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Prevalence of fairy-toe syndrome in general population

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Abstract
Background: The foot is the most distally situated bone consisting of many other smaller bones and joints which play very essential role in foot biomechanics while walking or standing that is on weight bearing. Metatarsals of the foot are designed such that the weight is distributed equally on all the 5 metatarsals. In fairy toe syndrome, the fifth metatarsal is mal aligned or abnormally placed causing alteration in the associated biomechanics of the foot which may result in deformity leading to chronic pain. The objectives of the study was to identify whether the fairy toe syndrome is present in general population and to identify whether it is present in weight bearing, non-weight bearing or in both the situations.
Method: The study was conducted by observing the footprints of the population on a sheet for the impressions of the fifth tarsal bones. Absence or even slight faded impressions of these tarsal with respect to other tarsals indicates the presence of the fairy toe syndrome in the individual. Conclusion: the prevalence of fairy toe syndrome is found to be more prominent in most of the population but is found more in females.

Keywords: Fairy toe syndrome, over pronation, fifth metatarsal

Introduction

In fairy toe syndrome, the fifth metatarsal is mal aligned or abnormally placed causing alteration in the associated biomechanics of the foot which may result in deformity leading to chronic pain. This can be due to excessive pronation of the foot that is the valgus deformity leading to shortening of the medial longitudinal arch of the foot.

The foot is the most distally situated bone consisting of many other smaller bones and joints which play very essential role in foot biomechanics while walking or standing that is on weight bearing. Metatarsals of the foot are designed such that the weight is distributed equally on all the 5 metatarsals Normally biomechanics of the foot and ankle consists of the static and the dynamic stabilizers. Static component includes the bones, joints, ligaments and fascia while dynamic stabilizer includes all the muscles contributing in walking and running activities. muscles activity is not necessary in static stability of the lower limb in rest. The arch in the foot is maintained by the passive ligamentous and the osseous support which is tensile strength of the plantar aponeurosis and the action of the metatarsals. Plantar aponeurosis contributes approximately 60% stress of the weight-bearing whereas metatarsals takes up about 25% [1].

Any abnormality in the static structures may cause other disorders such as abnormal pronation and supination of the foot which are hyper or hypomobilities due to which the ability of the foot to act as a shock absorber. Abnormal pronation is a compensation for soft tissue and osseous deformity [2]. This deformity can cause symptoms which may alter the quality of life of an individual. The alignment of the joint and the congruency of the metatarsal and tarsal bones is necessary for establishing the medial and the lateral arches of the foot for effective weight bearing. Static mechanism also include the windlass effect of the plantar aponeurosis [1].

These over-pronation can further may result into pathological conditions such as hallux valgus, metatarsalgia, knee pain, plantar fascitis, etc. These conditions may further cause discomfort, constant and chronic pain leading to long term complications. some of the over-pronation of the foot is physiological and compensatory pronation occurs due to anatomical reasons but it is potentially harmful [3]. These over-pronation causes shortening of the Achilles tendon increasing the stress on the knee. Also the increase in the over-pronation of the foot causes increase in the angle of inclination of the hip [7]. These increase may further increase a valgus stress on the knee causing further deterioration. In obese people, they tend to bear their weight more medially may result into overpronation [5]. According to the study conducted in 2017, the effect of the body mass index on biomechanics of adult females foot concluded that the obesity can contribute to overpronation resulting in foot pain. These overpronation of the foot may further cause to not bear the weight on the fifth metatarsal. These change in the postural biomechanics of the foot during weight bearing or non-weight bearing or both due to fairy toe syndrome can cause various malalignments and disorders in the foot resulting in chronic pain and associated conditions.

Metatarsals of the foot are designed such that the weight is distributed equally on all the 5 metatarsals. An alteration in weight distribution to the metatarsophalangeal joints from the functional or structural alterations which may further result into biomechanical metatarsalgia [8]. Any alteration in the weight distribution on the foot may give rise to metatarsalgia. In fairy toe syndrome as the 5th metatarsal is not able to bear weight, whole weight of the person is shifted medially that is towards the 1st metatarsal causing metatarsalgia that is foot pain below the metatarsal heads.

The aim of this study is to determine the prevalence of fairy toe syndrome in general population. The objectives of the study is to identify whether the fairy toe syndrome is present

in general population and to identify whether it is present in weight bearing, nonweight bearing or in both the situations. The need for the study is as the fairy toe syndrome is the new and a unique condition that is affecting a general population. The postural biomechanics of the foot during weight bearing or non-weight bearing or both due to fairy toe syndrome can cause various mal-alignments and disorders in the foot resulting in chronic pain and associated conditions. These study will also make the population aware of the postural and structural abnormalities of their body due to fairy toe and the related symptoms causing discomfort and lowering the quality of life.

