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Quality of Life in Adult Population with Flat Feet

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ABSTRACT

Introduction: Flat foot is a common, yet neglected postural deformity. It is necessary to assess implications of flat feet on quality of life in the physically active age group of 20- 40 years.
Aim: To determine the impact of flat foot on foot-related health and Quality of Life (QOL), among a population of 20-40 year-old individuals with bilateral flexible flat feet.
Methodology: A cross-sectional study in a population sample of 100 individuals (43 males and 57 females), having bilateral flexible flat feet was performed. Subjects with an FPI score of +6 to +12 and a Navicular Drop Test result of 10mm or more were included. Participants completed the Revised Foot Function Questionnaire (FFI-R) to quantify foot-related health and quality of life across 4 domains (pain and stiffness, difficulty, activity limitation, social issues). Statistical analysis dispersion was then performed.
Results: This study reveals that mean total disability percentage (+/-SD) of 100 individuals suffering from bilateral flexible flat feet and having mean (+/-SD) FPI score of 7.78 (+/-1.2) (right foot) and 7.79 (+/-1.2) (left foot), as measured by FFI-R scores, was 34% (+/-8.2). The total disability percentage ranged from 21-65%. The pain and stiffness, activity limitation and social domains were most affected with mean score percentages being 34%, 37% and 37% respectively.
Conclusion: The present study shows that quality of life as measured on the FFI-R is affected in individuals with flat feet in the age group 20-40 years. The most reported affected domains were pain, activity limitation and social domain. Participants with flat feet complained of foot pain, difficulty walking on uneven ground, walking fast, running, maintaining balance, concern at the appearance of their feet and difficulty in finding suitable footwear. Hence, these factors demand appropriate intervention.

Key words - flat feet, quality of life

INTRODUCTION

Flat foot is a common postural deformity. It is characterized by medial rotation and plantar flexion of the talus, eversion of the calcaneus, collapsed medial arch and abduction of the forefoot. In erect bipedal stance, the base of support is defined by an area bound posteriorly by the tips of the heels and anteriorly by a line joining the tips of toes. In pes planus the medial longitudinal arch is flattened, bringing the entire sole of the foot into near complete or complete contact with the ground. [1]

Prevalence of flat foot varies with age, type of population and the presence of comorbidities. Flat feet have been associated to family history, wearing footwear during childhood, urban residence [2] obesity [2,3] age [4,5,6] gender [5,7] BMI [4,5,8] and foot length [4,9]. Flat feet could also be secondary to various conditions, such as ligament laxity [10] Rheumatoid arthritis [11] Diabetes [12] foot or ankle injury, post-traumatic arthritis, peroneal spastic flat foot, Charcot foot and posterior tibial tendon dysfunction [13].

Prevalence of flat feet in children is inversely proportional with age [14-18].

Higher prevalence (21% to 57%) has been reported among children of two to six years and the prevalence declines in primary school children (13.4% to 27.6%) [15]. Prevalence of flat feet in adults has been reported to be between 13.6% to 26.62% [4,8,19].

The deformities concomitant with flat foot may cause pain, instability, uneven plantar pressure distribution, gait problems and foot fatigue [20] which may have a significant influence on daily activities. All these changes can subsequently lead to slower walking speed, decreased stride length and cadence and increased stance duration [21] all of which reduces functionality and overall well-being [3,4,19,22].

In our literature review, we found, studies evaluating quality of life in individuals with flat feet have been conducted in the adolescent age groups [22], and in those above 40 years [4] or 60 years [3, 19].

Vocational, avocational & activities of daily living in adults involve sufficient amount of time weight-bearing on our feet, such as while walking, running, traveling in public transport or standing at workplace. Flat arches may predispose the affected patients to undue stress and faulty biomechanics causing pain and difficulty. Thus it is imperative to assess their quality of life to and evaluate the extent of their difficulty. This is particularly important in individuals who travel or work on a daily basis, i.e., the age group of 20-40 years as they are more susceptible to occurrence of pain, limitation and social obstacles pertaining to foot problems. There is an increasing need to promote foot health amongst adults since it is an issue that is common but frequently ignored as being trivial. Quantifying the impact of flat feet on quality of life in such individuals therefore makes it possible to identify the impact and plan preventive and rehabilitative strategies in these patients.

