

Incidence of Genu Valgum in Relation to Intermalleolar Distances of Adults in Amassoma South-South Nigeria

W.N. Dare, A.Z. Erefah and D.D. Mac-Eteli

Department of Human Anatomy, Faculty of Basic Medical Sciences,
College of Health Sciences, Niger Delta University, Wilberforce Island, Nigeria

Abstract: Intermalleolar distance of 80 adults, (50 normal and 30 with genu valgum) of both gender between the age bracket of 18-35 years were measured with a caliper to establish values for analysis. All subjects are resident in Amassoma, Bayelsa State Nigeria. The mean intermalleolar distance obtained for normal adult males was 1.79 cm with a standard deviation (SD) of 0.42 and 4.56 cm for females with SD of ± 1.71 , while the mean IMD for adult males with genu valgum was 13.92 cm with SD of ± 8.64 . A casual observance of the mean values of the mean IMD between males and females in the normal subjects and those with genu valgum indicated variations amongst the values. These variations were however not statistically significant between the male and female genu valgum group, while there was a statistically significant difference in the mean IMD values between normal adult males and females ($P < 0.05$) for both groups. It could then be concluded that a mean IMD of < 4 cm and < 8 cm may be considered within the safe limits for males and females respectively in the normal adult population. The difference between males and females could be due to the wider pelvis in the females than in males.

Key words: Genu Valgum • Intermalleolar Distance • Stapling • Osteotomy

INTRODUCTION

Literature regarding the variation of intermalleolar distances (IMD) in Nigerian adults is scanty. Measurement of IMD is an important tool in assessing the angular status of a person's lower limb, thus it may help in classing such an individual as having knocked knees (genu valgum) bowed legs or being normal. It may also help authentically in the final analysis of the angular status of the lower limbs. Genu valgum is a Latin-derived word used to describe the knock-knee deformity.

Intermalleolar distance is an important anthropometric tool in the assessment of the angular status of the lower limb. It is the distance between the medial malleoli of the ankles with the femoral condyle touching [1,2]. The measurement is used in the classification of individuals in a population having genu valgum (knock-knees), genu varum (bowed legs) or normal limbs.

Genu valgum (knock-knee) is a combination of lateral femoral neck anteversion and lateral tibial torsion [3]. It is a structural deviation that causes abnormal lateral stress

on the patella so that legs are bowed inward in the standing position, if someone's knees are touching, then ankles also touch. In a person with knock-knee, the knees normally touch each other but the ankles are separated from each other by a distance.

Genu valgum may be physiologic or pathologic [4, 5]. Physiologic genu valgum occurs in children younger than six years and resolves by age six. Pathologic genu valgum occurs in adolescent and adults. Pathologic genu valgum may be acquired or congenital. Acquired genu valgum may be due to infectious diseases like polio, mistreated (or untreated) traumatic injuries of the lower limb. Congenital causes of genu valgum are due to genetic disorders such as Down's syndrome, hereditary multiple exostoses, neurofibromatosis, Marfan syndrome and untreated congenital abnormalities.

Genu valgum is hereditary (due to gene mutation) [6]. The incidence of genu valgum is higher in overweight children than non-overweight counterparts of similar age [7]. In their study [8, 9] of 427 (212 males and 215 females) normal European children age 10 to 16 years discovered that intermalleolar distance is greater in females than in

males. Bonnet *et al.* [10] studied 2166 Nigerian children age 1 to 10 years reported greatest intermalleolar distance of 2.5cm and 2.2cm between ages 2 and 4. Araziogun and Memik [11] reported that children with clinical tibiofemoral angles, intercondylar and intermalleolar distances tended to be bow legged at birth, maximally knocked- kneed at age 3 and regain normal lower limbs at the age of 8 years. In a study of 590 Turkish children (287 girls and 303 boys) age 3-17 year [12] determined mean values and normal limits of tibiofemoral angles, intercondylar and intermalleolar distances. They reported a significant higher degree of valgus angle than previous reports. The maximal mean angle obtained was 9.6° at 7 years for boys and 9.8° at 6 years for girls. Turkish children age 3-17 years exhibited < 11° physiological valgus and that varus or valgus higher than 11° during this period should be considered abnormal.

Knocked knees combined with an intermalleolar distance of more than 10cm at age 10 or 11 years is unlikely to correct spontaneously [13]. At skeletal maturity the medial intermalleolar separation is greater in boys than girls [14]. Stapling and human growth hormone administration resolves genu valgum [15].

The study is aimed at assessing the incidence of genu valgum among adults (18-35 years) in Amassoma sub-urban community using intermalleolar distance.

This is a prospective study conducted for the first time in Amassoma community to ascertain the frequency and occurrence of genu valgum (knock knees) in the adult population of people resident in Amassoma.

