SKELETAL DYSPLASIAS IN A HOSPITAL IN SOUTHERN INDIA

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ABSTRACT

A hospital based study of skeletal dysplasias was conducted over a period of 2 years in Daz'angere, Karnataka, in which 169 cases of skeletal dysplasias were studied. One hundred were osteochondrodysplasias and were grouped according to international classification of osteochondrodysplasias. Among the individual cases, osteogenesis imperfect a (13 cases) had the maximum representation. Several cases of rare disorders were also identified. Eighty eight cases of skeletal dysplasias were in the pediatric age group and of these 41 were newborns. The incidence of skeletal dysplasia among newborns was 19.6 per 10,000 deliveries and lethal dysplasias 5.2 per 10,000 deliveries. In 7 cases of skeletal dysplasia, an antenatal diagnosis was possible by ultrasonography.

Key words: *Skeletal dysplasia, Osteochondrodysplasia, Skeletal disorders, Growth disorders, Ultrasonography.*

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Skeletal dysplasias are a heterogeneous group of conditions associated with abnormalities in size, shape and density of the skeleton(l). Few among this group are lethal(2). Epidemiological studies help in defining the heterogeneity and provide insight into the frequency of occurrence. However, studies showing the incidence and pattern of skeletal dysplasia in the population are scanty. Most of the studies on skeletal dysplasias concentrate on specific groups or on individual case reports(3-5).

In one of our previous studies, we found that the incidence of congenital malformations was very high in this part of the country(6). A high rate of consanguinity in our area was implicated% a«. one of the factors for this high occurrence(6). The same factor could also affect the frequency of skeletal dysplasias. To know the frequency and the type of skeletal dysplasias it is ideal to have a population based study. Lack of resources and infrastructure, illiteracy and lack of awareness among people are the hindrances in carrying out a population based study in our setup. Eventhough less optimal, a hospital based study gives the trends in the population. We conducted a hospital based study of skeletal dysplasias in Davangere, a central town in Karnataka State, to explore the prevalence and type of skeletal dysplasias.

Material and Methods

The study was conducted for a period of 2 years in 3 major hospitals attached to J.J.M. Medical College in Davangere. All newborns delivered in these hospitals during this period an

patients of all age groups visiting different speciality departments with obvious disorders of skeleton were selected for the study. A thorough clinical evaluation, analysis of pedigree charts, screening of family members with minor anomalies were done along with detailed radiological study. X-rays of 8 areas like skull (lateral and anterior), spine lateral and anteroposterior, chest pelvis/knee, forearm, hand/wrist and feet were taken for all cases. Additional X-rays were also taken in relevant cases. Infantograms with extraviews of specific parts were taken for newborns. Ultrasound examination of abdomen, echocardiography, assessment of mental status, ophthalmic and auditory assessment and relevant available biochemical investigations were done in indicated cases. Attempts at iritrauterine diagnosis were made in pregnant women with history of affected children and in mothers who gave a positive family history suggestive of skeletal dysplasias like short stature, deformities, *etc.* Clinical photqgraphs were taken for all cases for documentation and further analysis. The cases were grouped according to International Classification(7).

Results

Of 169 cases studied, 100 were osteochondrodysplasias (*Table* I). The remaining were mostly dysostosis *(Table II)* and some of the cases with obvious skeletal involvement did not find a place in the classification and were grouped as miscellaneous *(Table III).*

There were 88% cases in the pediatric age group. Forty one newborns had skeletal disorders, of which 26 were skeletal dysplasias. and 7 were lethal dysplasias. The total number of deliveries in the hospitals during the study period was 13,244; thus the incidence of skeletal dysplasias was 19.6 per 10,000 deliveries, whereas the incidence of lethal skeletal dysplasias was 5.2 per 10,000 births. In 7 cases of dysplasias an antenatal diagnosis was made using ultrasound. These included one case each of thanatophoric dysplasia, diastrophic dysplasia, asphyxiating thoracic dysplasia, achondrogenesis, osteogensis imperfecta and 2 cases of campomelia.

