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Epidemiological profile of pregnant women and perinatal outcomes of newborns with gastroschisis from a single reference center in Northeastern Brazil

Epidemiologický profil těhotných žen a perinatální výsledky novorozenců s gastroschízou z jednoho referenčního centra v severovýchodní Brazílii

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Summary: Objective: To determine the maternal epidemiological profile and perinatal outcomes of fetuses with gastroschisis at a reference center in Northeastern Brazil. **Methods:** A retrospective cohort study was conducted between January 2014 and December 2022 using medical records. Inclusion criteria comprised of pregnancies ≥ 24 weeks, with a prenatal diagnosis of gastroschisis confirmed in the postnatal period. **Results:** During the study period, 1,773 newborns with congenital anomalies were born at the service center, 50 were identified as having gastroschisis and four cases were excluded. Prevalence of gastroschisis was 11.5/10,000. Regarding the maternal sociodemographic profile, the mean age was 21 years, 38/46 (83%) were mixed, 34/46 (74%) had a partner, and 32/46 (70%) had high school education. Regarding associated maternal diseases, only 6/46 (13%) had hypertension, none had pre-existing diabetes mellitus, and 4/46 (8.7%) developed gestational diabetes mellitus. As for gastroschisis type, 33/46 (71%) were classified as simple, 11/46 (23.9%) as complex and 2/46 (4.4%) had no information. In 36/46 newborns with gastroschisis, primary closure was performed in the first surgery. The mean time of use of mechanical ventilation was 13 days, the mean time interval between surgery and ambient air was 8 days, the mean time of use of parenteral nutrition was 35 days, and the mean length of stay in the neonatal intensive care unit (NICU) was 39 days. Clinical complications in newborns with gastroschisis included neonatal infection in 35/46 (76%), blood transfusion in 33/46 (72%), hydroelectrolytic disorders and sepsis in 29/46 (63%), and cholestasis and fungal infection/sepsis in 8/46 (17%). Neonatal death occurred in 16/46 (34.8%). **Conclusion:** Newborns with gastroschisis presented high rates of surgery with primary closure, blood transfusion and neonatal infection. Furthermore, we identified prolonged use of parenteral nutrition, long stay in the NICU, and prolonged use of antibiotic therapy.

Key words: gastroschisis – prevalence – epidemiological profile – perinatal outcomes – reference center

Introduction

The incidence of abdominal wall defects is approximately 1 in 2,000 live births [1]. Gastroschisis is a congenital anomaly of the anterior abdominal wall, with the presence of herniated abdominal structures, most often the intestine and occasionally the bladder, stomach and liver. The defect is usually paraumbilical on the right, and the herniated organs do not have a protective membrane, remaining in direct contact with the amniotic fluid [2,3]. Gastroschisis is a rare malformation and has been addressed more frequently due to the discussion about its etiology, the increase in its incidence, the current possibility of earlier diagnosis of the malformation by ultrasound as well as, of course, advances in surgical techniques, with better nutritional support and postoperative care [4].

Increased incidence of gastroschisis in the UK had already been observed in 2006, particularly in younger women under the age of 20, where incidence was 4.71 per 10,000 compared with 0.26 per