Methodology

After the approval from the ethical committee of Krishna institute of medical sciences, deemed to be university. A study was conducted among the general population of the Patan district. The sample size was taken as 98 by simple random sampling method. The samples include the general population of 25-65yrs old, with BMI greater than and equal to normal value, flat foot individuals, individuals with overpronated foot. The population excluded is the individuals with any wound infection, amputed limb, edema or swelling over foot and diabetic polyneuropathy. A consent was signed by every individual participating in the study and the detailed information about the study was given to them. The study was conducted by observing the footprints of the population on a sheet for the impressions of the fifth tarsal bones. Absence or even slight faded impressions of these tarsal with respect to other tarsals indicates the presence of the fairy toe syndrome in the individual.

The outcome measure used is to observe the footprints for an abnormal missing or fading of the imprints of the fifth metatarsal in weight bearing and non-weight bearing. This was a study for assessment of fairy-toe or abnormal placement of the fifth metatarsal. This study is conducted in Krishna institute of medical sciences 'Deemed to be university', Karad in 2021.General population between the age group of 25-65yrs old were selected. Subjects were chosen by simple random sampling. An informed written consent were obtained from the subjects. Assessment was performed using ink and a blank paper. Imprints of the foot will be taken of every individual in both weight bearing and non-weight bearing. Observation of the imprints for fairy toe was done.

Statistical Analysis

The Data obtained was calculated according to the presence of fairy toe syndrome in the individuals. Descriptive analysis of the participants included in the study is calculated in percentage. Statistical analysis of the recorded data was done by using the software Microsoft excel.

Table 1: Demographic variables in the Study

Age	Frequency of Individuals	Percentage
25-50yrs	73	74.48%
51-65yrs	25	25.52%
Gender		
male	51	52.04%
female	47	47.96%
BMI		
18.5-24.9	65	66.32%
>25	33	33.68%

