

The importance of early diagnosis of congenital torticollis: a five-year retrospective study at a tertiary centre

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ABSTRACT

Aim To determine the frequency of congenital muscular torticollis (CMT), identify associated risk factors and assess common associated neonatal conditions.

Methods This retrospective study reviewed medical records of newborns diagnosed with CMT at the Clinic for Gynaecology and Obstetrics, University Clinical Centre Tuzla, from 1 January 2019 to 31 December 2023. Data on maternal, pregnancy, delivery, neonatal and physiotherapy-related variables were analysed.

Results During the five-year period, 16,899 newborns were delivered, of whom 141 (0.83%) were diagnosed with CMT. CMT was most frequent among newborns of primiparous mothers (94; 66.7%) and after vaginal delivery (78; 55.3%). Most newborns had an Apgar score ≥ 8 (108; 76.6%) and were born at ≥ 37 weeks of gestation (130; 92.2%). CMT was slightly more common in female newborns (73; 51.8%) and was more often right-sided (88; 62.4%). Complete recovery was reported among all newborns with available physiotherapy follow-up data.

Conclusion The frequency of CMT over the five-year period was 0.83%. Early diagnosis and timely initiation of physical therapy were associated with complete recovery among newborns with available follow-up data.

Keywords: congenital muscular torticollis, newborn, physical therapy, risk factors

INTRODUCTION

Congenital muscular torticollis (CMT) is a deformity that develops during the neonatal period and is caused by unilateral idiopathic fibrosis of the sternocleidomastoid muscle (1). This leads to contracture of the sternocleidomastoid muscle, resulting in restricted neck movement and the characteristic posture—cervical flexion on the affected side and cervical rotation on the opposite side (2). Epidemiological studies indicate an incidence ranging from 0.3% to 2.0% (3). Additionally, numerous studies have documented a rising trend in the incidence of CMT (4,5).

CMT is the third most common congenital musculoskeletal deformity in children, following hip dysplasia and calcaneovalgus, and has serious implications for the quality of life of both the child and the family (6). The exact aetiology of its devel-

opment remains unclear; however, foetal positioning in utero during pregnancy, as well as birth trauma, are considered contributing factors (6). However, some studies have questioned complicated or traumatic birth as the main cause of congenital torticollis (7). It is likely that foetal head descent or abnormal foetal position during the third trimester may lead to trauma of the sternocleidomastoid muscle (8). Additionally, venous occlusion associated with persistent lateral flexion and neck rotation may be a contributing cause (9).

CMT is more commonly observed in male infants and on the right side of the neck. Numerous risk factors can contribute to the occurrence of CMT. Multiple pregnancy has been identified as one of the primary risk factors for its development (10). Maternal parity has also been recognised as a contributing factor, with a higher prevalence among primiparas, as well as pregnancies with reduced amniotic fluid levels (11). Other risk factors associated with the development of torticollis include breech presentation and dystocia during delivery, as well as instrument-assisted vaginal deliveries (vacuum extraction and forceps) (12).

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Table 1. Maternal and birth characteristics, annual frequency and physiotherapy treatment frequency of newborns with congenital muscular torticollis

