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Research Article

Congenital Malformations Seen in Libreville, Management and Evolution

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Abstract

Objective: To describe the epidemiological and therapeutic aspects of congenital malformations visible in public hospitals in Libreville.

Methods: A retrospective and descriptive study that took place in the five neonatology departments of Libreville and included all newborns hospitalized from January 2013 to December 2017 for congenital malformation visible at birth.

Results: The prevalence of malformations was 2.29% (78 cases/3408 hospitalized newborns). The sex ratio was 1.11. The proportion of premature newborns was 24.4%, the average weight was 2795g ± 545g. Mean maternal age was 26.2 ± 6.8 years. These mothers resided in Libreville (61%), were unemployed (53.9%), with a history of spontaneous abortion in (41%). The syphilis, hepatitis and HIV serologies had a completion rate of 71.7%, 70.6% and 75.6%, respectively. Toxoplasmosis and rubella serologies were performed in 60.3% of cases. The CMV and Herpes serologies were not carried out in any mother, as well as the folic acid supplementation. Taken alone, the main malformations observed were in the central nervous system (55.1%), digestive (39.7%) and osteoarticular (25.6%). The poly malformations were observed in 39.7% with a predominance of the association myelomeningocele and hydrocephalus. In 92.3% of cases, they were diagnosed after birth. Surgical management was observed in 43.6% of cases. The mortality rate was 61.5%.

Conclusion: Congenital malformations remain a concern in our services by their frequency and their prognosis.

Keywords: *Congenital Malformation; Newborn; Evolution; Libreville; Gabon*

Abbreviations

ARV: Antiretroviral Drugs; CHUA: University Teaching Hospital of Angondjé; CHUL: University Teaching Hospital of Libreville; CHUO: University Teaching Hospital of Libreville; CHREM: Regional Hospital Center of Melen; CM: Congenital Malformations; HIV: Human Immunodeficiency Virus

Introduction

A congenital malformation (CM) is an irreversible abnormality in the conformation of a tissue, organ or a larger part of the body, resulting from an intrinsic developmental disorder [1]. These malformative pathologies constitute a group of diverse disorders developed in utero by mistake of development, existing by this fact from the birth whatever their repercussion and even if it is not apparent or immediately detectable [1,2]. CM is one of the leading causes of neonatal morbidity and mortality, it is a real public health problem with high prevalence, with approximately 3 million children born each year with major malformations and responsible for 495,000 deaths [3]. They result in long-term disabilities and have a detrimental impact on individuals, their families, society, and health systems [2,4].

Most of these malformative anomalies are predictable by diagnostic, drug or vaccine means such as the rubella vaccine. The prognosis depends on the speed of diagnosis and treatment, and diagnosis and management are still problematic in developing countries in general and in Gabon in particular because it is not a priority in health policies. The first steps in the management of these pathologies involve the establishment of a national malformation registry (allow a perfect identification of the different types), the knowledge of the risk factors (for effective action upstream) and the training of health workers for the diagnosis, treatment and sensitization of the population. In Gabon there is no registry of CMs, and very few epidemiological data on the issue. A study by Mombo., *et al*. in southeastern Gabon showed a prevalence of MC of 0.14% and 0.64% respectively in rural and semi-rural areas [5]. We therefore wanted to do this preliminary work on clinically apparent congenital malformations with the aim of describing the epidemiological and therapeutic aspects in the 5 main neonatology services of public hospitals in Libreville.

Material and Methods

This is a retrospective and descriptive study that took place in the neonatology departments of CHUA, CHUL, CHUO, HIAOBO and CHREM from January 2013 to December 2017. We included all newborns hospitalized in the neonatal department during this study period who had at least one congenital malformation clinically visible at birth and whose parents signed the informed consent.

The parameters studied were the characteristics of the newborn, the type of malformation, the care and evolution, the background and the socio-professional conditions of the parents. During this period, the number of newborns hospitalized was 785 at the CHUA, 920 at the CHUL, 759 at the CHREM, 377 at the CHUO and 567 at HIAOBO, for a total of 3408 newborns.

Results

Prevalence of malformations

During the study period, we identified 78 cases of clinically apparent malformations out of a total of 3408 hospitalized newborns, a prevalence of 2.29%.

