Gastroschisis in Neonates: How Disparities Between France and Ivory Coast can Drive Care Improvements

Thierry Tumameu Kouam [1,2], Kokoé Midékor Gonébo[1], Pauline Lopez[1], Alexis Belgacem[1], Laure Ponthier [1], Yapi Landry Ake [2], Ello Nicolas Moh[2], Laurent Fourcade [1], Quentin Ballouhey[1]

[1]Paediatric Surgery Department, Limoges University Hospital, [2]Paediatric Surgery Department, University Hospital Cocody-Abidjan

Abstract

Background: Gastroschisis is a rare congenital condition that is typically diagnosed antenatally in developed countries. However, in resource-limited settings, it remains a significant therapeutic challenge. Mortality rate in sub-Saharan Africa is alarmingly high, ranging from 69.8 to 95%, compared to 2%–8% in high-income countries. **Objective:** This study aimed to identify disparities in the diagnosis and management of gastroschisis between low- and high-income countries to propose strategies for improving global outcomes. **Material and Methods:** We conducted a retrospective, observational, two-centre study at the University Hospital Centres of Cocody (Abidjan, Ivory Coast) and Limoges (France). The study included 34 neonates from Cocody and 19 from Limoges, treated between January 2012 and June 2023. **Results:** In Cocody, only 8.8% of cases were diagnosed prenatally, all deliveries occurred in peripheral centres, and 70.6% of neonates were transferred within 24 hours. Bowel reintegration was performed in a single stage in 38.2% of cases and in a two-stage procedure in 41.2%. In contrast, all cases in Limoges were diagnosed antenatally, deliveries took place within the hospital, and bowel reintegration occurred within 60 minutes of birth—either in one stage (78.9%) or two stages (21.1%). Mortality by day 28 was 94.1% in the Cocody cohort compared to 10.5% in Limoges. **Conclusion:** The key factors contributing to high mortality in resource-limited settings include a low antenatal diagnosis rate, leading to a high proportion of deliveries in peripheral centres and delays in surgical intervention. Additionally, the lack of paediatric intensive care units may have further increased mortality in complex cases.

Keywords: Gastroschisis, Prognosis, Developing countries, Abdominal wall defect

Introduction

Gastroschisis is a congenital paraumbilical abdominal wall defect that can be detected as early as the 12th week of gestation during routine prenatal screening in developed countries.[1] It occurs in approximately four per 10,000 live births[2] and is classified as either simple or complex. The simple form involves the extrusion of the small bowel or colon without additional gastrointestinal abnormalities, while the complex form is characterised by associated intestinal complications, including necrosis, perforation, atresia, and volvulus.[3] These complications significantly increase both short-term morbidity and mortality. Management of gastroschisis requires timely reintegration of the bowel and progressive parenteral nutrition support throughout the neonatal period, typically within a neonatal intensive care unit. While bowel reintegration with sutureless closure may be feasible in certain cases prior to referral, the optimal management strategy is often provided in a facility with specialised expertise.[4,5] This ensures accurate differentiation between simple and complex gastroschisis, enables appropriate surgical intervention when needed, and supports the early initiation of parenteral nutrition in the first days of life. The incidence of gastroschisis appears to be increasing globally,[6] with notable differences in prognosis based on geographical location.[7] Mortality rates in sub-Saharan African countries are high, ranging from 69.8 to 95%, in contrast to the 2% to 8% reported in high-income countries.[8-12] The challenges in diagnosis and treatment are more pronounced in resource-limited settings, highlighting the significant disparity in outcomes between different regions.[7]

Address for correspondence: Quentin Ballouhey
Pediatric Surgery Department, Limoges University Hospital
8 Avenue Dominique Larrey, 87044 Limoges Cedex, France
Email: q.ballouhey@gmail.com

Resubmitted after revision: 02-09-2026 **Accepted:** 10-10-2026 **Available Online:** 07-11-2026

Access this article online

Quick Response Code:

