

Prevalence of Flatfoot in Iranian Children: A Systematic Review and Meta-Analysis

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Abstract

Background: Flatfoot (FF) is one of the most common deformities in children, which is divided into two flexible or rigid types. Given the prevalence of FF and the importance of orthopedic diseases, this meta-analysis was conducted to determine the prevalence of FF in children and adolescents in Iran.

Methods: This study has extracted data related to the prevalence of FF in people under 18 years of age by a meta-analysis of articles published in ISI-PUBMED-SCOPUS-EMBASE-SID-MAGIRA-GOOGLE SCHOOL databases. Original studies published in Persian or English reporting the prevalence of FF in the Iranian population were included in the study. If there was no access to the full file of the article for any reason, it was excluded from the study. Data was analyzed by CMA 3.

Results: It was revealed that the prevalence of FF in girls was equal to 20.8%, and 20.3% in boys. The total prevalence of FF was equal to 20.1%. The prevalence of unilateral FF was equal to 3.9%. The prevalence of bilateral FF was 6.1%. The prevalence of FF was 17.7% for mild FF, 14.2% for moderate FF and 2.8% for severe FF.

Conclusion: Given the high prevalence of FF in Iran, it is suggested that necessary measures be taken to prevent FF while training parents about different effective and risk factors.

Key Words: Flatfoot, Children, Systematic review and meta-analysis.

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1- INTRODUCTION

Orthopedic diseases are common in all ages causing different physical and mental diseases, and disabilities for patients. These diseases may include orthopedic injuries and/or congenital diseases. Any deviation and/or disturbance in the anatomical and functional status of the feet can transmit its effects in a chain-like manner to the joints and upper limbs (1-4). Also, "foot" as one of the organs related to the human orthopedic system, is very important as a support for the body on the ground. So that it has 3 main functions of absorbing the forces of collision with the ground, maintaining the balance and transferring the forward forces (5, 6).

Flatfoot (FF) is one of the most common deformities in children, which is divided into two flexible or rigid types. Rigid FF has higher discomfort compared to flexible FF. For this reason, there will be higher dysfunction and fatigue (7). Flexible FF improves in childhood through three processes; so that by increasing muscle control caused by neuromuscular growth and improving balance in a person, the reduction in physiological laxity and ossification of foot structures improves flexible FF (8, 9). FF in childhood is usually asymptomatic, but given the sensitivity that parents have regarding their child's development, orthopedic abnormalities, especially FF, are among the common reasons for parents to visit doctors (10, 11).

FF causes deformity in children, affecting the child's mental image. Also, fatigue and/or heaviness in the foot, pain, painful callus on the soles of the feet, and swelling are among the complications of FF (12). In fact, compared to those with normal feet, those with FF are twice more prone to stress and fatigue fractures. FF can be diagnosed using standing radiographs of the foot and ankle as well as clinical examinations (13-15). FF is associated with obesity, family history, gender, use of

shoes in infancy and patient age. For this reason, the prevalence of FF may vary depending on the demographic information and lifestyle of patients (16-20).

Given the prevalence of FF and the importance of orthopedic diseases, this meta-analysis was conducted to determine the prevalence of FF in children and adolescents in Iran.

2- MATERIALS AND METHODS

This study has extracted data related to the prevalence of FF in under-18-year-old individuals through meta-analysis and searching articles published in ISI, PUBMED, SCOPUS, EMBASE, SID, MAGIRA, and GOOGLE SCHOOL databases. The search was done independently by two researchers during 1997-2023 and the data was entered in a researcher-made checklist (**Table 1**).

The keywords were child, teenager, school-aged child, students, orthopedic diseases, musculoskeletal disorders, and flexible flatfoot (flat feet), with the conjunctions of AND, OR, and NOT. Original studies that reported the prevalence of FF as frequency or percentage in the Iranian sample and in Persian or English were included in the study. If there was no access to the full text of the article for any reason, it was excluded from the study. Data was analyzed by CMA 3.

3- RESULTS

The findings of 16 articles published during 1997-2021 were analyzed. Total prevalence was reported in 14 articles, the prevalence in boys and girls was reported in 8 articles (separately), FF was reported in 4 articles, and FF severity was reported in 4 articles.

Table 1 presents the primary findings of the original articles, and **Table 2** demonstrates a summary of the analyzed results of this meta-analysis study. According to the results, the prevalence of

FF in girls was equal to 20.8%, and it was 20.3% in boys. The total prevalence of FF was equal to 20.1%. The prevalence of unilateral FF was equal to 3.9%. The prevalence of bilateral FF was equal to 6.1%. The prevalence of mild FF was equal to 17.7%, 14.2% for moderate FF and 2.8% for severe FF (**Fig. 2-12**).

