



PREVALENCE OF FOOT POSTURE DEFORMITIES IN SALES PEOPLE: A FOOT POSTURE INDEX ANALYSIS

¹Resa Paulson, ²Riya Dias, ³Mohamed Ihsan, ⁴Sreelekha K.S, ⁵Rintu Roy.

¹Assistant Professor, ²BPT Intern, ³BPT Intern, ⁴BPT Intern, ⁵BPT Intern

¹College Of Physiotherapy

Medical Trust Institute of Medical Science, Cochin, Kerala, India

ABSTRACT: BACKGROUND: Extended periods of standing are linked to abnormalities in the posture of the feet, hence reducing their longevity. Males and females have different foot shapes geometrically. Foot discomfort significantly affects one's quality of life and is a major public health concern. Our aim is to find out the gender specific differences in foot posture deformities in salespeople.

OBJECTIVE: To find out the prevalence of foot posture deformities using foot posture index and associated foot pain in salespeople.

METHODS: A cross sectional study was done in 100 males and 100 females in sales Industry. The Foot posture deformities were assessed using the foot posture index and foot pain was assessed using SAFE- Q Questionnaire.

RESULTS: A total of 200 participants who satisfied in the inclusion criteria participated in the study. Mean age of participants was (mean= 42) and (SD= 9.6). According to foot posture index analysis, 54% have foot posture deformities. Out of 100 males, 53% are affected and out of 100 females, 55% are affected. There is 2% minor increase in foot posture deformities in females compared to males. In subjects with foot posture deformities, 41.5% of males and 81.8% of females have foot pain.

CONCLUSION: The study concluded that salespeople have significant foot posture deformities. In our research, there is 2% minor increase in foot posture deformities in females compared to males. Many of them have foot posture deformities in both feet. Females have more pronated foot posture deformities while males have both supinated and pronated types. We also found that women with foot posture deformities have increased foot pain compared with males. In our study, obese people have increased foot posture deformities.

KEYWORDS: Foot posture deformities, FPI, SAFE-Q

I. INTRODUCTION

Foot has a diverse and efficient role in locomotion due to its primary function of supporting body's weight and its crucial role during movement. Maintaining good foot posture is essential to prevent future misalignments that could impair the body's biomechanics as well as long term foot health. However, the foot is more vulnerable to daily strain because of poor foot position during activities of daily life like standing, walking, and running. Increased musculoskeletal ailments, including low back pain, ankle or foot injuries from overuse patellofemoral pain syndrome, and medial stress syndrome, have been linked to poor foot posture and misalignment. Many employees in a broad range of occupations must stand for extended periods of time at one location in order to do their task. When working in a standing posture for an extended period of time every day and when it is not feasible to switch between standing and other postures, it might become problematic. Long stretches of time spent standing are linked to serious issues and abnormalities with the ankles and feet. Prolonged standing is generally linked to decreased blood flow to the lower extremities, which lowers the amount of nutrients that muscles receive and causes pain and exhaustion [1]. It is thought that excessive foot pronation or supination, or rolling in or out, puts undue strain on the foot and subsequently the limb tissues[2]

II. NEED OF STUDY

Prolonged standing exposure is linked to abnormalities in the alignment of the feet and it also increases risk of foot disorders. Foot posture deformities can lead to pain, fatigue, discomfort, and reduced productivity. Salespeople often wear ill-fitting shoes or have inadequate foot support and often spend long hours standing, increasing risk of musculoskeletal disorders. Our objective is to ascertain whether foot posture malformations are gender specific, given the morphologic and geometric differences between male and female foot shapes. Understanding the relation between foot posture deformities and foot pain will help to understand the quality of foot in salespeople. We want to raise awareness about the importance of taking proper breaks during the workday, as well as the usage of orthoses and appropriate footwear, to help salespeople avoid developing foot posture deformities. Determining the extent of these deformities can help with the creation of preventative strategies to reduce the risk of foot-related issues, such as ergonomic interventions and focused exercise regimens. There is a dearth of study on those working in the sales sector.