Souhrn: **Cíl:** Stanovit mateřský epidemiologický profil a perinatální výsledky plodů s gastroschízou v referenčním centru v severovýchodní Brazílii. **Metody:** Retrospektivní kohortová studie byla provedena v období od ledna 2014 do prosince 2022 s využitím lékařské dokumentace. Kritéria pro zařazení zahrnovala těhotenství ≥ 24 týdnů s prenatální diagnózou gastroschízy potvrzenou v postnatálním období. **Výsledky:** Během sledovaného období se v zařízení narodilo 1 773 novorozenců s vrozenými vadami, z nichž 50 bylo identifikováno s gastroschízou a čtyři případy byly vyloučeny. Prevalence gastroschízy byla 11,5/10 000. Co se týče sociodemografického profilu matek, průměrný věk byl 21 let, 38/46 (83 %) mělo smíšený těhotenský syndrom, 34/46 (74 %) mělo partnera a 32/46 (70 %) mělo středoškolské vzdělání. Pokud jde o související onemocnění matek, pouze 6/46 (13 %) mělo hypertenzi, žádná neměla preexistující diabetes mellitus a 4/46 (8,7 %) vyvinulo gestační diabetes mellitus. Co se týče typu gastroschízy, bylo 33/46 (71 %) klasifikováno jako jednoduché, 11/46 (23,9 %) jako komplexní a 2/46 (4,4 %) neměly žádné informace. U 36/46 novorozenců s gastroschízou byl primární uzávěr proveden při první operaci. Průměrná doba používání mechanické ventilace byla 13 dní, průměrný časový interval mezi operací a podáním okolního vzduchu byl 8 dní, průměrná doba používání parenterální výživy byla 35 dní a průměrná délka pobytu na jednotce intenzivní péče pro novorozence (NICU) byla 39 dní. Mezi klinické komplikace u novorozenců s gastroschízou patřila neonatální infekce u 35/46 (76 %), krevní transfuze u 33/46 (72 %), hydroelektrolytické poruchy a sepse u 29/46 (63 %) a cholestáza a plísňová infekce/sepse u 8/46 (17 %). K úmrtí novorozence došlo u 16/46 (34,8 %). **Závěr:** Novorozenci s gastroschízou vykazovali vysokou míru chirurgických zákroků s primárním uzávěrem, krevní transfuzí a neonatální infekcí. Dále jsme identifikovali dlouhodobé užívání parenterální výživy, dlouhodobý pobyt na jednotce intenzivní péče o novorozence a dlouhodobé užívání antibiotik.

Klíčová slova: gastroschíza – prevalence – epidemiologický profil – perinatální výsledky – referenční centrum

10,000 in mothers over the age of 30 [5]. A study published in 2016 used data on gastroschisis from 15 US state programs to evaluate the average annual change in prevalence, comparing specific time periods (2006–2012 vs. 1995–2005). An increase of 30% was found, from 3.6/10,000 births in 1995–2005 to 4.9/10,000 births in 2006–2012 [6]. In Brazil, a study analyzed the annual incidence of gastroschisis from 2,000 to 2017 and identified the highest incidence in mothers under 20 years of age, which showed a significant increase during the study period [7].

Gastroschisis can be classified as simple or complex according to the conditions observed in the intestine. The simple form is the most common, with low morbidity and a better survival rate. On the other hand, the complex form is directly associated with prolonged hospital stay, short bowel syndrome, and death, with a high association with atresia, volvulus, necrosis, and perforation [8]. In Brazil, state of Rio de Janeiro, the mortality rate for isolated gastroschisis was 12.9% between 2005 and 2014 [9]. In the Brazilian global context of gastroschisis, only eight studies (most of the studies from the Southeast region) were found (912 patients), with mean maternal age of 20.7 years, mean antenatal diagnosis rate of 80.2%, mean cesarean section rate of 77.7%, mean hospital stay of 40.8 days, and mean mortality rate of 25.3% [10].

This study aimed to assess the maternal epidemiological data and perinatal outcomes of fetuses with gastroschisis at a reference center in northeastern Brazil.

Methods

A retrospective cohort study was conducted at the Assis Chateaubriand Maternity School, Federal University of Ceará (UFC), city of Fortaleza, sate of Ceará, Northeastern Brazil, between January 2014 and December 2022. The medical records of all fetuses with gastroschisis born at the service were carefully analyzed. Inclusion criteria comprised pregnancies ≥ 24 weeks, with a prenatal diagnosis of gastroschisis confirmed in the postnatal period by a neonatologist and/or pediatric surgeon. Exclusion criteria comprised absence of postnatal data and minor congenital anomaly. This study was approved by the UFC Research Ethics Committee.

We assessed the following maternal demographic characteristics: age; ethnicity; marital status; scholarship; and occupation. Obstetric characteristics included number of pregnancies, miscarriages, and deliveries, gestational age at the beginning of prenatal care, gestational age at diagnosis of gastroschisis, prenatal care at the service, number of ultrasound examinations at the service. Habits and maternal diseases included alcohol consumption, smoking, illicit drug use, body mass index (BMI), hypertension, pre-existing diabetes mellitus and gestational diabetes mellitus. Delivery and newborn data comprised delivery type, gestational age at delivery, sex, birth weight, and Apgar scores at the 1st and 5th minutes. Postnatal outcome surgery data were gastroschisis type, surgery type, time between birth and surgery, primary closure in the first surgery, surgical complications. Postnatal outcome data for neonatal intensive care unit (NICU) admission enclosed use of mechanical ventilation, use of continuous positive airway pressure (CPAP), time between surgery and ambient air, time on parenteral nutrition, time on antibiotic therapy, clinical complications, length of stay in NICU, death.

