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## RESEARCH ARTICLE

# IS OSTEOARTHRITIS OF KNEE A CULPRIT FOR VARUS AND VALGUS DEFORMITY? A RETROSPECTIVE STUDY

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**ABSTRACT**

**Background:** Osteoarthritis is the most common arthritis in humans, and knee OA is a major cause of chronic disability. There are no treatments that change the natural course of OA.
**Aims:** To study age wise and gender wise prevalence of varus-valgus deformity in patients with osteoarthritis of knee.
**Method & Materials:** Ethical clearance from IEC was obtained. In this retrospective study, 214 radiographs of subjects in the age range of 50-65years, both genders without history fracture or other severe arthritic condition were assessed on the PACS software. The radiographs were graded according to kellgren and lawerence classification & all 4 grades of OA knee were included. A long axis of femur and tibia were drawn and the angle formed by the two lines was measured.. The values were recorded as varus (lesser than $180^0$) or valgus (greater than $180^0$) and presented based on the grade-wise, age groups-wise & gender-wise distribution. Statistical analysis was done and presented.
**Results:** Knee alignment was measured in 214 radiographs, within the age group 50-65 years. The mean of the angulations was found to be $173.19^0$(±4.25). The mean of tibiofemroal angle in different grades of osteoarthritis was gr. 1(n=96) $175.53^0$(±3.37), gr. 2(n=83)$172.53^0$(±3.59), gr.3(n=31) $167.93^0$(±2.28), gr.4(n=4)$166.92^0$(±2.08).Varus-valgus prevalence being varus=197 (92.05%) valgus=17(7.94%). The prevalence of deformity and angulations is greater in females (173.54) as compared to males (172.74)
**Conclusion:** In this study we can conclude that there is greater prevalence of varus deformity in osteoarthritis of knee and the amount of deformity tends to increase with an increase in the severity of osteoarthritis. The prevalence of deformity and angulations is greater in female as compared to male.



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## INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by loss of articular cartilage, hypertrophy of bone at the margins, sub-chondral sclerosis and a variety of biochemical and morphological alterations of the synovial membrane and joint capsule. (Harrington, 1983) Most cases of osteoarthritis have no known cause and are referred to as primary osteoarthritis. Primary osteoarthritis is mostly related to aging. Secondary osteoarthritis occurs secondary to any disease or condition. (Sharma *et al*., 2003) Osteoarthritis mainly occurs in the weight bearing joints of the body, knee is mostly commonly affected followed by hip. Osteoarthritis indeterminately occurs in elderly age group. Osteoarthritis occurs commonly in females above 45 years of age while before 45yrs it is common in males. (Sharma *et al*., 2004) The prevalence of osteoarthritis of the knee in India is 28.7%. Age, weight, trauma to joint due to repetitive movements in particularly squatting and kneeling is common risk factors of knee osteoarthritis. (Sharma *et al*., 2003) Knee alignment is a major determinant of load distribution through the knee, and is thought to play a role in disease progression of osteoarthritis, both radio graphically and symptomatically. In primary knee osteoarthritis it has been shown that varus alignment increases the risk of medial osteoarthritis progression, and valgus alignment increases the risk of lateral osteoarthritis progression, with the severity of mal-alignment predicting the decline in physical function. (Ganvir and Zambare, 2001) There is conflicting information, however, as to whether mal-alignment predicts disease incidence in the general population. The recent study by Alexandra N. Colebatch *et al* showed that increasing varus mal-alignment is associated with progression of knee OA, as

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well as with development of knee OA, although this finding was only seen in overweight persons (Alexandra *et al*.,). Another study recently found no association between knee alignment and incidence of knee OA (Brouwer *et al*., 2007). Purpose behind doing the current is lack of literature on Indian population, no study has been done using the PACS software in india and if osteoarthritis is detected early it can be corrected. Hence the objective of our study is to find out the prevalence of varus-valgus deformity in patients with osteoarthritis of knee in an Indian population using radiographs.