Hence, this study was conducted with the objective of assessing the impact of flat feet on the quality of life in 20 to 40 year-old individuals. We aimed to study how flat feet impacts the different QOL domains like foot pain, foot stiffness, difficulty in performing daily tasks, activity limitation and Social issues.

METHODOLOGY

The study is a cross-sectional study. 100 individuals (43 males and 57 females) with bilateral flexible feet in the age group 20-40 years were included in the study after obtaining an informed consent. Patients with secondary flat feet post trauma, rheumatic foot affection, diabetes or neurological affection were excluded from our study.

Diagnosis of flatfoot was based on Foot Posture Index (FPI) and Navicular drop test conducted on both feet of each subject. Individuals with an FPI score of +6 to +12 and a Navicular Drop Test result of 10 mm or more were included in our study.

Navicular drop test: It is a means of quantifying the degree of foot pronation. The inter-tester and intra-tester reliability for navicular height ranged from 0.87-0.96 and 0.73-0.96 respectively, as Sell et al [23]. Each subject was positioned in standing so there is full weight-bearing through the lower extremity and the foot was brought to the subtalar joint neutral position. The location of the navicular tuberosity was marked and its distance from the supporting surface was measured. The patient was then asked to stand in relaxed position and then the amount of sagittal plane excursion of the navicular was measured. A result of more than 10mm is a positive test and indicates excessive foot pronation [24].

Foot Posture Index: Foot Posture Index has demonstrated to have both good intra-rater reliability, ICC = 0.93 - 0.94 [25] and inter item reliability, Cronbach's alpha = 0.83 [26]. It is a clinical tool used to rate standing foot posture using set criteria and a simple scale to quantify the degree to which a foot is pronated, neutral or supinated. Talar head position, curves above and below the lateral malleolus, medial longitudinal arch congruence, talo-navicular joint prominence, calcaneal eversion and forefoot

adduction/abduction are scored. Features corresponding to a neutral foot posture are graded as zero, while pronated postures are given a positive value, and supinated features as negative value [26].

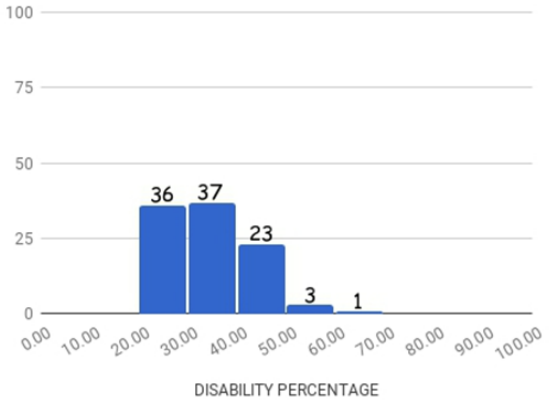
After screening for flat feet on the above mentioned tests, the participants were requested to fill the Revised Foot Function Questionnaire. The test–retest person reliability is reported to be 0.96 and the item reliability as 0.93[27]. The FFI was revised (the FFI-R) in 2006 and items were added to measure psychosocial domains and quality of life related to foot health. The FFI-R assesses foot pain, foot stiffness, difficulty, activity limitation and social problems caused due to foot problems. It contains 68 items to evaluate overall foot function, foot health, and quality of life. The questionnaire is distributed over 4 domains- pain and stiffness (19 questions), social and emotional outcomes (19 questions), difficulty (20 questions), and activity limitation (10 questions). Higher scores indicate worse foot health and poorer foot-related quality of life.

RESULTS

100 individuals with bilateral flexible feet in the age group 20-40 years participated in this study. Our results reveal that the mean total disability percentage as assessed by the Revised Foot Function Questionnaire across all 4 domains (pain and stiffness, difficulty, activity limitation, social issues) was 34% ranging between 21% and 65%. (Table 1& 2)

Table 1: Total disability percentage on the Revised Foot Function Questionnaire and FPI of the right & left foot of our study participants.

Parameter	(Left foot) Mean (+/- SD)	(Right foot) Mean (+/- SD)
FPI	7.79 (1.2)	7.78 (1.2)
Disability %	34 (8.2)	



GRAPH 1: The number of participants in different disability percentiles on the Revised Foot Function Questionnaire.

GRAPH 1 shows that the highest number i.e. 37 subjects were in the disability range of 30-40%, followed by 36 subjects within the 20-30% disability range.

Table 2: Percentage disability of our participants in various domains of the Revised Foot Function Questionnaire.