MATERIALS AND METHODS

Eighty adults of 25-35 years of age, (50 normal and 30 with genu valgum) both males and females were used for this investigation. They were all from Amassoma Community in Bayelsa State.

Each subject was told to stand erect, back the wall with the feet together and the knees touching each other. A caliper was then placed between the medial malleoli of the ankles and adjusted until its pointed ends rested on the right and left medial malleoli respectively.

The distance between the pointed ends of the caliper corresponds to the intermalleolar distance between the ankles. The caliper was then placed on a calibrated transparent rule and the measurement taken and recorded.

The methods mentioned above are clinical methods, which are inexpensive and do not expose the patient to radiation and correlate well with radiological measurements [1].

The means, standard deviations and variance of the measurements were computed for both sexes differently.

RESULTS

The present study suggests gender variation in the intermalleolar distances both in normal adults and those with genu valgum. Women tend to have higher Q angles and consequent higher intermalleolar distances than men. These variations were statistically significant between the male and female adult normal groups ($p < 0.0001$), there was also statistically significant difference between the genu valgum adult males and females ($p = 0.0054$).

This study supports the work of earlier observations; it has however established that a mean intermalleolar distance of 24cm for adult males and 28cm for adult females within this region is normal. Values greater than these should be considered abnormal and requires careful follow up and evaluation.

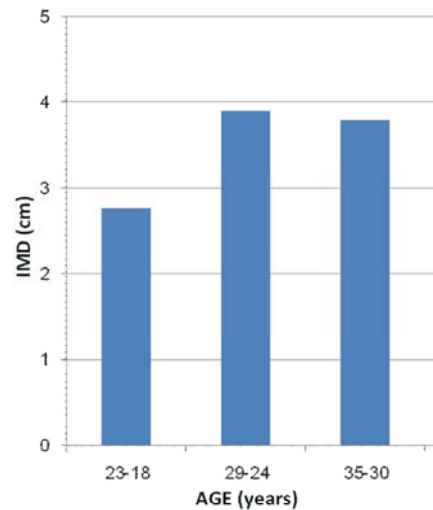


Fig. 1: Bar chart showing intermalleolar distances in normal adults at different age groups.

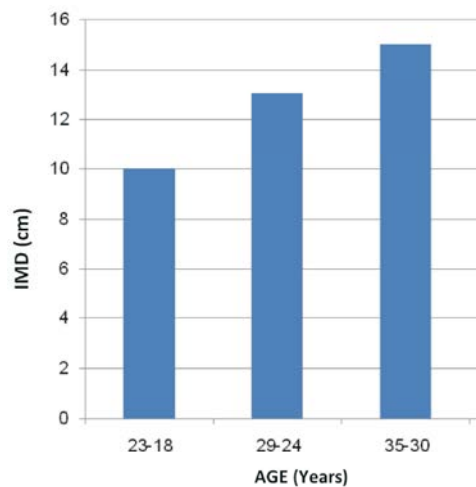


Fig. 2: Bar chart showing intermalleolar distances in adults with genu valgum at different ages

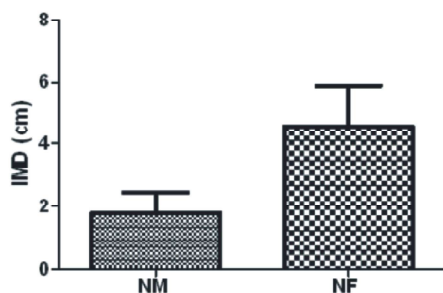


Fig 3A

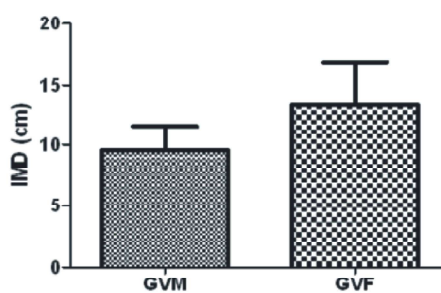


Fig 3B

Fig. 3: Unpaired student t- test (two tailed) for normal adults(male and female) and genu valgum adults (male and female) $p < 0.0001$ and $p = 0.0054$ respectively.

DISCUSSION

The present study was directed principally towards estimating the mean intermalleolar distances in normal adults and those with genu valgum. From the data collected, variations were observed in the mean intermalleolar distances between males and females in both cases (normal adults and adults with genu valgum).

These variations were statistically significant between the male and female adult normal groups ($p < 0.0001$), there was also statistically significant difference between the genu valgum adult males and females ($p = 0.0054$). There exists a statistically significant difference between the normal and genu valgum male and female subjects as has already been established by earlier observations.

The present study indicates higher intermalleolar distances for females than males in both cases. This is consistent with the earlier observation of an intermalleolar distance of ≈ 4 cm for normal males and ≈ 8 cm for normal females reported by (9) in a study of normal Europeans in France. However, a higher intermalleolar distance for males with genu valgum than in the females possessing the condition has been reported by Sharrard[12] in his work on Brazillians with the idiopathic type of genu valgum.