Variable	Year of observation					Total	p
	2019	2020	2021 N (%)	2022	2023		
Mother's age, years							
< 19	1 (3.7)	0 (0)	1 (8.3)	0 (0)	0 (0)	2 (1.42)	0.001
20–24	5 (18.5)	5 (17.2)	2 (16.6)	8 (25)	8 (19.5)	28 (19.86)	
25–29	7 (25.9)	13 (44.8)	5 (41.6)	9 (28.1)	14 (34.2)	48 (34.04)	
30–34	8 (29.6)	9 (31)	4 (33.3)	9 (28.1)	15 (36.6)	45 (31.9)	
35–39	5 (18.5)	2 (6.9)	0 (0)	6 (18.7)	3 (7.3)	16 (11.3)	
40–44	1 (3.7)	0 (0)	0 (0)	0 (0)	1 (2.4)	2 (1.4)	
Parity							
First	19 (70.4)	16 (55.2)	9 (75)	23 (71.8)	27 (65.8)	94 (66.7)	0.001
Second	8 (29.6)	11 (37.9)	3 (25)	7 (21.8)	13 (31.7)	42 (29.8)	
Third	0 (0)	1 (3.45)	0 (0)	1 (3.13)	0 (0)	2 (1.4)	
> 3	0 (0)	1 (3.45)	0 (0)	1 (3.13)	1 (2.4)	3 (2.13)	
Birth weight of newborns, g							
2000–2499	0 (0)	0 (0)	2 (6.25)	1 (2.4)		3 (2.13)	0.001
2500–2999	4 (14.8)	4 (13.8)	3 (25)	7 (21.8)	3 (7.3)	21 (14.9)	
3000–3499	11 (40.7)	13 (44.8)	3 (25)	9 (28.13)	13 (31.7)	49 (34.75)	
3500–3999	12 (44.4)	12 (41.4)	6 (50)	14 (43.75)	24 (58.5)	68 (48.2)	
Apgar score							
0–3	0 (0)	0 (0)	0 (0)	0 (0)	2 (4.8)	2 (1.4)	0.398
4–7	5 (18.5)	4 (13.8)	2 (16.7)	10 (31.25)	10 (24.4)	31 (21.9)	
≥ 8	22 (81.5)	25 (86.2)	10 (83.3)	22 (68.75)	29 (70.7)	108 (76.6)	
Annual frequency of births and prevalence of CMT							
Live births	3633	3422	3353	3264	3227	16899	N/A
CMT, <i>n</i> (%)	27 (0.74)	29 (0.85)	12 (0.36)	32 (0.98)	41 (1.27)	141 (0.83)	
Physiotherapy treatment frequency [†]							
Once weekly	3 (15.8)	10 (43.5)	5 (62.5)	13 (52)	22 (88)	53 (53)	0.001
Twice weekly	6 (31.6)	6 (26.1)	2 (25)	9 (36)	3 (12)	26 (26)	
No treatment	10 (52.6)	7 (30.4)	1 (12.5)	3 (12)	0 (0)	21 (21)	

[†] Physiotherapy treatment frequency was based on parent-reported data available for 100 newborns.

CMT, congenital muscular torticollis; N, number; N/A, not applicable.

Early diagnosis and physical therapy are crucial for successful treatment. Without adequate intervention, children may develop functional impairments as well as aesthetic concerns (13). The rehabilitation programme includes neck stretching and muscle strengthening exercises, with a strong emphasis on parental education to ensure that exercises are performed daily at home (14). Manual massage, which influences the nervous system, muscular function and circulation, is also used in clinical treatment (15).

Surgical treatment may be necessary in cases where fibrous tissue is present and conservative therapy has proven ineffective (16). Given that surgical intervention is aggressive, children who do not respond to physical therapy are candidates for botulinum toxin administration (17).

This study was conducted because data on congenital torticollis in Bosnia and Herzegovina and the wider region are limited. The findings may be useful to obstetricians, neonatologists and physiatrists involved in early diagnosis and management.

The aims of this study were to determine the frequency of torticollis, identify risk factors and assess the most common associated conditions in newborns with torticollis.

MATERIAL AND METHODS

Patients and study design

This retrospective study was based on medical records from the Clinic for Gynaecology and Obstetrics, University Clinical Centre Tuzla, covering the period between 1 January 2019 and 31 December 2023. The inclusion criterion was a diagnosis

of congenital muscular torticollis during the newborn period. Exclusion criteria were twin pregnancies, multiple congenital anomalies, and stillbirth. The study was approved by the Ethics Committee of the University Clinical Centre Tuzla (approval number: 02-09/2-75/21; date: 22 October 2021).

Methods

Data were collected on newborn characteristics (side of torticollis, gestational age, birth weight, sex, birth trauma, hypoxic-ischaemic encephalopathy, intracranial haemorrhage, and congenital anomalies of the locomotor system) and maternal, pregnancy and delivery characteristics (maternal age, parity, foetal presentation, multiple pregnancy, gestational age and mode of delivery). CMT was diagnosed by a neonatologist during the first examination after birth or during the first days of life. Physiotherapy-related data included the age at the first physiatrist examination, number and frequency of follow-up examinations, parental education and treatment outcome after 12 months. Questionnaire data were available for 100 parents of children with CMT and were collected during paediatric follow-up visits during and after physiotherapy treatment. The remaining 41 newborns were unavailable or lost to follow-up.

Statistical analysis

Descriptive statistics were used for data analysis. Statistical processing was performed using SPSS, version 24.0 (IBM Corp., Armonk, NY, USA). The Shapiro–Wilk test was used to assess

Table 2. Newborn sex and side of congenital muscular torticollis

Side of CMT	Male	Female N (%)	Total	<i>p</i>
Left-sided	23 (33.8)	30 (41.1)	53 (37.6)	0.373
Right-sided	45 (66.2)	43 (58.9)	88 (62.4)	
Total	68 (100)	73 (100)	141 (100)	

CMT, congenital muscular torticollis; N, number; *p*, probability value.

normality of distribution. Categorical variables were expressed as frequencies and percentages. Student's *t*-test was used to compare normally distributed continuous variables, and the χ^2 test was used to compare categorical data. A value of $p < 0.05$ was considered statistically significant.