Of 100 dysplasias, osteogenesis imperfecta was the one having maximum representation (13 cases). Others lhaving high representation included osteopetrosis (9 cases), mucopolysaecharidosis <8 cases), thantophoric dysplasia (5 cases), metaphyseal dysplasia {5 cases), camptomelic dysplasia (6 cases) and fibrous dysplasia (5 cases) Several-fclassical cases of rare disorders like pyknodysostosis, Engelman disease and Pyle's disease were aldo identified. Some of these dysplasias are shown in *Figs. 1-4.*

Discussion

This study of skeletal dysplasias conducted over a period of two years identified a large number of cases. Literature on this type of vast study on skeletal dysplasias is rare, especially from India. Most of the studies focus on case reports of specific types of dysplasias and dysostosis. A study by Joshi *et al.(5)* focused mainly on limb defects, while another study was done on craniofacial malformations(4). A complete study on dysplasias in society is difficult because, majority of dysplasias are nonlethal, many do not manifest at birth and many

TABLE I—*Classification of Osteochondrodysplasias*

Type	Male	Female	Total
A. Defects of the tubular (and flat) bones and/or axial skeleton			
1. Achondroplasia group			
Thanatophoric dysplasia	2	3	5
Achondroplasia	4	0	4
Hypochondroplasia	2	0	2
2. Achondrogenesis	1	0	1
3. Metatrophic dysplasia	1	0	1
4. Short rib dysplasia group			
SRP—Type I Saldino Noonan	0	1	1
Asphyxiating thoracic dysplasia	3	1	4
5. Atelosteogenesis/diastrophic dysplasia group			
Diastrophic dysplasia	4	1	5
Stickler dysplasia	2	0	2
6. Spondylo epiphyseal dysplasia congenita	0	1	1
7. Other spondyloepi-metaphyseal dysplasias			
Pseudoachondroplasia	1	0	1
8. Mucopolysaccharidosis	4	4	8
9. Spondylometaphyseal dysplasia	2	0	2
10. Multiple epiphyseal dysplasia	1	0	1
11. Chondrodysplasia punctata	1	0	1
12. Metaphyseal dysplasia	3	2	5
13. Mesomelic dysplasia	1	0	1
14. Acro/acro-mesomelic dysplasias			
Pseudo-hypoparathyroidism	1	0	1
Cranioectodermal dysplasia	1	1	2
15. Dysplasias with significant (but not exclusive) membraneous bone involvement			
Cleidocranial dysplasia	2	3	5

(Contd.)

TABLE I *(Contd.)*

Type	Male	Female	Total
16. Bent bone dysplasia			
Camptomelic dysplasia	3	2	5
17. Dysplasias with decreased bone density—Obsteogenesis imperfecta (several types)	6	7	13
18. Dysplasias with defective mineralization			
Hypophosphatasia	0	1	1
Hypophosphatemic rickets	3	0	3
19. Dysplasias with increased bone density			
Osteopetrosis	5	4	9
Pyknodysostosis	1	1	2
Diaphyseal dysplasia, Camurati Engelman	3	1	4
Frontometaphyseal dysplasia	2	1	3
Pyle's (disease) dysplasia	1	0	1
B. Disorganized development of cartilagenous and fibrous components of the skeleton			
Multiple cartilagenous exostosis	0	1	1
Fibrous dysplasia	2	3	5

go unnoticed. Even those with major manifestations cannot be studied fully in our setup because in rural areas most of the illiterate people consider these as a hand work of Cod and the chronic nature of these disorders prevents the parents from seeking medical help.

The present study, though hospital based, identified a large number of cases in a relatively short span of time. Considering the fact that the study was conducted on people with obvious deformities, we have probably underestimated the true prevalence which appears to be high in this area. In 26% of skeletal dysplasias, a diagnosis was made during the neonatal period. This was possible due to the easy accessibility to cases during the newborn period following hospital deliveries. The incidence of skeletal dysplasias among the hospital delivered babies was 19.6 per 10,000 deliveries. Eventhough mothers in various high risk group, may more frequently choose hospital delivery, the high incidence noted in our study is

