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Original research article

Magnitude of Musculoskeletal Deformities in Newborns at A Tertiary Care Hospital in South Karnataka

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Abstract

Newborns have unique anatomy and physiology, the presentation of which is relatively an unexplored territory to Orthopaedic surgeons and hence is a matter of concern. Due to limited literature and records available about the same, it raises a platform for further research and study.

This study aims to estimate the magnitude of musculoskeletal deformity among the newborns by evaluating the hospital incidence of musculoskeletal birth deformity and enumerate different musculoskeletal deformities and report it as proportion.

This is a prospective observatory study done in a tertiary care hospital of south India for a period of two years. All the live births born, routinely screened by the department of Paediatrics were referred to the Department of Orthopaedics in case of underlying musculoskeletal deformity. Whereas all the dead births born (inclusive of intra-uterine demises, still-births, and abortions) with any involvement of the musculoskeletal system in the antenatal ultra-sonographic foetal scan were notified to the Department of Orthopaedics. A thorough physical examination was conducted on all the referrals. Data was recorded, compiled, tabulated and analysed.

A total of 5837 new births were screened for musculoskeletal birth deformity which were inclusive of 5668 live births born and 169 dead births born. Overall hospital incidence of musculoskeletal birth deformity in our study was 9.25 per 1000 births (54 cases) and 5.46 per live births (31 cases). Club foot was the most common defect overall (17 cases/ 31.5%) and among the live births whereas spina bifida was the second (16 cases/ 29.6%) and most common among dead births.

The magnitude of musculoskeletal birth deformity is not as low as to be ignored by Orthopaedics surgeons. Few more studies will help in increasing the awareness of common deformity among the doctors thereby reducing the morbidities of musculoskeletal birth deformity by early diagnosis and apt treatment.

Keywords: Musculoskeletal Deformity, Newborn, Congenital, Magnitude

Introduction

Birth defects include structural or functional anomalies with measurable effects on physical, intellectual and social well-being. In the fourteenth century, these babies were referred to as Monsters (derived from a Latin word – "Mostrum"), perceived as omens, portents or punishments of supernatural origin. In the seventeenth century, William Harvey, an English physiologist made the first attempt to look for the causes of such malformation. The perspective of abnormalities in embryonic development and disorders of conception was described in "Exercitatitiones de generatione animalium". The sixth decade of the 19th century saw a number of teaching hospitals in Mumbai (India) with several studies to evaluate the incidence of congenital malformations in newborns. This led to the ignition of various similar studies in other regions of the country.

"Just as children are not little adults, newborns are not just little children." On one hand, these newborns have distinctive anatomy and physiology and on the other hand, the exposure of Orthopaedic surgeons to musculoskeletal birth defects is comparatively a less explored territory and hence, their presentation to doctors is a matter of concern. A thorough physical examination with basic knowledge regarding the development of newborns is essential in making the proper diagnosis.

A foetus grows in a mother's womb in a definite pattern, any change in this pattern may lead to several anomalies. Development of Limbs start at 5-6th intrauterine weeks, based on which the musculoskeletal problems can be acknowledged as:

1. congenital/ chromosomal (prior to 6 weeks)
2. Environmental factors- like increased intra-uterine pressure, tumours, trauma and infection.

A flail limb in a newborn can be most commonly associated with underlying fractures or brachial plexus palsy apart from infections to prevent long-term morbidity. Clubfoot is the most commonly encountered foot pathology whereas metatarsus adductus, calcaneovalgus deformity, and congenital vertical talus are not uncommon. Polydactyly and syndactyly are also to be acknowledged, which are generally seen in syndromic babies with multi-systemic anomalies. The contracture of the joint is normal in the newborns, which improves spontaneously, but important to identify and institute a proper treatment.

This study aims to evaluate the magnitude of musculoskeletal problems in neonates. With a primary objective of evaluating its incidence and enumerate the different types of musculoskeletal deformities present in the newborns. No conflict of interest has been noted.