Domain	Mean score % (+/-SD)	Range %
Pain and stiffness	34(9)	21 - 65
Difficulty	24 (8)	23 - 75
Activity limitation	37(10)	8 - 50
Social issues	37(10)	22 - 59
Total disability	34 (8)	21 - 62

The values shown in table 2 are the mean (+/- SD) percentage scores in the domains of pain and stiffness, difficulty in performing everyday activities, activity limitation and social issues in our study participants. The table also includes the minimum & maximum scores of the study group in each domain.

TABLE 3: Table showing the most affected activities in our study participants in various domains of the Revised Foot Function Questionnaire.

Domain of the Revised Foot Function Questionnaire.	Activity in the domain	Participants (%) who report some difficulty performing this activity
Difficulty	Walking on uneven ground	79
Difficulty	Running	79
Difficulty	Walking fast	75
Difficulty	Maintaining balance	43
Activity limitation	Performing sports activities	40
Social issues	Concern at appearance of feet	45
Social issues	Finding fashionable shoes	60
Social issues	Finding comfortable footwear	64

Table 3 shows that most participants, i.e., 79, reported difficulty in Walking on uneven ground and running, while the next most difficult activity was walking fast, reported so by 75 participants.

Table 4: The number of participants reporting problems in different domains in percentile groups – pain and stiffness, difficulty in activities of daily living, activity limitation and social issues.

Percentage affection in each domain	Pain and stiffness	Difficulty in activities of daily living	Activity limitation	Social issues
10-20%	0	0	2	0
20-30%	33	28	40	37
30-40%	42	38	35	35
40-50%	19	11	19	15
50-60%	5	1	3	13
60-70%	1	1	1	0

Table 4 categorizes the number of participants and percentage affection in each domain the Revised Foot Function Questionnaire. Majority of the participants had affection in the range between 20 to 50 % which varied domain-wise.

DISCUSSION

The purpose of our study was to determine the quality of life in individuals suffering from flat feet, between 20 to 40 years of age. 100 participants with flat feet with a mean (+/- SD) FPI score of 7.78 (right foot) and 7.79 (left foot) and navicular drop of 11.11 (+/-1.4) in the left foot and 11.07 (+/-1.51) in the right foot, participated in our study. Revised Foot Function Questionnaire was administered to the participants to assess the QOL affection due to flat feet. This study reveals that in subjects with flat feet, aged 20-40 years, the percentage disability of individuals in the pain and stiffness domain is 34%, difficulty domain (in performing everyday activities) is 24%, activity limitation domain is 37% and the social limitation domain is 37%. The total disability percentage across all four domains is 34%.

We selected individuals in the 20 to 40-year age group as individuals in this age group are involved in various occupational, non-occupational and recreational activities with the foot in weight bearing posture. Some examples include standing/walking at workplace and also while commuting, shopping, household chores, running, driving etc. These activities demand a decent level of physical activity and foot function both. This is also the prime child-bearing age in women and an increase in the physical activity related to their caretaking.

For quality of life assessment, we administered the Revised Foot Function Questionnaire in our study as it consists of 68 activity-specific questions and explores the activity limitation and social domains in depth which are not explored so profoundly in other foot health questionnaires. Also it has demonstrated satisfactory psychometric properties with test– retest reliability as 0.96 and the item reliability as 0.93[27].

In the pain domain of Revised Foot Function Questionnaire, a high proportion i.e. 78% of our study participants reported foot pain at the end of a typical day, 42% of experienced pain when they first stood without shoes, and 59% of the subjects had pain when they first walked without shoes. At its worst, 34% of the subjected reported the pain to be of mild intensity, 43% of people had moderate pain while 14% of the subjects had severe pain.

The postulated reasons for pain in individuals with flat feet are explained hereafter. Excessive pronation in flat feet causes shock absorption to be decreased. A normal foot experiences a pressure 1.5 times the body weight on coming in contact with the ground. People with flat feet experience higher fatigue because of decreased shock absorption [28]. Cadaver studies have linked foot pain in flat-footed individuals to increased plantar fascia strain [29], talo-navicular joint hypermobility [30], increased dorsal compressive forces in the midfoot [31] and reduced gliding of the tibialis posterior tendon.[32] Excessive stress on metatarso-phalangeal joints, tibialis posterior muscle

and tendon and plantar fascia are also associated to foot pain [20]. The tibialis posterior muscle is a major dynamic support of the medial arch. During gait, it controls pronation through eccentric activity and supinates the foot by contracting concentrically [33-35]. Tibialis posterior dysfunction is a significant problem linked with flat foot [33]. Intrinsic muscles tend to be overused in a flat foot as it may rely more on the active contraction of the intrinsic muscles to stabilize the arches because of loss of passive support from ligaments as in a normal or high-arched foot, resulting in foot fatigue and pain at the end of the day as reported by many of our study subjects [20].

