

## Cerebral palsy in twins and multiple births at Sindhudurg Arabian west coast of Maharashtra (Large cohort analysis of 206124 births from 1996 to 2014)

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### Abstract

**Introduction:** This study aims at the prevalence of cerebral palsy in multiple births and also to determine the effects of birth weight and gestational age on the risk of cerebral palsy in a defined and contemporary Sindhudurg population. **Material and Methods:** Children born in 38 primary health centers, seven rural hospitals, three sub district hospitals and one civil hospital of this district between 1996 to 2014, inclusive comprised the cohort 2090 multiple birth deliveries with 4152 live births. Total number of deliveries from 1996 to 2014 was 2,06,124 observed in Sindhudurg district. **Results:** A moderate or severe congenital cerebral palsy had in 41 twins and three triplets, a prevalence of 10.8 and 13.6 per thousand twin and triplet children (95% CI 42, 9.8). The crude rate per 1000 survivors is 11.4 in multiple births. The cerebral palsy prevalence in male twins was three times more than female twins (RR =3.6, 95% CI 2.1, 6.2) and was higher in each birth weight group (below 1400 grams & 1500 to 2000 grams). The twins born with birth weight less than 1600 grams had prevalence of 58 per thousand (95% CI 42, 106), risk three times higher than that of singletons in the same birth weight group (RR = 1.2, 95% CI 0.6,1.8). Multiple logistic regression analysis confirmed the importance of twins and triplets as a risk factor for cerebral palsy with regard to weight and gestational age. **Conclusion:** Twin pregnancies and triplets produced 12 and 14 times more often cerebral palsy than singleton pregnancies.

**Keywords:** cerebral palsy, twins, multiple births, incidence, prevalence, birth weight

### Introduction

The prevalence of cerebral palsy in twins and higher multiple births is well known since many decades<sup>(1,2)</sup>. This increased risk of cerebral palsy in multiple births as compared to singletons, are more seen only in recent literature<sup>(3,4)</sup>. Now a days it is being observed an increasing trend in twins and higher order multiple

births, partly due to infertility treatments programs, predates recent increase in survival of low and very low birth weight premature twin babies in neonatal intensive care units<sup>(5,6,7)</sup>. This study aims at the prevalence of cerebral palsy in multiple births and also to determine the effects of birth weight and gestational age on the risk of cerebral palsy in a defined and contemporary Sindhudurg population.

## Material and Methods

The study was conducted in Sindhudurg District in South-West of Maharashtra State. The location of Sindhudurg District is given in figure 1. There are 38 primary health centers, seven rural hospitals (Community Health Centers), three sub-district hospitals and one District Hospital in Sindhudurg district. Authors have collected data about all children born in the above-mentioned hospitals in this district for 19 years from 1996 to 2014, (both inclusive) for analysis. The data has segregated list of live, stillbirths and multiple births. Other variables were mode of delivery, sex, birth weight, gestational period. The dependent variable was cerebral palsy. The data was obtained from the delivery and operation theatre registers of above-mentioned hospitals over the period of 1996 to 2014. This data quality and completeness was validated by comparing hospital delivery registers with birth registers of Grampanchayat and municipal urban vital statistic registers.



**Figure 1: Sindhudurg, Maharashtra**

## Results

Total number of deliveries from 1996 to 2014 was 2,06,124 in Sindhudurg district. In the study period of 1996 to 2014 a total of 2,090 multiple birth deliveries with 4,152 live births were recorded in the delivery and operation theatre registers of above hospitals. Out of this 642(30.7%) were caesarean section and forceps

application was accomplished in 186(8.9%). Pre term deliveries were 738 (35.3%). During study period 1,252(30.2%) low birth weight and 194(4.7%) very low birth weight babies were observed. In 4,152 children of multiple births, 2263 (54.5%) were females and 1889 (45.5%) were males. There were 4,146 twins and 6 triplets, with 201,972 singleton survivors.

