



Prevalence of Hallux Valgus in general population

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Abstract

Purpose: Hallux valgus is relatively common condition, occurring when the hallux deviates laterally towards the other toes, and the first metatarsal head becomes prominent medially.^[1] While development of hallux valgus is multifactorial, causes are hereditary factor, wearing tight footwears, rheumatoid arthritis or obesity. Women tend to be affected more than male with sex ratio as high as 9:1 with predominance of Hallux valgus, increases steadily with age. Muscle imbalance in adductor and abductor of toe muscle was cited as major factor of production of Hallux valgus. Inappropriate or constricting footwear appears to be primary extrinsic cause, therefore school children and office individuals have chances of having hallux valgus. Other intrinsic factors play a role as well, it is reported that pesplanus has some influence on bunion formation also pronation of hindfoot is a major cause of this condition. The study was conducted to determine the prevalence of hallux valgus and intensity of pain in general population with help of footboard measurement and goniometer. **Method:** An Observational study comprising of 110 samples. The samples were assessed with the help of footboard and goniometer, **Results:** 67% of Female and 44% of male out of total samples, 70% have bilateral hallux valgus and 30% have unilateral hallux valgus and majority of the samples have grade 1 hallux valgus then grade 2 and 3. **Conclusion:** It was concluded that women tend to affect more than male and out of total samples majority of samples have Grade 1 degree of hallux valgus and very few samples have pain while movement or walking.

Keywords: Footboard measurement, Goniometer, NPRS.

Introduction:

Hallux valgus is relatively common condition, occurring when the hallux deviates laterally towards the other toes, and the first metatarsal head becomes prominent medially.¹

While development of Hallux valgus is believed to be multifactorial, causes are congenital, hereditary factor, wearing tight footwears/socks, disease like gout, rheumatoid arthritis, diabetes, down syndrome, postimmobilization stiffness, joint trauma or obesity. Womens tend to be affected more than male (F:M=10:1)²

In the normal foot the articular surface of the first metatarsophalangeal joints are not usually set strictly at right angles to the long axes of their supporting bone; if the general line of the articular surface are marked by joining their



medial and lateral ends we find that, that of the metatarsal head is tilted slightly laterally on the shaft, and the shaft of the proximal phalanx is again tilted slightly laterally on its own articular surface.

Increased valgus can be produced either by greater tilting of one or both of the articular surface in relation to their supporting bones or, quite differently, by displacement at the joint itself, the phalanx moving laterally round (or off) the head of the metatarsal.

Pathologically hallux valgus may be differentiated from an increased in the normal valgus alignment of the great toe by the relationship to each other of the articular surface of the first metatarsophalangeal joint. The earliest change in lateral deviation of the proximal phalanx on the metatarsal head which may progress rapidly to subluxation. Once the subluxation has occurred progression of the deformity is likely.

A callus develops over the medial side of the head of the metatarsal bone, and the bursa becomes thickened and inflamed; excessive bone (exostosis) forms, resulting in a bunion. In normal persons, the metatarsophalangeal angle (the angle between the longitudinal axis of the metatarsal bone and the proximal phalanx) is 8° to 20° . The angle is increased to varying degrees in hallux valgus.

Different types of valgus deformity- The first type (congruous hallux valgus) is a simple exaggeration of the normal relation of the metatarsal to phalanx of the big toe. The deformity does not progress, and the valgus deformity is between 20° and 30° . The second type (pathological hallux valgus) is a potentially progressive deformity, increasing from 20° to 60° this may further lead to subluxation. This type may occur in deviated (early) and subluxed (later) stages.³

Clinical features are Pain in great toe and also ulceration on medial side of metatarsophalangeal joint of great toe due to friction and pressure from footwear, Adduction of phalanges, Reddening and inflammation, Pain/difficulty while walking or wearing shoes, restrict the movements, gait instability or impaired balance in older peoples.

Complications of Hallux valgus can further lead to hallux rigidus/hallux limitus, Hammer toe, Subluxation or dislocation of proximal phalanges on the metatarsal head, Functional limitation.

Footboard grading of Hallux valgus are:

1. Grade-1 corresponded to 5-15 degrees deviation per foot.
2. Grade-2, 16-25 degrees.
3. Grade-3, 26 degrees and over.

To check the value of this method of grading a 50% of random sample of population will be taken from shoe wearing and non shoe wearing community.