4-DISCUSSION

The prevalence of orthopedic diseases is high and taking care of these patients is important (35). Fractures and deformities related to orthopedic diseases and/or other body organs may be caused by trauma, and congenital, or during birth (36, 37).

Also, given the role of musculoskeletal diseases in children's health, it is important

to investigate the prevalence of musculoskeletal diseases in children (38).

According to the results, the total prevalence of FF was 20.1%. In a study by Bhoir et al. with a sample size of n=80 in the age range of 18-25 years, it was equal to 11.25% (39). In a study by Ganapathy et al. with a sample size of n=250 in the age range of 18-24 years, it was equal to 5.2% (40). In another study by Tashiro et al. with a sample size of n=619, it was reported as 17.8% (41). Yet another study by Ukoha et al. with a sample size of n=649 in the age range of 18-27 years, reported it as 13.9% (42). In a study by Abich et al. with a sample size of n=823 in the age range of 11-15 years, it was found to be 17.6% (43).

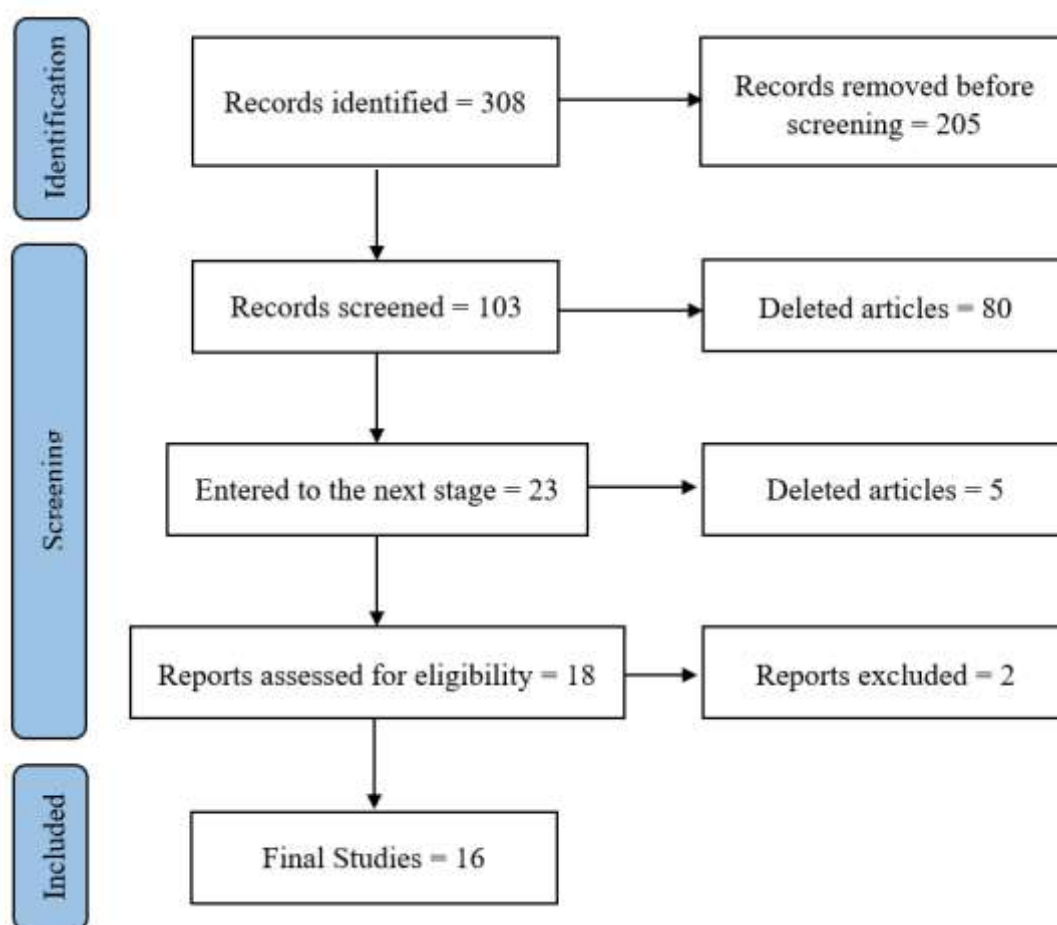


Fig. 1: Flowchart of systematic review

Table-1: Articles included in the systematic review stage

No.	Author (year of publication)	Year	City	Age	N			Feet with FF		Severity			%		
					Girls	Boys	Total	One-sided	Two-sided	Mild	Moderate	Severe	Girls	Boys	Total
1	Zakeri et al (21)	2016	Abadan	6-13	195 (50.9%)	188 (49.1%)	383	-	-	3.7	17.8	1	20.3%	24.6%	22.5%
2	Sadeghi et al (22)	2011	Isfahan	7-14	329	342	671	14.1	9.5	-	-	-	23%	24%	23.5%