III. REVIEW OF LITERATURE

[1] Aditi R Sawant et al (2023)

Conducted a study on prevalence of foot posture deformities using foot posture index in various intensive care unit nurses. In this study 159 nurses from various ICU's were included on assessing foot posture. Foot posture index was used to examine the prevalence of foot posture deviation. According to the findings, 43% of participants had pronated foot, 14% participants had highly pronated foot, 16% participants had supinated foot, 7% had highly supinated foot posture, 20% had normal foot. It was found that nurses who were working continuously with fewer rest periods had pronated foot posture deformity.

[2] Mariana R.C Aquino et al (2018)

conducted a study on reliability of foot posture index individual and total scores for adults and older adults. In this study 21 adults and 19 older adults were participated. The examiners performed FPI-6 on two days of data collection. It was found that for adults FPI-6 scores demonstrated test-retest reliability varying from fair to substantial and inter-rater reliability varying from fair to almost perfect.

[3] Hisateru Niki et al. J Orthop Sci.2013 March.

Conducted a study on validity and reliability of Self-Administered Foot Evaluation Questionnaire (SAFE-Q). The Japan Society for Surgery of the foot developed a quality-of-life questionnaire instrument for use in pathological conditions related to the foot and ankle. Version 2 of the SAFE-Q was administered to 876 patients and 491 non patients and the test-retest reliability 10 was evaluated for 131 patients. The study revealed that the test-retest reliability is high for each subscale, consequently the SAFE-Q is valid and reliable.

[4]Joana Ferreira Hornestam et al (2021)

Conducted a study on Foot pronation affects pelvic motion during the loading response phase of gait. Pelvic, hip, and foot angular positions of 20 participants were collected while they walked at fast speed wearing flat and medially inclined insoles inserted in the shoes. Pelvic motion in frontal and transverse planes was analyzed during the loading response phase. Foot eversion-inversion was analyzed during the complete stance phase to verify the insoles effectiveness in inducing increased pronation and to exclude excessive pronators. The study concluded that increased bilateral foot pronation changes pelvic motion during walking and should be assessed, as a contributing factor to possible pelvic and lower back disorders.

[5] Yi Wang et al. (2023)

Conducted a study to test the reliability of foot posture index (FPI-6) for evaluating foot posture in patients with knee osteoarthritis. Thirty volunteers with KOA (23 females, 7 males) were included in this study, assessed by two raters and at three different moments. Inter-rater and test-retest reliability were assessed with Cohen's Weighted Kappa (Kw) and Intraclass Correlation Coefficient (ICC). Bland-Altman plots and respective 95% limits of agreement (LOA) were used to assess both inter rater and test-retest agreement and identify systematic bias. Moreover, the internal consistency of FPI-6 was assessed by Spearman's correlation coefficient. The study concluded that the reliability of FPI-6 total score and the six items of FPI-6 were fair to substantial and the results can provide a reliable way for clinicians and researchers to implement the assessment of foot posture in patients with KOA.

[6]Patrick McLaughlin et al. (2016)

Conducted a reliability study on Inexperienced examiners and the Foot Posture Index. A total of 83 participants (n=41 female) from the student body at Victoria University (Melbourn) were involved. Participants were required to walk approximately 10m to the FPI-6 assessment station and stand on a 30cm high platform whilst. The study concluded that FPI-6 can be used in a reliable manner with minimal training and experience, particularly for the total FPI-6 score and the classification of foot posture based on this score.