TABLE II—*Dysostosis and Other Disorders of Skeleton*

Condition	Male	Female	Total
Cases of dysostosis with cranial and facial involvement			
(a) Craniosynostosis	2	0	2
(b) Acrocephalosyndactyly	2	0	2
Cases of dysostosis with predominant axial involvement			
(a) Vertebral segmentation defects (Klippel-Feil syndrome)	0	1	1
(b) Sprengel's anomaly	1	0	1
Cases of dysostosis with predominant involvement of extremities			
(a) Ectrodactyly	2	0	2
(b) Radio-ulnar synostosis	1	0	1
(c) Polydactyly	2	2	4
(d) Syndactyly	1	1	2
(e) Poly-syndactyly	1	0	1
(f) Rubeinstein-Taybi syndrome	1	0	1
(g) Fanconi anemia	0	1	1
(h) TAR syndrome	1	0	1
(i) Oro-facio digital syndrome	1	1	2
(j) Holt-Oram syndrome	1	1	2
(k) Femoral focal deficiency	0	1	1

significant. Anderson reported a point prevalence at birth of lethal skeletal dysplasias to be 15.4 per 100,000 in a population based study(3). The incidence of the same in our study was 52 per 100,000 births.

The high frequency of consanguineous marriages in this part may be an important contributing factor for this high incidence of skeletal dysplasias and other inherited disorders of skeleton(6). Previously we observed that 26.5% of hospital deliveries are to consanguineous parents(6). The prevalence pattern of various skeletal dysplasias observed in our study may not reflect the true incidence in the community, but it throws some light on the possible pattern.

In our study though 88% of skeletal dysplasias belonged to the pediatric age group, a late diagnosis in some of the cases with very obvious deformities was

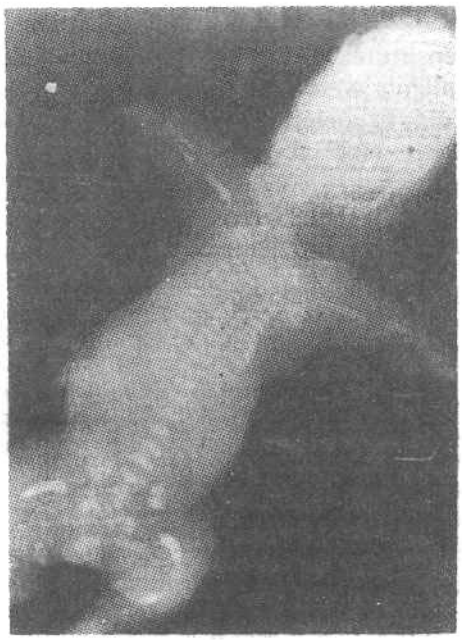

Fig. 1. Thanatophoric dysplasia; note the short, bent and "telephone receiver" femora.

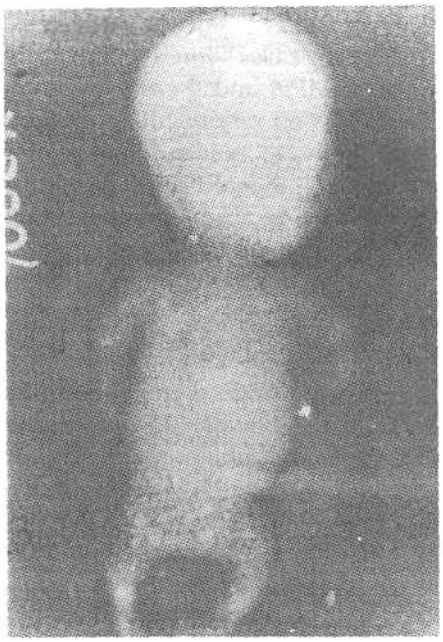

Fig. 2. Achondrogenesis, note the extremely short limb bones with unossified vertebrae.

the list of ostoechondrodysplasias has been expanding, these classifications help to narrow the possibilities, in individual cases, to one or two broad categories and are of great help in diagnosis. Of the 169 cases studied, we were able to group 100 cases according to this classification. Many of our cases with obvious skeletal disorder did not find a place under the new classification. A detailed classification of dysostosis and expanding the scope of classification of dysplasias may help to categorize many of the inherited disorders of skeleton for which no proper grouping exists.

Clinical examination also has an important role in the diagnosis and management of these patients. Many of these disorders in this group are associated with cardiac, ophthalmic, and auditory manifestations(2) and so identification of these has a bearing on the management. Clinical examination also helped us to suspect and then diagnose some skeletal dysplasias which were evolving in early life, for example, Crouzon's syndrome.

