

Prevalence of Idiopathic Toe Walking in Children from 2.5 to 4 Years of Age in Schools in Pune

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ABSTRACT

Background: Children walking on their toes instead of with a typical gait, without evidence of an underlying medical condition, are defined as idiopathic toe walkers. The prevalence of idiopathic toe walkers in Pune is unknown.

Methods: An observational prevalence study of 2.2-4 years old children (n=349) living in Narhe-Ambegaon, Pune, was performed at 5 different schools. Children were assessed for gait pattern, ROM and tightness measurement.

Results: Of the 349 children in the study (190 boys, 159 girls), 5 children (1.4%, 3 boys and 2 girls) were found to be idiopathic toe walkers. Moderate to severe tightness was observed in these children.

Conclusion: The Prevalence of idiopathic toe walking in school going children 2.5 to 4 years in Narhe-Ambegaon region is 1.43%.

Keywords: Prevalence, Idiopathic toe walking, children,

INTRODUCTION

Most children begin walking at 12 to 15 months of age.¹ Often, in the early stages of walking, children try different foot positions for walking.¹ Walking up on their toes may be part of this. By around 24 months, they should walk with their feet flat on the ground.¹ By 3 years of age, children should walk with a heel-toe pattern.¹ If walking up on their toes persists this is called toe walking.¹ Toe walking refers to a walking pattern in which a child walks on the balls of their feet and there is no contact between the heels and the ground.¹ There are many medical reasons for this type of walking pattern.¹ Idiopathic toe walking is sometimes referred to as habitual or behavioural, occurs when a child walks on the balls of their feet for an unknown reason. This term applies to toe walking in a child who has been evaluated by their doctor and no medical reason has been identified.¹ Idiopathic toe walking occurs in

otherwise healthy and typically developing children.¹ It always occurs in both feet.¹ Toe walking is a gait abnormality characterized by an absence of heel strike by both feet during gait, with the forefoot engaging in the majority of floor contact throughout the gait cycle. Although toe walking is commonly seen during development in children who are first learning to walk, a consistent heel-toe pattern of gait usually develops by approximately age 22 months. Persistent toe walking beyond age 2 years merits further evaluation. ITW is best defined as bilateral toe walking with or without Achilles tendon contractures in a child older than age 2 years in the absence of other etiologies. In several small studies, ITW was estimated to occur in 7-24% of the childhood population. A large Dutch cross sectional study from 2011 found a prevalence of 12% in the general population. A large Swedish study from 2012 found the prevalence of ITW to be

4.9% in children aged 5 years 6 months. The children who continued toe walking after 5.5 years were called as active toe walkers while the children who discontinued toe walking were called as inactive toe walkers. The classic presentation of a child with ITW is one who is otherwise neurologically normal, possesses normal muscle strength, selective control and demonstrates a preference for walking on the balls of the feet. Children with ITW may demonstrate mild tightness of the heel cords, whereas others have a full passive ankle range of motion (ROM). In some cases of ITW, a child has the ability to walk in a normal heel-toe fashion and just prefers not to.

1. AIM

To find out the prevalence idiopathic toe walking in children from 2.5 to 4 years of age in Narhe-Ambegaon.

2. OBJECTIVES:

- 1) To observe the gait pattern in children under study.
- 2) To measure the range of motion of ankle and knee and hip joint.
- 3) To measure the tightness of Gastrocnemius and Soleus muscle.

3. METHODOLOGY

- 1) Ethical approval was taken from the ethical committee of Smt. Kashibai Navale College of Physiotherapy, Pune, Maharashtra.
- 2) **Study design:** Observational study
- 3) **Study area:** Narhe-Ambegaon, Pune.
- 4) **Sample size:** 349
- 5) **Sampling method:** Convenient Sampling
- 6) **Study duration:** 6 months.

A) INCLUSION CRITERIA:

- School children with onset of toe walking since independent ambulation.
- Bilateral toe walking.
- School children with idiopathic toe walking.
- Age 2.5-4 years

B) EXCLUSION CRITERIA :

- Children with any trauma that will alter gait in last 6 months.

- Children with any neurological or musculoskeletal or systemic disorder.

C. Material used:

- Pen
- Paper
- Goniometer

PROCEDURE:

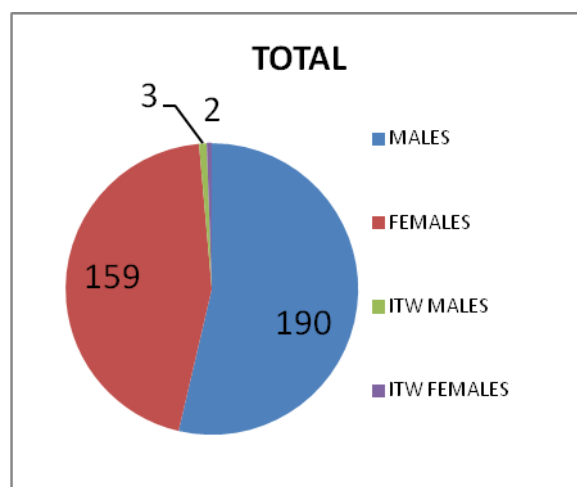
- Ethical committee approval was obtained and permission was taken from the Principal of SKNCOPT.
- Permission from the Principal of the school was taken.
- Subjects were selected according to inclusion criteria.
- Informed written consent was taken from the parents of the subjects after explaining the purpose of the study.
- Assessment of the child was done which includes ROM and tightness measurement.

RESULT AND ANALYSIS

- This study recruited 349 children (190 boys, 159 girls); amongst them 3 boys (1.57%) and 2 girls (1.25 %) were found to be idiopathic toe walkers. Moderate to severe tightness was observed in these children.

