly leads to neglect and rejection by the mother and family members and sometimes the traditional birth attendant. The baby may be left unprotected and not fed leading to hypothermia and hypoglycaemia on arrival at the health facility. This is done hoping that the baby may die. Outright infanticide may be practiced. It is however known that many of the neonates with congenital anomaly, who were once thought to be incompatible with life, are now living normally [1,19].

Tackling the challenges

Although, neonatal surgical care in Africa is bedeviled by very high morbidity and mortality, the responsibility of reducing them is beyond the paediatric surgeons alone as everybody involved in

the care of the surgical neonate, the community, the government and all the funding agencies must be prepared to provide workable solutions towards reducing the mortality as most of them are preventable.

Obstetrics issues and early referral

Prenatal diagnosis ensures that antenatal care is well supervised and adequate plans made to deliver babies with congenital anomalies including in utero transfer to the nearest surgical centre where specialized services will be rendered. Prenatal diagnostic centres should be established where other diagnostic services in addition to ultrasonography can be done for early diagnosis of congenital anomalies and in utero transfer of such babies when indicated to obstetric centre nearest to the paediatric surgical centre. It also ensures proper planning of delivery of the baby in order to reduce the morbidity and mortality associated with neonatal surgery. Hospital delivery should be encouraged in order to reduce the number of babies born at home with congenital anomalies as this will ensure early presentation in the hospital. The traditional birth attendants in the health centres, mission houses and homes should be trained adequately to empower them to be able to provide initial management like minimal resuscitation for the neonates immediately after birth, recognize congenital malformations when they are present and refer them early to hospitals with facilities to cater for neonatal surgical diseases. This will reduce the high morbidity and mortality associated with neonatal surgical care.

Efforts should be made to provide good road networks and repair bad roads linking the peripheral areas to the referral hospitals while well-equipped ambulance services should also be provided to transport these babies over long distances in order to prevent the neonates from developing the metabolic and cardiopulmonary instability they are often prone to.

Provision of equipment and facilities

Appropriately sized surgical instruments is key to successful outcome of neonatal surgical procedures as the use of fine instruments would give less tissue destruction, allow for precision during surgical procedures, reduce perioperative blood loss and enhance wound healing with consequent reduction in morbidity and mortality of these procedures. Therefore, the provision of appropriately sized surgical instruments, equipment and other relevant facilities will enhance neonatal surgical care.

Neonatal intensive care is critical to survival of the ill neonate and the provision of well-equipped

NICU with trained staff is mandatory for improved morbidity and mortality rate of neonatal surgery. Neonatal intensive care units are non-existent in most hospitals in Africa because they are very expensive to maintain. Where they exist, running the facilities efficiently is constrained by shortage of personnel, essential drugs and non-drug consumables. These constraints make the running of these units far from satisfactory [19]. The absence [24,25] or poor neonatal intensive care [4] facilities is a contributing factor to the poor outcome. Therefore, the establishment of NICU can be regionalized for effective utilization of resources and for easy collation of data necessary for the purpose of research. Hospitals dedicated to the care of children can also be established with good compliment of adequately staffed and well equipped NICU to enhance the perioperative management of these neonates.

Provision of safe anaesthesia

Anaesthetists should be encouraged to take up interest in paediatric anaesthesia and general duty doctors to take up anaesthesia as a career by giving them incentives [8,11]. This will improve their knowledge of the anatomical, physiological and pharmacological make-up of the surgical neonate thus enhancing improved neonatal anaesthetic services. They should also be exposed to the use of regional anaesthesia on the surgical neonate because of its advantage of providing effective perioperative analgesia that precludes respiratory depressant effect and to also reduce the incidence of anaesthesia related problems often associated with general anaesthesia.

Adequate analgesia is essential to the outcome of neonatal surgical procedures and it has been suggested that the appropriate use of correct doses of opioids together with multimodal approaches such as rectal paracetamol and wound infiltration with local anaesthetic agents such as bupivacaine would give better quality analgesia in the neonate without respiratory depression [19].

Training of relevant personnel

The training and retraining of paediatric surgeons should be encouraged and neonatal surgery training should form a major portion of the paediatric surgical curriculum in order to improve the outcome of neonatal surgical care. Apart from ensuring adequate exposure to paediatric surgery during general surgical training, general surgeons can also be made to undergo short training or courses in paediatric surgery in order to take care of minor to moderate neonatal surgical problems while the major ones can

be referred to the tertiary centres for paediatric surgeons to handle [11]. Similarly, efforts should be made to train other specialists like the neonatologist, neonatal intensivist and neonatal nurses who will support the paediatric surgeon. They should also be made to go for periodic workshops and retraining in order to improve outcome.

Increasing awareness and research

The host communities should be informed through public enlightenment campaign on the availability of paediatric surgical services in their respective hospitals. The hospitals can achieve this by sponsoring talks and interviews in both prints and electronic media to educate the members of the public that neonatal surgical problems which they hitherto thought cannot be treated can be treated if they come to the hospital, sensitize them about the availability of paediatric surgery service in the hospital and the need to come early for treatment.

There are a few published reports on various aspects of neonatal surgery from SSA. To improve this, paediatric surgeons have a duty to generate/spawn awareness about the availability and problems of neonatal surgical services in the region through regular publication of their experiences in relevant journals and through presentations of their experiences at symposia and meetings of the various associations of paediatric surgery in SSA [8]. It is also important for these associations to work together with the various paediatric associations to formulate policies in the various aspects of the management of medical and surgical problems of the neonate for the government and other stakeholders to work with while providing funds for their care.

Adequate healthcare financing and proper planning

The provision of neonatal surgical services is expensive. The regular maintenance of the facilities required to cater for the neonates is capital intensive and often beyond the reach of most SSA countries. Therefore, adequate awareness about the epidemiology of neonatal surgical health problems would assist the government to provide adequate funds for the care of the surgical neonate, plan properly on the effective utilization of the funds made available and formulate appropriate policies that would improve the outcome of care. It will also provide a platform for non-governmental organisations and other donor agencies to examine the various areas where they can function and provide funds to assist in the management of the surgical neonate. For example, the last two decades

have witnessed entrance of the Smile Train foundation into Nigeria and they have been providing free surgical care for neonates and infants with cleft lip and palate in the country and other parts of Africa. The government should also establish well-staffed Children's hospitals that are adequately equipped in the various regions of the country in order to concentrate the care of the neonate and use available resources judiciously to obtain a very good outcome of care. This will also improve data collection method and research output for proper planning and policy formulation.

Conclusion

Neonatal surgery is a highly specialized service. Improving the economy, public health, sanitation and provision of social amenities like electricity and good roads are fundamental to improving child health generally and neonatal health in particular. The quality of neonatal surgical services is a measure of the quality of paediatric surgical services provided in any centre [8,11]. In reducing the neonatal surgical morbidity and mortality, there should be increase in the number of paediatric surgeons and other professionals needed to achieve good outcome. These professionals should be involved in health advocacy and enlightenment of the members of the public on the need to shun harmful cultural beliefs and practices and present early to the hospital for better outcome. The government should embark on appropriate allocation of resources with proper accountability for effective use. The NGOs, funding organisations and donor agencies should also be encouraged to assist in providing funds, facilities and equipment for the care of the surgical neonate. They should also assist in advocacy and provision of training updates or retraining programmes for professionals whose clinical practices converge on the critically ill surgical neonate.

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