General characteristics of the sample

Newborns characteristics

Newborns born at term accounted for 75.6% (n = 59). Of the 24.4% (n = 19) of preterm infants, 6 had a gestational age of less than 34 weeks. The proportion of male newborns was 51.3%, a sex ratio of 1.11. Sexual ambiguity was observed in 2 cases.

The average weight was 2795g ± 545g with extremes ranging from 1210g to 4100g. the proportion of newborns with a low birth weight (< 2500g) was 29.5% (n = 23). The average size was 48 ± 4 cm with extremes ranging from 24 cm to 58 cm and mean head circumference 32 cm with extremes of 24 cm to 48 cm. The Apgar score at 1 minute ranged from 3/10 to 7/10 in 17.9% of cases (n = 14) and > 7/10 in 82.1% (n = 64). After 5 minutes, 3 neonates (3.84%) had an Apgar score between 3/10 and 7/10 and 96.2% with Apgar > 7/10.

Mother's characteristics

The general characteristics of mothers are shown in table 1. The mean age of mothers was 26.2 ± 6.8 years with extremes ranging from 16 to 40 years. The median of the parity number was 2 parities. The history of spontaneous abortion was found in 41% of the mothers, multiparous in almost all cases. Only one mother had a family history of malformation. With respect to chronic maternal diseases, 4 had high blood pressure and 1 HIV positive. Toxic consumption, alcohol consumption was observed in 1 mother. The serological status is shown in table 2. Obstetrical ultrasound was performed in 35 mothers (44.87%). A single ultrasound was performed in the first trimester.

Characteristics of Mothers		
	Number	**%**
Age (years)		
< 18	9	11.5
19 - 25	35	44 .9
26 - 35	24	30.8
> 35	10	12.8
Residency		
Libreville	48	61
Inland	17	22.1
Owendo	9	11.7
Akanda	2	2.6
Bikele	2	2.6
Profession		
Unemployed	42	53.9
Scholar	19	24.4
Salaries	8	10.2
Liberal Profession	7	9
Student	2	2.5
Parity		
Primipare	17	21.8
Multipare	61	78.2
Characteristics of fathers		
Age (years)		
< 18	0	0
19 - 25	13	16.6
26 - 35	39	50
> 35	26	33.4
Profession		
Salaried	22	28.2
Liberal profession	22	28.2
Scholar	2	2.6
Student	2	2.6
Unemployed	30	38.4

Table 1: *General characteristics of the parents.*

Serologies	Positif		Négatif/immunisé		Non réalisés	
	N	(%)	N	(%)	N	(%)
Toxoplasmose	2	(2,6)	45	(57,7)	31	(39.7)
Rubéole	2	(2.6)	45	(57.7)	31	(39.7)
Syphilis	3	(3.8)	53	(67.9)	22	(28.3)
CMV	0	(0)	0	(0)	78	(100)
Herpes	0	(0)	0	(0)	78	(100)
Hépatite	1	(1.3)	54	(69.3)	23	(29.4)
VIH	1	(1.3)	58	(74.3)	19	(24.4)

Table 2: *Mothers infectious serologies.*

Mothers living in the provinces accounted for 22.1% (n = 17), including 6 cases (35.4%) in Franceville, 3 cases (17.6%) in Koulamoutou, Moanda and Kango and 1 case (5.9%). from Port Gentil and Mouila.

The drugs taken by mothers during pregnancy consisted mainly of iron, sulfadoxine-pyrimethamine, alpha methyldopa for four hypertensive mothers, and unspecified ARV treatment for a mother living with the HIV virus. Three patients admitted to taking misoprostol, and two of the traditional potions of unknown composition targeted abortion in the first trimester of pregnancy. No mothers received folic acid supplementation before or during pregnancy.

Father's characteristics

The general characteristics of fathers are shown in table 1. The average age of fathers was 32 ± 5 years with extremes ranging from 20 to 58 years. In 78.2% (n = 61) of cases the origin of the fathers was urban. The family history of malformation was found in 3 fathers (3.8%).

Congenital Malformations Observed

Age of discovery of malformations

The discovery was immediately after birth in 92.3% (n = 72) of cases. The 6 cases (7.7%) discovered during pregnancy were 4 cases of omphalocele, 1 case of gastroschisis and 1 case of hydrocephalus. All were diagnosed on the third trimester ultrasounds.