## MATERIALS AND METHODS

Ethical clearance was taken from the Institutional Ethical Committee at D.V.V.P.F's college of physiotherapy. 214 knee radiographs of patients in the age group of 50-65 years with osteoarthritis available at D.V.V.P.F's memorial hospital PACS database were analyzed. The radiographs with fracture in lower limb or any severe arthritic or infective condition of the knee were excluded from analysis.

### Radiographs

The AP, weight-bearing, short knee X-ray was obtained with the patient standing with the back of their knees in contact with the vertical cassette, and the central beam centered 2.5 cm below the apex of the patella with a film to focus distance of 100 cm. All the radiographs were obtained in a similar manner.

### Measurement of angle

The angle was measured with the help of inbuilt angle measure of radiology's PAC software. The long axis of femur was drawn by drawing a line from the midpoint of the shaft of femur to center of knee joint, later the long axis of the tibia was drawn similarly by drawing a line from the midpoint of the shaft of tibia to the center of the knee joint, the medial angle made by these 2 lines was recorded. Knee angle was drawn for all the radiographs by the similar method. The medial angle if greater than $180^0$ was categorized as valgus alignment and if lesser than $180^0$ was categorized as varus deformity.

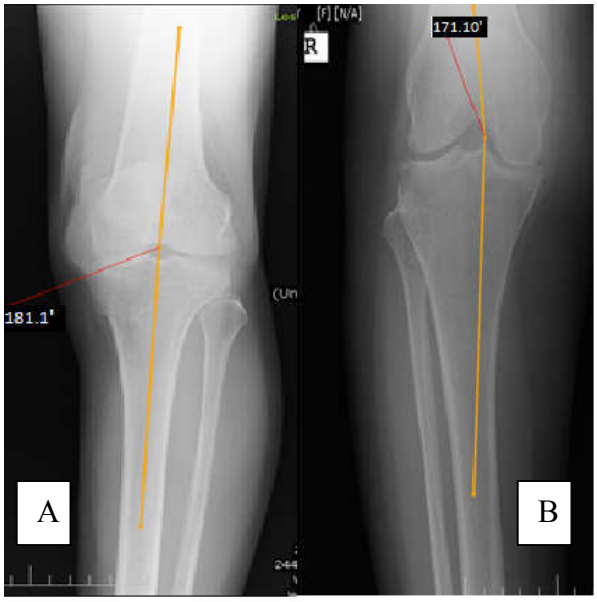


**Figure 1. A- knee radiograph showing valgus mal-alignment B- knee radiograph showing varus mal-alignment**

Radiological evidence of osteoarthritis in knee was also graded based on Kellgren and Lawerence classification for knee osteoarthritis.

### Kellgren and Lawerence classification

Grade 0: No radiographic features of osteoarthritis are present.
Grade 1 : Doubtful joint space narrowing and possible osteophytic lipping. (Fig 2.a)
Grade 2 : Definite osteophytes and possible joint space narrowing on anteroposterior weight-bearing radiographs. (Fig 2.b)
Grade 3: Multiple osteophytes, definite joint space narrowing, sclerosis, possible bony deformity. (Fig 2.c)
Grade 4: Large osteophytes, marked joint space narrowing, severe sclerosis and definitely bone deformity. (Fig 2.d)

### Statistical analysis

Descriptive statistics was done using GRAPH PAD instat 3, Mean and standard deviation of angles was calculated Age wise, Gender wise & according to grading of osteoarthritis. The percentage of varus and valgus deformity was also recorded.