We collected and managed study data using the Research Electronic Data Capture (REDCap, Vanderbilt University, Nashville, TN, USA), an electronic data collection and management tool hosted at the UFC Clinical Research Unit. Variables were presented as mean and

Tab. 1. Socioeconomic and demographic characteristics of pregnant women with fetuses with gastroschisis.
Tab. 1. Socioekonomické a demografické charakteristiky těhotných žen s plody s gastroschízou.

Socioeconomic and demographic characteristics	N = 46*
Age (Mean)	21.2 ± 4.6 (21.0)
Race	
white	5 (11%)
mixed	38 (83%)
asian	1 (2.2%)
not informed	2 (4.3%)
Marital status	
single	11 (24%)
married	6 (13%)
stable union	28 (61%)
widow	1 (2.2%)
Education	
literate	1 (2.2%)
elementary school	11(24%)
high school	32 (70%)
Occupation	
paid	15 (33%)
unpaid	24 (52%)
student	7 (15%)

*N (%), mean ± standard deviation (median).

Tab. 2. Obstetric characteristics and maternal diseases of pregnant women with fetuses with gastroschisis.
Tab. 2. Porodnické charakteristiky a mateřské onemocnění těhotných žen s plody s gastroschízou.

Obstetric characteristics and maternal diseases	N = 46*
Obstetric characteristics	
number of pregnancies	1.63 ± 1.10 (1.00)
number of deliveries	0.57 ± 1.03 (0.00)
number of miscarriages	0.15 ± 0.47 (0.00)
Smoking	
yes	1 (2.2%)
no	45 (98%)
Alcohol use	
yes	1 (2.2%)
no	45 (98%)
Illicit drugs use	
yes	2 (4.4%)
no	43 (96%)
unknown	1
Maternal BMI (kg/m²)	
< 18.5	4 (8.7%)
18.5 and 24.9	22 (48%)
25 and 30	6 (13%)
> 30	3 (6.5%)
no information	11 (24%)
Hypertension	
yes	6 (13%)
no	40 (87%)
Pre-existing diabetes mellitus	
yes	0 (0%)
no	46 (100%)
Gestational diabetes mellitus	
yes	4 (8.7%)
no	42 (91%)

*N (%), mean ± standard deviation (median).
BMI – body mass index

standard deviation, median, percentiles, minimum and maximum, frequency and prevalence. The Chi-square test of independence, Wilcoxon rank sum test and Fisher's exact test were used to analyze participant characteristics, checking that the data did not follow a Gaussian distribution. Pearson's Chi-squared test and Fisher's exact test were used to investigate associations between categorical variables. A 5% significance level was used. Statistical analyses were performed using the R statistical program.

Resulst

During the study period, 1,773 newborns with congenital anomalies were born at the service and 50 were identified as having gastroschisis. Of these, three cases were excluded because of major malformations, and one case was excluded because of gestational age < 24 weeks. During the study period, we observed a variation in the annual prevalence of gastroschisis cases at the institution, ranging from 4.4–16.7/10,000 live births. During the nine years assessed (2014–2022), the prevalence of gastroschisis was 11.5/10,000.

In relation to maternal sociodemographic variables of the 46 pregnant women, we found that the mean age was 21 years (21.2 ± 4.6), 38/46 (83%) were mixed, 34/46 (74%) had a partner, 32/46 (70%) had high school education, and 24/46 (52%) did not have a paid occupation (Tab. 1).

Tab. 3. Characteristics of delivery with pregnant women with fetuses with gastroschisis.
Tab. 3. Charakteristika porodu u těhotných žen s plody s gastroschízou.