Type of malformations and their frequency

The various malformations are shown in table 3. In isolation, the most common were central nervous system malformations (55.1%), digestive malformations (39.7%) and osteoarticular malformations (25.6%).

Malformation type	Number	Isolated cases n (%)	Associated cases n (%)
Central Nervous System Malformations (55,1%)	43		
Hydrocephalus	19	9 (47.4)	10 (52.6)
Myelomeningocele	19	10 (52.6)	9 (47.4)
Microcephaly	4	1 (25)	3 (75)
Méningocèle	1	1 (100)	0 (0)
Digestive Malformations (39.7%)	31		
Anal Imperforation	11	6 (54.6)	5 (45.4)
Fentes orofaciales	8	6 (75)	2 (25)
Omphalocele	8	3 (37.5)	5 (62.5)
Gastroschisis	4	4 (100)	0 (0)
Osteo-Articular Malformations (25.6%)	20		
Club foot	9	0 (0)	9 (100)
Hip dislocation	3	0 (0)	3 (100)
Arthrogryposis	2	2 (100)	0 (0)
Polydactyly	2	0 (0)	2 (100)
Agenesis of the finger and the toes	1	0 (0)	1 (100)
Phocomelia	1	0 (0)	1 (100)
Chest Malformations	1	1 (100)	0 (0)
Sacroccocygeal teratome	1	1 (100)	0 (0)
Malformations Urogenitales (2.6%)	2		
Sexual ambiguity	2	1 (50)	1 (50)
Eye. Ear. Face and neck malformations (2.6%)	6		
Facial dysmorphism	3	0 (0)	3 (100)
Stiff neck	1	0 (0)	1 (100)
Hypertelorism	1	0 (0)	1 (100)
Low implanted ears	1	0 (0)	1 (100)

Table 3: *Distribution according the types and the frequencies of malformations.*

The poly malformations (39.7%, n = 31) are shown in table 4.

Polymalformations	Numbers	%
Hydrocephalus + Myelomeningocele	5	6.4
Anal imperforation + Sexual ambiguity	1	1.3
Omphalocele + Macroglossia + bladder exstrophy	1	1.3
Omphalocele + clubfoot + polydactyly	1	1.3
Hydrocephalus + Myelomeningocele + clubfoot + right hip dislocation	1	1.3
clubfoot + deformation of the pelvis	1	1.3
Congenital hip dislocation + clubfoot + absence left-handedness + hydrocephalus	1	1.3
Stiff neck + clubfeet + right wrist deformation	1	1.3
Anal imperforation + recto vaginal fistula	1	1.3
Microcephaly + harelip + polydactyly	1	1.3
Hypertelorism + lower limb deformity + facial dysmorphism	1	1.3
Anal imperforation + malformation of limbs	1	1.3
Omphalocele + Genu recurvatum	1	1.3
Hydrocephalus + cleft lipopalatine	1	1.3
Myelomeningocle + polymalformative syndrome	1	1.3
Cleft lip-nostril + Macroglossia	1	1.3
Myelomeningocele + open bite + deforming lower limbs	1	1.3
Myelomeningocele + club feet	1	1.3
Cleft palate + short tongue	1	1.3
Microcephaly + short limbs	1	1.3
Retrognathism + ear and limb malformation	1	1.3
Omphalocele + microcephaly	1	1.3
Hydrocephalus + Botfoot	1	1.3
Omphalocele + anorectal malformation	1	1.3
Cleft palate + Glossoptosis + shortness of the lower limbs	1	1.3
Other polymalformations	2	2.6
Total	31	

Table 4: *Distribution of the principals malformations identified.*

Neonates of mothers who used misoprostol for abortion all had a club-foot combination and hip dislocation.

Evolution of malformed newborns

Treatment

Surgical management

Surgical management was performed in 51.3% (n = 40) of cases. Among them, 11/19 cases of hydrocephalus benefited from a ventriculoperitoneal bypass (57.9%).

Myelomeningocele was treated in 10/19 neonates or 52.6% of which 4 were associated with a ventriculoperitoneal bypass.

Sacrococcygeal teratoma, gastroschisis and omphalocele were treated in 100% of cases. The anal imperforation was repaired temporarily by the establishment of a colostomy in 54.5% of cases (n = 6/11) (Figure 1).