**Table 1. Baseline characteristics**

| Total No. Of Radiographs | Female | mean± SD | male | Mean |
|---|---|---|---|---|
| 214 | 119 | $173.54^0$ | 95 | $172.74^0$ |

**Table 2. Prevalence of Varus and Valgus angle**

| Deformity | Total | Percentage |
|---|---|---|
| Varus | 197 | 92.05% |
| Valgus | 17 | 7.94% |

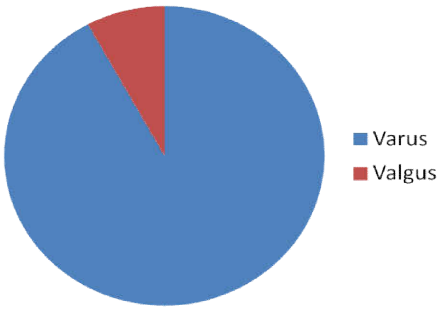


**Fig.3. Pie chart showing percentage of knee deformity**

**Table 3. Age wise Varus & Valgus angles in males and females**

| Age group | Total | Mean | male | Mean | Female | Mean |
|---|---|---|---|---|---|---|
| 50-55 | 112 | $172.58^0$ | 53 | $172.19^0$ | 59 | $172.94^0$ |
| 56-60 | 44 | $174.76^0$ | 22 | $174.11^0$ | 22 | $174.79^0$ |
| 61-65 | 58 | $173.15^0$ | 20 | $172.13^0$ | 38 | $173.38^0$ |

**Table 4. Grade wise mal-alignment at knee in males and females**

| Grade of OA | Total | Mean | male | Mean | Female | Mean |
|---|---|---|---|---|---|---|
| 1 | 96 | $175.53^0$ | 47 | $175.22^0$ | 49 | $173.83^0$ |
| 2 | 83 | $172.34^0$ | 30 | $171.73^0$ | 53 | $173.31^0$ |
| 3 | 31 | $167.93^0$ | 16 | $167.95^0$ | 15 | $167.91^0$ |
| 4 | 4 | $166.92^0$ | 1 | $168.45^0$ | 3 | $166.41^0$ |