It could be suggested that the observations of Sharrard[12] might have been influenced by racial differences in the length, shape and thickness of ossified adult bones. Majority of the adults with genu valgum in this study possessed the condition at early age progressing into adulthood.

Interactions with Orthopedic Surgeons of the University of Port Harcourt teaching hospital revealed that genu valgum is not common in the south-south zone of Nigeria in contrast to a higher occurrence obtainable in

the Western zone of the country, reasons not yet understood.

It was gathered that osteotomy and stapling are the common surgical procedures for correcting genu valgum in this region. Stapling is carried out on the skeletally immature child where the epiphysis is yet to be fused with the shaft of the bone. Osteotomy on the other hand is carried out on the skeletally mature adult where bone growth has ceased and the epiphyses fused with the shaft of the bone.

It is unfortunate however that majority of people possessing genu valgum in this country do not see the need to undergo corrective surgical procedures. Most people fear that the surgical procedures may cause a permanent distortion in the orientation of their bones and hence prefer to manage the condition as long as it does not affect their movement and the attainment of set goals in life. Prevention could go a long way to reduce the incidence of genu valgum, if mothers as well as families can help their growing children by supplementing more frequently their diet with food rich in vitamin D2 (Ergocalciferol).

Care must be taken when administering vitamin D to children as ingestion of excess quantities can lead to hypercalcaemia, mobilization of calcium from bone and renal dysfunction. Proper awareness and enlightenment with regards to genu valgum by medical and health workers can help alleviate the condition.

CONCLUSION

The present study supports the work of earlier observations; it has however established that a mean intermalleolar distance of < 4 cm for adult males and < 8 cm for adult females within this region is normal. Values greater than these should be considered abnormal and requires careful follow up and evaluation.

REFERENCES

1. Bade, B., A. Tella, S.O. Ogunlade, A.A. Adeyemo, A.A. debisi, T.O. Alonge, S.A. Salawu and A.O. Akinpelu, 2003. Normal values of knee angle, intercondylar and intermalleolar distances in Nigerian children. *West African Journal of Medicine*, 22(4): 301-303.
2. Dorland's illustrated medical dictionary, 29th Edition, 1999.
3. Steven, P.M., M. Maguire, M.D. Dales and A.J. Robin, 1999. Physeal Staping for orthopedic genu valgum. *Journal of pediatric orthopedics*, 19: 645-649.
4. Sherman, M., 1960. Physiological boeing of the legs. *South Medical Journal*, 53: 830-836.
5. McCarthy, J.J., D.H. Kim and R.E. Eilert, 1996. Post traumatic genu valgum operative versus non-operative treatment. *Journal of Pediatric Orthopedics*, 18: 518-521.
6. Ghorbani, K. and J. Carapetian, 1994. Hereditary Pubertal genu valgum in Iran. *Clinical genetics*, 45(4): 190-193.
7. Bonnet, S.B., A. Quintanar, M. Alaves, J. Martinez, M. Espino and F.J. Picarza, 2003. Presence of genu valgum on obese children cause or effect. *Journal of Pediatric Orthopedics*, 58(3): 232-235.
8. Heath, C.H. and Stahelli, 1993. Normal limit of knee angle in white children. *Journal of pediatric orthopedics* 13: 259-262.
9. Cahuzac, J., D.F. Vardon Sales and L. Ganzy, 1995. Development of the clinical tibiofemoral angle in normal adolescents; *Journal of bone and joint surgery*, pp: 729-737.
10. Chang, J.C.Y., P.S. Chan, S.C. Chaing and P.W. Hui, 1991. Angular and rotational profile of the lower limb in 2630 Chinese children. *Journal of Pediatric Orthopedics*, pp: 154-16.
11. Araziogun, T.C. and R. Memik, 2001. Normal Development of tibiofemoral angle in children a clinical study of 590 normal from 3 to 17 years of age. *Journal of pediatric Orthopedics*, 21(2): 264-267.
12. Sharrard, W.J.W., 1976. Knock knees and bowlegs *British medical Journal*, pp: 826- 827.
13. Volpon, J.B., 1997. Idiopathic genu valgum treatment by epiphysiodesis in adolescence *internal orthopedics*, 21(4): 228-231.
14. Omolaja, A.A., K. Kumar, A.H. Crawford and C.F. Strife, 2003. Epiphyseal stapling and recombinant human growth hormone for correction of genu valgum in children with chronic renal insufficiency. *Journal of Pediatric Orthopaedics*, 23(5): 639-642.
15. Rahmani, N.F., H. Daneshmandi and K.H. Irandoust, 2008. Prevalence of Genu Valgum in Obese and Underweight Girls. *World Journal of Sport Sciences*, 1(1): 27-31.