

## Research Article

## Epidemiology of Angular Deformities of the Knee in a Tertiary Hospital South-South, Nigeria

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**Abstract: Introduction:** Angular deformities of the limbs are common in our communities and they are attributed to many causes and as such medical care is not sought early. With relative increase in knowledge, some of the parents are presenting in the hospital because of the social stigma attached to the deformity. The challenge has been with treatment of most of the cases with corrective osteotomy where there is paucity of implant for fixation. **Objectives:** To study the pattern and treatment of presentation of patients with angular deformities of the knee in outpatient clinics of the department of Orthopaedics and traumatology in University of Calabar Teaching Hospital. **Patients and methods:** A retrospective study of 108 patients who presented in our orthopaedic clinic in a 7 year period (January, 2011 to December, 2017). Data was obtained from the clinic records and medical record department of the hospital after due ethical approval. Statistical analysis was done using Statistical Package for Social Sciences software version 22 for windows (SPSS 22 Trademark of IBM Corporation). P-value of 0.05 was considered statistically significant. **Results:** A total of 155 knees from 108 patients were seen. The age ranged 1-65 years with mean age 12 years  $\pm$  SD 16.5 years. There were more females than male with the female to male ratio of 1.3:1. Of the 108 patients recruited 45.4% of them were due to Blount's disease, 40.7% due to Rickets while 13.9% were deformities due to severe osteoarthritis of the knees. Genu valgum deformities constituted 49.1% were while 46.3% were genu varum and 5(4.6%) had windswept deformity where one leg was in valgum and the other varum. Sixty patients (55.6%) were treated by corrective osteotomy and most stabilized with cast materials, another 30.6% had medical treatment and 13% were on watchful waiting with limb splinted. **Conclusions:** The study showed that angular deformities are common, the commonest cause is Blount's disease.

**Keywords:** angular, deformity, knee, pattern.

### INTRODUCTION

The natural history of the knees follows an order which starts with genu varum (bow legs) and medial tibial torsion are normal in newborn and infants and at ages 6 to 12 months, there is a maximal varus presentation. And if growth continues normally, at ages 18 to 24 months, the lower limbs gradually straightens with a zero tibio-femoral angle (when the infant begins to stand and walk). As the infant develops, the knees gradually drift into valgus (knock-knee). This valgus deformity is maximal at around age 3-4 years with an average lateral tibio-femoral angle of 12 degrees (Arazi, M. *et al.*, 2001). However, by the age 7 years genu valgum spontaneously corrects to that of the adult

alignment of the lower limbs of 8 degrees of valgus in the female and 7 degrees in the male. Females have wider pelvis which accounts for the greater degree of valgus seen in females. Several classifications for these deformities exist, though most of them are quite selective but majority of them deal with either varus or valgus deformities. The most recent classifications tend to contradict each other and are too complex for non-specialists. The clinical assessments of angular deformities of the knees are based on angular deviations expressed in degrees of varus or degree of valgus (Kamath, A.F. *et al.*, 2010). The terms "valgus" ("twisted" or "bent" in Latin) "varus" ("crooked" in Latin) are commonly used to describe "knock-kneed"

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and “bowlegged” limbs, respectively. These deformities may be unilateral or bilateral and sometimes they are combined with one deformity on one leg and the other on the second leg presenting with the “windswept” deformity. Though, these terms are sometimes unclear and may be responsible for poor quality of treatment given to patients.

Physiologic changes associated with growth and development in the knees and pathologic deformities which required treatment, are responsible for angular deformities of the knees (Kling, T.F. 1987). The aetiology depends on either Varus or Valgus deformities; for genu varum, it could be due to physiologic bowing, rickets, lateral ligament laxity, Blount’s disease, congenital pseudo-arthritis of tibia, growth abnormalities of the upper tibia epiphysis, infections like osteomyelitis, trauma near the growth epiphysis of the femur, tumours affecting the lower ending of the femur and upper end of tibia. Valgus deformities may be a manifestation of physiologic changes of normal growth and development, renal osteo-dystrophy (renal rickets), skeletal dysplasia, spondylo-epiphyseal dysplasia, mal-united fractures, infections or vascular insults etc.\_ In physiologic genu varum, there is a gentle curve involving both the thigh and the leg with more pronounced bowing in the lower third of the femur and at the juncture of the middle and upper thirds of the tibia (Do, T.T. 2001); whereas in ligamentous hyperlaxity it is at the knee joint. Blount’s disease pathology I usually at the proximal tibia metaphysis with an acute medial angulation immediately below the knee. But in congenital familial form of tibia vara, it is at the lower tibia occurring at the junction of the middle and the lower thirds (Cheema, J.I. *et al.*, 2003). In Nigeria, there have been studies in Zaria by Salawu (Salawu, S.A.I. 1992), in Ilorin by Solagberu (2000) and in Benin by Bafor *et al.*, (2008) on angular deformities of the knees in children. However, in this study, the pattern in both children and adults were considered and the treatment given to the various groups have also been highlighted.

