

ASSOCIATION OF CONGENITAL ANOMALIES IN LIVE BIRTHS WITH THEIR OBSTETRIC-NEONATAL AND SOCIODEMOGRAPHIC PROFILES

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ABSTRACT

Objective: to identify the association of congenital anomalies in live births with the obstetric-neonatal and sociodemographic profile.

Methods: an ecological study, conducted in 2019, with 251,444 live births, identified through the database of the Live Birth Information System of the Minas Gerais Health Secretariat. Descriptive statistics and binary logistic regression were adopted for the analysis.

Results: 1,865 cases of anomalies (0.7%) were found, with predominance of deformity of the musculoskeletal system in 789 (42.3%) live births. The variables that presented a significant association with congenital anomalies were single mothers, age ≥ 35 years old, inadequately performed prenatal care initiated in the third trimester of pregnancy, double (or more) pregnancy, preterm births, cesarean delivery, fetal breech presentation, exclusive assistance by the medical professional during delivery, newborn with high-risk 5-minute Apgar score, low birth weight, and male gender.

Conclusion: in 2019, the congenital malformations in the state of Minas Gerais were associated with single women, aged ≥ 35 years old, who underwent inadequate and late prenatal care, and with double or more pregnancies. In relation to the newborns, the malformations were associated with a high risk for late sequelae, weight between $\leq 1,000$ g and $< 2,500$ g, and male gender.

DESCRIPTORS: Health information systems. Live birth. Children's health. Congenital anomalies. Health profile.

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ASSOCIAÇÃO DE ANOMALIAS CONGÊNITAS EM NASCIDOS VIVOS COM SEUS PERFIS OBSTÉTRICO-NEONATAL E SOCIODEMOGRÁFICO

RESUMO

Objetivo: identificar a associação das anomalias congênitas em nascidos vivos com o perfil obstétrico-neonatal e sociodemográfico.

Métodos: estudo ecológico, realizado em 2019, com 251.444 nascidos vivos, identificados por meio do banco de dados do Sistema de Informações de Nascidos Vivos da Secretaria de Saúde de Minas Gerais. Para análise, adotaram-se a estatística descritiva e a regressão logística binária.

Resultados: foram encontrados 1.865 casos de anomalias (0,7%), com predominância de deformidade do sistema osteomuscular em 789 (42,3%) nascidos vivos. As variáveis que apresentaram associação significativa com a anomalia congênita foram mães solteiras, idade ≥ 35 anos, pré-natal realizado de forma inadequada, iniciado no terceiro trimestre de gestação, gestação dupla ou mais, nascimentos pré-termo, parto cesárea, apresentação fetal pélvica, assistência exclusiva do profissional médico durante o parto, recém-nascido com Apgar de alto risco no quinto minuto, baixo peso ao nascer e sexo masculino.

Conclusão: em 2019, as malformações congênitas no estado de Minas Gerais associaram-se às mulheres solteiras, com idade ≥ 35 anos, que realizaram pré-natal inadequado e tardio, com gestações duplas ou mais. Em relação aos recém-nascidos, as malformações foram associadas com alto risco para sequelas tardias, peso entre ≤ 1.000 g e < 2.500 g e ser do sexo masculino.

DESCRITORES: Sistemas de informação em saúde. Nascimento vivo. Saúde da criança. Anormalidades congênitas. Perfil de saúde.

ASOCIACIÓN ENTRE ANOMALÍAS CONGÉNITAS EN NACIDOS VIVOS Y SUS PERFILES OBSTÉTRICO-NEONATAL Y SOCIODEMOGRÁFICO

RESUMEN

Objetivo: identificar la asociación entre las anomalías congénitas en nacidos vivos y el perfil obstétrico-neonatal y sociodemográfico.

Métodos: estudio ecológico realizado en el año 2019 con 251.444 nacidos vivos, identificados por medio de la base de datos del Sistema de Información sobre Nacidos Vivos de la Secretaría de Salud de Minas Gerais. Para el análisis, se adoptaron estadística descriptiva y regresión logística binaria.