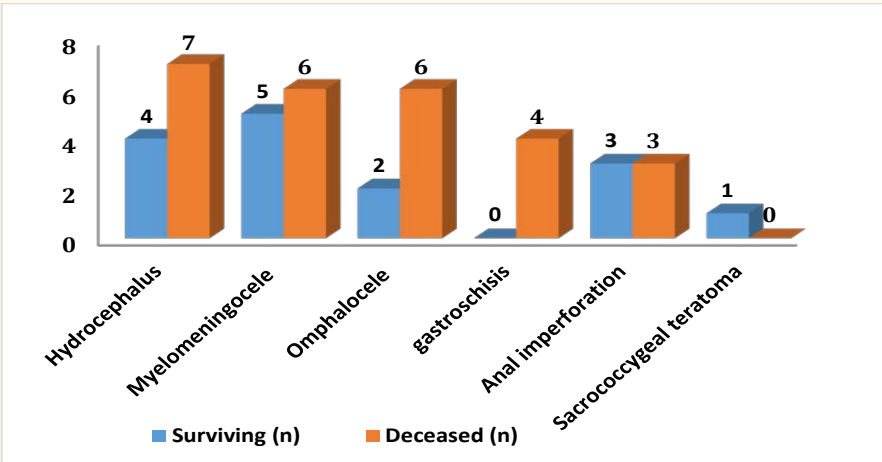

Figure 1: *Distribution of congenital malformations.*

In the group of operated patients, the management of hydrocephalus was done beyond the 6th month of life in all patients. That of myelomeningocele beyond the first month of life. With regard to gastroschisis, only one was operated on the day of his birth, the other 3 were operated after 48 hours of life. The omphalocele was managed surgically after 48 hours of life in two patients whose pouch was broken and after the first month of life for the others. Anal imperforation was performed (colostomy) within 48 hours of life in all children.

Immediate complications

Postoperative complications were observed in 35/40 children, or 87.5% overall. These complications were sepsis (13), surgical wound superinfection (8), meningitis (4), seizures (4), peritonitis (2), ulcerative necrotizing enterocolitis (2) and obstruction of the wound. bypass valve (2). The delay in onset of postoperative complications ranged from 1 to 120 days.

Mortality rate

The overall mortality rate in the study population was 61.5% (n = 48) of cases. Death was more observed in the neonate group with poly malformation (83.9%, n = 26/31). In the case of isolated malformation, the mortality rate was 46.8% (n = 22/47). Death occurred in the first week of life in 66.7% (n = 32/48). Of these, 46.8% (n = 14/32) were premature newborns.

The proportion of newborns who died before adequate management was 45.8% (n = 22/48). Of these children, 77.3% (n = 17/22) required surgical treatment, they were children with hydrocephalus (5), myelomeningocele (6), anal imperforation associated with a poly malformative syndrome (5), a meningocele (1).

Of the 40 (51.3%) children operated, 26 (65%) passed away.