Website: https://www.afrjpaedsurg.com

DOI: https://doi.org/10.67481/ajps.v23i2.1317

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: editor@afrjpaedsurg.com

How to cite this article: Tumameu KHT, Gonébo MKA, Lopez P, Belgacem A, Ponthier L, Ake YL, *et al*. Gastroschisis in Neonates: How Disparities Between France and Ivory Coast can Drive Care Improvements. Afr J Paediatr Surg 2026;23(2):94-100. https://doi.org/10.67481/ajps.v23i2.1317

In light of these disparities, this study aims to compare the management and prognosis of gastroschisis through a retrospective analysis of two distinct populations in Côte d'Ivoire and France.
The goal is to identify disparities in diagnostic and therapeutic practices and to propose improvements in care that could reduce mortality in sub-Saharan Africa.

Materials and Methods

This was a retrospective, observational, two-centre study conducted in the paediatric surgery departments of Cocody (Abidjan, Ivory Coast) and Limoges (France).

Population

The study included all newborns with gastroschisis referred to the paediatric surgical centres in Abidjan and Limoges between January 2012 and June 2024, regardless of whether they had a prenatal diagnosis. Both surgically managed and non-surgically managed cases were included in the analysis.

Data Collection and Analysis

Data were collected using a survey sheet that included information on antenatal factors (such as the quality of pregnancy monitoring, ultrasound findings, and exposure to tobacco or alcohol during pregnancy), perinatal factors (including delivery conditions, gestational age, macroscopic features of gastroschisis, and classification according to Lefort and Borde),[13] therapeutic aspects (e.g., primary or secondary bowel reintegration, ileostomy or colostomy), and progressive factors (morbidity and survival outcomes). All data were retrospectively gathered from obstetric and paediatric records following approval by the Ethics Committee of the Limoges University Hospital Centre (registration number 38-2023-05).

Statistical Methodology

Statistical analyses were performed using Microsoft Prism 5 software (GraphPad Software, San Diego, California, USA). All tests were two-sided, and a p-value ≤ 0.05 was considered statistically significant. Descriptive statistics for patient characteristics were reported as percentages for qualitative variables and as means ± standard deviation for continuous variables. Quantitative data were compared using a paired t-test and Mann–Whitney test, while qualitative data were analysed with Fisher's exact test.

Result

A total of 57 patients were referred to our centres, with four patients excluded due to incomplete data. This included 34 cases from Cocody, averaging 4.8 patients per year, and 19 cases from Limoges, with an average of 1.6 patients per year (Table 1). In the Limoges cohort, maternal smoking was recorded in eight patients (42.1%), while no smoking history was noted in the Cocody cohort. No alcohol exposure was reported in either group.

Prenatal Diagnosis

In Cocody, 9 out of 34(37.5%) parturients, underwent prenatal screenings, with an average of 2.8 exams per patient (range: 1-6).
Only three mothers (8.8%) received a prenatal diagnosis of gastroschisis, with a mean gestational age at diagnosis of 23 weeks (±7.2). In Limoges, all 19 parturients underwent prenatal examinations, averaging 8.3 screenings per patient. The average gestational age at diagnosis in Limoges was 15.5 weeks (±3.9), with a median of 14 weeks (range: 12-23). Additionally, nine parturients (47.4%) in Limoges underwent amnioinfusion or amniotic fluid drainage (Table 2).

Postnatal Diagnosis

In Cocody, all newborns with gastroschisis were referred to the surgical centre by non-medical transport, with their intestinal loops covered by an occlusive dressing soaked in physiological saline (Figure 1). To the best of our knowledge, no fatalities occurred during transport. Of the 34 newborns, 24 (70.6%) were admitted within 24 hours of birth. Among these, 19 newborns (55.9%) were classified as Type 2 (Figure 2).



