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**Dr. Amit S Patel**  
Guide (Incharge Principal), MB.  
Gohil Institute of Medical  
Science and Research Center,  
College of Physiotherapy,  
Navsari, Gujarat, India

**Jolly H Pandya**  
Intern of Bachelor of  
Physiotherapy, MB. Gohil  
Institute of Medical Science and  
Research Center, College of  
Physiotherapy, Navsari,  
Gujarat, India

**Raj D Viramgama**  
Intern of Bachelor of  
Physiotherapy, MB. Gohil  
Institute of Medical Science and  
Research Center, College of  
Physiotherapy, Navsari,  
Gujarat, India

**Magduma M Aakhalu**  
Intern of Bachelor of  
Physiotherapy, MB. Gohil  
Institute of Medical Science and  
Research Center, College of  
Physiotherapy, Navsari,  
Gujarat, India

**Bhumika A Vishwakarma**  
Intern of Bachelor of  
Physiotherapy, MB. Gohil  
Institute of Medical Science and  
Research Center, College of  
Physiotherapy, Navsari,  
Gujarat, India

**Corresponding Author:**

**Dr. Amit S Patel**  
Guide (Incharge Principal), MB.  
Gohil Institute of Medical  
Science and Research Center,  
College of Physiotherapy,  
Navsari, Gujarat, India

## Prevalence and incidence of flat foot due to prolonged standing among traffic police in Navsari: A cross-sectional study

**Dr. Amit S Patel, Jolly H Pandya, Raj D Viramgama, Magduma M Aakhalu and Bhumika A Vishwakarma**

### Abstract

**Background:** Adult flatfoot is defined as a foot condition that persists or develops after skeletal maturity and is characterized by partial or complete loss or collapse of medial longitudinal arch. There are majority of studies on flat foot in spite of that we can say that still there is no literature available on Flat Foot in Traffic Police. As traffic police officers have long standing hours on duty, medial longitudinal arch may become flat due to stress from pounding on surface. Hence this study was undertaken to find out the Prevalence and Incidence of Flat Foot due to prolonged standing among Traffic Police of Navsari by measuring their Foot Posture Index.

**Purpose of The Study:** Aim of this study was to assess the foot posture index in Traffic Police of Navsari and objective is to find effect of normal BMI and overweight on long static standing duty hours on medial arch of foot based on WHO classification of BMI.

**Methods:** A cross sectional study was conducted in M.B Gohil Institute Of Medical Science And Research Center, College Of Physiotherapy, Navsari (OPD) on 158 traffic Police including both male and female of Navsari district based on inclusion and exclusion criteria, out of which 30 were excluded. Outcome of the study that is Foot Posture Index-6 were assessed for each Traffic Police with prior informed consent form signed by the participant. Prevalence and incidence of flat foot is done statistically.

**Outcome Measure:** Foot Posture Index – 6

**Statistical Analysis:** Statistical analysis was done using SPSS 26 software.

**Results:** Prevalence and incidence of Flat Foot in our study population was 34% in right foot and 33% in left foot, based on FP1-6 scores. In our study, 63% population was with Normal BMI, scored 33% with pronated foot in right side and 32% pronated foot in left side, and 37% was with Overweight BMI, scored 36% with pronated foot in right side and 34% pronated foot in left side. 73% were male and 27% were females resulted with high prevalence of flat foot in males. Unilateral Pronation was 17% and Bilateral Pronation was 83%.

**Conclusion:** This study indicates that effect of prolonged standing is responsible for causing of flat foot in traffic police of Navsari district with normal BMI and overweight BMI almost equally.

**Keywords:** Flatfoot, traffic police, Navsari, prolonged standing.

### Introduction

The foot is really unique to human being. The foot has to act-

1. As a pliable platform to support the body weight in the upright posture, and
2. As a lever to propel the body forwards in walking, running or jumping.