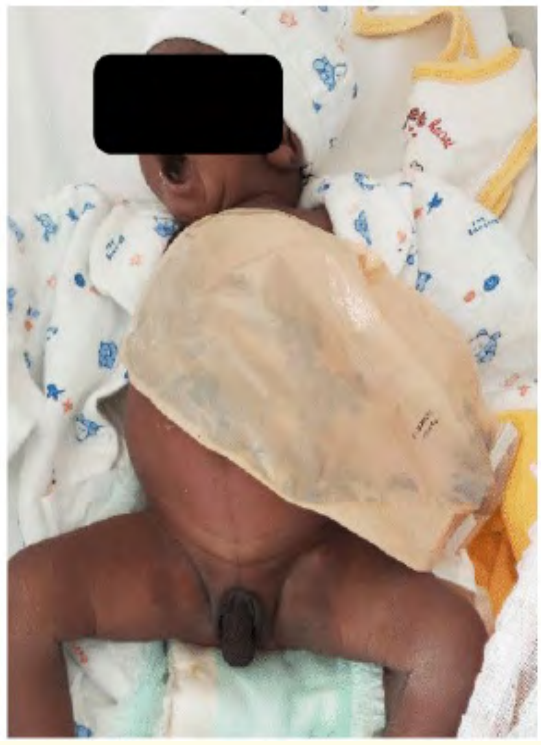

Figure 2: *Temporary stoma in a child with anal imperforate.*

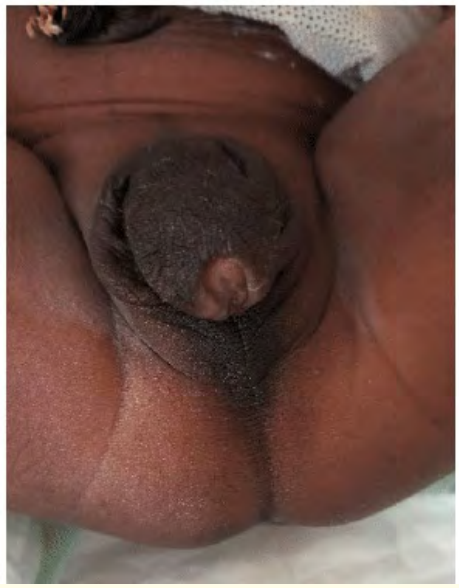

Figure 3: *Anal imperforation and sexual ambiguity.*

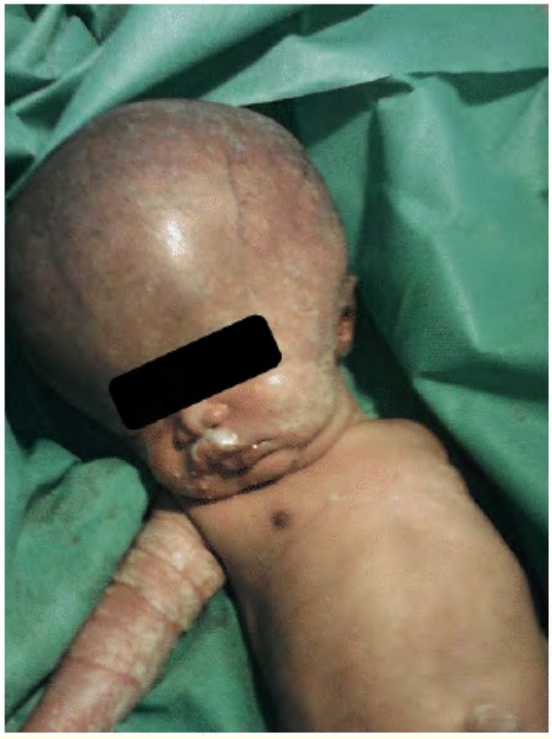

Figure 4: *Hydrocephalus.*

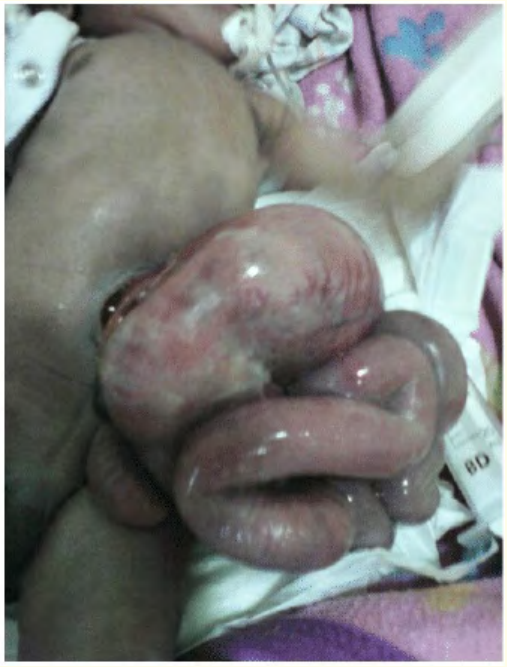

Figure 5: *Gastroschisis.*

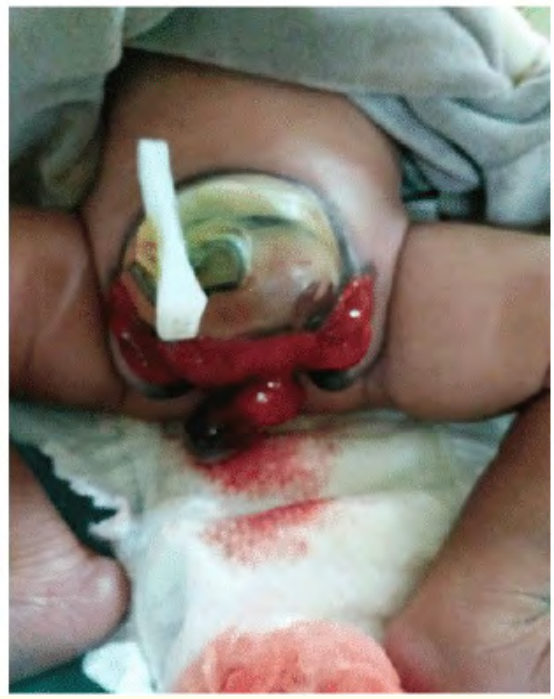

Figure 6: *Omphalocele + bladder exstrophy.*

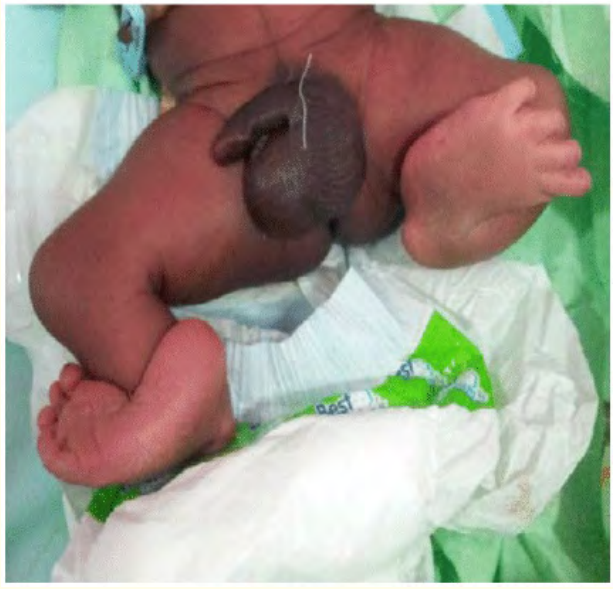

Figure 7: *Limb malformation.*

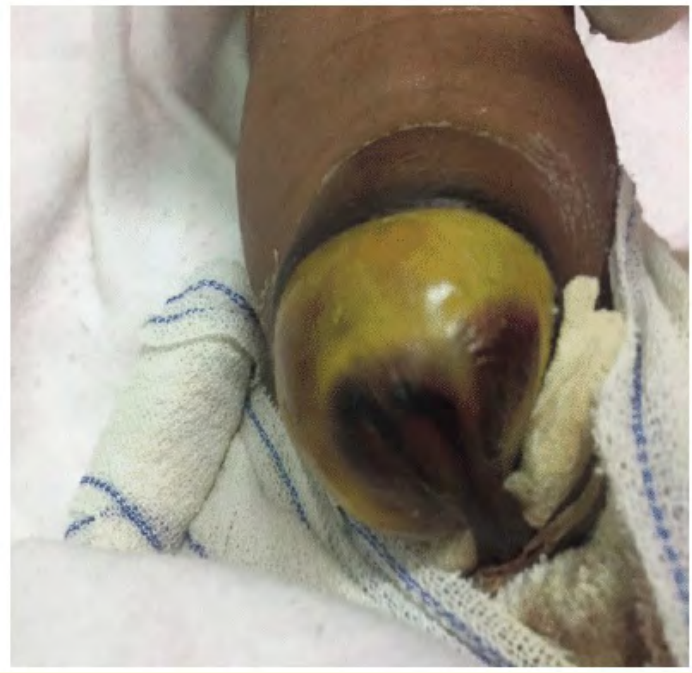

Figure 8: *Omphalocele.*

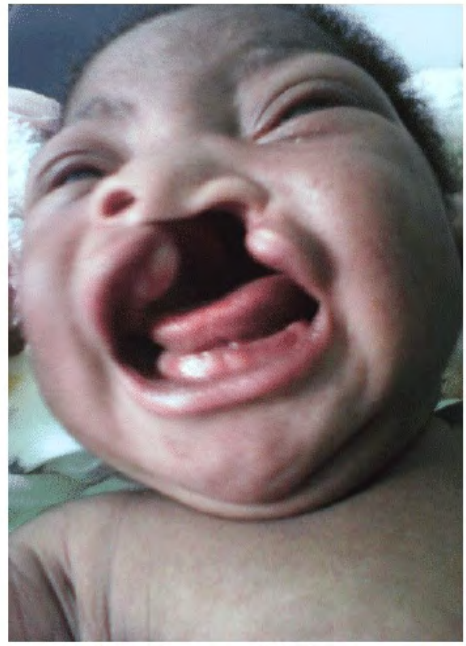

Figure 9: *Cleft lip and palate.*

Discussion

The limits of the study

Our work focused on malformations clinically visible or detectable by clinical examination and only neonates hospitalized in neonatal services is a limit to the study since other non-visible malformations such as heart disease among other things, and late-diagnosis malformations outside the neonatal period were not sought. The respective nature of the study led to the lack of information on certain parameters, which did not allow us to have all the data necessary to carry out complete epidemiological analyzes. A prospective, broader study is planned to better map the different birth defects.