Delivery characteristics	N = 46*
Delivery type	
cesarean section	45 (98%)
vaginal	1 (2.2%)
Gestational age at delivery (weeks)	35.48 ± 2.34 (36.00)
Sex	
male	23 (50%)
female	23 (50%)
Birth weight (grams)	2,315 ± 557 (2,283)
< 2,000	11 (23.9%)
2,000 and 2,499	19 (41.3%)
> 2,500	16 (34.8%)
Birth weight vs. Apgar score	
AGA	31 (67%)
LGA	2 (4.3%)
SGA	13 (28%)
Minor congenital anomaly	
yes	6 (13%)

*N (%), mean ± standard deviation (median).
AGA – appropriate for gestational age, LGA – large for gestational age, SGA – small for gestational age

Tab. 4. Description of the surgical and hospital stay variables of newborns with gastroschisis.
Tab. 4. Popis chirurgických a hospitalizačních proměnných u novorozenců s gastroschízou.

Surgical characteristics	N = 46*
Gastroschisis type	
simple complex	33 (71.7%)
no information	11 (23.9%)
Surgery on newborn	2 (4.4%)
yes	45 (98%)
no	1 (2.2%)
Time interval for surgery (days)	2.60 ± 3.72 (0.70)
Primary closure performed in the first surgery	
yes	36 (78%)
no	10 (22%)
Newborn hospital stay	
time in use of mechanical ventilation (days)	13 ± 12 (8)
time from surgery to ambient air (days)	8 ± 10 (4)
time of parenteral nutrition use (days)	35 ± 27 (34)
length of stay in the NICU (days)	39 ± 31 (35)
doses of antibiotic therapy used	3.98 ± 2.79 (3.50)
total time on antibiotic therapy (days)	31 ± 24 (27)

*N (%), mean ± standard deviation (median).
NICU – neonatal intensive care unit

Regarding obstetric characteristics, we found that the median number of pregnant women had a previous pregnancy without miscarriage and prenatal care started at 10 weeks of gestation. As for smoking and alcohol use, we found that 45/46 (98%) did not drink or smoke and 43/46 (96%) did not use illicit drugs. Regarding the BMI, we found that 22/46 (48%) had a BMI between 18.5 and 24.9 kg/m^2. With respect to associated maternal diseases, we found that only 6/46 (13%) had hypertension, none had pre-existing diabetes mellitus, and 4/46 (8.7%) developed gestational diabetes mellitus (Tab. 2). The mean start of prenatal care was around the 12th week of pregnancy, and the diagnosis of gastroschisis was given around the 21st week of pregnancy. Regarding prenatal care at the institution, we found that 31/46 (67.4%) of patients came from the own institution and 38/46 (83%) of pregnant women had undergone an ultrasound at the institution.

As for variables related to delivery, we found that 45/46 (98%) were delivered by cesarean section, the mean gestational age was 36 weeks, 23/46 (50%) were female, the mean birth weight was 2,315 grams, with 11/46 (23.9%) weighing < 2,000 grams, 19/46 (41.3%) weighing between 2,000 and 2,400 grams and 16/46 (34.8%) weighing > 2,500 grams. In terms of Apgar scores, we found that 27/46 (58.7%) had a score ≥ 8 at the 1st minute and 41/46 (89.1%) had a score ≥ 8 at the 5th minute. We found that 31/46 (67%) were born with appropriate weight for gestational age. Regarding the presence of associated anomalies, we found that 6/46 (13%) had some minor anomaly, with cryptorchidism being the most common (Tab. 3).

Concerning gastroschisis type, we found that 33/46 (71%) were classified as simple, 11/46 (23.9%) as complex and 2/46 (4.4%) had no information. Regarding the surgery, we found that 45/46 (98%) of newborns underwent some type of surgery. The mean time between delivery and surgery was 2.60 hours. In 36/46 newborns with gastroschisis, primary closure was performed in the first surgery. The mean time of use of mechanical ventilation was 13 days; the mean time interval between surgery and ambient air was 8 days; the mean time of use of parenteral nutrition was 35 days; and the mean length of stay in the NICU was 39 days. As for antibiotic therapy, we found that the mean was nearly four courses and the mean duration was 31 days (Tab. 4).

Clinical complications in newborns with gastroschisis included neonatal infection in 35/46 (76%), blood transfusion in 33/46 (72%), hydroelectrolytic disorders and sepsis in 29/46 (63%), and

cholestasis and fungal infection/sepsis in 8/46 (17%). Neonatal death occurred in 16/46 (34.8%) (Tab. 5).