Resultados: se encontraron 1.865 casos de anomalías (0,7%), con predominio de deformidad del sistema osteomuscular en 789 (42,3%) nacidos vivos. Las variables que presentaron una asociación significativa con las anomalía congénitas fueron las siguientes: madres solteras, edad ≥ 35 años, cursar atención pre-natal inadecuada e iniciada en el tercer trimestre de embarazo, embarazo de gemelos o más bebés, nacimientos prematuros, parto por cesárea, presentación fetal pelviana, asistencia exclusiva de un médico durante el parto, recién nacido con Apgar de alto riesgo al quinto minuto, bajo peso al nascer y sexo masculino.

Conclusión: en el año 2019, las malformaciones congénitas en el estado de Minas Gerais estuvieron asociadas a mujeres solteras, con edad ≥ 35 años, que cursaron atención pre-natal inadecuada y tardía, con embarazos de gemelos o más bebés. En relación con los recién nacidos, las malformaciones estuvieron asociadas con alto riesgo de secuelas tardías, peso entre ≤ 1.000 g y < 2.500 g y ser del sexo masculino.

DESCRIPTORES: Sistemas de información en salud. Nacido vivo. Salud infantil. Anomalías congénitas. Perfil de salud.

INTRODUCTION

Since the 1970s, in Brazil, the information pertaining to births was based exclusively on the Civil Registry System and released by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE). Due to the existence of birth under-recording and to the importance of the information on live births for health statistics, epidemiology and demography, in 1990, the Live Birth Information System (*Sistema de Informações sobre Nascidos Vivos*, SINASC) was implemented¹. The SINASC aims at gathering epidemiological information referring to the births throughout the national territory and presents as its most poignant benefit the basis of interventions related to women's and children's health at the federal, state and municipal levels, belonging to the Unified Health System (*Sistema Único de Saúde*, SUS)¹.

The main form that feeds this system is called Statement of Live Birth (SLB). This is a provisional identity document, printed in three copies, previously numbered, with free distribution and under the responsibility of the Ministry of Health². Since 1999, the inclusion of congenital anomalies (CAs), or congenital defects, stood out in this statement³. CAs can be described as congenital defects, congenital disorders and congenital malformations, resulting from a failure in one or more body components during embryonic development at the structural, functional, metabolic, behavioral or even hereditary levels, and occurring in an isolated or associated manner, configuring the syndromes in the associated form⁴⁻⁵.

It is estimated that there are approximately 300,000 deaths annually due to CAs worldwide, which represents 7% of all the neonatal deaths, generally more prevalent in locations with low mortality rates, such as Europe, which is possibly justified by environmental and genetic factors⁶. Etiologically, from 15% to 25% of the CAs in newborns are due to genetic changes; from 8% to 12%, to environmental factors; and from 20% to 25%, to genes and environmental factors (multifactorial inheritance)⁷, with factors such as the following standing out: age extremes, advanced paternal age, low schooling, absence of a partner, unfavorable socioeconomic conditions, late initiation of prenatal care, living in rural areas, pre-existing diseases or developed during pregnancy, treatments implemented without exact clinical evidence, previous history of abortion or child with a CA, exposure to teratogenic substances, twinning and number of children⁸. In addition, 40% to 60% of the anomalies are of unknown origin⁷. Cardiovascular, musculoskeletal and urogenital CAs are the most common CAs, with a decline of the neurological CA in Brazil after the inclusion of folic acid supplementation⁹. However, it can be considered that, currently, microcephaly associated with Zika infection has exerted a negative impact on national public health since, from October 2015 to May 2017, 26 American countries reported confirmed cases of congenital Zika syndrome and, in this period, of the universe of 3,374 cases, 82% occurred in Brazil¹⁰.

The state of Minas Gerais was able to implement the SINASC in mid-1991, which allowed for the characterization of the birth profile. The SINASC was considered an important progress in the registration of data and as support for the planning and implementation of public policies aimed at maternal and child health in this scenario¹¹. However, it is possible to observe that the scientific research studies in this scope consider mainly the quality assessment of this information system and the profile of neonatal mortality and prematurity, making the literature collection incipient regarding the association of CAs in live births with the obstetric-neonatal and sociodemographic profile in this state¹¹.

Consequently, it becomes fundamental to contextualize the CA scenario in view of their association possibilities. Existing research is still scarce, and the results from this type of study can support protocols, health policies and evidence-based best practices¹¹. Thus, this study presents the following as hypothesis: the CAs in live births in the state of Minas Gerais are associated with worse

obstetric-neonatal and sociodemographic indicators. Thus, this study aimed to identify the association of CAs in live births with the obstetric-neonatal and sociodemographic profiles of the state of Minas Gerais.