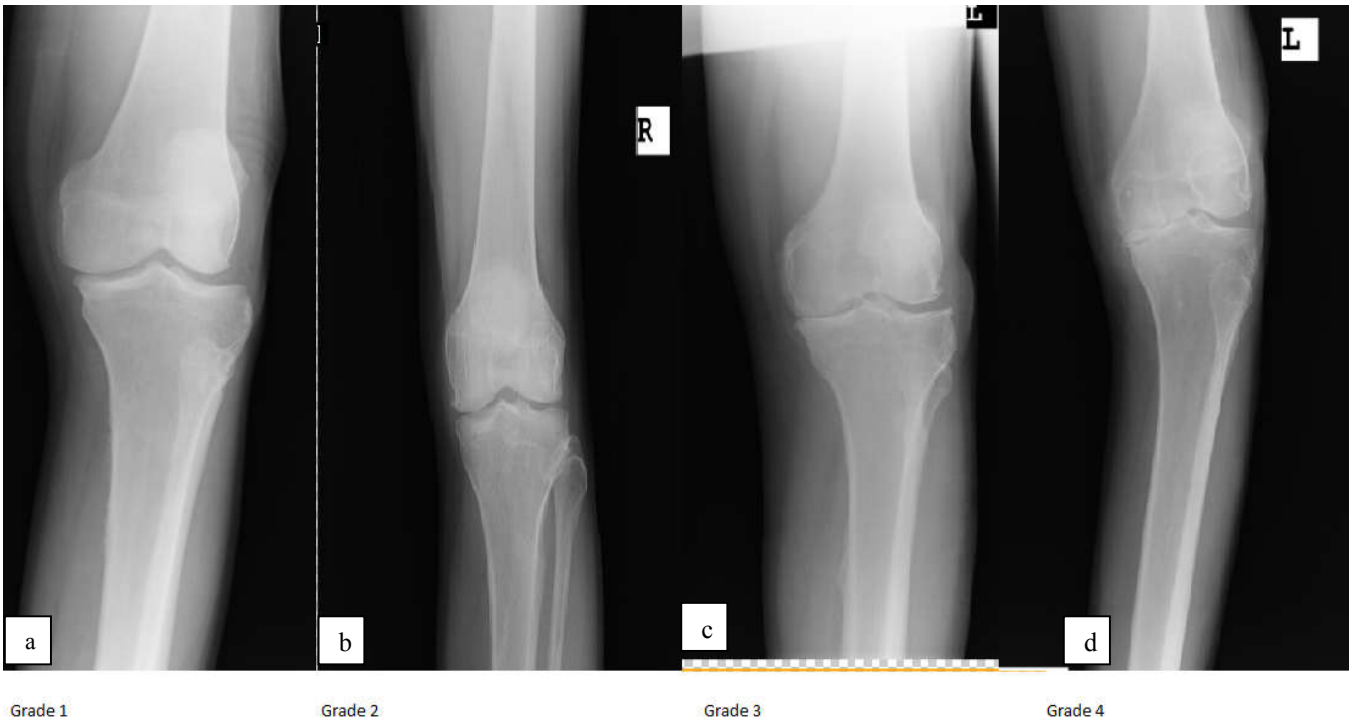


**Fig 2.a- shows grade 1 osteoarthritis based on kellegren and lawernce classification**
**2.b- shows grade 2 osteoarthritis based on kellegren and lawernce classification**
**2.c- shows grade 3 osteoarthritis based on kellegren and lawernce classification**
**2.d- shows grade 4 osteoarthritis based on kellegren and lawernce classification**