MATERIALS AND METHODS

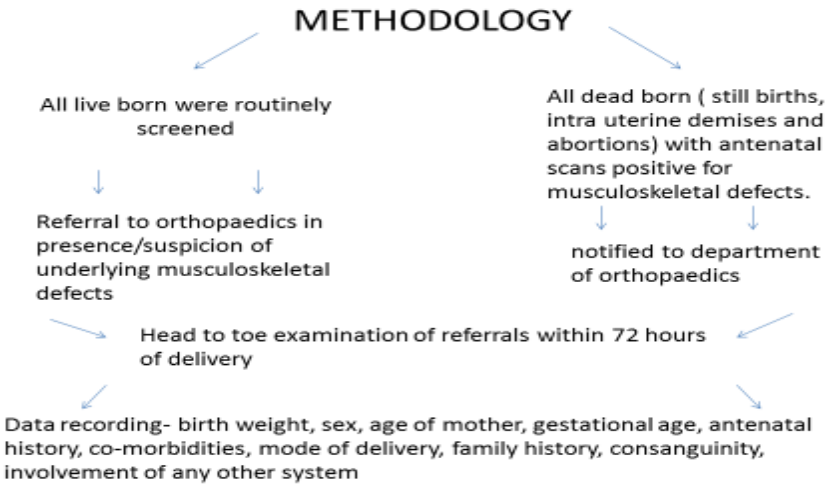
Our study is a hospital-based prospective explorative study done in a tertiary care hospital, Mysuru, India. It was done for two years, from 1st October 2017 to 30th September 2019 with a purposive sampling technique. All the new births in our hospital were designated as the study population with the following criteria-

INCLUSION CRITERIA

All the newborns (live births born, stillbirths born, intra-uterine dead born and abortions) delivered in JSS HOSPITAL (MYSURU, KARNATAKA) presenting with musculoskeletal defects were included in the study.

EXCLUSION CRITERIA

Newborns with musculoskeletal defects of face and neck (example- cleft lip, cleft palate, webbed neck, cystic hygroma, low set ears, frog eyes, etc.) without the involvement of the defects in trunk, spine, and extremities were excluded from the study. Pathology as a result of trauma or infection acquired by the newborn after the delivery.



A thorough physical head to toe examination was conducted on the referrals, meeting the inclusion criteria. This step was done within 24 hours (not more than 72hours) of the time of delivery. All the live births born were re-examined at the time of discharge to look for survival of the baby any active intervention is done by the Orthopaedic specialists.

Necessary investigations as blood investigations, radiographs or ultrasonography scans were carried out to complement or confirm the diagnosis made clinically.

Clinical pictures and photographs of the antenatal ultra-sonographic scan reports were also taken (subject to availability).

Data and Statistical analysis:

A total number of live/ dead births and anomalous babies born were aggregated by the data provided by the Medical Records Department of the hospital.

Continuous data were represented as mean and standard deviation. Graphical representation of data: Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test was used as a test of significance for qualitative data. "p value" of 0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

A total of 5837 new births were screened for musculoskeletal birth defects which were inclusive of 5668 live births born and 169 dead births born (stillbirths/ abortions/ intra-uterine demises). In our study, 26 males and 28 females had musculoskeletal defects with males being slightly more common among live births whereas females being more common overall and among dead births. The mean birth weight of babies was 2.70$\pm$0.78 kg and 0.43$\pm$0. 32 kg among live birth and dead birth respectively. 32.40% of live births with musculoskeletal defects had prematurity out of which 6.4% of babies had a gestational age of fewer than 28 weeks. The mean age of the mother was 25.58 and 26.04 among live births and dead births respectively with a minimum age of 17 years (1 case) and a maximum age of 56 years (1 case). None of the mothers in our study had a history of any drug abuse or teratogenic drug intake and none of

them had a positive/significant family history. 32.4% of the live births were premature and 58.1% were the first child. Only 3 consanguineous marriages were recorded.