To meet these requirements, the human foot is designed in the form of elastic arches or springs. These arches are segmented, so that they can best sustain the stresses of weight and of thrusts. An arched foot is a distinctive feature of man<sup>[2]</sup>.

Absence or collapse of the arches leads to flatfoot (pes planus), which may be congenital or acquired. The effects of a flat foot are as follows-

- a) Loss of spring in the foot leads to a clumsy, shuffling gait,
- b) Loss of the shock absorbing function makes the foot more liable to trauma and osteoarthritis,

- c) Loss of the concavity of the sole leads to compression of the nerves and vessels of the sole [2].

Adult flatfoot is defined as a foot condition that persists or develops after skeletal maturity and is characterized by partial or complete loss or collapse of medial longitudinal arch. Adult flatfoot may present as an incidental finding or as a symptomatic condition with clinical consequences ranging from mild limitations to severe disability and pain causing major impediments. It is often a complex disorder with variety of symptoms and various degrees of deformity [4].

According to World Health Organization (WHO), occupational health is defined as "The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaption of work to people, and people to their jobs [4].

Traffic Police have a high risk job as said by Driscoll *et al.* They also have many health related issues due to their occupation. Mostly their physical health is affected because of their long hours of standing duty on the road, exposure to sun and cold, constant travelling on bike throughout the day [4].

It is observed that Traffic Police officers who are on the streets everyday are prone to developing varicose veins of lower limbs due to damage of valves. This leads to swelling and lot of discomfort. They are also prone to joint problems and photosensitivity due to long hour exposure in sun. The unhealthy diet and irregular eating time and lack of exercise make them obese and the long static standing hours makes their body stiff. It may be due to improper footwear they use also causes foot posture related problems especially as they require long static standing for long hours [4].

Literature on the prevalence of adult flat foot in Indian population is limited and wherever it is available the methods employed to determine the flat feet, such as Foot print method or Visual Assessment method, are less reliable [7].

This study focuses on the prevalence and incidence of flat foot due to prolonged standing among Traffic Police of Navsari by measuring their foot posture index. The result may be helpful in early detection and correction of flat foot which proves beneficial in avoiding or preventing later knee, ankle and gait problems due to altered biomechanics and uneven weight distribution.

## Methodology

### Study Setting

M.B Gohil Institute of Medical Science and Research Center, College Of Physiotherapy, Navsari OPD.

### Study Design

Cross – sectional study.

### Study Sample Size

128 Traffic Police of Navsari district as per inclusion criteria.

### Study Sample Design

Convenient Sampling.

### Study Population

Traffic Police of Navsari District.

### Study Duration

The study was undertaken for a total of 6 months.

## Materials Used

- Pen and pencil
- Assessment form
- FPI datasheet
- Weight machine
- Inch tape
- Marker
- Scale
- Step stool

## Selection Criteria

### Inclusion Criteria

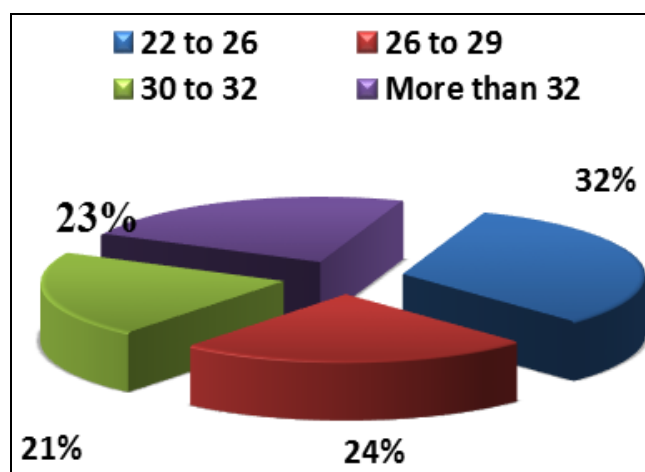
- Age group between 22 to 40 years.
- Both genders– male and female.
- Body Mass Index (BMI) - 18.5-24.9 normal - 25.0-29.9 overweight.
- Subject willing to participate in study.
- Traffic police with 6 to 8 hours of duty, standing at traffic junction.