METHOD

This is an ecological study¹², whose population consisted of the live births of the state of Minas Gerais during 2018, and identified through the SINASC, the database being provided by the State Health Secretariat of Minas Gerais (*Secretaria do Estado da Saúde de Minas Gerais*, SES/MG). The 2018 database contained 263,652 Statements of Live Births (SLBs). The inclusion criteria for this study were as follows: live births, included in the SINASC database from January 1st to December 31st, 2018, to mothers of any age living in the state of Minas Gerais.

The following were excluded: SLBs of an epidemiological nature, which refers to the statements issued when it is not possible to generate a normal SLB, usually in circumstances of the child's death;¹³ the SLBs of live births with less than 23 gestational weeks; and those that did not specify whether the newborn had CAs or not. A total of 12,208 live births did not meet these criteria, mainly due to lack of records on CAs. Therefore, a population of 251,444 newborns was considered for this study.

The database was provided by SES/MG, after the project was approved by the Research Ethics Committee, following Resolution 466, of December 12, 2012. The Informed Consent Form was waived, since the information was already collected and filed, without personal identification variables such as name and address, which reinforced the confidentiality of the information.

The computerized database was handled only by the research team and by a statistician.

For data extraction, an instrument developed by the researcher was used, divided into three parts, namely: the first, called "Identification", which characterized the newborn, presenting the variables of gender, birth weight and 5-minute Apgar score, and the mother, identifying schooling, age, marital status and race; the second part of the instrument, called "Vital Cycle", characterized pregnancy and delivery, considering the variables of number of previous pregnancies, type of pregnancy, quality of prenatal care, week when prenatal care was initiated, gestational weeks, type of delivery, induced delivery, professional who assisted the delivery, presentation of the newborn at delivery, 5-minute Apgar score of the newborn, and birth weight; the third part of the instrument, called "Congenital Anomaly", highlighted the presence and description of the CAs identified.

The frameworks adopted for the interpretation of the findings were the premises contained in the work group called National Institute of Child Health and Human Development (NICHD), comprised by the American College of Obstetricians and Gynecologists (ACOG), the American Academy of Pediatrics (AAP), the Society for Maternal-Fetal Medicine (SMFM), March of Dimes (MOD), and by the World Health Organization (WHO), as well as data from the Ministry of Health and the International Classification of Diseases and Health-Related Problems (ICD)¹⁴.

Based on the knowledge and on the scientific evidence deliberated by these institutions and technical standards, for this research, the division of prenatal care into trimesters (first trimester: initiation of prenatal care in the first, second and third months; second trimester: fourth, fifth and sixth months; and third trimester: seventh, eighth and ninth gestational months). Newborns with 37 or fewer complete gestational weeks were considered as preterm; as early-term, those with 37 - 38 weeks; as full-term, 39 - 40 weeks; as late-term, 41 weeks; and, as post-term, those with 42 or more gestational weeks¹⁴. Maternal age was stratified into 19 years old or less, from 20 to 34 years old, and 35 years old or more (age groups justified for representing low-risk pregnancy, normal pregnancy, and risk pregnancy, respectively).

If the pregnant women attended a minimum of six prenatal consultations, they were considered adequate. Prenatal care was inadequate when the pregnant women attended less than six consultations¹⁵. 5-minute Apgar scores below 7 characterized newborns as with high risk at birth and 5-minute Apgar scores equal to or greater than 7 represented habitual risk at birth¹⁴. Birth weight was stratified as extremely low weight for newborns weighing less than 1,000 g; as very low weight for newborns weighing less than 1,500 g; as low weight for newborns less than 2,500 g; or, weighing more than 4,000 g, as fetal macrosomia; and, between 2,500 g and 4,000 g, as adequate weight¹⁶. Regarding the mother's schooling¹⁴, a period of less than 8 years of study (equivalent to Elementary School) was defined as low instruction level and a period greater than or equal to 8 years of study (corresponding to High School) was considered as adequate instruction level.