Subject with moderate to severe Hallux valgus are found to exhibit significantly reduced velocity & step length on both walking surfaces & less rhythmic acceleration pattern in vertical plane when walking on irregular surface compared to subjects with no or mild Hallux valgus. During swing phase, Hallux valgus participants demonstrated greater hallux valgus dorsiflexion throughout terminal swing and greater dorsiflexion of the forefoot with respect to



the hindfoot during midswing. Muscle imbalance in abductor & adductor of toe muscle was cited as major factor of production of Hallux valgus.

Methods: Screening of 140 healthy individuals including both genders male and female of age groups between 10 to 60 years were done in Pimpri area of Pune city, India. The subjects who participated in the study according to inclusion criteria was selected as a sample of the study by convenient method. Exclusion criteria were any recent foot fractures, congenital foot deformity or rheumatoid arthritis. The study was conducted with 140 samples by observational study design, out of which 30 were having normal bilateral hallux valgus which were deducted later on and only 110 were taken in the study which were having unilateral or bilateral hallux valgus.

Further the assessment of hallux valgus angle was carried out with the help of footboard measurement and goniometer. Footboard was made with the help of wooden board. Wooden board was divided equally and in the centre divider was attached of wooden block so that the subjects can stand simultaneously at a time and assess for bilateral angle of hallux valgus. The subjects have to stand in such a way that the head of MTP joint should touch the divider and goniometer placed on the divider, were fulcrum placed just aside the MTP joint on footboard. The fixed arm of the goniometer was placed on the longitudinal line of the first metatarsal bone on footboard, and the movable arm was placed on the longitudinal line of the great toe. The value of the hallux angle between these 2 lines was recorded.

Along with the angle of hallux valgus pain assessment was also taken with the help of NPRS scale, subjects were asked the intensity of pain while movements or walking. Ergonomic advice were given for the moderate to severe grades of hallux valgus individuals and also advice on proper footwear to wear.

Data analysis: Demographic data was done to find the prevalence of hallux valgus and also to find gender distribution between different age groups and pain intensity.

Results: Study shows that hallux valgus is more prone in age group between 10 to 20 years, then to mid age 21 to 30 years and least in age group between 51 to 60 years. It also says that out of total samples 60% are female and 40% are male, and the majority of subjects falls in Grade-1 ($5-15^\circ$) with bilateral left- 69% and right- 62% , Grade-2 ($16-25^\circ$) with bilateral left-18% and right-36% and in Grade-3 (26° and above) with bilateral left-2% and right-3% and Normal has bilateral left-23% and right-10%. Study also says that 77% of individuals have bilateral hallux valgus and 33% have unilateral hallux valgus. 80% of individual wear shoes, 45% wear chappals, 23% wear sandals, 7% wear flats and 3% wear heels. Study says that on NPRS Scale 16% of individual have pain and 95% of individual have no pain.

Discussion: The present study on "Prevalence of hallux valgus in general population" was conducted to determine the prevalence of hallux valgus in healthy individual residing in Pimpri, Pune city. The study was conducted with 140 samples by observational study design, out of which 30 were having normal bilateral hallux valgus which were deducted later and only 110 were having unilateral or bilateral hallux valgus.

The first objective of this study was to explore the prevalence of Hallux valgus. Christian Klein et al (2009) concluded in their study that risk of having hallux valgus is increased in children wearing school shoes and shoes of insufficient length. To assess the relationship between poorly fitting shoes and risk of Hallux valgus a



significant correlation between the fit of shoes and hallux valgus angle > 4 degree was found indicating poor fit. Our study says that hallux valgus was more prone in age group between 10-20 years then the mid age group, because as this age group are school going children they tend to wear school shoes of insufficient length for 8-9 hours, due to which hallux valgus is increased in this age group.

Our study says that hallux valgus is more in females 67% then male 44% out of 110 samples because women tend to wear heels and tight constricted footwear with narrow toe box which attributed to obese or overweight women who are likely to wear constricted footwear then male, as stated by N.H.CHO et al (2009) that greater hallux valgus was significantly increased in women while it is significantly greater in white then in black indicating an ethnic difference in addition to shoe wearing patterns also HYLTON B. MENZ et al (2011) stated that hallux valgus was associated with the lower BMI in women but higher BMI in men while they attributed to overweight or obese women being more likely to wear less constrictive footwear.