Previous studies conducted on different age group as compared to our population indicate that QOL is affected in patients with flat feet. The results of a previous study [4] conducted on individuals over 40 years of age have showed that patients suffering from flat foot have significantly lower scores in the different quality of life domains in the Foot Health Status Questionnaire (FHSQ) than non-sufferers. Another study on 6-12 year olds with flexible flat feet reported that the score percentage in the foot pain domain was 96% and footwear domain was 72% on the FHSQ, indicating that the subjects experienced more foot pain, greater restrictions in terms of footwear and consider their feet to be are suboptimal state of health[22] .

Our study, conducted on 20 to 40-year-old individuals with flat feet, shows higher scores indicating lower quality of life in the pain, activity limitation and social domains (Table 2). In the difficulty domain there is affection in some areas such as walking on uneven ground, walking fast, running and maintaining balance. Many participants in our study found it difficult to participate in outdoor sports activities due to foot pain and instability while running in the activity limitation domain. Social domain affection was attributed to inability to find comfortable or suitable footwear and concern at the appearance of feet (Table 3). The participants reported that finding suitable footwear is difficult because most types of footwear, especially heels and shoes with thin soles, as these cause pain in their feet.

Our results indicate that, many of our patients (75% to 79%) have reported difficulty in walking, running, ascending/ descending stairs and stepping over obstacles, all of which require a single-leg stance at some point of time (Table 3). Single-leg stance is attained during many activities such as during walking, running, going up and down stairs, kicking a ball, stepping over obstacles, getting dressed etc. Single-leg stance brings the greatest load to the lower extremity.

Since the foot is the most distal part of a complex closed kinematic chain during weight-bearing, any deformities such as a flat arch may cause instability, altered muscle activity, consequential gait deviations which may lead to lower extremity problems in the future[36,37]. In a study that compared knee joint kinematics between subjects with and without flatfoot, it was reported that children with flexible flatfoot a tendency towards increased hip flexion, adduction, less hip internal rotation and increased knee internal rotation during the stance phase of gait [37]. Research findings indicate that there are changes in muscle activity at the ankle [38,39], knee [40] and hip [38] in overpronated feet. The stability of flat-arched individuals has been found to be less than that of normal individuals. The valgus position of the calcaneum and talar tilt disturbs the entire kinematic chain and makes it unstable [41-43]. A study examining balance in different foot types suggested that static balance was marginally affected by foot type.[44] But the Star Excursion Balance Test showed differences in dynamic reach among different foot types, suggesting that biomechanical changes occur due to misalignments in the midfoot, thereby affecting stability limits during dynamic activities. These aforementioned changes

may be the reason why several participants (43%) of our study were experiencing instability in the foot and reported problems in balance (Table 3).

Hence, our study results reveal that in the sphere of health-related quality of life, scores on the Revised Foot Function Questionnaire have indicated that individuals with flat feet experience limitations in carrying out a wide range of physical activities, are more socially conscious and experience pain that hinders participation in leisure activities.

CONCLUSION

We conclude that the quality of life of patients suffering with flat feet in the age group of 20-40 years and having a mean FPI score of 7.78 (right foot) and 7.79 (left foot) was 34% as assessed on Revised Foot Function Questionnaire. The pain and stiffness, activity limitation and social domains were most affected with mean score percentages being 34%, 37% and 37% respectively.

The presence of flat feet in an individual in the age group 20-40 years impacts his/her quality of life in the form of foot pain, difficulty to do daily living tasks such as walking on uneven ground, walking fast, running, and maintaining balance. Also, a high proportion of our participants reported having trouble in walking on uneven ground and running (79%). Leisure and sports activities are also minimized due to foot pain that occurs while running. It also affects him/her socially in the form of difficulty in finding fashionable and comfortable footwear and there is an increased concern towards appearance of feet.

Conflict of Interest

The authors declare no conflict of interest.

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