In relation to the CAs, eleven categories were grouped¹⁷: congenital malformations of the nervous system; congenital malformations of the eye, ear, face and neck; congenital malformations of the circulatory system; congenital malformations of the respiratory system; cleft lip and cleft palate; other congenital malformations of the digestive tract; congenital malformations of the genital organs; congenital malformations of the urinary tract; congenital malformations and deformities of the musculoskeletal system; other congenital malformations and chromosomal anomalies not elsewhere classified. In this study, the term "multiple anomalies" was considered for those newborns who presented more than one anomaly, also covering anencephalies, with an emphasis on microcephalies.

The data were managed in the Excel® software and analyzed in the Statistical Package for the Social Sciences (SPSS), version 20.0. Univariate analyses of the categorical variables were performed, with distributions of absolute, relative and percentage frequencies. Subsequently, binary logistic regression was performed in two stages: the first addressed the gross binary logistic regression between the independent variables and the anomaly, and those with p-values<0.20 in the gross analysis were introduced in the adjusted analysis, considering a significance level of p<0.05.

RESULTS

To contextualize the scenario, 251,444 live births and their respective mothers were characterized. Table 1 shows the epidemiological characterization of the live births and Table 2, that of mothers. Tables 3 and 4 characterize the associations between the CAs (n=1,865) and the obstetric-neonatal and sociodemographic profile of the mothers.

Table 1 – Distribution of the epidemiological characterization of the live births. Minas Gerais, MG, Brazil, 2018. (n=251,444)

Characteristic	n (%)
Gender	
Male	128,449 (51.1)
Female	122,969 (48.9)
Absent*	26 (0)
Weight	
Adequate	218,226 (86.8)
Low	20,195 (8.0)
Fetal macrosomia	9,318 (3.7)
Very low	2,040 (0.8)
Extremely low	1,661 (0.7)
Absent	4 (0)

Table 1 – Cont.

Characteristic	n (%)
5-minute Apgar	
Habitual risk	241,183 (95.9)
High risk	2,185 (0.9)
Absent†	8,076 (3.2)

* Live births without their gender stated in the Statement of Live Birth or indicated as unknown data; † Newborns without their Apgar score stated in the Statement of Live Birth.

Table 2 – Distribution of the epidemiological characterization of the live births' mothers. Minas Gerais, MG, Brazil, 2018. (n=251,444)

Characteristics	n (%)
Maternal age group, years old	
≤19	32,337 (13.3)
20-34	174,476 (69.4)
≥35	44,631 (17.3)
Absent and unknown	-
Marital status	
Single	101,752 (40.5)
Married	111,182 (44.2)
Widow	543 (0.2)
Judicially separated/divorced	4,697 (1.9)
Stable union	31,259 (12.4)
Absent and unknown	2,011 (0.8)
Schooling*	
No schooling	452 (0.2)
1 st -4 th grade	7,272 (2.9)
5 th -8 th grade	49,772 (19.8)
High School	132,159 (52.6)
Incomplete Higher Education	12,335 (4.9)
Complete Higher Education	45,765 (18.2)
Absent and unknown	3,689 (1.4)
Mother's race/skin color	
White	84,390 (33.6)
Black	21,228 (8.4)
Asian	2,092 (0.8)
Brown	136,721 (54.4)
Indigenous	530 (0.2)
Absent and unknown	6,483 (2.6)

* For schooling, the statistical analysis was performed in seven variables. However, when the discussion was conducted, the data were grouped into two variables (more or less than 8 years of study), for better detailing the data.

As for the CAs, 1,865 (0.7%) were identified, with prevalence of the musculoskeletal CAs, representing 789 (42.3%) anomalies; of multiple anomalies, which were 370 (19.8%); and followed by anomalies of the nervous system, totaling 128 (6.9%).

There was predominance of the male gender in relation to the presence of CAs, with 1,015 (55.2%) cases, the most frequent being the musculoskeletal anomalies, represented by 419 (41.3%) cases, and the CAs of the nervous system, with 73 (7.2%) cases.

Regarding the mothers' age, in all the age groups established, the most frequent CAs were those of the musculoskeletal system (789 cases; 42.3%) and, according to the mothers' age group, it was distributed into women aged 19 years old or less (98 cases; 12.0%), from 20 to 34 years old (542 cases; 69%), and aged 35 years old or more (149 cases; 19%).