Figure 1: Newborn patient referred to Cocody Hospital Centre, with intestinal loops covered by an occlusive dressing

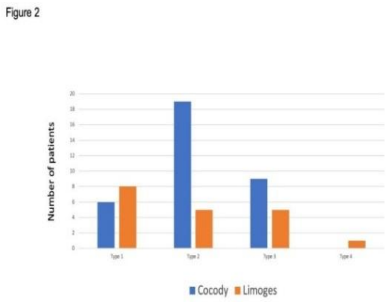


Figure 2: Classification of patients at each center according to Lefort



Figure 3: Newborn patient in transitional care, wrapped in two plastic bags, between delivery and the operating room at Limoges Hospital.
Ap: appendix; large arrow: colon; small arrow: small intestine.

In Limoges, all newborns were initially wrapped in two plastic bags (Figure 3) and transferred to the operating room for surgical management, including a skin incision within 60 minutes of arrival. Of the 19 cases, 8 (42.1%) were classified as Type 1.

Therapeutic Aspects

At both centres, newborns underwent gastric emptying prior to bowel reintegration. In Cocody, colonic emptying was performed using physiological saline, while in Limoges, gastrograffin was used to exclude possible associated defects in digestive permeability. A bladder catheter was placed in all patients, and orotracheal intubation (OTI) under general anaesthesia was performed for all patients in Limoges.

Neither centre administered perinatal antibiotic therapy systematically. In Cocody, 7 out of 34 newborns (20.6%) did not undergo surgery due to death prior to the procedure (Table 3). Among the remaining patients, 8 (23.5%) underwent progressive bowel reintegration using a dedicated silo, while 6 (17.6%) were managed with a makeshift solution (such as female condom or urine bag).

In Limoges, four progressive reintegrations were performed using a dedicated silo, two with Gortex® plates, and one with a combination of both (Figure 4). Additionally, six patients (31.6%) in Limoges required ileostomy or colostomy due to perforation and intestinal atresia. No patients in Cocody required OTI.

The average duration of postoperative OTI in Limoges was 4.4 days (±5.7 days; median 4 days; range 1-13 days).

Parenteral nutrition was initiated on day 1 for all patients, while oral intake was gradually introduced through minimal enteral feeding with breast milk. In the Cocody group, 13 patients (38.2%) received parenteral nutrition on day 1, while the remaining patients were managed with oral intake of physiological saline or breast milk. The average time to resume gastrointestinal transit was 2 days (±1 day; median 2 days, range 1-3 days) in Cocody, compared to 5.6 days (±3.5 days; median 4 days, range 1-14 days) in Limoges.

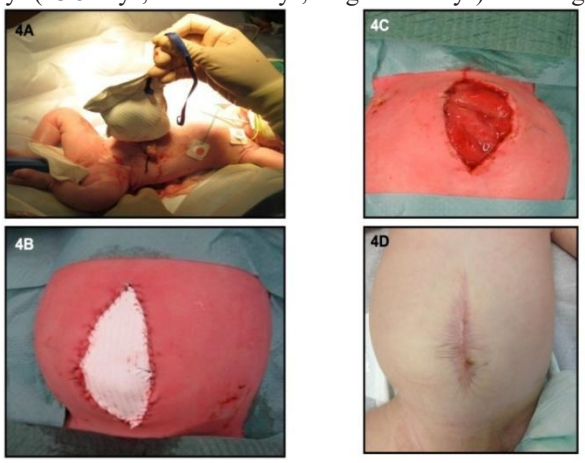


Figure 4: Management of a patient with type III gastroschisis at Limoges using the progressive closure technique:
4A. Progressive reintegration of the bowel using a silo.
4B. Closure of the muscle defect using a Goretex® plate.
4C. Fibrosis effect on the parietal after removal of the plate.
4D. Cosmetic appearance of the abdominal wall at three months of age after the epithelialization phase.

Survival at 28 days was 5.9% in Cocody and 89.5% in Limoges. The two survivors in Cocody underwent single-stage bowel reintegration, so did 14 of the 17 survivors (82.3%) in Limoges.

In addition, the authors report the main challenges encountered in the overall management of gastroschisis in Ivory Coast compared with France (Table 4).