Sociodemographic characteristics of parents.

In our study, the majority of malformed newborns were from mothers under 35 years of age with an average age of 26.2 ± 6.8 years, with the most observed age group being 19 to 25 years of age. This is similar to the studies by Sabiri., *et al*. (27.2 ± 5) [6], by Kamla., *et al.* (27.2 ± 5) [7], Fiogbe., *et al*. (28 ± 7.54) [8], Mashako [9] in whom MCs were the most observed in the age group from 19 to 35 years of age (38.5%). But it is well established that age groups < 18 years and > 35 years are risk factors [2]. This highlights the multifactorial role of the environment, genetic and ethnic variations that define certain risk factors.

The average age of fathers was 32 ± 5 years, close to that observed by Sabiria., *et al*. in Morocco (35.3 ± 5 years) [6] without there being a relationship between paternal age and occurrence Although several studies have concluded that the association of advanced paternal age is associated with the significant risk of occurrence of various CMs [10,11].

According to the WHO, CM is more common in families and resource-poor countries, and it is estimated that about 94% of severe CMs occur in low- and middle-income countries [2]. We observed a high representation of unemployed mothers and fathers (78.21% and 37.17%), as well as Alassane in Mali (83.7% and 24%) [12]. In Cameroon [7] and Morocco, the proportions of unemployed mothers were 28.7% and 42.8% respectively [6]. This suggests that the socio-economic level is a factor of occurrence of CM

Prevalence of CM

The prevalence of CM in our study is 2.29%. This percentage is lower than that reported by Mombo., *et al*. south-east of Gabon (0.14% and 0.64%) [5], Mashako., *et al*. in DRC (3.4%) [9], Aloui and al in Tunisia (46.47% of autopsied fetuses) [14] and Alao., *et al*. in Benin (1 case per week) [15]. This difference is explained by the fact that this figure includes all the visible and non-visible malformations for Aloui, a longer duration for Mashako., *et al*. and a wider recruitment for Alao., *et al*. Our prevalence is close to that observed by Fiogbe., *et al*. (2.66%) in Benin [8], Alassane in Mali (2.91%) [12] and Feldkamp., *et al*. in the USA (2.03%) [16]. In Cameroon and Nigeria, the prevalence observed by Kamla., *et al*. [7] and Eke., *et al*. [17] are smaller, respectively 9 cases per 1000 births and 0.98%, as well as that observed by Gandhi., et al. India (1.23%) [18].

This disparity in prevalence is explained by the fact that CMs are a heterogeneous group of antenatal disorders of diverse and multifactorial origin that may be monogenic, chromosomal, hereditary, or secondary to an environmental aggression or malnutrition. micronutrients. This justifies that at the global level, CMs constitute a real public health problem with a high prevalence, varying from one region to another, from one country to another and to one's own country [2,19]. Considering all types of major abnormalities as minor, the worldwide prevalence is about 14% of live births [20]. In Europe, they account for 10.1% of births [21]. Most commonly, these congenital anomalies are seen at the cardiac (25%), limb (20%), and central nervous system (15%) levels [2,19]. In our study, poly malformations accounted for 39.7% of cases. This rate is higher than that found by Ghandi., *et al.* in India (13.2%) [18]. The malformations of the nervous system are the most observed, dominated by hydrocephalus and neural tube closure abnormalities (n = 38/43), isolation or association. This observation is also made in Cameroon by Kamla., *et al.* [7], Djientcheu., *et al*. [22], Gandaho., *et al.* in Benin [23], Eke., *et al.* in Nigeria [17], Mohat., *et al.* [24] and Gandhi., *et al.* in India [18]. Globally, these malformative diseases of the central nervous system (CNS) are among the most observed MCs, accounting for 15% of congenital anomalies in Europe [19,25]. Of these CNS abnormalities, neural tube defects are the most common and affect the brain and spinal cord, so are very commonly associated with cerebrospinal fluid circulation disorder [1].