Table 3 shows the unadjusted multivariate analysis of the CAs with the mothers' socio-demographic profile.

Table 3 – Unadjusted multivariate analysis of the congenital anomalies with the mothers' sociodemographic profile. Minas Gerais, Brazil, 2018. (n=1,865)

Variables	Congenital anomaly n	Gross OR value (95%CI)	Adjusted OR value	p-value
Maternal schooling*				
Illiterate	5	1.44 (0.59-3.50)		> 0.05
1 st -4 th grade	58	1.03 (0.78-1.37)		> 0.05
5 th -8 th grade	418	1.09 (0.94-1.25)		> 0.05
High School	917	0.90 (0.79-1.02)		> 0.05
Incomplete Higher Education	85	0.89 (0.70-1.13)		> 0.05
Complete Higher Education	353	1		
Marital status				
Single	817	1.17 (1.00-1.36)	1.23 (1.04-1.45)	<0.05†
Married	773	1.01 (0.87-1.18)	1.01 (0.85-1.19)	> 0.05
Widow	4	1.07 (0.38-2.89)	0.52 (0.13-2.14)	> 0.05
Separated	49	1.52 (1.11-2.08)	1.41 (1.0-1.97)	> 0.05
Stable union	215	1		
Age group, years old				
20-34	1,177	1	1	
≤19	242	1.11 (0.97-1.28)	1.10 (0.94-1.29)	> 0.05
≥35	446	1.49 (1.33-1.66)	1.31 (1.17-1.49)	<0.05†
Race/Skin color				
White	600	1		
Black	176	1.67 (0.99-1.38)		> 0.05
Asian	15	1.00 (0.60-1.69)		> 0.05
Brown	1,026	1.06 (0.95-1.17)		> 0.05
Indigenous	6	1.60 (0.71-3.60)		> 0.05

* For schooling, the statistical analysis was performed in seven variables. However, when the discussion was conducted, the data were grouped into two variables (more or less than 8 years of study), for better detailing the data; † Significant association; ‡ The information without records was excluded from the variables. OR: Odds Ratio; 95%CI: 95% Confidence Interval.

The association between CAs and variables related to the obstetric-neonatal and sociodemographic profile was verified in single women (Odds Ratio – OR=1.23; 95%CI=1.04-1.45); mother aged 35 years old or more (OR=1.31; 95%CI=1.17-1.49); inadequate prenatal care (OR=1.38; 95%CI=1.21-1.58); double or more pregnancy (OR=2.18; 95%CI=1.85-3.31); prenatal care initiated in the second trimester (OR=1.31; 95%CI=1.13-1.53) and in the third trimester (OR=1.83; 95%CI=1.12-2.11); preterm newborn (OR=3.44; 95%CI=3.06-3.86) and early term newborn (OR=1.25; 95%CI 1.30-2.60); cesarean delivery type (OR=1.33; 95%CI=1.19-1.50); fetal breech presentation (OR=2.08; 95%CI=1.78-2.45); medical professional who assisted the delivery (OR=1.87; 95%CI=1.30-2.70); high-risk 5-minute Apgar score (OR=9.65; 95%CI=8.04-11.59); extremely low weight (OR=2.21; 95%CI=1.58-3.08); very low birth weight (OR=3.98; 95%CI=3.00-5.33); low weight (OR=2.91; 95%CI=2.52-3.38), and male newborn(OR=1.20; 95%CI=1.08-1.32) (Table 4).

Table 4 – Adjusted multivariate analysis (logistic regression) of the congenital anomalies with the obstetric-neonatal profile. Minas Gerais, Brazil, 2018. (n=1,865)