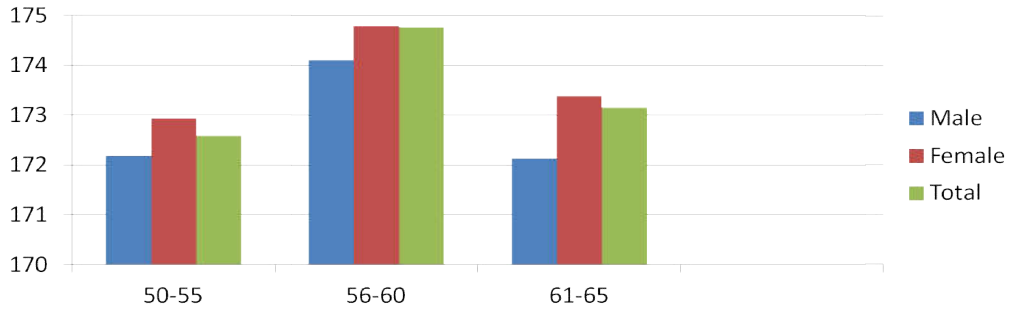


**Fig.4. Age wise deformity seen in both males and females**

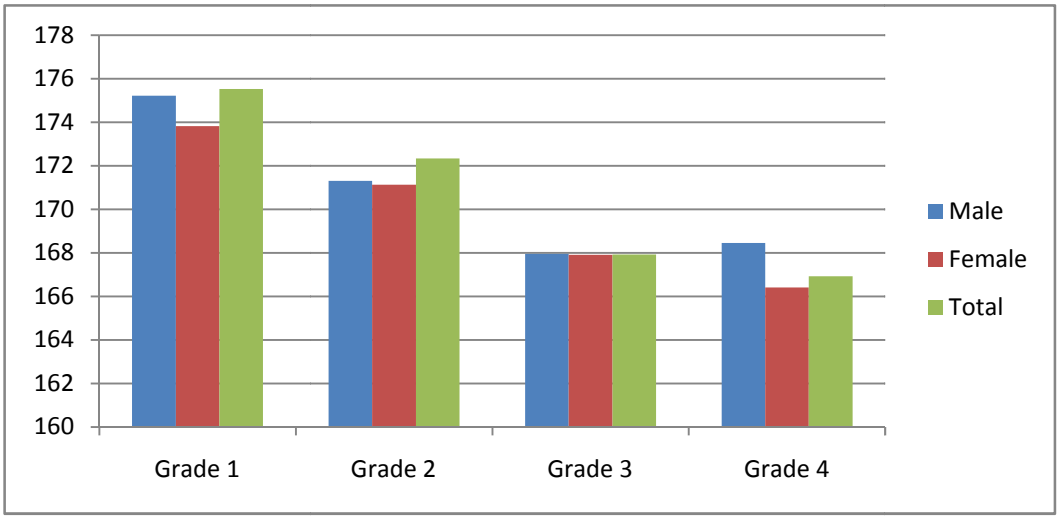


**Fig.5. Sex wise mal-alignment at knee in males and females**

Knee alignment was measured in 214 radiographs with a age between 50-65 years, the radiographs had evidence of osteoarthritis of knee based on Kellgren and Lawerence classification. The percentage of varus deformity (n=197) was found to be 92.05% and valgus deformity (n=17) was found to be 7.94%. The mean of 214 angulations was $173.19^0$ (±4.25). The mean angle for various grades of osteoarthritis was Grade 1= $175.53^0$(±3.37), Grade 2 = $172.53^0$(±3.59), Grade 3 =$167.93^0$ (±2.28), grade 4 = $166.92^0$ (±2.08). The prevalence of varus-valgus deformity was greater in females (52%) as compared to the males(48%), the mean values for the angulations being $173.54^0$ for females and $172.74^0$ for males.

## DISCUSSION

This study demonstrates that the prevalence of varus deformity (92.05%) is more as compared to the valgus deformity (7.94%) in osteoarthritis knee. The mean of varus-valgus deformity was 173.19(±4.25). The results of our study are similar to study done Brouwer GM in the year 2007, in which they found that the prevalence of mal-alignment of knee in osteoarthritis was found to be more prevalent in females as compared to males of. (Alexandra *et al*.,) Knee alignment predicts progression of osteoarthritis of knee, however there is no clear support to this predication. Sharma *et al*. (2001) and Brouwer *et al*. (2007) demonstrated a relationship between these, Hunter *et al*. found no such relationship in their study (Sharma *et al*., 2001) The prevalence of varus deformity and mal-alignment being more may be consider due to neglect of health in female, hormonal changes and repeated motion at the knee joint such as squatting and kneeling to do various activities throughout the day to do household chores. The majority of rural population work in farms and assume postures which put the knee to various stress which leads to wear and tear thereby leading to osteoarthritis. The prevalence of varus deformity may be attributed to a physiological varus present at the joint, and changes at the ankle and hip may relate to medial load bearing at the knee during ambulation. The prevalence of OA varus mal-alignment may be due to the presence of a wider pelvis, increased laxity at the knee joint and household work which puts the knee in deleterious positions.

The mal-alignment was found to be more severe in the grade 3 Osteoarthritis patients based of kellegren and lawerence classification, this suggests that as there is progression OA in severity the amount of mal-alignment increases. In the grade 4 stage of osteoarthritis there may be presence of fixed flexion deformity thereby false angulations are reported on the xray. Similar reports were provided in the study of Cerejo *et al*. (Richards *et al*., 2005) mal- alignment is seen to be more in the more diseased (damaged) which are the most vulnerable knee joints. Varus/valgus alignment is important for reasons in addition to these direct effects at the knee. First, mal-alignment very likely puts stress not only on articular hyaline cartilage but also on other joint tissue, e.g., menisci, subchondral bone, and ligaments, which may contribute to the development and progression of OA. (Sharma *et al*., 2003) Second, mal-alignment may participate in a vicious circle, with knee OA worsening (e.g., from mal-alignment to worsening of OA to worse malalignment). This predictor of progression of osteoarthritis can be used in physiotherapy intervention in early stages of osteoarthritis so as to prevent progression and severity of the disease. (Harrington, 1983) Mal-alignment *resulting* from knee OA may be attributable to loss of cartilage and bone height. The progression of OA observed in this and other studies implies that whatever the original cause(s) of the mal-alignment, mal-alignment assessed at baseline increases the risk of knee OA progression in the period following the baseline evaluation. (Harrington, 1983; Felson and Nevitt, 2004; Johnson *et al*., 1980)