**PATIENTS AND METHODS:**

This was a retrospective study of 108 patients with 155 knees who presented in our orthopaedic clinic in a 7 year period (January,2011 to December,2017).Data was obtained from the clinic records and medical record department of the hospital after due ethical approval.

We reviewed the clinical records of all patients both children and adults who present with angular deformities of the knees and who were followed in our orthopedic outpatient clinics between the period under review as earlier stated. The patients’ demographic data, clinical assessment and radiological investigation which involved a standard plain X-rays orthoroentgenogram to assess angular deformities of the knees were noted. Other investigation modalities such

as laboratory request forms were assessed which consisted of white and red blood count, levels of calcium, phosphorus and alkaline phosphates (especially in children) were also noted.These were matched with the documented xrays findings to confirm the diagnosis as were documented in their case files. The limb affected ,the type of deformity and the cause of the deformity as well as the treatment offered were all included in the proforma.

The data was analyzed using Statistical Package for Social Science, version 22, for Windows, by International Business Machine 2011 Descriptive statistics were applied to determine means, frequencies, and ranges. A confidence interval of 95% was assumed, and the difference was considered significant at  $p \geq 0.005$ . The results are presented in frequency distributions, tables, and charts.

**RESULTS:**

A total of 155 knees from 108 patients were seen. The age ranged 1-65years with mean age 12 years  $\pm$  SD 16.5 years.There were more females than male with the female to male ratio of 1.3:1.majority of the patients were between age one to ten years(67.6%) as seen in table 1.There were more of bilateral knee affectation (43.5%) than single knee, the left knee (33.3%)being affected more than the right(23.1%).Genu valgum deformities constituted 49.1% while 46.3% were genu varum and the other 4.6% were ‘windswept’ deformities in which one leg was in valgum and the other was in varum deformity. Of the 108 patients recruited 45.4% of them were due to Blount’s disease,40.7% were due to Rickets while 13.9% were deformities due to severe osteoarthritis of the knees. Amongst the patient that had rickets and Blount’s disease, majority of them were between the ages of 1-10 years with values of 38 and 35 patients respectively; severe osteoarthritis on the other hand, was seen in the middle age group between the ages of 51-60 years (figure 2).This is expected to be a very active age group who fend for their families, hence, there is a reduction in productivity with resultant economic hardship. There was an association between the age and the aetiology angular deformities of the knees in this study with a  $P < 0.0005$ . Sixty patients (55.6%) were treated by corrective osteotomy and most stabilized with cast materials, another 30.6% had medical treatment and 13% were on watchful waiting with limb splinted.

**Table1. Patients’ age distribution**

Age (Years)	Frequency	Percent
1-10	73	67.6
11-20	18	16.7
21-30	3	2.8
31-40	2	1.9
41-50	5	4.6
51-60	5	4.6
61-70	2	1.9
<b>Total</b>	108	100.0