### Exclusion Criteria

- BMI –  $\leq$ 30 and above- underweight and obese.
- Subject with any systemic illness and other musculoskeletal disorders specifically in lower limb like foot injuries, degenerative changes of hip and knee.
- Subject with any recent surgeries of lower limb.
- Traffic police with sitting and computer work.

## Result

In total, 128 participants were evaluated from which 73% of participants were males and 27% were females.

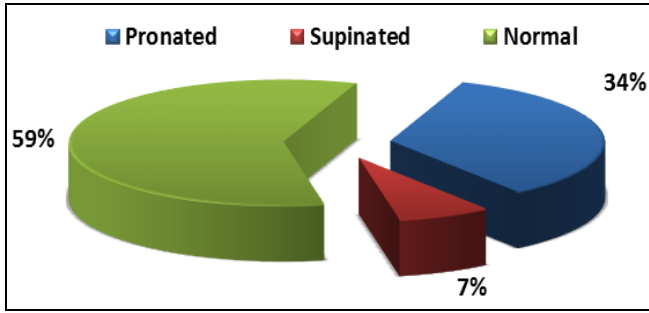


Graph 1: Graph of age distribution

The average age of participants was 22-40 years. The Age wise distribution shows 32% Traffic Police was between 22-26 years, 24% was between 26-29 years, 21% was between 30-32 years and 23% with more than 32 years of age.

Table 1: FPI for Right Leg Distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Pronated	44	34.4	34.4	34.4
Supinated	9	7.0	7.0	41.4
Normal	75	58.6	58.6	100.0
Total	128	100.0	100.0	

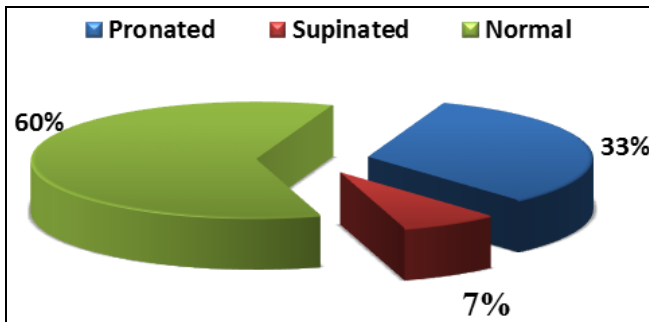


Graph 2: Graph of Fpi results for right leg

In total 34% participants had pronated foot, 7% participants had supinated foot, and 59% participants had normal foot posture at right side

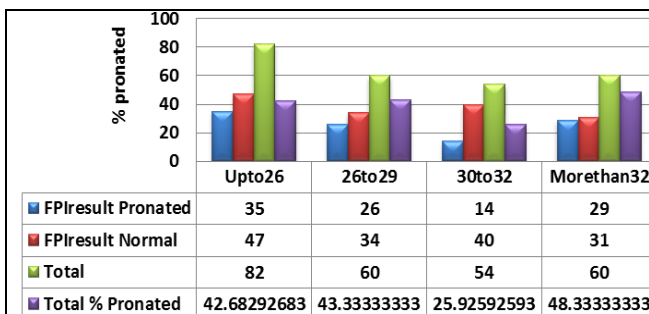
Table 2: FPI for left leg distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Pronated	42	32.8	32.8	32.8
Supinated	9	7.0	7.0	39.8
Normal	77	60.2	60.2	100.0
Total	128	100.0	100.0	