Table 1: Characteristics of the study population

Characteristics	Cocody	Limoges	*p*-value
Patients	34	19	
Sex [b]			
Male	15 (44.1%)	11 (57.9%)	0.49
Female	19 (55.9%)	8 (42.1%)	
Sex ratio	0.7	1.4	
Maternal age (years)	21.8 ± 5.4 (13-35)	25,2 ± 5,6 (18-35)	0,027
Gestation	2.03 ± 1.4 (1-8)	1.26 ± 0.56 (1-8)	0.31
Parity	1.03 ± 1 (1-7)	1.26 ± 0.56 (1-2)	0.41
Number of prenatal examinations	2.8 ± 1.4 (0-6)	8	
Ultrasound data	24 (70.6%)	19 (100%)	
Prenatal assessment [b]			Inf 0.001
Complete	9 (26.5%)	19 (100%)	
Incomplete	25 (73.5%)		
Term [b]			Inf 0.001
Premature	8 (23.5%)	18 (94.7%)	
Full term	26 (76.5%)	1 (5.3%)	
Method of delivery [b]			Inf 0.001
Vaginal delivery	29 (85.3%)	7 (36.8%)	
C-section	5 (14.7%)	12 (63.2%)	
Birth weight (g)	2390 ± 573	2262 ± 386	0.33
Length of hospitalisation (days)[c]	5.3 ± 3.6 (1-13)	53.1 ± 31.6 (2-134)	Inf 0.001

a : Median [interquartile range] b: Effective (percentage) c : Average ± standard deviation

Table 2: Characteristics of ultrasound data at Limoges and Cocody

Centre	Limoges	Cocody
Total number of patients with PU	19 (100%)	9 (37%)
Total number of patients with PD	19 (100%)	3 (33%)
Loops distension	1 (5.3%)	3 (33%)
Gastric distension	1 (5.3%)	0
Satisfactory amniotic fluid	9 (47.4%)	9 (100%)
Oligo amnious	9 (47.4%)	1 (11%)
Hydramnious	1 (5.3%)	0

PU : Prenatal ultrasound examination ; PD : Positive diagnosis of gastroschisis

Table 3: Therapeutic and evolutionary characteristics

Treatment	Cocody	CHU Limoges	*p* value
Patients	34	19	
Treatment type [b]			
A time	13 (38.2%)	15 (78.9%)	0.072
Progressive	14 (41.2%)	4 (21.1%)	
Not operated	7 (20.6%)		
Mortality by 28 days of life [b]			
Alive	2 (5.9%)	17 (89.5%)	0.001
Deceased	32 (94.1%)	2 (10.5%)	
Average age at death (days)	2.5± 0.8 (1-12)	7 ± 8.4 (1-13)	0.03
Cause of death [b]			
Respiratory distress	14 (41.2%)	1 (5.2%)	
Sepsis	8 (23.5%)	1 (5.2%)	
Cerebral asphyxia	2 (5.9%)	-	
Congenital heart disease	2 (5.9%)	-	

b : Effective (percentage)

Table 4: Main challenges in early gastroschisis management reported by the authors in Cocody

Challenge	Description
1. Low rate of antenatal diagnosis	The antenatal diagnosis rate remains low (8.8%), largely due to inadequate prenatal follow-up. Delayed diagnosis negatively affects postnatal management and neonatal outcomes.
2. Delivery in non-specialised facilities	Most deliveries occur outside specialised referral hospitals, resulting in delayed surgical intervention and a higher risk of complications.
3. Delayed and non-medicalised neonatal transfer	Newborns are frequently transferred without proper pre-transfer stabilisation, such as bowel protection. This increases the risk of infection, dehydration, and overall morbidity.
4. Delayed intestinal reduction	Cumulative delays in referral and transfer contribute to late intestinal reduction. Nearly 30% of cases undergo reintegration more than 24 hours after birth.
5. Absence of paediatric intensive care units	The lack of dedicated paediatric intensive care, limits management of severe cases and compromises postoperative monitoring and outcomes.