The subjects were divided into three main subgroups of hallux valgus with the help of assessing the individuals by footboard and goniometer in which number of individuals falls in Grade I ($5-15^{\circ}$) of hallux valgus, then in Grade II ($16-25^{\circ}$) and least under Grade III (26° and above) this linear rise of hallux valgus is caused due to wearing shoes or any constricting footwears for number of years and also cause due to hereditary reason.

HYLTON B. MENZ et al (2011) stated in their study that hallux valgus was unilateral in 41% of cases and bilateral in 59% of cases. Participant with bilateral hallux valgus exhibited greater impairment than those with unilateral hallux valgus.

Our study shows that there were total 77% of bilateral hallux valgus and 33% of unilateral hallux valgus out of 110 samples. Our study also shows that 16% population have pain that is due to pressure from footwear may also lead to the formation of hallux valgus that may become inflamed and painful although people with hallux valgus are more likely to report footpains and big toe pain. It is because the metatarsal bones move medially, the base of the proximal phalanx is carried with it, and the phalanx pivots around the adductor hallucis muscle that inserts into it, causing the distal end as well as the distal phalanx to deviate laterally in relation to the centre of the body. The long flexor and extensor muscles then have a bowstring effect as they are displaced to the lateral side of the joint, which can lead to increased stress on the proximal phalanx[8]

Christian Klein et al (2009) stated that a significant correlation between the fit of shoes and hallux valgus angle and increased for hallux angle > 4 degrees was found indicating poor fit. Our study shows that 80% of population wear shoes, 52% wear footwear which are toe separator (chappal, slippers, flats) and 23% of population wear no toe separator footwear like (sandals, heels). As wearing shoes with an elevated heel and narrow toe box or insufficient length of shoes can cause linear rise of hallux valgus with increase in number of years shoes wear worn.

Conclusion:

The study concluded that, hallux valgus was more common in general population, and in population out of which women were more prone to have hallux valgus then male because of their ethnic difference and wearing tight constrictive footwear with narrow toe box and heels. Age group between 10-20 years and 21-30 years tend to have



more hallux valgus than in age group above 40 to 60 years, as 10 to 30 years of age group tend to wear shoes for more than 8-9 hours due to school and office.

Out of the total samples most of the individuals were having hallux valgus which falls in grade I degree ($5-15^{\circ}$) then to the grade III (26° and above) assessed with the help of footboard and goniometer. Out of which 33% were unilateral and 77% were bilateral hallux valgus associated with pain. In our study 77% were bilateral hallux valgus and 33% were unilateral hallux valgus.

Number of population wear no toe separator footwear's like (shoes, sandals, heels) and rest wear toe separator footwear's like (chappals, slippers, flats) due to wearing constricted shoes from childhood or due to their profession hallux valgus was more common in population.

Only 16% of population out of total samples were having pain in great toe and foot while movement or walking in which they were bilaterally affected then those with unilateral hallux valgus

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Tables:

Table no: 1 Age groups of different individuals having hallux valgus.

| AGE | NO. OF INDIVIDUALS |
|-------|--------------------|
| 10-20 | 37 |
| 21-30 | 26 |
| 31-40 | 17 |
| 41-50 | 10 |
| 51-60 | 21 |

Table no :2 Data of gender distribution

| GENDER | NO. OF INDIVIDUALS |
|--------|--------------------|
| MALE | 44 |
| FEMALE | 67 |

Table NO: 3 Bilateral hallux valgus severity according to footboard grades.

| FOOTBOARD GRADES | RIGHT | LEFT |
|---------------------------|-------|------|
| 5 TO 15 ⁰ | 62 | 69 |
| 16 TO 25 ⁰ | 36 | 18 |
| 26 ⁰ AND ABOVE | 3 | 2 |
| NORMAL | 10 | 23 |



Table no: 4 Unilateral and bilateral hallux valgus

| HALLUX VALGUS | PERCENTAGE |
|---------------|------------|
| UNILATERAL | 33% |
| BILATERAL | 77% |

Table no : 5 Types of footwear used in individuals.

| TYPE OF FOOTWEARS | SHOES | CHAPPALS (TOE SEPARATER) | SANDALS (NO TOE SEPARATER) | FLATS | HEELS |
|-------------------|-------|--------------------------|----------------------------|-------|-------|
| NO OF INDIVIDUAL | 80 | 45 | 23 | 7 | 3 |