The crude rate of cerebral palsy per 1,000 survivors is 11.4 in multiple births. The relative risk was greatest in twins weighing 1800 to 2200 grams and less than 1400 grams in triplet which was statistically significant. Moderate or severe congenital cerebral palsy was present among 41 twins and 3 triplets reckoning a prevalence of 10.8 and 13.6 per thousand twin and triplet children (95% CI 42, 9.8) respectively. The cerebral palsy prevalence in male twins was three times more than female twins (RR =3.6; 95%CI =2.1 to 6.2) and was higher in each birth weight group (below 1400 grams & 1500 to 2000 grams). The twins born with birth weight less than 1600 grams had a prevalence of 58 per thousand (95% CI= 42 to 106), a risk three times higher than that of singletons in the same birth weight group (RR = 1.2; 95% CI= 0.6 to 1.8). Intra uterine death of one twin was associated with cerebral palsy prevalence in survivor of 108 per thousand (RR =108; 95% CI =26 to 112) and twelve times more than in twin pairs which were born alive (RR= 11, 95% CI 4.2, 26). Logistic regression confirmed lower gestational age, low birth weight with multiple pregnancies are all independent risk factors for cerebral palsy.

## Discussion

The population of twins in this study, represents virtually complete ascertainment in a defined birth cohort<sup>(8)</sup>. The rate of cerebral palsy for all the years is higher than reported series from western countries<sup>(9)</sup>. This paper is largely confined to the years of 1996 to 2014 where in the numerator and denominator is of good quality. Findings of this study confirm the significant increase in the risk of cerebral palsy in twins

and triplets weighing below 1600 gm. and 1200 gm. respectively. This observation is not in consistent with the observational studies done by Alberman and Judith Grether, twins weighing 2,500 gm. or higher was also at a higher risk of cerebral palsy. There is a need to make adjustment in line with known birth weight distribution of this twin and triplet population has been suggested to compare with singletons of the same population<sup>(10)</sup>. Both the prevalence of cerebral palsy in twins, triplets and proportion of total cerebral palsy that occurred in this study group was much higher than in earlier population-based studies<sup>(11,12)</sup>.

Twins and triplets make up a larger percentage of births now than three decades ago<sup>(13)</sup>. The increase in older antenatal mothers with higher birth rates, along with medical therapies for treating infertility, could be the factors for increase in number of twins and higher order multiple births<sup>(14)</sup>. With the advent of advanced neonatal services the tiniest, very low birth weight twins and triplets survive, but do suffer with residual long term neurological morbidity of cerebral palsy<sup>(15)</sup>. This striking success of neonatal intensive care units are going to contribute a larger share of cerebral palsy in these present days than in the past<sup>(16)</sup>. However the very low birth weight singletons will have the same risk factors of cerebral palsy as compared to twins and triplets, needs a large scale comparison study<sup>(17)</sup>. It is also a very important issue, whether the twins of normal birth weight with gestation period are at a greater risk of cerebral palsy than low birth weight twins and triplets. To answer this, it requires pooling of data of twins from various population-based studies<sup>(18)</sup>.

Multiple logistic regression analysis confirmed the importance of twins and triplets as a risk factor for cerebral palsy with regard to weight and gestational age<sup>(19)</sup>. It has also confirmed the birth weight and gestational age are independent effects. Statistically these two risk factors accounted in majority of cases of cerebral palsy in this study. The relative risk is greatest and significant for twins and triplets born before 36 weeks of gestation, directly related to prematurity

twins<sup>(20)</sup>. The population attributable risk qualifies the burden of cerebral palsy due to low-birth-weight twins and increased proportion of low-birth-weight twin survivors<sup>(21)</sup>. This implication is of great importance for counseling of parents facing the choice of multiple pregnancy<sup>(22)</sup>, which is very much necessary for prevention and service planning<sup>(23)</sup>.

## Conclusion

Twin pregnancies and triplets produced cerebral palsy 12 and 14 times more often than singleton pregnancies.

## Author Contributions

Article conception and structuration: RSK, RRK and Ranjani RK, APK, literature search, analysis and manuscript drafting: RSD, critical revision of manuscript content: RSK, SRK, conceived and designed protocol: RSK, APK, contributed for follow up of patients: RSD, Ranjani RK, and responsibility for the integrity of data analysis.

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