

Incidence of Skeletal Deformities in the Male Population of Some North Indian Districts

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Abstract

A study was undertaken in the male population of some north Indian districts to know the incidence of skeletal deformities. All the candidates presenting over a period of one and a half years for enrollment in the defence forces at a defence enrollment centre were subjected to medical examination. Persons who had or were suspected of having disabilities were referred to the concerned specialist for confirmation of the disability. All those persons whose disability was adjudged by the concerned specialist as being within permissible limits were taken as fit and the others whose disabilities were beyond permissible limits were taken as unfit. The results were compared with similar studies and discussed.

Keywords: Skeletal Deformity; Knock Knee; Flat Foot; Hammer Toes; Genu Valgus; Cubitus Varus.

Introduction

Various skeletal abnormalities, e.g. genu valgus, genu varus, flat foot etc are normally present in infants and toddlers and are considered physiological. They tend to correct themselves over time with growth. However, sometimes they do not correct with growth due to various factors and are present in adults.

AIM

The aim of this study was to find the incidence of various disabilities in a male north Indian population so as to create a sample database. The scope of this study was limited to skeletal deformities.

Material and Methods

All the candidates presenting over a period of one and a half years for enrollment in the defense forces were included for this study. The age group of this

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population was between 18 years to 22 years as this is the age limit for enrollment in the defense forces. This sample age group was considered ideal for this study as skeletal growth would have ceased by this age and any growth related correction of the deformities would not be taking place.

A doctor subjected all the candidates to medical examination, and any disability noted. All candidates having any disability were referred to the concerned specialist for confirmation of the disability. Any candidate who did not report for review to the concerned specialist for confirmation of his disability was taken as absent and removed from the study. All those persons whose disability was adjudged by the concerned specialist as being within permissible limits were taken as fit and the others whose disabilities were beyond permissible limits were taken as unfit.

The skeletal disabilities were grouped as under:

1. Upper limb deformities
 - a. Cubitus valgus > 15°
 - b. Digital deformities – Hyperextension, restriction of movement
 - c. Lower limb deformities
 - d. Hallux valgus
 - e. Hallux varus
 - f. Other toe deformities- Hammer toes, overriding toes

- g. Flat foot
- a. Genu valgus- Inter-malleolar distance (IMD) >5 cm with knees touching
- b. Genu varus- Inter-condylar distance (ICD) >7 cm with malleoli touching
- 2. Vertebral column deformities
 - a. Kyphosis
 - b. Scoliosis
 - c. Listhesis
 - d. Spondylosis
- 3. Anterior chest deformities
 - a. Pigeon chest
 - b. Barrel chest

The results are tabulated.

Observations

A Total of 4223 candidates reported for medical examination in the above period. Out of this a total of 334 candidates who had disabilities did not report to the specialists concerned and were removed from the study, leaving a total of 3889 candidates. After specialist review, 1471 candidates were found unfit for various causes, out of which 701 were for skeletal abnormalities. Many candidates were found to be suffering from multiples disabilities.

Total candidates - 3889

Unfit candidates - 1471

Unfit candidates with skeletal abnormalities - 701

Percent of unfit candidates - 37.82

Percent of unfit candidates with skeletal abnormalities - 18.02

Skeletal abnormalities as percent of Total unfit - 47.65

The Summary of Skeletal Abnormalities is as Under:

No of Disabilities Present	1	2	3	4
Total No	525	144	31	1

The Details of the Parts Affected are as Under:

S No	Part Affected	Incidence	% of Affected
1.	Foot	371	40.77
2.	Knee	77	8.46
3.	Hand	34	3.74
4.	Elbow	241	26.48
5.	Chest	34	3.74
6.	Spine	153	16.81
	Total	910	100

Note: The total number of disabilities is more than the number of persons unfit because of persons with multiple disabilities

Discussion

Army personnel have to undergo a lot of physical and mental stress and strain during the course of their routine duties, much more than are the case in civil life. Army, therefore, conducts a very stringent medical examination for candidates who desire to join the armed forces firstly because they have to be physically fit in order to bear the stress and secondly because even comparatively minor deformities may also cause injury or other problems under the stress of army training. This has been amply brought out in the study by Cowan DN et al [1] of Walter Reed Army Institute of Research,

Washington, DC, USA on 'Lower limb morphology and risk of overuse injury among male infantry trainees.' They have found that

"The cumulative incidence of lower limb overuse injury was 30%. Relative risk of (RR) of overuse injury was significantly higher among participants with the most valgus knees (RR = 1.9). Those with Q-angle of more than 15 degrees had significantly increased risk specifically for stress fractures (RR = 5.4). Anatomic characteristics were associated with several other types of injuries, including pain and nonacute muscle strain due to overuse."