The following can be used to prevent the varus-valgus deformity

(1) Use of lateral-wedged insoles for knee osteoarthritis, it decreases the degree of varus mal-alignment at knee by causing ankle pronation, thereby causing decrease medial joint load associated with osteoarthritis progression (Hunter *et al*., 2007; Z-hang *et al*., 2010)
(2) Use of valgus unloading knee braces, these reduce medial knee loading in varus deformity thereby improve pain and function (Kerrigan *et al*., 2004; Sharmal *et al*., 1997)
(3) Physical exercise-hip abductor strengthening, hip extensor strengthening & knee extensor strengthening, helps by reducing joint load.

### Conclusion

From this study, it can be concluded that OA is an important culprit for the varus and valgus mal-alignment in the knee joint. There is greater prevalence of varus mal-alignment as compared to valgus mal-alignment. The prevalence and severity is greater in females as compared to males.

### Limitation

The BMI of the subjects couldn't be calculated so the role of BMI in the severity of mal-alignment couldn't be assessed. Full-limb radiographs should be acquired so that hip and ankle landmarks would be incorporated into the measurement of alignment, instead of measurement of the femorotibial angle from the knee radiograph.

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**Conflict of interest:** None

## REFERENCES

Alexandra N. Colebatch *et al*, Effective measurement of knee alignment using AP knee radiographs.

Brouwer GM, van Tol AW, Bergink AP, Belo JN, Bernsen RMD, Reijman M, *et al*. 2007. Association between valgus and varus alignment and the development and progression of radiographic osteoarthritis of the knee. *Arthritis Rheum*., 56:1204–11.

Felson DT, Nevitt MC. 2004. Epidemiologic studies for osteoarthritis: new versus conventional study design approaches [review]. *Rheum Dis Clin North Am*., 30:783–97.

Ganvir, S.D., B.R. Zambare, 2001. Prevalence and Identification of Risk Factors for Knee Osteoarthritis among Elderly Men and Women. Osteoarthritis: diagnosis and medical/surgical management. Philadelphia: WB Saunders; p. 145–69.

Harrington IJ. 1983. Static and dynamic loading patterns in knee joint with deformities. *J Bone Joint Surg Am*., 65:247–59.

Hunter DJ, Niu J, Felson DT, Harvey WF, Gross KD, McCree P, *et al*. 2007. Knee alignment does not predict incident osteoarthritis: the Framingham Osteoarthritis Study. *Arthritis Rheum*., 56:1212–8

Johnson F, Leitl S, Waugh W. 1980. The distribution of load across the knee: a comparison of static and dynamic measurements. *J Bone Joint Surg Br*., 62:346–9.

Kerrigan dc *et al*. 2004. Effectiveness of a lateral wedge insole in the treatment of medial knee osteoarthritis; osteoarthr cartel., 12;46-55.

Richards JD *et al*. 2005. A comparision of knee bracing while walking for the treatment of oa; *J Bone Joint Surg BR*. 87;937-9.

Sharma L, Dunlop DD, Cahue S, Song J, Hayes KW. 2003. Quadriceps strength and osteoarthritis progression in malaligned and lax knees. *Ann Intern Med*., 138:613–9.

Sharma L, Dunlop DD, Hayes K. 2004. Is a strong quadriceps muscle bad for a patient with knee osteoarthritis? *Ann Intern Med*., 140:150.

Sharma L, Song J, Felson DT, Cahue S, Shamiyeh E, Dunlop DD. 2001. The role of knee alignment in disease progression and functional decline in knee osteoarthritis. *JAMA*, 286:188–95.

Sharmal *et al*. 1997. Is knee joint proprioseption worse in the arthritic knee versus the unaffected knee in oa? *Arthritis rheum*., 40;1518-25.

Z-hang W *et al*. 2010. OARSI re:commendations for the management of hip and knee osteoarthritis: part 3:osteoarthritis cartilage, 18-476-499.

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