Table no: 6 Pain on nprs scale

| PAIN ON NPRS SCALE | NO. OF INDIVIDUALS |
|--------------------|--------------------|
| PAIN | 16% |
| NO PAIN | 95% |

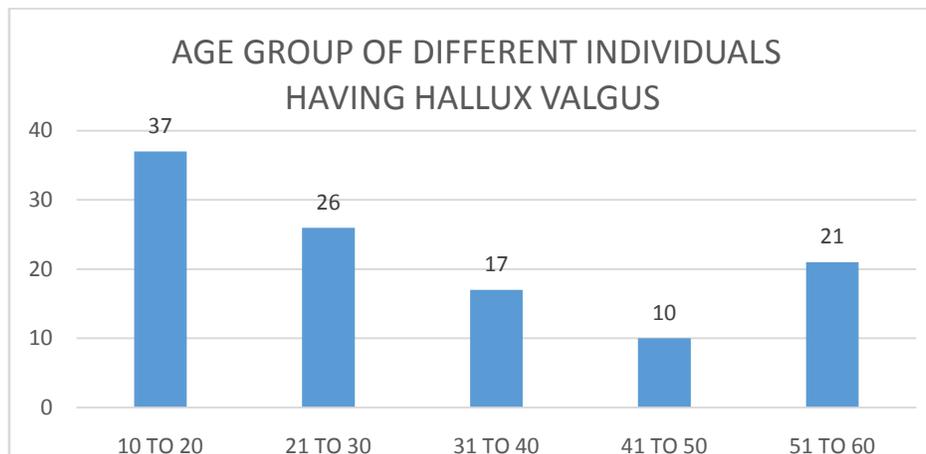


Figure no:1 Assessment of hallux valgus with help of footboard and goniometer.



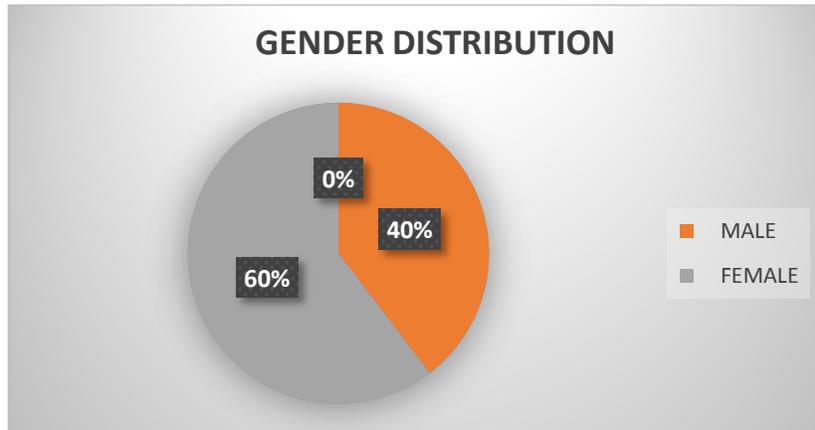
Graphs:

Graph no: 1 Age groups of different individuals having hallux valgus.