Reports of various authors, both from the developed countries as well as in less developed countries, who have studied this aspect of the problem is presented below.

Do TT [2] in a study at Children's Hospital Medical Center, Cincinnati found after the age of 2 years, any significant amount of residual bowing is abnormal and may be due to infections, traumatic physeal injuries, genetic predisposition, metabolic factors, or a combination of these.

Kling TF Jr. [3] in another study at James Whitcomb Riley Hospital for Children, Indiana University Medical Center, Indianapolis reported bowlegs and knock-knees are common concerns in the early years of life. For the majority of children, these problems represent normal physiologic development and they correct spontaneously. Other than physiologic varus and valgus, the common causes of pathologic malalignment include Blount's disease, rickets, hereditary conditions, infection, and trauma.

Bleck EE [4] has said Genu valgus and varus correct without treatment in the majority of patients. However, a small percentage of the disorders will

persist if untreated and some cases of genu varus appear to develop into the progressive form of the disorder, Blount's disease."

As is seen from the above reports, valgus and varus deformities are normally presenting children and vary in degree with age [2, 3,4]. Normally they resolve with age but may persist due to Blount's disease, rickets, hereditary conditions, infection, or trauma [2].

In our study we have measured the Inter Malleolar Distances (IMD) and Inter Condylar Distances (ICD). However, in most of the studies the Metaphyseal-Diaphyseal Angles of the tibia (MDA) or the Tibio Femoral Angle has been used.

Comparison of various studies becomes very difficult since various parameters are being used for measurement and the limits for normality are not very clear in all cases. However in this study on 'Normal limits of knee angle in white children—genu varum and genu valgum' at the University of Washington School of Medicine, Seattle by Heath CH, Staheli LT [5] provides a way out by giving one relationship between tibio-femoral angle or Knee angle and Inter-Malleolar Distance (IMD) wherein they mention a maximum Knee angle of 12° and maximum IMD of 8cm.

Arazi M, Ogun TC, Memik R [6] of Department of Orthopaedic Surgery and Traumatology, Selcuk University, Konya, Turkey in a study on 'Normal development of the tibio-femoral angle in children: a clinical study of 590 normal subjects from 3 to 17 years of age' found a significantly higher degree of valgus angle than that in previous reports. The maximal mean valgus angle was 9.6 degrees at seven years for boys and 9.8 degrees at 6 years for girls. These differences were considered racial differences between Turkish children and those of other races. Turkish children, aged between 3 and 17 years, exhibited < or =11 degrees physiologic valgus. A measurable varus angle or a valgus higher than 11 degrees during this period should be considered abnormal.

However Bowen RE, Dorey FJ, Moseley CF [7] in a study carried at Shriners Hospital for Children have, in addition, also used tibial deformity as a percentage of the total (%DT) to test the hypothesis that patients with progression have more tibial than femoral varus and they found that tibial varus was found to exceed femoral varus in all patients with progression and also in several patients whose deformity resolved spontaneously. Although more specific and more sensitive than the MDA, the %DT is a good but not perfect predictor of progression. However, all patients in this series with both a %DT >50% and an MDA of 16 degrees or greater went on to progress."

In another study in Department of Surgery, College of Medicine, University of Ibadan Omololu B. et al (8), on 'Normal values of knee angle, intercondylar and intermalleolar distances in Nigerian children' found that knees were maximally bowed at ages 1-3 years and reduced to neutral of 0 degrees at age five (5 years) in girls and age seven [7] in boys. The greatest intermalleolar distances of 2.5 cm and 2.2 cm were noted between the ages of 2 and 4 years.

Enwemeka CS [9] in their study of a total of 3,144 Nigerian school children, adolescents and adults found nine hundred and seventy-two (30.9%) of the subjects were identified with various physical deformities including Non-rachitic Primary Knee Deformities; Pes Planus; Talipes Equinus Varus; Scoliosis; Limb Length Discrepancy; Cubitus Valgus and Hallux Valgus.

In our study of 3889 young adults we have found a total of 701 (18.02%) persons with skeletal deformities Bhat BV, Babu L [10] in a Department of Pediatrics, Jawaharlal Institute of Post-Graduate Medical Education and Research, Pondicherry project studied congenital malformations prospectively from September 1989 to December 1992 covering 12,797 consecutive deliveries. The overall incidence of malformations was 3.7% and it was 3.2% among live births and 15.7% among still births.

Our report falls between these two values. Further work needs to be done in other regions of India to correlate whether incidence is region specific or otherwise and also a survey to see if there is any correlation between the incidence of skeletal anomalies and average socio-economic development of the region.

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