Overall hospital incidence of musculoskeletal birth defects in our study was 9.25 per 1000 births (54 cases). The incidence of musculoskeletal defects among live births born in our hospital was 5.46 per 1000 live births. A total of 48 anomalous births were recorded among 169 dead births born accounting for 28.4%. Among the anomalous births, 47.9% of babies had musculoskeletal defects with or without other system involvement. [Figure 1]

Among the live births, lower limb involvement was most common whereas it was axial skeleton involvement among the dead births [Table 1]. The ratios of defects in extremities to axial skeleton were 9.67:1 and 1:2 among live births and dead births respectively. Right to left ratio among lower limb was 1:1.34 among live births whereas none of the cases with right lower limb involvement was seen among dead births. 8 live births and 6 dead births had bilateral involvement of the lower limb. CTEV was the most common musculoskeletal defect among the lower limb defects followed by DDH [Table 2]. Among the upper limb involved births, brachial plexus injury (Erb's palsy) was most commonly encountered. Right side to left-sided ratio among upper limb was 1:2.5 and 5 cases with involvement of bilateral upper limb were also recorded [Table 3]. Spina bifida occulta was the most common overall defects recorded in the axial skeleton but among the dead births born open spina bifida was most common [Table 4].

Club foot was the most common defect (17 cases/ 31.5%) and spina bifida was the second (16 cases/ 29.6%). Among the live births born CTEV (41.9%) was the most common musculoskeletal defect whereas among dead births spina bifida (56.52%) was the most common with 13 cases of each of them. The incidence of CTEV in our study was 2.23 per 1000 live births.

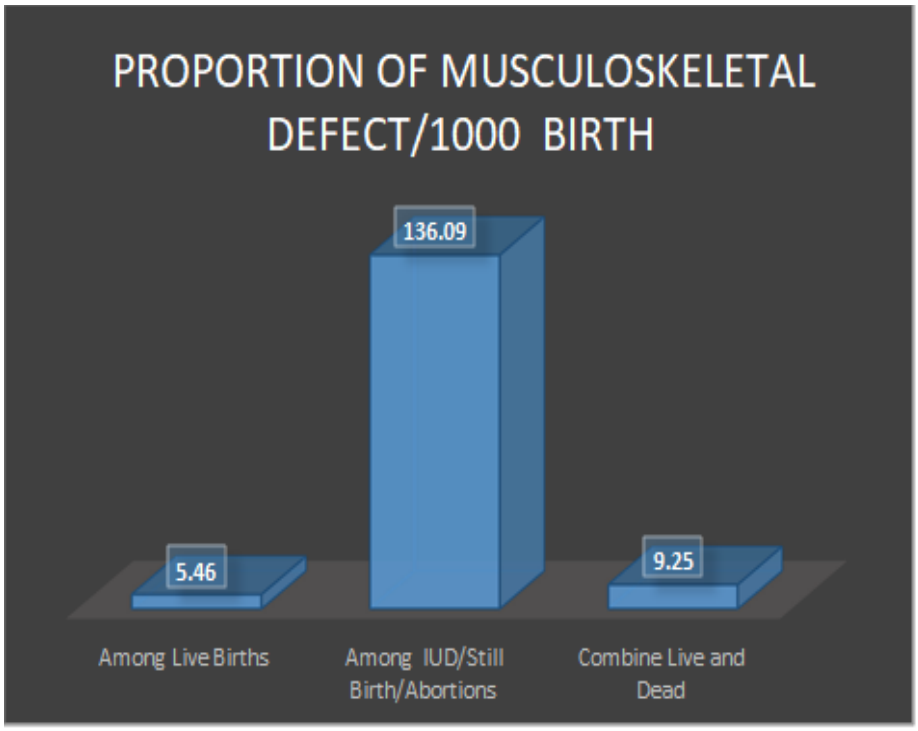


Figure 1: Graph wise distribution of proportion of Musculoskeletal defects in our study

Figure 2: a case of mermaid syndrome (fused lower limb), among dead births. Picture from behind and from the front.