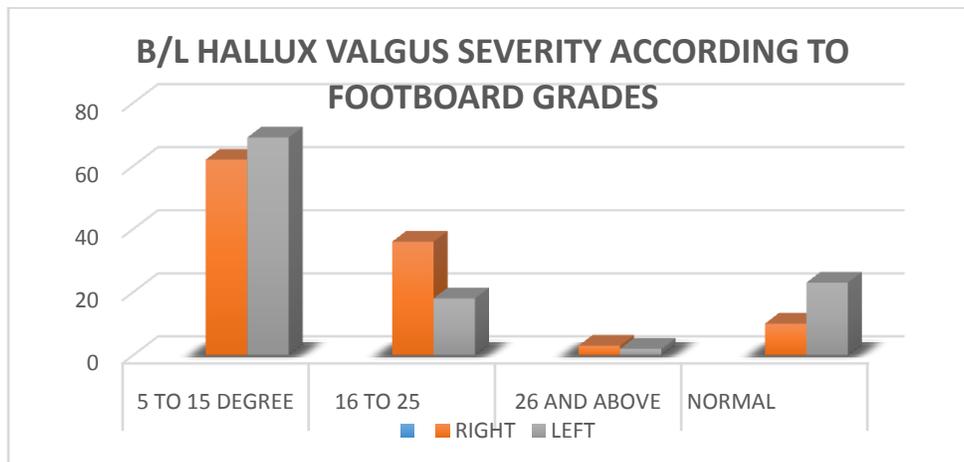




Graph no :2 Data of gender distribution

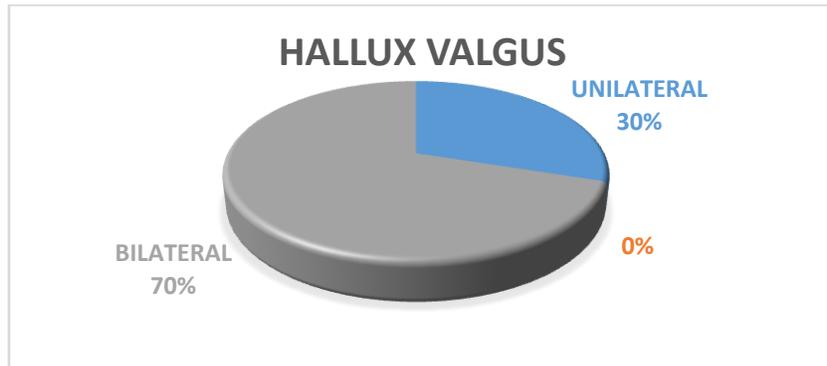


Graph no: 3 Bilateral hallux valgus severity according to footboard grades.

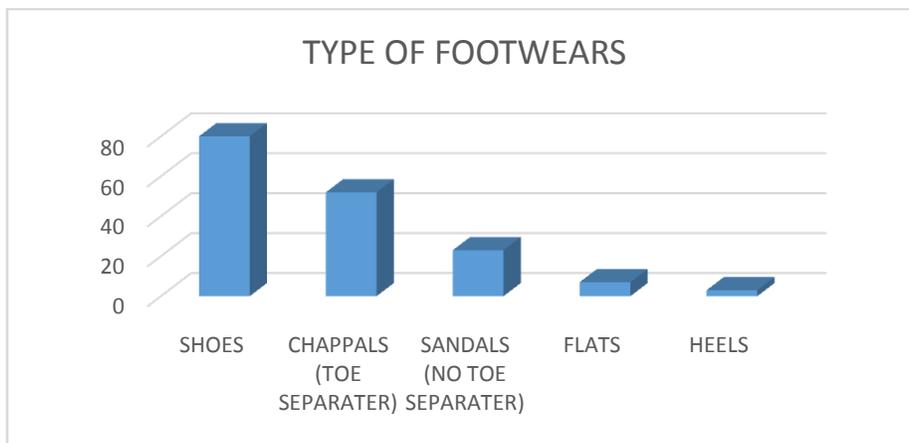




Graph no: 4 Unilateral and bilateral hallux valgus

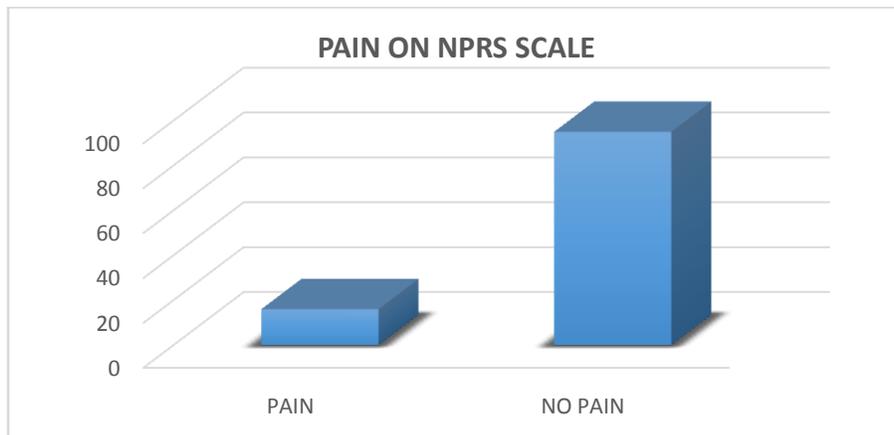


Graphno : 5 Types of footwear used in individuals.





Graph no: 6 Pain on nprs scale



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