Table 5: Proposed strategies to improve gastroschisis outcomes resource-adapted settings

Strategy	Description
1. Strengthening antenatal screening	Improve access to and quality of prenatal care to increase detection rates. Antenatal screening for congenital anomalies could be integrated into the WHO Emergency Obstetric and Neonatal Care (EmONC) package, facilitating early referral, anticipation of postnatal management, and preparedness for timely intestinal reduction.
2. Reducing delays in intestinal reduction	Implement a standardised management algorithm to ensure intestinal reduction within the first hour of life whenever feasible.
3. Development of paediatric intensive care services	Establish or strengthen paediatric intensive care units to enable close monitoring and optimal management of postoperative complications.
4. Improving access to parenteral nutrition	Ensure availability of central venous parenteral nutrition to support postoperative survival and recovery.
5. Training of medical and paramedical staff	Organise targeted capacity-building programs for healthcare professionals involved in gastroschisis care to update knowledge, standardise practices, and improve outcomes.

Discussion

This study highlights notable disparities in the antenatal diagnosis of gastroschisis, subsequent delays in postnatal bowel reintegration, and the management of complex cases. The main limitation of this study is its retrospective design, which hinders exhaustive data collection, particularly regarding ultrasound diagnosis criteria.

The antenatal diagnosis rate in the Cocody group was 8.8%, consistent with findings from other African studies, where reported rates range from 0% to 20%.[14] This low rate can be attributed to limited access to care and the overall quality of healthcare in a population with lower socioeconomic status, compared to France. The frequency and quality of prenatal consultations directly influence the accuracy of sonographic imaging, as previously noted in several African studies.[3] In our study, antenatal diagnosis plays a pivotal role in improving prognosis by determining the location of delivery and facilitating appropriate bowel management, such as reintegration or packaging. Strengthening antenatal screening remains a major challenge in our setting in Ivory Coast. Improved prenatal detection would facilitate early referral to specialised centres, enable anticipation of postnatal management, and ensure preparedness for prompt intestinal reduction.

Most cases in Cocody were classified as Lefort 2 (55.9%) due to the poorly vascularised nature of the intestines, whereas in Limoges, the majority were classified as Lefort 1 (42.1%). This difference could be related to delays in patient admission and the place of delivery. In Limoges' tertiary centre, patients were transferred directly from the obstetrical delivery room to the paediatric operating room after initial bowel packaging, allowing for bowel reduction within an hour of delivery. In contrast, in Ivory Coast, the non-medical transfer of patients from peripherical centers resulted in several hours exposure of the bowel loops before reintegration, without antibiotic prophylaxis. This led to aggravated perivisceritis, making one-stage reintegration more difficult. This delayed intervention increases the risk of sepsis and contributes to the higher post-reintegration mortality observed rate in Cocody.

Similar patterns have been observed in other low- and middle-Income countries, where decentralised obstetric services often lead to delayed referrals and suboptimal early neonatal stabilization.[15] Such delays place newborns at heightened risk of hypothermia, dehydration, and intestinal injury before definitive care can be provided. Notably, intestinal reduction was frequently postponed, with nearly 30% of patients undergoing the procedure more than 24 hours after birth. Evidence indicates that early reduction—ideally within the first hour of life—improves survival and minimizes complications.[16] In contrast, delays beyond 24 hours are associated with increased bowel oedema, ischaemia, and higher rates of postoperative morbidity.

In Limoges, intestinal reintegration was performed under general anaesthesia with OTI for all patients. In Cocody, most reintegrations were carried out without general anaesthesia. Bedside reintegration under sedation is increasingly recommended in countries with limited resources,[3,17] and could also be considered for simpler cases in high burden countries, as it yields favourable outcomes.[4] This practice helps reduce anaesthetic risks and delays in reintegration. The use of sutureless closure at the bedside has gained popularity in such settings,[18] sometimes in combination with the use of a silo.[19] While some cases of umbilical hernias have been reported with this approach, surgical closure is not always necessary. Furthermore, no differences were found between suture and sutureless methods in terms of wound infection, time to enteral feeding, or time to discharge from the neonatal intensive care unit.

Several African series highlight that most newborns with gastroschisis are transferred without bowel protection, such as placement in a bowel bag.[20] These findings underscore the need for a standardised management algorithm to facilitate intestinal reduction within the first hour of life whenever feasible and to optimise neonatal transfer conditions—an ongoing challenge in many settings.