Identification of dysplasias antenatally is important in the management of pregnancy and in genetic counselling. Many disorders in this group involve disproportionate short stature of prenatal onset and structural abnormalities that may lead to intrauterine death or fatal perinatal complication(9). Currently, diagnosis of many fetal malformations is

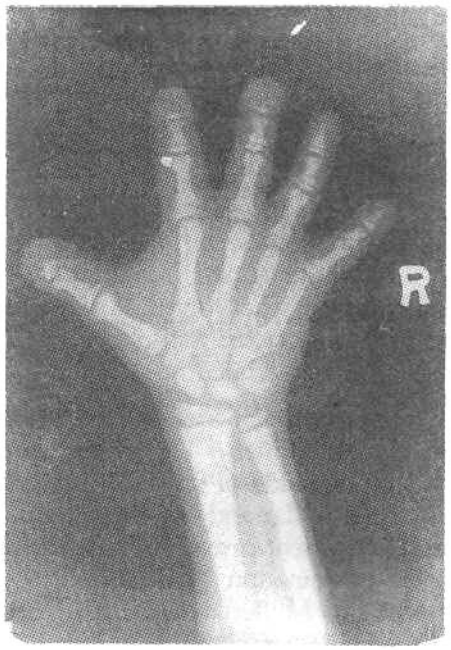

Fig. 3. Pyknodysostosis; note the hyperostosis with osteolysis of terminal phalanges.

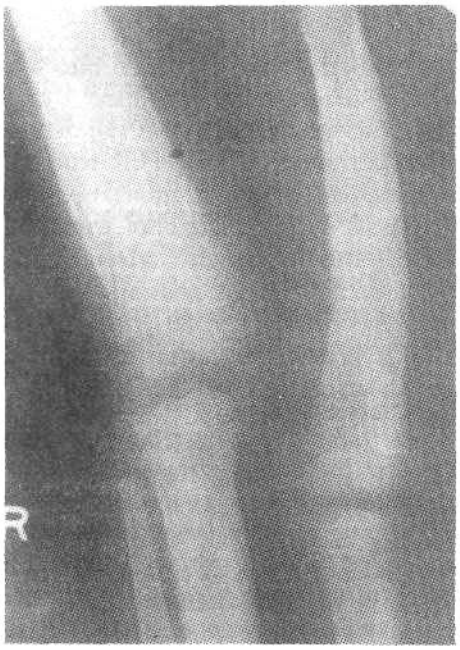

Fig. 4. Englemann's Disease; note diaphyseal thickening of long bones.

feasible due to improved ultrasound resolution, better sonographic skill and experience(9). In our study ultrasound examination was carried out in pregnant women with previously affected children and in mothers who gave family history of short stature or other anomalies. In 7 cases an antenatal diagnosis was possible. Ultrasonography is already finding routes into interior parts of our country. As it is noninvasive, it is more acceptable to mothers. Increased utilization of this modality will help to identify more number of cases antentally.

Many bone dysplasias identifiable at birth are of special interest to obstetricians, as these can be diagnosed antenatally by ultrasound examination. Prenatal diagnosis of skeletal dysplasia during the second trimester allows termination of a fetus affected with severe disorder or for proper planning of natal and post natal management. For example in some types of osteogenesis imperfecta, atraumatic delivery is conducted and in thrombocytopenia, absent radius syndrome, platelet transfusion may be needed. A large number of skeletal dysplasia can be diagnosed by good fetal ultrasonography by a person experienced in the field, but sometimes fetal radiography is required to substantiate or elucidate fetal skeletal dysplasia syndrome.

Before attempting prenatal diagnosis

of skeletal dysplasias by ultrasonography, it is essential to record detailed pedigree, ask about parental consanguinity and exposure to any teratogenic agent. The initial step in ultrasonography includes an accurate measurement of femora, humeri, radii, ulanae, tibiae and fibular lengths and compare with the standards available in the literature(10,ll).

It is concluded that prevalence of skeletal dysplasias in this part of the country is fairly high and this may possibly be related to the higher frequency of consanguineous marriages.

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