Variables	Congenital anomaly n	Gross OR value (95%CI)	Adjusted OR value (95%CI)	p-value
Number of previous pregnancies				
Nulliparous	726	0.97 (0.89-1.07)		>0.05
Multiparous	1,111	1		
Type of pregnancy				
Single	1,805	1	1	-
Double or more	59	1.40 (1.08-1.82)	2.18 (1.85-3.31)	<0.05*
Prenatal care				
Adequate	1,370	1	1	
Inadequate	466	1.22 (1.10-1.36)	1.38 (1.21-1.58)	<0.05*
Initiation of prenatal care				
1 st trimester	1,470	1	1	
2 nd trimester	246	1.17 (1.02-1.34)	1.31 (1.13-1.53)	<0.05*
3 rd trimester	40	1.54 (1.12-2.11)	1.83 (1.30-2.60)	<0.05*
Gestational weeks				
Preterm	519	3.44 (3.06-3.86)	1.48 (1.26-1.74)	<0.05*
Early term	546	1.25 (1.11-1.34)	1.05 (0.93-1.18)	> 0.05
Full term	652	1	1	
Late term	90	0.97 (0.77-1.21)	0.95 (0.75-1.20)	> 0.05
Post term	24	0.83 (0.55-1.25)	0.82 (0.54-1.26)	> 0.05
Type of delivery				
Vaginal	637	1	1	-
C-section	1,226	1.34 (1.27-1.54)	1.33 (1.19-1.50)	<0.05*
Induced delivery				
No	1,505	1	1	-
Yes	308	1.22 (1.08-1.38)	0.98 (0.85-1.12)	> 0.05
Professional who assisted the delivery				
Other professionals	34	1	1	-
Physician	1,811	2.47 (1.76-3.47)	1.87 (1.30-2.70)	<0.05*

Table 4 – Cont.

Variables	Congenital anomaly n	Gross OR value (95%CI)	Adjusted OR value (95%CI)	p-value
Presentation of the newborn				
Cephalic	1,594	1	1	-
Breech	217	3.30 (2.86-3.81)	2.08 (1.78-2.45)	<0.05*
Transverse	9	2.64 (1.36-5.11)	1.57 (0.75-3.26)	> 0.05
5-minute Apgar				
Habitual	1,624	1	1	-
High risk	220	16.51 (14.25-19.14)	9.65 (8.04-11.59)	<0.05*
Weight				
Extremely low	67	7.40 (5.76-9.51)	2.21 (1.58-3.08)	<0.05*
Very low	83	7.47 (5.95-9.37)	3.98 (3.00-5.33)	<0.05*
Low	429	3.82 (3.42-4.27)	2.91 (2.52-3.38)	<0.05*
Adequate	1,232	1	1	-
Macrosomia	54	1.03 (0.78-1.35)	1.02 (0.77-1.35)	> 0.05
Gender				
Female	824	1	1	-
Male	1015	1.18 (1.08-1.29)	1.20 (1.08-1.32)	<0.05*

* Significant association; † The information without records was excluded from the variables. OR: Odds Ratio; 95%CI: 95% Confidence Interval.

DISCUSSION

The prevalence of CAs found in this study (0.7%) presents a similar percentage in comparison to other national and international surveys¹⁸⁻¹⁹. The slight predominance of the male gender among the newborns in 2018 in the state of Minas Gerais is similar to literature findings¹⁸. A cross-sectional study carried out in Belo Horizonte (MG), from January 1994 to December 2014, characterized the profile of 738,314 declared births, stating that 51.1% were male¹¹. The literature also points to a secular trend in the proportion of births between the genders in South America during the second half of the 20th century, showing that the birth rate corresponding to the male gender exceeds that of the female gender¹⁸.

The study presented 86.8% of the newborns with adequate weight and 95.9% with Apgar scores classified as habitual risk. Birth weight is a parameter used not only to indicate the intrauterine conditions to which the child was subjected during the gestational period, but also to analyze the newborns' health, being considered a determining factor for their survival¹⁶. A retrospective cohort study conducted from 2013 to 2014 at a maternal and child health hospital in the city of Jinan, China, analyzed 2,415 women who had a single delivery and identified that the risk of giving birth to a newborn with high birth weight increases when the mother's pre-gestational Body Mass Index is also increasing, exceeding 24 kg/m², and that public awareness-raising strategies on gestational weight gain are necessary¹⁹.

Likewise, low birth weight is also a public health concern because, when a child with birth weight below 2,500 g is born, there are up to 20 times more chances of infant mortality²⁰. The birth weight presented in this study is similar to that of a survey carried out in a Family Health Center in the city of Sobral (CE) with 64 newborns, which verified most of this population with adequate weight²¹.

As for the newborn's Apgar score, the result of this research confirms the findings in the literature, which show lower prevalence of 5-minute Apgar scores <7. However, the need remains to encourage the adoption of rigorous newborn admission protocols, which refrain from any error during this assessment²².