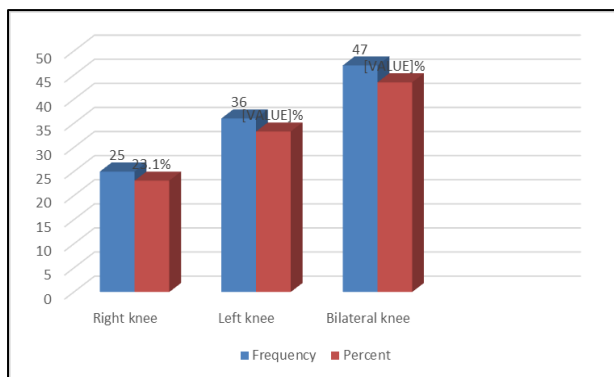


Figure1. The different levels of affectation of the knee

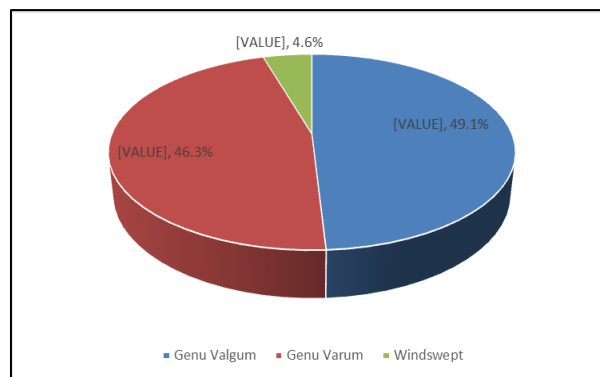


Figure2. The type of deformities

Table2. Age and cause of deformities

	Age category							Total
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	
Rickets	38	5	1	0	0	0	0	44
Blount's disease	35	12	1	0	1	0	0	49
Severe Osteoarthritis	0	1	1	2	4	5	2	15
<b>Total</b>	73	18	3	2	5	5	2	108

Df=12 and P < 0.0005

Table3. Aetiology and different treatment methods

	Aetiology			Total
	Rickets	Blount's disease	Severe Osteoarthritis	
Splinting	1	0	0	1
Corrective osteotomy	10	35	15	60
Medical treatment	32	1	0	33
Watching waiting	1	13	0	14
<b>Total</b>	44	49	15	108

**DISCUSSION:**

Angular deformities of the knees are common presentations in the Orthopaedics and Paediatrics outpatient clinics. For the paediatric age group, the parents are concerned because of the social stigma and undue attention the condition draws to the child and the parent particularly in an African setting. Several variations exist in the tibiofemoral angle. Studies have shown some geographical differences. At age 11, there is at least 2.5 degrees of valgus in white children according to the studies by Heath and Stahl (1993). There was about 11 degrees difference at age between 1 to 10 years in both sexes in a series by Omololu *et al.*, (Omololu, B. *et al.*, 2003). The normal development of tibiofemoral angle have been documented by different authors (Arazi, M. *et al.*, 2001; Salenius, P., & Vankka, E. 1975). In this study, there was a female preponderance, this is not in keeping with the work done by other authors within African and other countries which found more of males being affected by angular deformities of the knees (Salawu, S.A.I. 1992; Solagberu, B.A. 2000; Bafor, A. *et al.*, 2008; Heath, C.H., & Staheli, L.T. 1993; Omololu, B. *et al.*, 2003). Blount's disease was seen as the commonest cause of angular

deformities of the knees, this was also not in keeping with findings by Salawu (Salawu, S.A.I. 1992) and Bafor *et al.*, (2008) who found rickets as the commonest cause of the deformities, on the other hand, Solagberu (Solagberu, B.A. 2000) in his work reported physiologic changes as the commonest cause of angular deformities which agrees with what is reported in USA that most Paediatrics Orthopaedics referral are due to physiologic changes in the knees (Kling, T.F. 1987). The awareness of physiologic genu deformities among the population appears to be responsible for its absence as one of the aetiological factors in the angular deformities in this study. The reason for having more of Blount's disease in this study is not fully understood, but it might be deduce from the culture of the people here who practised the "fattening room" tradition where newly married bride was kept in a room and fed until she was fat enough to be acceptable by the groom, this in turn results in having obese babies which predisposes to Blount's disease. Obesity most likely may be responsible for the bilateral angular knee deformities which are largely due to early weight bearing as proposed by Kessel

(1970). That pressure on the medial tibia epiphysis slows its growth with a resultant bowing, owing to continuous growth of the fibula. This agrees with studies by other authors (Solagberu, B.A. 2000; Bafor, A. *et al.*, 2008). Osteoarthritis (OA) was seen as the third leading cause of angular deformities of the knees in this study, this was because the study included adult respondents unlike other studies that involved only the paediatric age group. Those who suffered from OA were between the middle age group and some of them had angular deformity earlier in life which were not treated either from Blount's disease or poorly managed fractures. Most patients who had corrective osteotomy as mode of treatment were those who had Blount's disease, those who had OA and few patients with failed medical treatment for rickets. Other patients were treated with braces and some medically, but the very young patients before ages 3 who had Blount's disease were under watchful waiting using knee ankle foot orthoses (KAFO) and were reassessed using the Langenskiold classification, for possible osteotomy when they were above age 3 years.

In conclusion, Blount's disease is the commonest cause of angular deformities of the knee among patients who present in Orthopaedics clinic of the University of Calabar teaching hospital with angular deformities of the knees, this however the prevalence in the general community might be different.

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