According to Tab. 6, in relation to the association between obstetric characteristics/maternal diseases and death of newborns with gastroschisis, only gestational age at the beginning of prenatal care showed a statistically significant association (P = 0.018). As for the association between surgical variables of newborns with gastroschisis, we observed that the following variables were associated with neonatal death: primary closure in the first surgery (P = 0.020); time of mechanical ventilation (P = 0.038); time of parenteral nutrition (P = 0.040);

Tab. 5. Clinical complications and death of newborns with gastroschisis.
Tab. 5. Klinické komplikace a úmrtí novorozenců s gastroschízou.

Clinical complication and death	N = 46*
neonatal infection	35 (76%)
hemotransfusion	33 (72%)
hydroelectrolytic disorder	29 (63%)
sepsis	29 (63%)
fungal infection/sepsis	8 (17%)
cholestasis	8 (17%)
metabolic acidosis	6 (13%)
surgical wound infection	4 (8.7%)
necrotizing enterocolitis	4 (8.7%)
intestinal sub-occlusion	2 (4.3%)
neonatal death	16 (34.8%)

*N (%), mean ± standard deviation (median).

Tab. 6. Association between obstetric characteristics/maternal diseases and death of newborns with gastroschisis.
Tab. 6. Souvislost mezi porodnickými charakteristikami/mateřskými onemocněními a úmrtím novorozenců s gastroschízou.

			Neonatal death	
Variables	**N**	**Yes, N = 16**	**No, N = 30**	**P value****
Number of pregnancies	46	1.38 ± 0.62 (1.00)	1.77 ± 1.28 (1.00)	0.383
Number of deliveries	46	0.25 ± 0.45 (0.00)	0.73 ± 1.20 (0.00)	0.112
Number of abortions	46	0.19 ± 0.54 (0.00)	0.13 ± 0.43 (0.00)	0.798
Gestational age when started prenatal care (weeks)	46	9.3 ± 2.8 (8.1)	13.1 ± 6.5 (11.4)	0.018
Prenatal care at the institution	46			0.639
yes		9 (56%)	19 (63%)	
no		7 (44%)	11 (37%)	
Gestational age when started prenatal care at the institution (weeks)	36	17 ± 12 (22)	22 ± 11 (25)	0.213
Ultrasound examination at the institution	46			0.105
yes		111 (69%)	27 (90%)	
no		5 (31%)	3 (10%)	
Number of ultrasound examinations at the institution	46	1.50 ± 1.26	1.83 ± 1.46	0.657
		(2.00)	(2.00)	
Smoking	46			> 0.999
yes		0 (0%)	1 (3.3%)	
no		16 (100%)	29 (97%)	
Alcohol use	46			> 0.999
yes		0 (0%)	1 (3.3%)	
no		16 (100%)	29 (97%)	
Illicit drugs use	45			0.545
yes		0 (0%)	2 (6.7%)	
no		15 (100%)	28 (93%)	

**Chi-square test of independence, Wilcoxon rank sum test, Fisher's exact test.
BMI – body mass index

Tab. 6 – continuing. Association between obstetric characteristics/maternal diseases and death of newborns with gastroschisis.
Tab. 6. – pokračování. Souvislost mezi porodnickými charakteristikami/mateřskými onemocněními a úmrtím novorozenců s gastroschízou.

			Neonatal death	
Variables	**N**	**Yes, N = 16**	**No, N = 30**	**P value****
Maternal BMI (kg/m²)	46			0.095
< 18.5		3 (19%)	1 (3.3%)	
18.5 and 24.9		9 (56%)	13 (43%)	
25.0 and 30.0		0 (0%)	6 (20%)	
> 30		0 (0%)	3 (10%)	
no information		4 (25%)	7 (23%)	
Hypertension	46			0.078
yes		0 (0%)	6 (20%)	
no		16 (100%)	24 (80%)	
Pre-existing diabetes mellitus	46		> 0.999	
yes		0 (0%)	0 (0%)	
no		16 (100%)	30 (100%)	
Gestational diabetes mellitus	46			0.114
yes		3 (19%)	1 (3,3%)	
no		13 (81%)	29 (97%)	

**Chi-square test of independence, Wilcoxon rank sum test, Fisher's exact test.
BMI – body mass index

and length of stay in the NICU (P = 0.017) (Tab. 7). In the analysis of the association between clinical complications/gastroschisis type and death of newborns with gastroschisis, metabolic acidosis (P < 0.001) and gastroschisis type (P = 0.023) were statistically significant (Tab. 8).