For the contextualization of this scenario, the epidemiological description of the mothers was also important, mostly characterized in the age group of 20 to 34 years old, married, with complete High School and mixed skin-color. Other studies also identified a predominant age group between 20 and 34 years old, pointing out that this maternal age profile has been maintained in Brazil for at least two decades^{11,21}.

Regarding the mothers' marital status, the result of this research contradicts that observed in the literature, which indicates predominance of single women, pointing out that the majority does not have a steady partner, which can be a burden factor for the mother after birth^{11,18}.

Schooling is a major factor for the safety and quality of pregnancy. Low schooling leads to difficult access to appropriate prenatal services and better equipped maternity hospitals. For this reason, the children present fewer chances of survival²³. Maternal skin color is also determinant in relation to the number of children. Black-skinned (black- and brown-skinned) women have larger families; in the Southeast Region, white-skinned women have the lowest fertility rate in the country (1.55 children per woman) and, in the North Region, black-skinned women have more children (2.67 children per woman). Historically, in Brazil, the health indicators of mothers and newborns, according to race/skin color, show an unfavorable panorama for black- and brown-skinned women, noticing, for example, that in the health services women also differ according to their instruction level and skin color. At delivery, black- and brown-skinned women were more penalized, for not being accepted in the first maternity hospital they resorted to and, during delivery, they received less anesthesia²⁴.

Nursing care management in obstetric and neonatal care, performed by nurses, both at the hospital level and in Primary Care through clinical Nursing protocols based on the best available evidence, enables adequate and comprehensive care for live births with adequate weight and habitual risk Apgar scores, as there is empowerment of the mother-child binomial and of the family, as well as human, multidimensional, safe and timely care, with the use of light technologies, rational costs and good practices, educational and integrative actions, and non-pharmacological or pharmacological technologies according to the need²⁵.

With emphasis on the CAs, predominance of the musculoskeletal anomalies was identified, mainly in male newborns, and more frequent in mothers in the age group between 20 and 34 years old. In agreement with this result, a research study carried out in Rio Grande do Sul between 2005 and 2014 and addressing CAs, pointed out predominance of male newborns, brown-skinned mothers and with musculoskeletal anomaly²⁶. The predominance of osteoarticular malformations can be related to ease of diagnosis, as they are visible in the physical examination at birth²⁷.

As for the mothers' obstetric and sociodemographic profile, an association with the CAs was identified in single women, aged 35 years old or more, who performed prenatal care inadequately and only in the third trimester of pregnancy, double or more pregnancy, cesarean delivery, with preterm newborns in fetal breech presentation, high-risk 5-minute Apgar, and predominant monitoring by the medical professional during delivery. In the literature, an association was verified between the categories of congenital malformations and maternal variables such as age, drug use, number of prenatal consultations, schooling and number of pregnancies, as well as neonatal variables such as gestational age, weight and gender (p-values between <0.001 and 0.047)²⁸. Similar results were found in this research. A case-control study observed maternal risk factors that may have influenced the occurrence of CAs such as history of children with CAs, family history and inbreeding between the parents²⁸.

Other research studies also highlight similar associations to those of this study, such as attending less than six prenatal consultations and newborns with Apgar scores below 7, weight $\leq 1,500$ g and gestational age ≤ 31 weeks²². A greater chance of anomalies was also recorded in premature infants (OR=2.39; 95%CI=2.30-2.49), mothers aged over 40 years old (OR=1.59; 95%CI=1.47-1.71), newborns with birth weight between 500 g and 2,500 g (OR=3.35; 95%CI=3.21-3.49) and multiple pregnancies (triple or more: OR=2.68; 95%CI=1.91-3.77; double: OR=1.28; 95%CI=1.19-3.77)²⁷.

The association of single mothers with CAs points to something incipient in relation to the literature that addresses this theme, configuring a new finding, which suggests greater deepening. From the perspective of the social determinants, the mother's marital status is considered, in which women with marital stability attain beneficial standards, ranging from the reduction of reproductive risk (number of partners and communicable diseases) to better food safety conditions, for having family income added to that of the partner⁶.

