Original Article

Primary Angular Knee Deformities among Nigerian School Children

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Summary:

Background: Primary angular knee deformities are common occurrences in children. The exact incidence rate of primary angular knee deformity among children in Nigeria is unknown. This study aims at determining the incidence of primary angular knee deformity among Nigerian children of school age.

Patients and Methods: Over seven thousand Nigerian children, aged between 9 to 14 years, wishing to gain admission into the Nigerian Air Force Military Schools in Jos, Nigeria were clinically examined for the presence of angular knee deformities.

Results: Out of the 7,968 children that were examined during the eight year period, an incidence rate for genu varus of 5.9 per 1,000 boys was recorded for all degrees of the condition. In 7(25%) of these cases, the deformities were classified as severe and associated with obesity in 3 cases. The incidence rate for mild, unilateral genu valgus was 2 per 1,000 boys. Among the girls examined, an incidence rate of 5.6 per 1,000 was recorded for primary genu varus deformity of all degrees of severity. Two cases (11%) were classified as severe and obesity was associated with moderate degrees of the condition in 2 cases. For genu valgum, the incidence rate was 3.4 per 1,000 girls; in 2 of the cases the deformity was unilateral, severe and associated with patella alta. An overall incidence of 5.8 per 1,000 children of both sexes for genu varum and 2.6 per 1,000 children for genu valgus was recorded.

Conclusion: The commonest type of angular deformity in this study is genu varum, and it had a male preponderance. Obesity is frequently associated with genu varum among Nigerian children of school age.

Key Words: Primary angular deformities, Knee, Children, Incidence.

Introduction

Knee deformities in Nigerian children are common and they constitute a source of concern to both parents and Orthopaedic Surgeons[1]. This is because these deformities are cosmetically unacceptable to the parents who often seek medical help only to be told that such malalignments involving the knees represent normal physiological developments that will correct spontaneously without treatment. Orthopaedic surgeons on the other hand, although, content with the fact that most of these knee deformities will correct without treatment when the child is about seven years of age , have to contend with the problem of ruling out secondary causes of angular deformities of the knee like metaphyseal dysplasia, fibrous dysplasia, rickets and non rachitic deformities such as Blount's disease, congenital causes like osteogenesis imperfecta and early traumatic injuries to the epiphysis (Salter Harris injuries). Malunited fractures or ligamentous injuries or laxity contribute to secondary causes of angular knee deformities. All these involve a

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plethora of radiological and biochemical investigations, which impose a huge financial burden on the parents who are only told at the end that such physiological abnormalities do not require any specific treatment. The demarcation of the degree of deformity that requires treatment is not clear cut. However it is generally held that any deformity of 15 degrees should be treated to avert future complications and restore good economy of locomotion and cosmesis[2].

In order to partly settle these persisting problems concerning such angular deformities of the knee, an attempt at determining the incidence of this condition forms the main objective of this study. The incidence of non-rachitic deformities of the knee in Nigerian children in a hospital setting has previously been determined by Oyemade[3]. Our study however has been designed to have a more national outlook involving Nigerian children from all 36 states of the Federal Republic of Nigeria. We hope that the morbidity statistics for primary knee deformities in this study will not only help in updating National health records but also serve to indicate the number of children with severe angular malformations of the knee requiring Orthopaedic intervention. All these gains will eventually be helpful in planning comprehensive national health programmes for the future.

Patients and Methods

This survey was carried out at the Nigerian Air Force Hospital, Jos, on all prospective Nigerian children who wished to gain admission into the two separate Military Colleges meant for boys and girls. All the candidates studied accrued to the survey between August 1988 and August 1995 when yearly routine medical examinations were carried out on all prospective children of secondary school age between nine and fourteen years. The routine medical examination included a meticulous family and past medical history of all the candidates to unveil such secondary causes of angular deformity of the knee that might have existed.