These neural tube closure abnormalities are associated with folic acid deficiencies as it is shown that taking 400 micrograms of folic acid per day in the peri-conception period reduces the prevalence of neural tube defects by more than 50% [26]. This recommendation is not applied in our country and this launches the debate on its effective application to women in peri-conception or pregnant period and for this, planning of pregnancies is necessary. However, in our society, pregnancies are usually not planned and women do not benefit from this supplementation probably due to a late start of prenatal consultations. Systematic supplementation in the diet could be considered at home as advocated by some authors who see in this method of supplementation a protection for other malformations such as certain cardiopathies, cleft lip and palate, anal atresia and perhaps even trisomy 21 [27]. This lack of use of folic acid is also observed by Kamla., et al. in Cameroon [7], in Nigeria by Eke [17] and Olufemi., et al. [28] and is not specific to our regions because in one developed country like France, a defective policy of folic acid supplementation is observed, and is the cause of the increase in the prevalence of spina bifida [20].

Diagnostic

The diagnosis of CM can be made before birth, at birth or later in life [2]. Since the improvement of radiological diagnostic techniques, the vast majority of serious MCs are in almost all cases diagnosed antenatal in developed countries. In our work, 92.3% of malformations were discovered at birth or in the first week of life and only 7.7% of antenatal cases. This low antenatal diagnosis rate is also observed in Cameroon [22], Benin [23], Nigeria [28] and Morocco [26]. This deficiency of antenatal diagnosis observed is the result of poor pregnancy monitoring because only 44.8% of mothers have performed an obstetric ultrasound. Similarly, in the Djientcheu., *et al*. study, antenatal ultrasonography was performed in only 32.8% of cases [22]. No mother has achieved CMV and Herpes serology, although the role of these infectious agents is well established, especially in low- and middle-income countries [3]. This is explained by the fact that these two examinations are not included in the systematic antenatal assessment and are few during prenatal consultations in our country.

Management and evolution

The proportion of newborns who received surgical treatment was low in our study (51.3%). This finding is also made in Nigeria (61.2%) [17] and Cameroon (26.09%) [22]. The lack of technical platform, specialized staff and low socioeconomic conditions is probably the explanation.

In our study, the mortality rate is 61.5% (n = 48). This high rate is also observed by Mashako., *et al*. in Congo (59.6%) [8] and Stevenson in the USA (34.4%) [10]. This mortality depends directly on 2 parameters.

First, the type of malformation. In our study, death was more observed in children with CNS and GI abnormalities. CNS MCS are known to be the most disabling in newborns in sub-Saharan African pediatrics [22]. In Niger, Sanoussi., *et al*. observe a high rate of death of children with neural tube defects (86.82%) [29]. Like Radouani., *et al*. in Morocco (20 to 36%) [26]. Lower rates are observed in Cameroon (11.59%) [22] and Nigeria (1.4%) [17]. This difference highlights the 2nd parameter, the quality of support. This care is not adequate in our country because of the lack of an efficient technical platform and specialized staff (responsible for the lack of care observed in some patients), the low socio-economic level, which has a serious impact on quality of care since most pediatric surgeons are in the private sector, the price of surgical equipment is very high is not within the reach of many parents (e.g. the cost of the peritoneal catheter in the management of hydrocephalus is 700.000 CFA, about 1067 €). This explains the very high proportion of newborns who died in the first week of life (66.7%, n = 32/48) and before treatment (45.8%, n = 22/48).

However, we know that the mortality rate of children with MC remains very high. MCs are the leading cause of infant mortality in many countries around the world [20], and despite advances in screening and treatment techniques, WHO still estimates that 276,000 newborns die each year before they die. 28 days of age due to congenital anomalies [2]. These deaths due to congenital anomalies become the most important cause of mortality when the overall mortality rate is low as in the European Region, where 17 to 43% of infant mortality has been attributed to a congenital anomaly [30].

Conclusion

Congenital malformations remain a concern in our services by their frequency and their prognosis. They constitute an important cause of mortality in a context of still problematic care. Mortality factors are known. It is important to focus on prevention (use of folic acid) and remedial treatment through the acquisition of an efficient technical platform that includes well-trained staff.

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