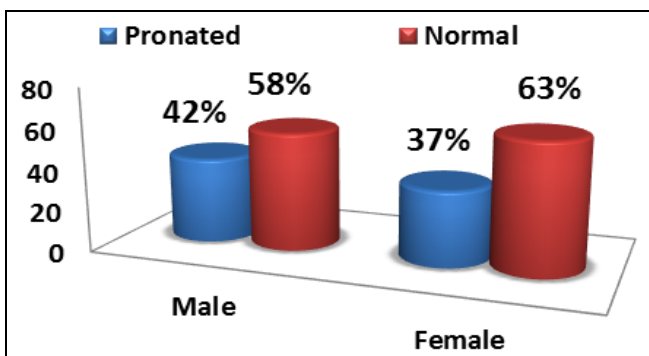


Graph 3: Graph of FPI results for left leg

In total, 33% participants had pronated foot, 7% had supinated and 60% with normal foot posture at left side.



Graph 4: Graph of Effect of Age on Leg Pronation

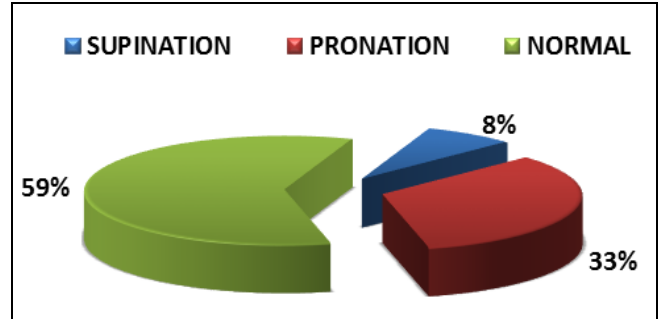


Graph 5: Graph of Effect of gender on FPI

The BMI groups were with 63% between 18.5-24.9 (Normal weight) and 37% between 25-29.9 (Overweight), out of which pronated foot in overweight was 36% and pronated foot in normal BMI was 33%.

Table 3: Normal Bmi Fpi Result For Right Side

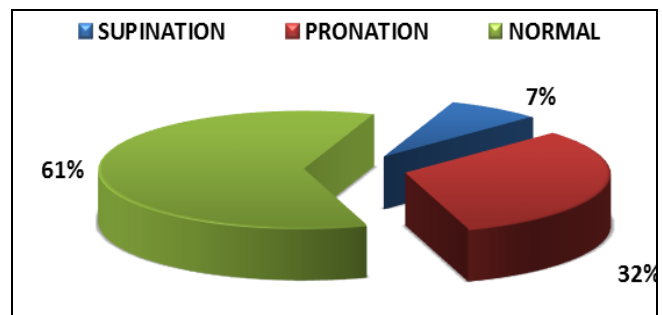
	Supination	Pronation	Normal	Total cases
FPI Result %	8%	33%	59%	
Total cases	6	27	48	81



Graph 6: Graph of normal BMI FPI result for right side

Table 4: Normal BMI FPI Result For Left Side

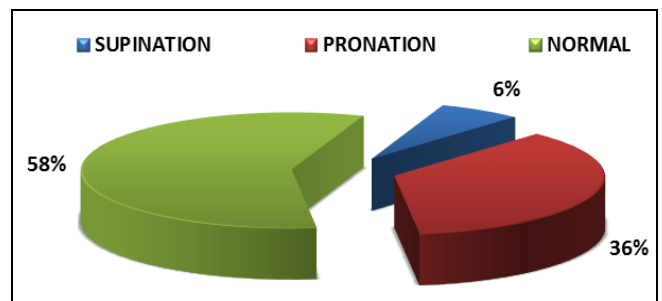
	Supination	Pronation	Normal	Total cases
FPI result %	7%	32%	61%	
Total cases	6	26	49	81