IV. RESEARCH METHODOLOGY

- Study design: Cross sectional study
- Study Population: Sales people
- Study setting: Community
- Study Duration: 3 months
- Sampling method: Purposive sampling
- Study size: 200

V. CRITERIA**INCLUSION**

1. Sales people within the age limit of 25-55 years
2. Both males and females
3. The working hours should be 8-10 hours
4. The sales people with minimum of 3 years of experience

EXCLUSION

1. Not willing to cooperate in this study
2. Not within age limit, working hours and years of experience
3. DVT, physical trauma to foot\ankle, musculoskeletal conditions of foot, lower limb surgeries, varicose veins and congenital flat foot
4. Psychologically unstable or other neurological conditions
5. External appliances, metal implants 18

VI. OUTCOME MEASURES

- FPI
- SAFE-Q

FPI

FPI is a diagnostic tool aimed at quantifying the degree to which a foot can be considered to be in pronated, supinated or neutral position. The 6 clinical criteria employed in the FPI – 6 are:

1. Talar head palpation
2. Supra and infra lateral malleolar curvature
3. Calcaneal frontal plane position
4. Prominence in the region of TNJ
5. Congruence of medial longitudinal arch
6. Abduction or adduction of forefoot on the rear foot

Each of the component tests or observations are simply graded 0 – for neutral with a minimum score of -2 for clear signs of supination and +2 for positive signs of pronation.

The final FPI score will be a whole number between -12 and +12.

SAFE -Q

The Japanese society for surgery of the foot [JSSF] is a developing QOL Questionnaire Instrument for use in pathological condition related to foot and ankle.

It consists of 34 questionnaire items which provide 5 subscale scores:

- 1] Pain and pain related
- 2] Physical functioning and daily living
- 3] Social functioning
- 4] Shoe related
- 5] General health and well being

In addition, the instrument has an optional questionnaire item that provide a sports activity subscale score.

VII. PROCEDURE OF THE STUDY

The subjects were carefully selected based on the inclusion and exclusion criteria. Subjects were taken from different shops across Kerala. The consent was taken from the respondent for the participation in this study. We introduced ourselves and briefly explained the purpose of study of the sales people who met the criteria for the study. The subjects were asked to fill a demographic questionnaire (including BMI, years of experience, hours of standing). Foot posture was assessed using FPI, where the subjects are asked to stand in a relaxed stance position with double limb support, arms at their side and looking straight ahead. Talar head was palpated. The scoring of other 5 criteria were done by taking 3 photos of medial longitudinal arch, posterior angle and talonavicular joint of both left and right feet with a mobile camera. The camera was positioned approximately 30 cm from the medial side of the foot for the medial longitudinal arch, approximately 25 cm from the posterior aspect of the calcaneus for the posterior angle view, as well as 25cm from the TNJ and approximately 45° from the posterior calcaneus for the TNJ view. The questionnaire SAFE – Q relating to the foot pain were circulated among the sales people. After collecting the data, we analyzed each of their scores and analysed the foot posture deviation in each gender.

VIII. STATISTICAL ANALYSIS

PREVALENCE OF FOOT POSTURE DEFORMITIES IN SALES PEOPLE

GENDER	NORMAL	FOOT POSTURE DEFORMITIES
MALES	47%	53%
FEMALES	45%	55%

TABLE -1 Shows prevalence of foot posture deformities of male and female sales people. Out of males, 53% are affected and out of females, 55% are affected.

FOOT POSTURE DEFORMITIES OF RIGHT AND LEFT FEET

GENDER	ONLY RIGHT FOOT POSTURE DEFORMITIES	ONLY LEFT FOOT POSTURE DEFORMITIES	FOOT POSTURE DEFORMITIES IN BOTH FEET	NORMAL
MALES	13%	7%	33%	47%
FEMALE	18%	11%	26%	45%

TABLE -2: Shows foot posture deformities of right and left feet. 13% of females and 18% of females have right foot posture deformities and 7% males and 11% females have left foot posture deformities. 33% males and 26% females have foot posture deformities in both feet.