RESULTS

Over the five-year period, a total of 16,899 newborns were delivered. Among them, 141 (0.83%) were diagnosed with torticollis, with the highest number recorded in 2023 (41 cases; 1.27%) (Table 1). Of 141 deliveries, gestational age ≥ 37 weeks was observed in 130 pregnancies, while preterm delivery was recorded in 11 cases (7.80%). Considering the mode of delivery over the five-year period, vaginal delivery was more frequent (78 cases; 55.32%) than caesarean section (63 cases; 44.68%).

The largest proportion of mothers belonged to the age groups of 25–29 years (34.04%) and 30–34 years (31.91%) ($p = 0.001$). The highest percentage was observed among primiparas (94 cases; 66.7%), which was significantly higher than among secundiparas, tertiparas or multiparas ($p = 0.001$) (Table 1).

The largest number of newborns had a birth weight of 3500–3999 g (68 cases; 48.23%), which was significantly higher than the number of newborns with lower birth weights ($p = 0.001$). Most newborns had an Apgar score ≥ 8 (108 cases; 76.60%), while an Apgar score of 0–3 was recorded in a statistically significantly lower number of newborns (2 cases; 1.42%) (Table 1). Torticollis was found in 68 male newborns (48.23%) and 73 female newborns (51.77%). Right-sided torticollis was recorded in 88 cases (62.41%) (Table 2).

Of the total number of newborns, 21 had at least one associated condition with left side torticollis. The most frequently observed conditions were hypoxic-ischaemic encephalopathy, found in 6 cases (28.57%), and intracranial haemorrhage, also found in 6 cases (28.57%) with left side torticollis (Table 3). A statistically significant association was identified between these conditions and right-sided torticollis ($p = 0.001$).

A total of 100 parents of newborns with torticollis were surveyed. In 50 (50%) cases, the first physiatrist examination was performed within the first 7 days after birth. The first physiatrist examination within the first 30 days after birth was recorded in 43 (43%) newborns. The frequency of physiotherapy treatments was assessed in 100 newborns: 53 (53%) had one treatment per week, 26 (26%) had two treatments per week and 21 (21%) did not receive treatment (Table 1). According to parent-reported data, a single follow-up examination was sufficient for 53 (53%) newborns, while 34 (34%) required two follow-up examinations and 9 (9%) required three follow-up examinations. No additional follow-up by the physiatrist was necessary for 4 (4%) newborns. Regarding home-based physiotherapy, 88 (88%) parents received education on performing physiotherapy at home, whereas 12 (12%) did not. Complete recovery was reported among all newborns with available follow-up data.

DISCUSSION

Over the five-year period, the frequency of congenital torticollis was 0.83%. The highest number of cases was recorded in 2023. In our study, the frequency was lower than that reported by Minghelli in 2022, where a frequency of 1.5% was reported. Furthermore, in the same study, the frequency varied across years, with the highest frequency recorded in 2017 (2.7%) (5).

In this study, most mothers of newborns diagnosed with congenital torticollis belonged to the age group of 20–34 years. The highest proportion of pregnant women were primiparas, which is consistent with findings from previous studies (11). Vaginal delivery was more frequent than caesarean section in our cohort. Studies by Hardgrib et al. (7) and Lee et al. (18) highlighted the importance of reducing birth trauma, explaining the lower incidence of congenital torticollis after caesarean section delivery.

Although numerous studies have shown that congenital torticollis is more common in male newborns (10), our study found a slightly higher percentage of female newborns. Similar findings were reported by Amaral et al., although with a higher proportion of male newborns. That study reported no statistically significant difference in sex distribution, with male newborns comprising 51% and female newborns 49% (19).

A significantly higher number of newborns with right-sided torticollis was observed in our study, which contrasts with the findings of Bastos et al., where left-sided involvement was identified in 52.8% of cases (20). In the study conducted by Petronic