Graph 7: Graph of normal BMI FPI result for left side

Table 5: Overweight BMI FPI result for right SI

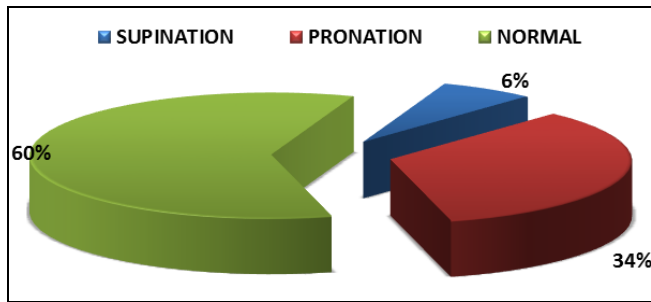
	Supination	Pronation	Normal	Total cases
FPI result %	6%	36%	58%	
Total cases	3	17	27	47



Graph 8: Graph of overweight BMI FPI result for right side

Table 6: Overweight BMI FPI result for left side

	Supination	Pronation	Normal	Total cases
FPI result %	6%	34%	60%	
Total cases	3	16	28	47



**Graph 9:** Graph of overweight BMI FPI result for LEFT SIDE

### Discussion

Present study aimed to find out occurrence of flat foot due to prolonged standing in Traffic Police. Multiple literatures have suggested prevalence of flat foot in obese person but no literature suggested prevalence of flat foot due to prolonged standing in Traffic Police.

While multiple measures and scales are available for determining prevalence of flat foot, FPI has been suggested to be more reliable although to be used with caution. FPI has been derived from search of literature of more than 140 papers. From these 140 papers 26 distinct clinically measures were identified.

Using the mentioned FPI scale the present study shows that 34% of prevalence of flat is present over right side and 33% of flat foot present at left side of Traffic Police.

In this study, incidence of pronated foot in normal BMI is 33% and overweight BMI is 36%, almost equal which justifies our study that may be present due to prolong standing work undertaken by Traffic Police with 6-8 hours of working. The result is helpful in early detection and correction of flat foot which proves beneficial in avoiding or preventing later knee, ankle and gait problems due to altered biomechanics and uneven weight distribution.

The result of this present study suggests that there is association of flat foot due to prolonged standing in Traffic Police and more occurrence of pronated foot over right leg dominance.

### Conclusion

Present study was done at Navsari District among the traffic policemen to assess the presence of flat foot due to prolonged standing with the help of FPI-6. Prolonged standing can cause deleterious effect on medial arch of Traffic Police.

The study concluded that 34% of Prevalence of Flat foot is present due to prolonged standing among Traffic Police. The present study also indicated that there is incidence of 33% of flat foot in Traffic police with normal BMI who are also prone to get flat foot due to prolonged standing as equal to police with overweight.

### References

1. Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise Foundations and Techniques 2012, 6<sup>th</sup> edition.
2. Chaurasia's BD. Human Anatomy Regional and Applied Dissection and Clinical 2004, 2. 4<sup>th</sup> edition.
3. Maheshwari J, Mhaskar. Essential Orthopaedics (Including Clinical Methods) 2015. 5<sup>th</sup> edition.
4. Arnaaz Rusi Doctor, Shweta Satish Devare Phadke, Foot Posture Assessment in Traffic Policemen", International Journal of Physiotherapy and Research 2017;5(4):2249-52. ISSN 2321-1822.
5. Ashwini Chougala, Vidit Phanse, Khanna E, Sudipta Panda. Screening of Body Mass Index & functional

flatfoot in adult: An observational study. International Journal of Physiotherapy & Research 2015;3(3):1037-41. ISSN 2321-1822.