TYPES OF FOOT POSTURE DEFORMITIES

FOOT POSTURE	MALE RIGHT	MALE LEFT	BOTH FEET	FEMALE RIGHT	FEMALE LEFT	BOTH FEET
NORMAL	54%	59%	46%	56%	63%	44%
PRONATED	10%	7%	8%	16%	8%	6%
HIGHLY PRONATED	0%	0%	14%	0%	0%	17%
SUPINATED	2%	1%	6%	0%	1%	4%
HIGHLY SUPINATED	2%	0%	4%	0%	1%	0%

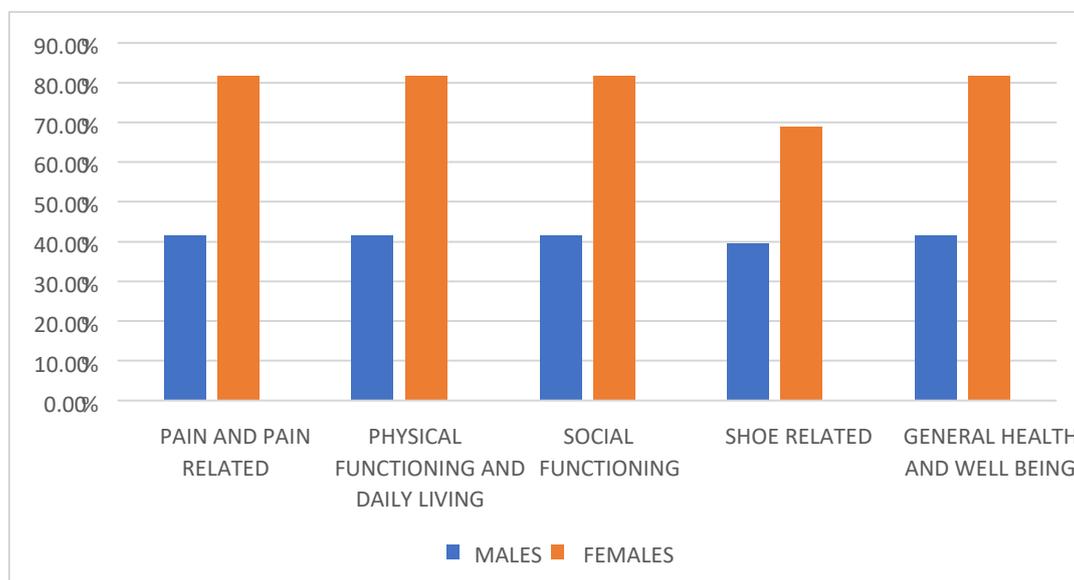
TABLE-3: Shows the types of foot posture deformities in salespeople

FOOT POSTURE DEFORMITIES AND BMI

BMI	MALES WITH FOOT POSTURE DEFORMITIES		FEMALE WITH FOOT POSTURE DEFORMITIES		TOTAL	
	N	%	n	%	n	%
UNDERWEIGHT (M-7, F-5)	6	85.7%	4	80%	10	83.3%
NORMAL (M-67, F-59)	31	46.2%	31	52.5%	62	49.2%
OVER WEIGHT (M-24, F-34)	14	58.3%	18	52.9%	32	55.1%
OBESSE (M-2, F-2)	2	100%	2	100%	4	100%
TOTAL	53		55		108	

TABLE 4: Shows the foot posture deformities according to BMI.

FOOT PAIN IN SUBJECTS WITH FOOT POSTURE DEFORMITIES



GRAPH 1: Shows the prevalence of foot pain in subjects with foot posture deformities

IX. RESULTS

1. The study was carried out in 100 males and 100 females in sales industry by using foot posture index (FPI) and SAFE-Q questionnaire.
2. Sales people have significant foot posture deformities.
3. In the present study it was found that in sales people, 54% have foot posture deformities. Out of 100 males, 53% are affected and out of 100 females, 55% are affected.
4. It was also found that there is a 2% minor increase in foot posture deformities in females compared to males. In subjects with foot posture deformities, 41.5% of males and 81.8% of females have foot pain.