Discussion

The prevalence of gastroschisis during the period assessed at our institution was 11.5/10,000 live births, data very similar to that presented by a university hospital center in Portugal between 2009 and 2019, with a prevalence of 10/10,000 [11]. In our study, we found a prevalence 10 times higher than that in Europe, which was 1.35 in 2021, including live births and stillbirths [12]. In a systematic review that included 10 articles between 1999 and 2022, the prevalence of gastroschisis in Sub-Saharan Africa varied widely, ranging from 0.026 to 1.75 [13]. In a recent study that estimated the prevalence of gastroschisis in all Brazilian regions, the overall prevalence of gastroschisis was 2.47 per 10,000 births, being higher in the Central-West region and lower in the Northeast region [14].

The median maternal age in our study was 21 years, which is similar to that found in the United States and Sub-Saharan Africa [13,15]. However, it differed from the findings in Japanese women living in Europe and the United States, where maternal age was predominantly between 30 and 39 years [16]. According to a study carried out by EUROCAT, the probable association between young maternal age and gastroschisis is due to the fact that this anomaly is caused by vascular rupture, in addition to younger mothers being more exposed to alcohol consumption, smoking and drug use [17]. However, although mean maternal age was young, we did not find a statistically significant association with these substances in our study because 98% of pregnant women did not use alcohol or tobacco and 96% did not use illicit drugs.

In this study, almost half of the pregnant women (48%) had a BMI within the normal range and only 8.7% had a BMI < 18.5 kg/m². This data differs from the literature, which suggests that gastroschisis is more commonly associated with malnourished pregnant women [18,19]. Studies even suggest an association between maternal obesity and a decreased risk of gastroschisis, which was not found in our study [20,21].

With respect to the association between obstetric characteristics and maternal diseases and neonatal death with gastroschisis, only gestational age at the beginning of prenatal care was statistically significant. Apparently, those who started prenatal care earlier had worse outcomes. This finding is contradictory to prenatal care guidelines, which recommend early initiation of prenatal care to improve postnatal outcomes [22]. This finding is also noteworthy because 50%

Tab. 7. Association between surgical variables and death of newborns with gastroschisis.
Tab. 7. Souvislost mezi chirurgickými proměnnými a úmrtím novorozenců s gastroschízou.

Variables		Neonatal death		
	N	Yes, N = 16	No, N = 30	P value**
Surgery	46			0.348
yes		15 (94%)	30 (100%)	
no		1 (6.3%)	0 (0%)	
Time for surgery (days)	46	2.90 ± 4.12 (0.92)	2.43 ± 3.54 (0.54)	0.496
Primary closure in the first surgery	46			0.020
yes		9 (56%)	27 (90%)	
no		7 (44%)	3 (10%)	
Complications during surgery	46			> 0.999
yes		1 (6.3%)	1 (3.3%)	
no		15 (94%)	29 (97%)	
Time of mechanical ventilation (days)	46	18 ± 14 (18)	10 ± 9 (6)	0.038
Continuous positive airway pressure (CPAP)	46			0.645
yes		1 (6.3%)	4 (13%)	
so		15 (94%)	26 (87%)	
Time between surgery and ambient air (days)	34	12 ± 12 (9)	10 ± 10 (6)	0.979
Time of parenteral nutrition (days)	46	24 ± 18 (27)	41 ± 30 (36)	0.040
Length of stay in the NICU (days)	46	25 ± 19 (27)	46 ± 34 (38)	0.017
Number of antibiotic therapy regimens	46	3.81 ± 2.10 (3.50)	4.07 ± 3.13 (3.50)	0.934
Time on antibiotic therapy (days)	46	22 ± 16 (23)	37 ± 26 (27)	0.097

**Chi-square test of independence, Wilcoxon rank sum test, Fisher's exact test.
NCIU – neonatal intensive care unit

of deaths occurred in neonates with simple gastroschisis.