Physical examination along the same lines was carried out to rule out secondary causes of knee deformities in these children. Specific examination of the knee was carried out in the recumbent position with the patella facing upwards. Following full loco-regional clinical examination of both knees a diagnosis of primary angular deformity was recorded when detected and the severity categorized. For valgus deformity, an intermalleolar distance of 3 to 9cm was considered mild, moderate if such a measurement was between 10 and 15cm and severe if it was greater than 15cm. A similar grading was employed for children with genu varum by measuring the intercondylar distance and the heights. Packed cell volume (PCV), erythrocyte sedimentation rate (ESR), total white cell count and urinalysis were done as basic laboratory investigations to screen for underlying pathologies. Radiological screening was obtained from plain X-rays of the chest and both wrists to rule out evidence of rickets or metaphyseal dysplasias. The total body weights of all candidates was also obtained and recorded. Based on the ideal weights for a particular age and sex obtained from a normogram, the total body weight was characterized as underweight if the weight was less than 10% below ideal weight, normal if plus or minus 10% of ideal weight and overweight if it was more than 10%of the ideal weight.

Results

During the eight year period stated in this survey, a total of 4,758 Nigerian boys and 3,210 girls were studied resulting in a population of 7,968 children that were examined and screened for primary angular deformities of the knee (Table 1).

Twenty eight new cases of primary genu varum

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Table 1:
Number of children examined for knee primary angular deformities

Year	No. of Boys (N=4,758)	No. of Girls (N=3,210)	Total (N=7,968)
1988	1089	379	1468
1989	527	549	1036
1990	654	560	1214
1991	714	519	1223
1992	450	320	770
1993	392	292	684
1994	425	341	766
1995	547	300	807

were recorded among the boys and all of these were bilateral out of the total of 4,758 boys examined (Table 2). Eight (29%) of the cases were characterized as mild, 13 (46%) as moderate and 7 (25%) as severe. The incidence rate for boys with primary genu vara which was defined as the number of new cases of the condition divided by the total number of boys examined during the periods was 5.9 per 1,000 boys. Similarly for genu valgum, 10 new cases were recorded all of which were of mild severity and unilateral in distribution resulting in an incidence of 2 per 1,000 boys. Collaborative total body weight values recorded for the boys indicated that 4,282 (90%) boys had normal weight, 143 (3%) were overweight and 333 (7%) underweight. Three overweight boys were discovered to have had

Table 2:
Number of Boys with primary angular knee deformities

Year	Genu Varum (n=28)			Genu Valgus (n=10)
	Mild	Moderate	Severe	Mild
1988	3	1	2	1
1989	1	2	1	2
1990	0	2	0	1
1991	1	3	2	1
1992	0	2	0	2
1993	1	1	0	1
1994	1	1	1	1
1995	1	1	1	1
Total	8 (29)	13 (46)	7 (25)	10 (100)

Percentages in parenthesis

Table 3:
Number of Girls with primary angular knee deformities

Year	Genu Varum (n=28)			Genu Valgus (n=10)
	Mild	Moderate	Severe	Mild
1988	0	2	0	1
1989	1	1	1	2
1990	0	2	0	1
1991	2	0	1	1
1992	0	2	0	2
1993	1	1	0	1
1994	0	2	0	2
1995	0	2	0	1
Total	4(22)	12(67)	2 (11)	11 (100)

Percentages in parenthesis

Table 4:
Number of children with primary angular knee deformities

Year	Genu Varum (n=46)			Genu Valgus (n=21)
	Mild	Moderate	Severe	Mild
1988	3	3	2	2
1989	2	3	2	4
1990	0	4	0	2
1991	3	3	3	2
1992	0	4	0	4
1993	2	2	0	2
1994	1	3	1	3
1995	1	3	1	2
Total	12(26)	25(54)	9 (20)	21(100)

Percentages in parenthesis

severe bilateral genu vara out of the 7 boys with this category of malalignment of the knee representing a total of 43%. All the other cases of primary angular deformities of the knee were of normal weight.