Early enteral feeding is increasingly recognised as essential,

based on several studies.[21-23] It is considered successful when full nutrition is achieved within the first 21 days of life. This outcome can be achieved most likely when the infant is born at 36 weeks of gestation, reintegration occurs within 10 hours of birth, the duration of OTI is under four days, and feeding is initiated before the 10th day of life.[24]

The average length of hospitalisation was 10 times longer in Limoges than in Cocody, with infants in Limoges staying an average of 53.1 days, compared to just 5.3 days in Cocody. This can be attributed to the absence of a paediatric intensive care unit at Cocody and the near-total lack of parenteral nutritional support. As a result, the mortality rate by day 28 was nine times higher in the Cocody group compared to Limoges. Mortality rates reported in African paediatric surgical units range from 30% to over 70%, primarily reflecting limited intensive care support and nutritional resources rather than deficiencies in surgical technique alone.[25]

Improving outcomes for gastroschisis in resource-limited African settings requires a multifaceted approach: strengthening antenatal screening, optimising referral and neonatal transport systems, and standardising early management protocols. Concurrently, investments in paediatric intensive care services, access to parenteral nutrition, and ongoing training of healthcare personnel are critical to reducing gastroschisis-related mortality. To address delays in postnatal management, the authors advocate for targeted efforts in Ivory Coast to raise awareness among healthcare providers about the importance of prenatal diagnosis and dedicated care programmes. Based on these considerations, Table 5 outlines several proposed strategies to improve outcomes.

Conclusion

Our study comparing the management of gastroschisis between Cocody University Hospital and Limoges highlights key factors contributing to the high mortality rate. The most significant of these are a low rate of prenatal diagnosis, leading to births in peripheral centres and delayed reintegration. Although the lack of an optimal paediatric intensive care unit and central venous parenteral nutrition are important challenges, our main recommendation is to prioritise improving antenatal screening in Ivory Coast. Early detection through better prenatal screening would allow for timely referrals to specialised centres and facilitate rapid intervention, including reintegration before the eighth hour of life.

Conflict of interest : None to declare.