Gestational age at diagnosis of gastroschisis was 21 weeks on average, four weeks shorter than in the study carried out in northern Brazil [22], highlighting the fact that only one case in our study had postnatal diagnosis. Studies show that lack of prenatal diagnosis is associated with a high mortality rate of gastroschisis in developing countries [13]. In Europe, between 2017 and 2021, more than 50% of gastroschisis cases were diagnosed < 14 weeks of gestational age and 35.4% between 14 and 23 weeks of gestation [12], probably because these countries invest in and recommend the performance of ultrasound for early diagnosis of congenital anomalies, and many of them even allow termination of pregnancy [23].

Regarding delivery characteristics, 98% of deliveries were by cesarean

Tab. 8. Association between clinical complication/gastroschisis type and death of newborns with gastroschisis.
Tab. 8. Souvislost mezi klinickými komplikacemi/typem gastroschízy a úmrtím novorozenců s gastroschízou.

Clinical complication		Neonatal death		
	N	Yes, N = 16	No, N = 30	P value**
hydroelectrolytic disorder	46	10 (63%)	19 (63%)	0.956
hemotransfusion	46	11 (69%)	21 (70%)	> 0.999
neonatal infection	46	10 (63%)	23 (77%)	0,328
metabolic acidosis	46	6 (38%)	0 (0%)	< 0.001
surgical wound infection	46	0 (0%)	4 (13%)	0.282
cholestasis	46	2 (13%)	6 (20%)	0.694
intestinal sub-occlusion	46	1 (6.3%)	0 (0%)	0.348
sepsis	46	5 (31%)	4 (13%)	0.241
other complications	46	14 (88%)	28 (93%)	0.602
Gastroschisis type	46			0.023
simple		8 (50%)	25 (83%)	
complex		6 (38%)	5 (17%)	
no information		2 (13%)	0 (0%)	

**Chi-square test of independence, Wilcoxon rank sum test, Fisher's exact test.

section, and the only newborn delivered vaginally had no prenatal diagnosis. The median gestational age was 36 weeks, with no differences in sex distribution, and the majority of newborns weighed > 2,000 grams. A Swedish study on the outcome and management of newborns with gastroschisis born between 1999 and 2020 after using a protocol showed a high frequency of survival, no deaths after 2005, favorable outcomes in terms of length of stay in the NICU, delivery by cesarean section in 92.1% of cases and a median of 36 weeks of gestational age at delivery [24].

The main clinical complications of gastroschisis identified in this study in the postnatal period were neonatal infection and sepsis, blood transfusion and hydroelectrolytic disorders. These complications are similar to those observed in the literature [22,25]. In a Brazilian study, 90.2% of 168 newborns with gastroschisis had postoperative infection and 41.3% had sepsis, with all infected newborns dying [22]. In our study, 5/16 newborns (31%) died due to infection, without statistical significance. Metabolic acidosis stood out as the main complication associated with neonatal death, affecting 6/16 newborns (38%). Metabolic acidosis was also the most common complication described in a study from Mexico, but it affected 32/42 newborns studied, accounting for 76% of cases, and led to death in 8/32 newborns (26%) [26]. The study suggests that the greater the amount of externalized intestine, the greater the risk of metabolic acidosis due to the production of a fetal inflammatory response due to exposure of the loops to amniotic fluid and that these changes contribute to fetal oxygen consumption [27].

During the study period, of the 46 newborns diagnosed with gastroschisis, all were admitted to the NICU with a mean length of stay of 39 days. Prolonged length of stay in the NICU is a relevant finding and is consistent with the literature [28,29]. A two-week shorter length of stay in the NICU was reported in a Swedish study that associated a reduction with the implementation of an institutional protocol [24].

Of the 46 cases of gastroschisis, 33 were classified as simple and 11 as complex, of which two were unclassified. Characterization regarding defect type was carried out in the postnatal period by describing the presence or absence of atresia, necrosis, perforation and volvulus [30]. We observed that, of the 11 cases of complex gastroschisis, 6 died, with a total of 55% of newborns. This finding is consistent with literature data showing higher morbidity and mortality in cases of complex gastroschisis [29].

Conclusion

In summary, we presented the epidemiological profile of pregnant women and the perinatal outcomes of newborns with gastroschisis at a tertiary care center in northeastern Brazil. We observed high rates of surgery with primary closure, blood transfusion and neonatal infection. Furthermore, we identified prolonged use of parenteral nutrition, long stay in the NICU, and prolonged use of antibiotic therapy.

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