Percentage of fairy-toe syndrome in individuals-

Table 2: According to presence or absence:-

Variables	Frequency	Percentage (IN %)
Positive	44	44.89
Negative	54	55.10

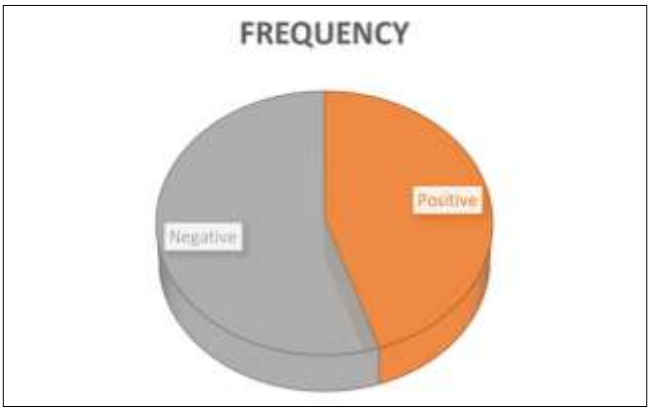

Fig 1

Table 3: According to gender

Variables	Frequency	Percentage
Male	17	17.34%
Female	27	27.55%

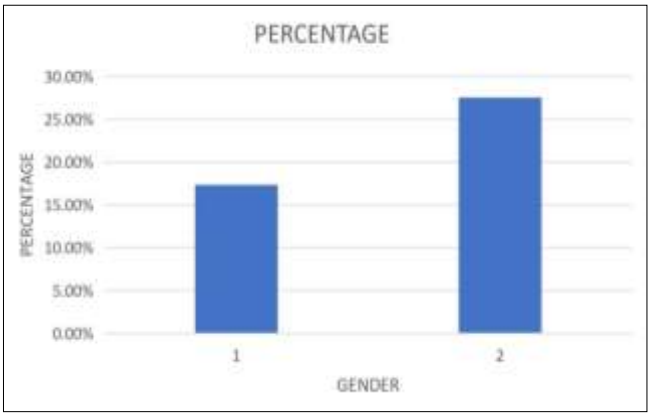

Fig 2

Table 4: According to BMI

Variables	Frequency	Percentage
1) 18.5-24.9	28	27.27%
2) >25	16	21.21%

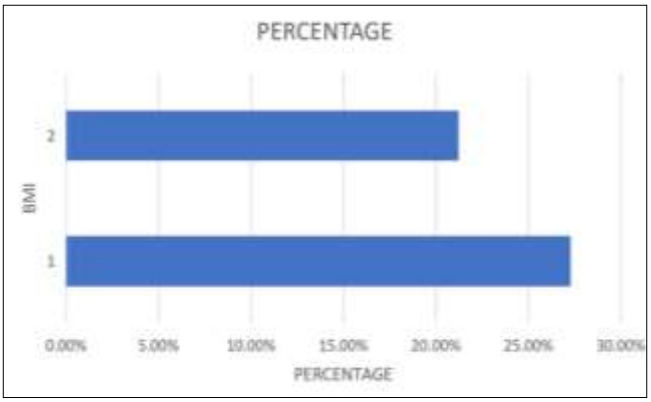

Fig 3

Table 5: According to age group

Variables	Frequency	Percentage
1) 25-50yrs	36	33.33%
2) 51-65yrs	8	03.03%

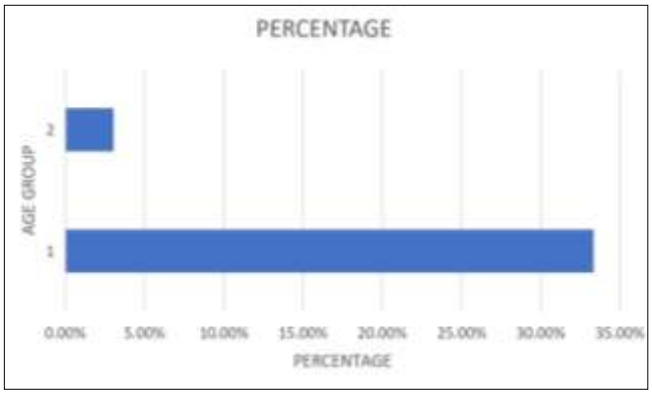

Fig 4

Result

In the general population, fairy toe syndrome is found to be more prevalent. To determine the prevalence of fairy toe syndrome 98 people were included from the general population of the rural area of Patan district in the study out of which 44.89% of population have been found to be affected with the fairy toe syndrome (Table no 2).

Fairy toe syndrome is found to be more prevalent in females (27.55%) than males (17.34%). It is present in both the situations when the individual is in weight bearing or nonweight bearing. Obesity or overweight of an individual not generally have any relation with the fairy toe syndrome. According to BMI of an individual the prevalence is found to be more in normal weighted individuals and not in obese.

Discussion

Fairy-toe is an unrecognized deformity altering an individual's comfort and quality of life due to the associated symptoms Fairy toe syndrome can also be seen in individuals who have altered weight distribution on their foot because of structural or functional deformity [8]. Individuals with fairy-toe will mostly be present with the altered weight distribution on the foot that can cause further discomforts. Individuals with fairy toe syndrome persist more weight on the medial side of the foot which may cause over pressure on the first and second metatarsal of the foot.

According to the study conducted in 2017 for the presence of flat foot in random population was found to be 26.62%. And also it was dependent on the age, BMI, comorbidities.[6] fairy toe syndrome in some individuals may be due to over pronation of the foot which may be present in flat foot individuals.

According to the study conducted in 2017, on correlation between foot over-pronation and angle on inclination of hip found that when there is an increase in an over-pronation of foot there is an increase in the angle of inclination of hip causing increase in the valgus stress on the knee.[7] hence the people with the over pronation which may cause fairy toe associated with the other comorbidities causing further discomforts [7].

According to the study conducted in 2014 on the normal plantar weight distribution pattern and its variations with change of functional position and its comparison with patients of knee osteoarthritis concluded that the altered plantar weight distribution and its variation along with change in functional position can have effect on functional disability in knee osteoarthritis [9].

According to the study conducted in 2008 on the pressure distribution patterns under the metatarsal heads in healthy individuals, they conclude that the maximum weight is distributed towards the middle column of the foot that is on the 2nd and 3rd metatarsal heads [10]. Hence, in obese and healthy individuals they tend to bear weight medially which may give rise fairy toe.

Conclusion

In this study, the prevalence of fairy toe syndrome is found to be more affecting the general population irrespective of weight bearing and non-weight bearing and some individuals have in both the situations. It is prevalent in females than males, and in normal BMI individuals than in obese. Hence, obesity and over weight of an individual does not have any relation with fairy toe syndrome.

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