Figure 3a: picture of right RADIAL CLUB HAND, 3b- radiograph showing absent radius, first metacarpal and phalanges of thumb

FIGURE 4: CASE OF CONGENITAL TRIGGER FINGER, LEFT SIDED a- from the top, b- from the side

Table 1: Distribution of Musculoskeletal defects among all the study subjects

		Among Live Births (n=31)		Among Dead Births (n=23)	
		Frequency	%	Frequency	%
Musculoskeletal defects	Upper Limb	7	22.5	2	8.6
	Lower Limb	22	70.9	6	26.1
	Axial Skeletal	3	9.6	16	69.5
	Generalized	0	0	3	13.1

Chi square =23.3 p=0.0001

Table 2: Distribution of type of Musculoskeletal defects in Upper limb

		Among Live Births (n=31)			Among Dead Births (n=23)		
		Right	Left	Bilateral	Right	Left	Bilateral
Upper Limb Defects	Radial Club Hand	1	0	0	0	0	0
	Brachydactyly	0	0	1	0	0	0
	Congenital trigger Finger	0	1	0	0	0	0
	Congenital Contracture Syndrome (wrist)	0	0	1	0	0	0
	Brachial Plexus Injury	0	2	1	0	0	0
	Trident Short hand	0	0	0	0	0	1
	Syndactyly	0	0	1	1	0	1

Table 3: Distribution of type of Musculoskeletal defects in Lower limb

		Among Live Births (n=31)			Among Dead Births (n=23)		
		Right	Left	Bilateral	Right	Left	Bilateral
Lower Limb Defects	CTEV	5	3	5	0	0	4
	Lower Limb Fracture	0	1	0	0	0	0
	DDH	1	2	2	0	0	0
	Tibia Recurvatum	0	1	0	0	0	0
	Osteomyelitis (Distal femur)	0	1	0	0	0	0
	Syndactyly	0	1	0	0	0	1
	Congenital Contracture Syndrome (feet)	0	0	1	0	0	0
	Mermaid Syndrome	0	0	0	0	0	2

Table 4: Distribution of type of Musculoskeletal defects in Axial Skeleton

		Among Live Births (n=31)	Among Dead Births (n=23)
Axial Skeleton	Spinal Bifida (Closed)	2	6
	Scoliosis	1	2
	Spinal Bifida (Open)	1	7
	Hemi vertebra	0	1
	Sacral Agenesis	0	1

DISCUSSION

India (in 2013) reported a neonatal mortality rate of 29 per 1000 live births, accounting for total neonatal death of 753,000 [1]. Preterm births were reported as the highest contributor to neonatal deaths (34.7%) while congenital anomalies constituted the fifth largest cause, being responsible for 9% of neonatal deaths in the year 2010 [2]. Global estimates suggest that congenital anomalies affect 2–3% of births [3]. Assuming a 2% birth prevalence, and "25,595,000 births in 2013" [4], counts to approximately 511,900 births affected with a congenital anomaly in India surpassing the combined total of anomaly affected births occurring in several high-income countries [5]. Though, the transition in causes of infant and child mortality in low and middle-income countries have been noted, including India [6]. "With a decrease in infectious causes of infant deaths, especially in urban areas in India, the proportion of mortality due to congenital anomalies is likely to increase." [7]

In our study, the total hospital incidence of musculoskeletal birth defects was recorded as 9.25 per 1000 total births whereas it was 5.46 per 1000 live births. A similar study was done in a tertiary care hospital of northeast India [8] which reported the incidence of musculoskeletal defects in newborns to be 13.46 per 1000 live births. This study included the defects of the face and neck like macrocephaly, microcephaly, low set ears and many more. These defects of the CNS and face and neck were purposely excluded by us to limit our study to Orthopaedics concern only. Another study done in a tertiary care hospital of Odisha, India reflected an incidence of musculoskeletal defects to be 4.40 per 1000 live births[9]. In a study done by Ghorpade et al. [10], over all prevalence of musculoskeletal defects was as high as 20.3 per 1000 neonates. This study was retrospectively done and included all the neonatal unit admissions irrespective of their deliveries being conducted in their hospital or outside. In contrast to our study which is prospective, inclusive of the births in our hospital and consideration of defects detected in the first 72hours of the delivery, their high prevalence should not be ignored. Various other studies done outside India reported the incidence/ prevalence of musculoskeletal defects ranging between 2-4% [11].

In this study, we also recorded all the anomalous dead births in our hospital. Out of the 48 anomalous dead births born 23 cases had musculoskeletal defects which accounted form 47.9%. The involvement of the central nervous system was recorded as the highest followed by musculoskeletal defects among dead births. This was done to know the burden of

musculoskeletal defects among the dead births born. Many studies showed similar results as ours and some even recorded musculoskeletal defects with the highest prevalence among all the congenital anomalies in India [12].