Table 3. Associated conditions in newborns with congenital muscular torticollis

Variable	Year of observation											
	2019		2020		2021		2022		2023		Total	
	RS [†]	LS [‡]	RS [†]	LS [‡]	RS [†]	LS [‡]	RS [†]	LS [‡]	RS [†]	LS [‡]	RS [†]	LS [‡]
	N (%)											
HIE	4 (40)	0 (0)	6 (54.55)	3 (50)	1 (14.29)	0 (0)	4 (26.67)	1 (20)	3 (37.5)	2 (40)	18 (35.29)	6 (28.57)
IH	1 (10)	3 (60)	0 (0)	1 (16.67)	1 (14.29)	0 (0)	6 (40)	1 (20)	3 (37.5)	1 (20)	11 (21.57)	6 (28.57)
Neonatal infections	2 (20)	0 (0)	3 (27.27)	0 (0)	2 (28.57)	0 (0)	0 (0)	1 (6.67)	1 (12.5)	2 (40)	9 (17.65)	3 (14.29)
Birth trauma	0 (0)	0 (0)	0 (0)	1 (16.67)	0 (0)	0 (0)	1 (6.67)	0 (0)	0 (0)	0 (0)	1 (1.96)	1 (4.76)
Breech presentation	1 (10)	2 (40)	0 (0)	0 (0)	3 (42.86)	0 (0)	0 (0)	1 (20)	0 (0)	1 (20)	4 (7.84)	4 (19.05)
More than two conditions	2 (20)	0 (0)	2 (18.18)	1 (16.67)	1 (14.29)	0 (0)	3 (20)	0 (0)	1 (12.5)	0 (0)	8 (15.69)	1 (4.76)
Total	10 (100)	5 (100)	11 (100)	6 (100)	7 (100)	0 (0)	15 (100)	5 (100)	8 (100)	5 (100)	51 (100)	21 (100)

[†] $p = 0.001$ for right-sided CMT; [‡] $p = 0.200$ for left-sided CMT.

CMT, congenital muscular torticollis; HIE, hypoxic-ischaemic encephalopathy; IH, intracranial haemorrhage; LS, left side; N, number; *p*, probability value; RS, right side.

et al., a predominance of right-sided involvement was noted, although with a smaller percentage difference (21).

In our study, CMT was most frequently associated with hypoxic-ischaemic encephalopathy and intracranial haemorrhage. A statistically significant correlation was identified between these conditions and right-sided torticollis. Breech presentation was recorded in this cohort and has been recognised as one of the key risk factors for the development of CMT (12).

In our study, most children underwent timely physiatrist treatment; however, one fifth of newborns did not undergo physiatrist treatment. Initiating physical therapy within the first month of life resulted in normal neck movements within 1.5 months of treatment in 98% of newborns diagnosed with CMT (22).

Through parental surveys, we found that most parents had received education on performing physical therapy at home. According to parent-reported data collected six months after birth, the recovery rate was 100% among newborns with available follow-up data. Numerous studies have highlighted the importance of educating parents about CMT before birth, as this allows them to participate more effectively in treatment and helps prevent the development of asymmetry. In cases where asymmetry or CMT occurs, well-informed parents are more likely to follow paediatric recommendations and initiate physical therapy at the appropriate time (22).

This is the first study from Bosnia and Herzegovina to report the frequency, risk factors, neonatal characteristics and associated conditions of congenital torticollis, as well as the role of early physical treatment in complete recovery. Highlighting factors associated with CMT may help clinicians ensure faster diagnosis and treatment, as well as closer monitoring for other deformities, such as congenital hip dislocation and foot deformities (e.g., metatarsus adductus).

The main limitations of this study are its retrospective design and reliance on medical records, hospital protocols and parent-reported questionnaire data for physiotherapy-related outcomes. A prospective design would allow direct assessment of treatment timing, adherence and recovery. In addition, data on assisted vaginal delivery, including vacuum extraction or forceps, were not available, although these factors are recognised risk factors for CMT. Finally, physiotherapy and follow-up data were available for only a subset of newborns, which may have introduced response bias.

CONCLUSION

The frequency of CMT over the five-year period was 0.83%. Early diagnosis and timely initiation of physical therapy were associated with complete recovery among newborns with available follow-up data. In this cohort, CMT was most frequently right-sided, and hypoxic-ischaemic encephalopathy and intracranial haemorrhage were the most common associated conditions.

FUNDING

No specific funding was received for this study.

CONFLICTS OF INTEREST

None to declare.

ETHICS STATEMENT

The study was approved by the Ethics Committee of the University Clinical Centre Tuzla (approval number: 02-09/2-75/21; date: 22 October 2021).

DATA AVAILABILITY STATEMENT

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS (CRediT)

Conceptualization: S.M., G.G., A.C.; **Data curation:** A.C., A.T.; **Formal analysis:** D.H., A.H., A.T.; **Investigation:** S.M., G.G., A.C.; **Methodology:** S.M., G.G., A.C.; **Project administration:** S.M.; **Supervision:** D.H., A.H.; **Writing – original draft:** S.M., G.G., A.C.; **Writing – review & editing:** S.M., G.G., A.C., A.T. All authors have read and agreed to the published version of the manuscript.

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