X. DISCUSSION

The study aimed to determine the prevalence of foot posture deformities in sales people using the Foot Posture Index (FPI) and associated foot pain using the SAFE Q questionnaire. The research found gender-specific differences in foot posture deformities, with females having slightly higher deformities compared to males. Obese individuals were more prone to foot posture deformities, with pronated foot posture being the most common deviation. The study also found that females with foot posture deformities had increased foot pain compared to males. Salespeople play a crucial role in the sales industry, but prolonged standing can lead to physical and mental challenges such as low back pain, foot pain, circulation issues, joint fatigue, varicose veins, increased risk of injuries, postural problems, reduced focus, and mental fatigue. This study focuses on factors like overpronation, neutral, and over supination in salespeople, identifying a mild association between foot pain and foot deformity. A study found that pronated foot posture is the most common foot deviation in intensive care unit nurses, with women having more deformities. Men also have both pronated and supinated foot posture deformities, possibly due to foot shape differences, ankle overstraining, prolonged standing without rest periods, and inappropriate footwear. The European Agency for Safety and Health at Work (EU-OSHA) report highlights the health effects of prolonged standing, including musculoskeletal disorders (MSDs), and provides guidance on safe limits for continuous standing. The report encourages prevention practices to avoid constrained standing and promote a more dynamic workstyle. Foot posture deformities and foot pain in sales professionals require a holistic approach. Preventative measures include foot rest, proper flooring, antifatigue mats, support stockings, compression socks, and exercises. Treatment involves rest periods, exercises, NSAIDs, and complementary therapy. Orthotic and footwear interventions, such as customized insoles, can reduce pain and improve balance. Maintaining a healthy weight through diet and exercise can reduce injury risk. Education about foot posture deformities and associated pain is crucial, advocating for healthy ergonomics, equal weight transfer, and adequate rest periods.

XI. CONCLUSION

The study concluded that long standing is associated with significant foot posture deformities in salespeople. In our study, there is a minor increase in foot posture deformities in females compared to males. Females have more pronated foot posture type deformity while males have both pronated and supinated foot posture deformity. Females with foot posture deformities have increased foot pain compared with males. In our study, obese people have highly pronated foot posture deformity. There are no significant age-related changes in foot posture deformities.

XII. LIMITATIONS

- Present study was conducted in small population, large sample size recommended for wider generalization.
- Other categories are recommended for good generalization.

XIII. FUTURE SCOPE

- Further study can be done by adding more samples.
- Women have more pronated feet than men, despite men having both types of feet- pronated and supinated.
- It could be an inventory for more elaborated study in the future.
- Exercises, massage and complementary therapy can be intervened to the workers to prevent foot posture deformities and associated foot pain.