Funding: Nil

References

1. Ducellier G, Moussy P, Sahmoune L, Bonneau S, Alanio E, Bory JP. [Gastroschisis: Prenatal ultrasonography and obstetrical criteria for predicting neonatal outcome]. Gynecol Obstet Fertil. 2016; 44(9):461-467.
2. Anderson JE, Galganski LA, Cheng Y, Stark RA, Saadai P, Stephenson JT, *et al*. Epidemiology of gastroschisis: A population-based study in California from 1995 to 2012. J Pediatr Surg. 2018; 53(12):2399-2403.
3. Machaea SS, Chitnis MR, Nongena P. Prevalence of gastroschisis and its neonatal mortality in the Eastern Cape Province tertiary institutions. Afr J Paediatr Surg. 2023; 20(1):46-50.
4. Witt RG, Zobel M, Padilla B, Lee H, MacKenzie TC, Vu L. Evaluation of Clinical Outcomes of Sutureless vs Sutured Closure Techniques in Gastroschisis Repair. JAMA Surg. 2019; 154(1):33-39.
5. Sandler A, Lawrence J, Meehan J, Phearman L, Soper R. A "plastic" sutureless abdominal wall closure in gastroschisis. J Pediatr Surg. 2004; 39(5):738-741.
6. Jones AM, Isenburg J, Salemi JL, Arnold KE, Mai CT, Aggarwal D, *et al*. Increasing Prevalence of Gastroschisis-14 States, 1995-2012. MMWR Morb Mortal Wkly Rep. 2016; 65(2):23-26.
7. Georgeades C, Mowrer A, Ortega G, Abdullah F, Salazar JH. Improved Mortality of Patients with Gastroschisis: A Historical Literature Review of Advances in Surgery and Critical Care from 1960-2020. Children (Basel). 2022; 9(10):1510.
8. Oyinloye AO, Abubakar AM, Wabada S, Oyebanji LO. Challenges and Outcome of Management of Gastroschisis at a Tertiary Institution in North-Eastern Nigeria. Front Surg. 2020; 7:8.
9. Camara S, Fall M, Mbaye PA, Wese SF, Lo FB, Oumar N. Congenital malformations of the gastrointestinal tract in neonates at aristide le dantec university hospital in Dakar: Concerning 126 cases. Afr J Paediatr Surg. 2022; 19(3):133-136.
10. Collaboration PAR: Paediatric surgical outcomes in sub-Saharan Africa: a multicentre, international, prospective cohort study. BMJ Glob Health. 2021; 6(9):e004406.
11. Amado V, Dias I, Filipe M, DeUgarte DA. Gastroschisis in Mozambique: current status and priorities for improving care from Hospital Central de Maputo, the largest and referral hospital of the country. Pediatr Surg Int. 2023; 39(1):95.
12. Midekor Gonebo K, Tumameu K, Bonny Obro R, Sounkéré Soro M, Ouattara S, Tembeley S, *et al*. Défet congénital de la paroi abdominale antérieure: défi de la prise en charge au CHU de Cocody. Revue Ivoirienne de pédiatrie et néonatologie. 2022; 1:110-114.
13. Lefort J, Borde J, Mitrofanoff P, Ensel J. [Gastroschisis. Analysis of 19 cases (author's transl)]. Chir Pediatr. 1978; 19(2):77-82.
14. Gangopadhyay N, Upadhyaya V, Sharma S. Neonatal intestinal obstruction: 15 years' experience. Afr J Paediatr Surg. 2008; 5(2):77-80.
15. Ekenze SO, Ajuzieogu OV, Nwomeh BC: Challenges of management and outcome of neonatal surgery in Africa: a systematic review. Pediatr Surg Int. 2016; 32(3):291-299.
16. Pastor AC, Phillips JD, Fenton SJ, Meyers RL, Lamm AW, Raval MV, *et al*. Routine use of a SILASTIC spring-loaded silo for infants with gastroschisis: a multicenter randomized controlled trial. J Pediatr Surg. 2008, 43(10):1807-1812.
17. Shalaby A, Obeida A, Khairy D, Bahaaeldin K. Assessment of gastroschisis risk factors in Egypt. J Pediatr Surg. 2020; 55(2):292-295.
18. Chesley PM, Ledbetter DJ, Meehan JJ, Oron AP, Javid PJ. Contemporary trends in the use of primary repair for gastroschisis in surgical infants. Am J Surg. 2015; 209(5):901-905; discussion 905-906.
19. Diyaolu M, Wood LS, Bruzoni M. Sutureless closure for the management of gastroschisis. Transl Gastroenterol Hepatol. 2021; 6:31.
20. Uba AF, Chirdan LB. Neonatal surgical emergencies in Nigeria. East Afr Med J. 2006; 83(7):345–350.

21. Raduma OS, Jehangir S, Karpelowsky J. The effect of standardized feeding protocol on early outcome following gastroschisis repair: A systematic review and meta-analysis. J Pediatr Surg. 2021; 56(10):1776-1784.
22. Dama M, Rao U, Gollow I, Bulsara M, Rao S. Early Commencement of Enteral Feeds in Gastroschisis: A Systematic Review of Literature. Eur J Pediatr Surg. 2017; 27(6):503-515.
23. Haraux E, Mercier A, Buisson P, Kongolo G, Ricard J, Canarelli J, *et al*. Type anatomique et prise en charge du laparoschisis. Nutrition Clinique et Métabolique. 2014; 28:S239.
24. Pratheeppanyapat T, Tepmalai K, Singhavejsakul J, Khorana J. The factors associated with successful early enteral feeding in gastroschisis. Pediatr Surg Int. 2018; 34(7):743-748.
25. Wesonga AS, Fitzgerald TN, R K. Gastroschisis in low-income settings: survival and predictors of outcome. Afr J Paediatr Surg. 2014-; 11(3):231–235.