	AGE	Ankle Plantarflexion	Ankle Dorsiflexion
Mean	3.24	29.6	6.2
STDEV	0.53	6.02	2.13

The pie chart below represents 5 idiopathic toe walkers with total number of 349 children.



DISCUSSION

This study establishes the prevalence of idiopathic toe walking in Narhe-Ambegaon area. For the age group of 2.5-4 years, 1.4% of the children are considered as idiopathic toe walkers.

A study done by Pahr Engstorm et al. reported a 4.9 % of prevalence of idiopathic toe walking in the age of 5.5 years.²

The present study includes younger population so that the idiopathic toe walking can be diagnosed early.

As stated in a study done by Sobel et al. an average of 12 degrees of dorsiflexion was present in the 1-2 year age group, which gradually diminished to -4 degrees in the 6 to 15 year age group.³

So there is a relationship between the ranges of ankle dorsiflexion and increasing age. The present study shows a similar finding.

In our study also the children who were found to have toe walking were mostly of the age group 3 to 4 years and the tightness of the calf muscles was found to be the cause of the idiopathic toe walking.

Similar studies done on idiopathic toe walking in Sweden and Seattle stated the cause of idiopathic toe walking to be because of visual, vestibular & tactile sensory issues whereas in the present study children with sensory disorders were also included.

Fred Dietz and Songsak Khunsree described various treatment options in their study and questioned the approach that whether toe walking should be treated or not. They believed idiopathic toe walking should be considered a cosmetic deformity and treated only if the gait troubles the family. Non-surgical treatment can be used in surgery-averse families even though its effectiveness is uncertain. Surgical treatment is a reasonable choice for families desiring rapid resolution of the toe walking.⁴

A cross sectional study done by Engelbert, Gorter et al. in 2011 established association between idiopathic toe walking and stiffness of ankle and other joints along

with bone density, muscle strength. A prevalence of 12% was found out of which 9% had severe restriction of ankle ROM for the children between age group of 8 to 20 years.⁵

An evidence summary given by Eiff, Steiner et al. states the methods for evaluation and treatment. In some case series and case studies, the researchers have used EMG studies to differentiate the idiopathic toe walking gait from cerebral palsy gait. There is overlapping in gait EMG values. But gastrocnemius co activation during resisted knee extension indicates neurological pathology. In kinematic analysis, maximum knee extension occurred at ground contact in idiopathic toe walking group whereas knee was flexed at ground contact in mild cerebral palsy group. Simple observation, physical therapy, serial casting, and Achilles tendon lengthening surgery have been studied in the treatment of idiopathic toe-walking. In a retrospective study of 80 children, parental satisfaction was proved to be good with these treatment methods.⁶

A review done by Stott and Walt et al. obtained the results from the studies in which children had undergone either serial casting or muscle lengthening. Out of 13, six had had serial casting only and seven had had muscle lengthening surgery. The children had undergone gait analysis and calf muscle strength testing. This study concluded that power generation from calf muscle showed various results but within normative values. The authors conclude that most subjects showed persistent changes in ankle kinematics and kinetics despite treatment but that this was not detectable visually in most subjects.⁷

A study done Stricker and Angulo et al. compared the three treatment methods such as observation, serial casting and observation, cast/brace treatment, or surgical intervention. Overall, 32% had a family history of ITW, 28% were born prematurely and 16% had psychomotor delay. Forty-eight untreated patients showed little change in passive ankle DF at final

follow-up, and only 25% of parents were satisfied with the child's gait. Compared with untreated children, casting/bracing appeared to offer no significant improvement in ankle DF or parental satisfaction. Surgical treatment was performed in 15 children with more severe equinus contractures. Triceps surae lengthening resulted in significantly improved ankle DF and 67% parental satisfaction ($p < 0.05$). Toe walking may persist after all standard treatment methods even in the absence of significant Achilles contracture.⁸

Le Cras S, Bouck J et al. have given evidence based guidelines for management of idiopathic toe walking.⁹

In a study done by Hirsch and Wagner, et al. 16 former patients with ITW, all were at least 13 years old then, were asked to participate in a follow-up investigation 7–21 years after being first diagnosed. 11 out of them consented for clinical examination during which they were videotaped for gait analysis and range of motion measurements for ankle joint were taken. They concluded that conservative treatment does not have a long term effect on the toe walking pattern.¹⁰

Brouwer and Davidson et al. studied effect of serial casting in children with ITW and CP. Serial casting to stretch the plantar-flexors has been advocated for idiopathic toe-walkers (ITW) and children with spastic cerebral palsy (CP), although outcomes have not been well studied. Neuromuscular function and gait were examined in eight children with CP (mean age, 7.1 years) and eight ITW (mean age, 7.5 years) casted for 3 to 6 weeks. Baseline comparisons indicated that children with CP produced lower isometric plantar-flexor torques ($p < 0.02$) concomitant with marked co-contraction ($p < 0.001$), greater ankle mobility ($p < 0.02$), and higher reflex excitability ($p < 0.001$) than ITW. After casting, both groups increased dorsiflexion range ($p < 0.001$), decreased resistance to passive stretch ($p < 0.005$), and produced maximal plantar-flexor torques in dorsiflexed positions ($p < 0.001$). Reflex

excitability was reduced in CP ($p < 0.05$). Immediately postcasting, no children toe-walked, but two with CP resumed a digitigrade pattern 6 weeks later. Gait velocity and stride length did not change ($p > 0.05$). Serial casting yielded positive outcomes that may be longer lasting in ITW.¹¹

CONCLUSION

The Prevalence of idiopathic toe walking in school going children 2.5 to 4 years in Narhe-Ambegaon region is 1.43%.

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