Eighteen new cases of primary genu varum deformity were recorded out of a total of 3,210 girls examined for the condition (Table 3). Sixteen of these were bilateral in distribution and the remaining 2 cases were unilateral. Four (22%) cases were mild, 12 (67%) moderate and 2(11%) were severe. These severe cases constituted the two unilateral cases of genu vara seen among the girls. The incidence rate for primary genu varum was determined as 5.6 per 1,000 girls examined during

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the period stated. For primary genu valgum there were a total of 11 new cases recorded, 2 of which were severe, unilateral and associated with patella alta. An incidence rate of 3.4 per 1,000 girls for all degrees of the deformity was recorded. Total body weight values for the girls indicated that 38 cases were overweight. Twelve cases in the overweight category were found to have had a moderate degree of genu vara representing 67% of the total number of girls with such a degree of genu varum deformity.

Table 4 indicates the total number of children with primary angular deformities of the knee recorded during this period. A total of 7,968 children were examined out of which a total of 46 new cases of genu vara were recorded resulting in an incidence of 5.8 per 1,000 children. Twelve (26%) were of the mild category, 25 (54%) moderate and 9 (20%) severe. There were 21 cases of unilateral genu valgum resulting in an incidence rate of 2.6 per 1,000 children that was recorded during the period of the survey.

Discussion

The exact incidence rate of primary angular deformity among school children in Nigeria has not been determined in any large epidemiological survey of this kind[4]. However the same universal physiologic mechanisms operating in the development of these knee deformities are known to explain its natural course. The physiologic variety of genu varum which is commoner in children that are less than one year of age develops with a tendency to valgus malalignment when the child is aged between one and a half and three years[5]. It is known that this stage of primary valgus deformity of the knee then pursues a natural history to a spontaneous resolution when the child is aged between seven and ten years[2,5,6]. The incidence rate of primary angular deformities of the knee in children will therefore be expected to vary in the Nigerian situation depending on such multifactorial indices as the genetic make-up, sex and other environmental determinants like the nutritional status of the population at large.[2,6]

The literature review on the subject of primary malalignment of the knee in children has been silent on the issue of sex incidence of this deformity[4,5]. The results of our survey indicate a sex ratio of M:F of 1:1 for all the degrees of severity of genu varum deformity. Classification based on the severity of these deformities, however, showed that primary genu varum abnormality was a more severe abnormality among Nigerian school boys and was almost always bilateral in distribution. This difference in severity among the sexes is probably explained by the fact that male children are more active especially during the ambulatory period of their development resulting in the persistence of the varum phase of development of the physiologic angular deformity of the knees. Primary genu valgum on the other hand was found to have a sex M:F ratio of 2:3 and was usually unilateral and of mild severity in these cases. Severe degrees of this deformity in girls were usually associated with patella alta predisposing to recurrent dislocation of the patellae. The paucity of unilateral genu varum in both sexes serves further to buttress the fact that a finding of unilateral genu varum in an adolescent child should arouse the suspicion of a diagnosis of Blount's disease in such a case.

This study also shows that obesity is frequently associated with severe degrees of genu varum in 43% of the cases recorded in this study among the boys and 17% of overweight girls with severe degrees of this deformity[6]. Again, the only plausible explanation for this finding is that obesity probably serves to add an extra weight for the individual's age and height which is diffusedly distributed to

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both knees resulting in perpetuation and exacerbation of the varum phase of physiologic malalignment of the knee in adolescent children. This is in agreement with Huter-Volkmann's principle of physeal growth which states that increased pressure on a physis inhibits growth. With the varus deformity, the weight of the body bears on the medial side of the proximal tibial epiphysis decreasing growth; while Delpech's law which states that decreased pressure on the physis stimulates growth comes to play on the lateral aspect. These forces interplay to increase the varus deformity in overweight children[6].

Extrapolating from these results for both sexes, an incidence rate of 5.8 per 1000 children for all categories of genu varum and 2.6 per 1,000 for genu valgus was recorded from this study which involved children of secondary school age from all the states of the Federation of Nigeria. When trying to make a final appraisal of this survey, we agree that the study was carried out supposedly on intelligent Nigerian children but this should not detract from the results that we have recorded since the incidence of primary angular deformities

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