XIV. REFERENCES

1. Bernardes RA, Caldeira S, Parreira P, Sousa LB, Apóstolo J, Almeida IF, Santos Costa P, Stolt M, Guardado Cruz A. Foot and ankle disorders in nurses exposed to prolonged standing environments: a scoping review. *Workplace Health & Safety*. 2023 Mar;71(3):101-16.
2. Reed LF. An investigation of foot and ankle problems experienced by nurses (Doctoral dissertation, Queensland University of Technology).
3. Sawant AR, Akash A. Prevalence of foot posture deformities using foot posture index in various intensive care unit nurses. *Int J Community Med Public Health* 2023; 10:3276-82.
4. The Foot Posture Index – Six item version FPI-6. User guide and manual, August 2005, Anthony Redmond 1998
5. Niki H, Tatsunami S, Haraguchi N, Aoki T, Okuda R, Suda Y, Takao M, Tanaka Y. Validity and reliability of a self-administered foot evaluation questionnaire (SAFE-Q). *Journal of Orthopaedic Science*. 2013 Mar 1;18(2):298-320.
6. Alahmari KA, Kakaraparthi VN, Reddy RS, Samuel PS, Tedla JS, Rengaramanujam K, Ahmad I, Sangadala DR, Mukherjee D. Foot posture index reference values among young adults in Saudi Arabia and their association with anthropometric determinants, balance, functional mobility, and hypermobility. *BioMed research international*. 2021 Mar 28; 2021:1-0.
7. Hong Y, Wang L, Xu DQ, Li JX. Gender differences in foot shape: a study of Chinese young adults. *Sports biomechanics*. 2011 Jun 1;10(02):85-97. 37
8. Parikh JH, Shukla DY. Comparison of Direct Versus Image Based Foot Posture Index in School Going Children. *International Journal of Science and Healthcare Research*. 2022 Aug 19;7(2):317-21.
9. Neal BS, Griffiths IB, Dowling GJ, Murley GS, Munteanu SE, Franettovich Smith MM, Collins NJ, Barton CJ. Foot posture as a risk factor for lower limb overuse injury: a systematic review and meta-analysis. *Journal of foot and ankle research*. 2014 Dec; 7:1-3.
10. McLaughlin P, Vaughan B, Shanahan J, Martin J, Linger G. Inexperienced examiners and the foot posture index: a reliability study. *Manual therapy*. 2016 Dec 1; 26:238-40
11. Aquino MR, Avelar BS, Silva PL, Ocarino JM, Resende RA. Reliability of Foot Posture Index individual and total scores for adults and older adults. *Musculoskeletal Science and Practice*. 2018 Aug 1; 36:92-5.
12. Menz HB, Dufour AB, Riskowski JL, Hillstrom HJ, Hannan MT. Foot posture, foot function and low back pain: the Framingham Foot Study. *Rheumatology (Oxford)*. 2013 Dec;52(12):2275-82. doi: 10.1093/rheumatology/ket298. Epub 2013 Sep 17. PMID: 24049103; PMCID: PMC3828513.
13. Almutairi AF, BaniMustafa A, Bin Saidan T, Alhizam S, Salam M. The Prevalence and Factors Associated with Low Back Pain Among People with Flat Feet. *Int J Gen Med*. 2021 Jul 20; 14:3677-3685. doi: 10.2147/IJGM.S321653. PMID: 34321913; PMCID: PMC8312604.
14. Redmond AC, Crosbie J, Ouvrier RA. Development and validation of a novel rating system for scoring standing foot posture: the Foot Posture Index. *Clin Biomech (Bristol, Avon)*. 2006 Jan;21(1):89-98. doi: 10.1016/j.clinbiomech.2005.08.002. Epub 2005 Sep 21. PMID: 16182419.
15. Mølgaard C, Lundbye-Christensen S, Simonsen O. High prevalence of foot problems in the Danish population: a survey of causes and associations. *Foot (Edinb)*. 2010 Mar;20(1):7-11. doi: 10.1016/j.foot.2010.03.002. Epub 2010 Apr 10. PMID: 20382520.
16. Redmond AC, Crane YZ, Menz HB. Normative values for the Foot Posture Index. *J Foot Ankle Res*. 2008 Jul 31;1(1):6. doi: 10.1186/1757-1146-1-6. PMID: 18822155; PMCID: PMC2553778.
17. Shen X, Wang S, Chen J, Li J, Li C, Xiang R, Zhao C, Xu X. Inter-rater reliability and test-retest reliability of the foot posture index (FPI-6) for assessing static foot posture in elderly female patients with knee osteoarthritis and its association with quadriceps muscle tone and stiffness. *Front Bioeng Biotechnol*. 2024 Jun 21; 12:1385986. doi: 10.3389/fbioe.2024.1385986. PMID: 38983600; PMCID: PMC11232489.
18. Motantasut P, Hunsawong T, Mato L, Donpunha W. Reliability of novice and experienced physiotherapists using the normalized navicular height truncated and the foot posture index-6 for classifying static foot posture in adults. *J 19. Tong JW, Kong PW. Association between foot type and lower extremity injuries: systematic literature review with meta-analysis. J Orthop Sports Phys Ther*. 2013 Oct;43(10):700-14. doi: 10.2519/jospt.2013.4225. Epub 2013 Aug 30. PMID: 23756327.
20. Nielsen RG, Rathleff MS, Moelgaard CM, Simonsen O, Kaalund S, Olesen CG, Christensen FB, Kersting UG. Video based analysis of dynamic midfoot function and its relationship with Foot Posture Index scores. *Gait Posture*. 2010 Jan;31(1):126-30. doi: 10.1016/j.gaitpost.2009.09.012. Epub 2009 Oct 21. Chuter VH. Relationships between foot type and dynamic rearfoot frontal plane