Despite the advances, prenatal care in Brazil needs significant improvements. In this study, inadequate and late prenatal care (third trimester of pregnancy) was associated with CAs in newborns. Low-quality prenatal care or lacking follow-up contributes to unfavorable outcomes regarding the diagnosis of fetal pathologies, making it impossible for families to access specialized multiprofessional assistance, in a timely manner, for couple counseling and treatment⁶.

The factors of double or more pregnancy, accompanied by cesarean delivery, with the birth of a preterm newborn and fetal breech presentation, were also associated with the presence of CAs in this study. Double or more pregnancy can cause congenital defects, due to errors during cell division⁶. Data such as gestational time, type of delivery and fetal breech presentation at the time of delivery must be carefully discussed, since there are limiting aspects when determining such associations, as previously detected anomalies, also intrauterine, may have been interrupted, affecting this statistic; and, when interrupted, cesarean delivery is used⁶.

The exclusive monitoring by only one health professional – in the case of this research, the physician – was associated with the occurrence of CAs. This is also a debatable factor, scarce in the literature and which instigates scientific deepening; however, it is worth noting that, in order for the monitoring of the newborn to be really effective, it is recommended that health care be provided by a multidisciplinary and specialized team, mainly consisting in neonatologists, nurses, physiotherapists, occupational therapists, speech therapists, ophthalmologists, neurologists, psychologists and cardiologists²⁹. In addition, due to the precarious gestational conditions of the mother or fetus, the presence of the physician at the time of delivery can be requested.

Three factors were more prevalent in relation to the newborn and the association with CAs, namely: low weight, male gender and high-risk 5-minute Apgar score. CAs are directly associated with infant morbidity and mortality, especially when considering the neonatal period, a time of major changes and vulnerability for the newborn. Therefore, studying, understanding and acting in CA cases is essential for an early diagnosis, the allocation of specialized resources necessary for the care of this child, and the improvement of the health and quality of life of the newborn and family²⁸.

It is relevant to carry out Nursing research studies with families who are in this situation of complex vulnerability in order to understand their experience in the daily routine of caring for such children. It is essential to commit to the development of research studies related to interventions that are effective for the instrumentalization of nurses in care, as well as training, in order to expand the theoretical knowledge of the Nursing area, based on scientific evidence. With this knowledge, it is possible to establish improvements in the public system of care for children with CAs in general, since this problematization is not an isolated governmental factor, and the professional category of Nursing, as a specialist in the subject matter of human care, must be engaged in this effort, beneficial not only for this population but also for the entire Brazilian society³⁰.

Neonatal mortality, early or late, due to preventable causes tends to decrease with the implementation of health policies, such as the increase in the gynecologist-obstetrician ratio per 100,000 inhabitants and the doubling of the number of beds in the neonatal intensive care unit per 1,000 live births, reinforcing the importance of strengthening the high-complexity network to reduce preventable neonatal deaths.

The use of secondary data (from the SINASC) is identified as a limitation of this research, with the completion quality of the statements that feed the system escaping from the researchers' control, which can imply information loss. However, in this study, variables with completeness above 80% were used.

The findings of this research indicate the need to offer specialized care to these newborns, with the intention of reducing and preventing morbidity and mortality in this population, as well as contributing to assistance, teaching and research, as they present a scenario based on evidence about the CAs in the state of Minas Gerais, highlight association variables, and provide a verification of the weak points of prenatal care in the state of Minas Gerais.

CONCLUSION

Data analysis indicated low prevalence of congenital malformations, being associated, according to the obstetric-neonatal and sociodemographic profile, to women aged ≥ 35 years old, single, with inadequate and late prenatal care, double or more pregnancies, newborns with high risk for late sequelae, low birth weight between $\leq 1,000$ g and $< 2,500$ g, and male.

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NOTES

ORIGIN OF THE ARTICLE

Extracted from the dissertation - Association of congenital anomalies in live births with the obstetric-neonatal and sociodemographic profile in the state of Minas Gerais, Brazil”, presented to the Graduate Program in Health Care of *Universidade Federal do Triângulo Mineiro*, in 2020.

CONTRIBUTION OF AUTHORITY

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Discussion of the results: Freitas LCS, Castro SS.

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APPROVAL OF ETHICS COMMITTEE IN RESEARCH

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CONFLICT OF INTERESTS

There was no conflict of interests in this study.

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