In our study involvement of lower limb (53.7%) was recorded as the highest among all the musculoskeletal defects recorded followed by the spine (42.6%) involvement and then the upper limb (20.4%). Club foot was the most common defect (17 cases/ 31.5%) and spina bifida was the second (16 cases/ 29.6%). Among the live births born CTEV (41.9%) was the most common musculoskeletal defect whereas among dead births spina bifida (56.52%) was the most common with 13 cases of each of them. The incidence of CTEV in our study was 2.23 per 1000 live births which are quite high when compared to a meta-analysis done by Smythe T et al (1960- 2015) [13] in which it was recorded as 1.19 per 1000 live births in India.

The majority of the dead births with musculoskeletal defects were found to have the gestational age between 13-24 weeks. This may be because of the first detailed antenatal scan being done at the gestational age of 10 weeks to 13 weeks.

A peculiar case of twin babies born as a result of emergency LSCS to a 22 years old mother at 32 weeks and 6 days of gestational age was noted. Both the newborns were male and had normal APGAR score with no twin to twin transfusion syndrome as chances of such pathology is less in dichroitic diamniotic scenarios. The first child had bilateral upper limb syndactyly and the second child had left upper and lower limb syndactyly with left undescended testis. In a study- care of the newborn done by Meharban S et al. [14] which showed limb deformities as one of the complications among the donor twins, may be a result of overcrowding in the mother's womb.

In our study 7 out of 31 live births born needed immediate active Orthopaedics intervention (22.6%). This included a case of osteomyelitis of distal femur, a case of meningomyelocoele with paraparesis, 3 cases of brachial plexus injury, a baby with fracture of shaft of femur due to osteogenesis imperfecta (denied any further interventions by the parents) and a baby with spinal diastemetomyelia (died, 6 hours post-delivery). A study done by RR Devi et al [8] reported that 54.76% of the newborns with musculoskeletal defects needed Orthopaedics consultation for further management although the criteria for the same were not made clear.

"Children with birth defects were also more likely to hospital admission for reasons other than birth defects"- Colvin and Bower [15]. Our study, further substantiating the above statement, as most of the defects involving the limbs are asymptomatic and have very low chances of mortality. Various defects like mild contracture syndromes, hallux valgus, metatarsus adductus, etc. which are easily skipped during initial neonatal screenings either, due to miniature anatomy of the babies or lack of knowledge among the doctors or both. "There are inherited neonatal orthopedic conditions like CTEV present at birth, which may be underdiagnosed" [16], although CTEV is one of the commonest musculoskeletal defects encountered. Early treatment may prevent morbidities and major/minor surgical interventions in the future from any major/minor deformity. Primarily, because the ligaments and soft tissues in a newborn are more relaxed and hence can be more generously stretched in the initial 3 weeks of birth as there is Relaxin hormone in the circulation of the baby [17].

CONCLUSION

Further studies of a similar kind, in different regions of India and the world, will be beneficial in knowing the burden of musculoskeletal defects in newborns and its associated implications. Awareness will result in better understanding, early diagnosis and treatment of the common musculoskeletal defects and hence will pave the path in reducing a load of morbidities shortly. This is a solitary centre-based study, limiting the size of the study population which makes it difficult for our results to be reflected as a whole for a vast country like India. Again, most of the attendance in our hospital belongs to middle socioeconomic status and may limit our exposure to many congenital malformation and syndromes (commonly observed among the lower socioeconomic status population).

A multi-disciplinary approach is required for early and appropriate detection of congenital malformations. Hence, we recommend a joint training programme for all the postgraduate students in the Department of Orthopaedics, Paediatrics and Obstetrics and Gynaecology for a better understanding of the common conditions of musculoskeletal defects. This will help the future Orthopaedic surgeons to learn more precisely regarding the correct methods of clinical examination of the babies, not only to look for musculoskeletal defects but also for the associated syndromes if any.

Many countries in the world, including our country, either don't have national data records for musculoskeletal defects or the national registries are poorly maintained. We highly recommend uplifting the standards in this sector.

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