6. Tejashree Bhoir, Dr Deepak Anap, Dr Abhijit Diwate, Prevalence of flat foot among 18-25 years old physiotherapy students: Cross sectional study. Indian Journal of Basic & applied medical research 2014;3(4).
7. Ashok Aenumulapalli, Manoj Mohan Kulkarni. Achleshwar Ramnarain Gandotra Prevalence of Flexible Flat Foot in Adults: A Cross-sectional Study, Journal of Clinical and Diagnostic Research 2017;11(6);AC17-AC20.
8. Dr. Shweta S. Devare Phadke, Dr. Hasmeet Sandhu, Dr. RaufIqbal, Dr. Sujata Yardi. Prevalence of Obesity in Navi Mumbai Traffic Police and Associated Change in Lumbar Curvature Angle", Journal Of International Academic Research For Multidisciplinary 2014, 2(3). ISSN: 2320-5083.
9. Masafumi Terada, Ara M. Wittwer, Phillip A. Gribble "Intra-Rater and Inter-Rater Reliability of the Five Image Based Criteria of the Foot Posture Index 6". The International Journal of Sports Physical Therapy. 2014;9(2):187-94.
10. Barbarah Kelly Gonçalves de Carvalho, Patrícia Jundi Penha, Nárima Lívia Jundi Penha, Rodrigo Mantelatto Andrade, Ana Paula Ribeiro, Sílvia Maria Amado João, The influence of gender and body mass index on the FPI-6 evaluated foot posture of 10- to 14-year-old school children in São Paulo, Brazil: a cross-sectional study", Journal of Foot and Ankle Research 2017;10:1.
11. Obinna Chinedu Okezue, Olisaemeka Ashley Akpangbo, Obinna Antoninus Ezeukwu Jeneviv Nene John, Davidson Okwudili John, "Adult Flat Foot and Its Associated Factors: A Survey among Road Traffic Officials", Novel Techniques in Arthritis & Bone Research 2019;3(4):555616.
12. Redmond AC, *et al.* Development and validation of novel rating system for scoring standing foot posture: the foot posture index. Clinical Biomechanics (Bristol, Avon) 2006;21910:89-98.
13. Alexandre Marois, Marie-Soleil Cloutier, Nicolas Saunier, Sylvanie Godillon, Daniel Lafond, Francois Vachon, "Safety, stress and work zone complexity: A field study on police officers performing on-foot traffic control", Transportation Research Interdisciplinary Perspectives 2019;1:100018.
14. Sayali Tribhuvan, Dr. Nupoor Kulkarni. Correlation between foot posture index (FPI) and knee osteoarthritis (OA) in elderly individuals, International Journal of Yoga, Physiotherapy and Physical Education 2019, 4(2). ISSN: 2456-5067.
15. Salvador Pita-fernandez, Cristina Gonzalez-martin, Francisco Alonso-tajes, Teresa Seoane-pillado, Sonia Pertega-diaz, Sergio Perez-garcia, Rocio Seijo-bestilleiro, Vanesa Balboa-barreiro, Flat Foot in a Random Population and its Impact on Quality of Life and Functionality", Journal of Clinical and Diagnostic Research 2017;11(4):LC22-LC27.
16. FernandesRudelle Cherie, "To Check Relation between Height Flexibility and Rom of Medial Longitudinal Arch of Foot in Traffic Policemen 2012.
17. Henry Gray (1821–1865). Anatomy of the Human Body 1918, 276.
18. Oatis CA, Beattle PF. Kinesiology: The Mechanics and Pathomechanics of Human Movement 2 edition.

Philidelphia: Lippincott Williams and Wilkins 2009.

19. Isa Halim, Abdul Rahman Omar A Review on health effects associated with prolonged standing in industrial work places IJRRAS 2011, 8(1).
20. Express News Service-Bangalore, on their feet for 8hours traffic cops have bone problem, 2012.
21. Redmond A. The Foot Posture Index: user guide and manual. Retrieved September 2005;29:2014.
22. <http://www.agius.com/hew/resource/ohsilo.html>
23. Driscoll, T. Mitchell, R. Mandryk, J Healey, S & Hendric, Work related Traumatic facilities in Australia, Australian Institute of criminology, L. 1989 to 1992, 1999. NOHSC, AusInfo, Canberra.
24. <http://kathmandupost.ekantipur.com/printedition/news/2012-03-11/occupational-hazards-for-traffic-police-officers.html>