3	Chehre-asa et al	2002	Zahedan	7-11	-	-	1750	-	-	-	-	-	4.5%	6.9%	5.7%
4	Kamali et al (23)	2008	Babol	6-18	504	628	1132	6.6%	5.2%	-	-	-	12.1%	11.6%	11.8%
5	Jafar-emami et al(10)	2005	Shiraz	7-11	-	-	812	-	-	23.4%	10.7%	1.6%	-	-	35.7%
6	Shapouri et al (24)	2019	Qom	6-7	620	830	1450	-	-	-	-	-	13.2%	13.5%	13.38%
7	Kachoosangy et al (25)	2013	Tehran	7-12	460	485	945	-	-	23%	34%	17%	75.2%	72.6%	74%
8	Karimi et al (26)	2016	Qom	10-12	-	-	243	-	-	-	-	-	-	-	27.6%
9	Azami herandi et al (27)	1997	Tehran	7-14	-	-	880	1.4%	3.4%	28.7%	5.3%	1.7%	-	-	35.6%
10	Milan et al (28)	2021	Tehran	6-20	-	1539	-	-	-	-	-	-	-	29.3%	-
11	Pourghasem et al (29)	2016	Babol	6-18	505	653	1158	-	-	-	-	-	14.5%	17.5%	16.1%
12	Homayouni et al (30)	2015	Shiraz	6-11	290	-	-	-	-	-	-	-	34.9%	-	-
13	Pashmdarfard et al (31)	2019	Zanjan	7-12	800	900	1700	-	-	-	-	-	-	-	29.5%
14	Mirbagheri et al (32)	2013	Chaharmahal and Bakhtiari	7-11	345	-	345	0(0)	7.8%	-	-	-	-	-	7.8%
15	Sadeghi-Demneh et al (33)	2015	Isfahan	7-14	327	340	667	-	-	-	-	-	-	-	19%
16	Abtahian et al (34)	2016	Shiraz	4-18	244	156	377	-	-	-	-	-	4.5	1.6	6.1%

Table-2: Prevalence of flat feet and its related factors

Variable		Number of studies	Event rate	Lower limit	Upper limit
Prevalence	Girls	8	20.8	9.9	38.5
	Boys	8	20.3	11.3	33.8
	Overall	14	20.1	13.1	29.7
Feet with FF	One sided	4	3.9	1.4	1
	Two-sided	4	6.1	3.9	9.4
Severity	Mild	4	17.7	12.0	25.4
	Moderate	4	14.2	5.8	30.9
	Severe	4	2.8	0.5	13.8

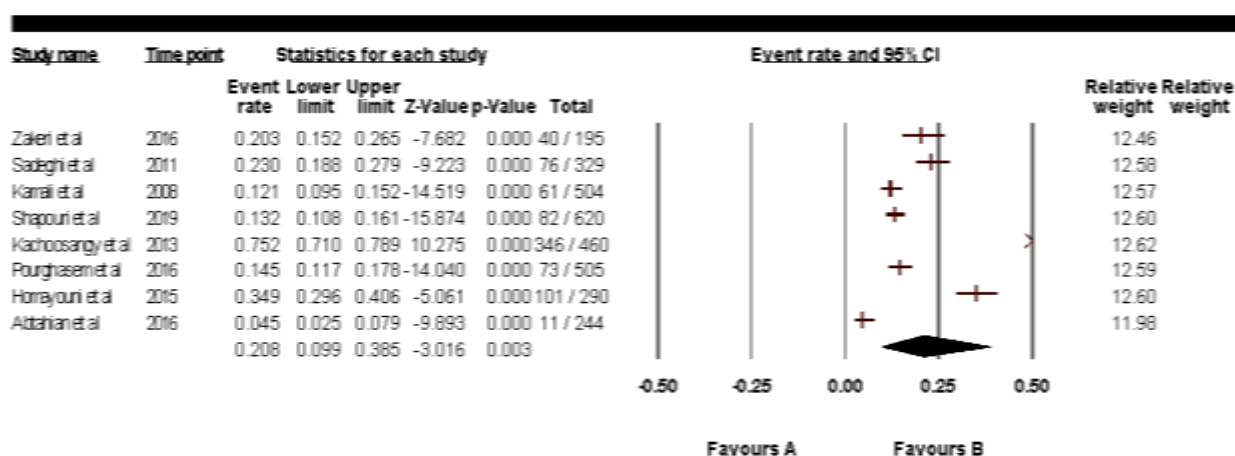


Fig. 2: Prevalence of flat feet in girls

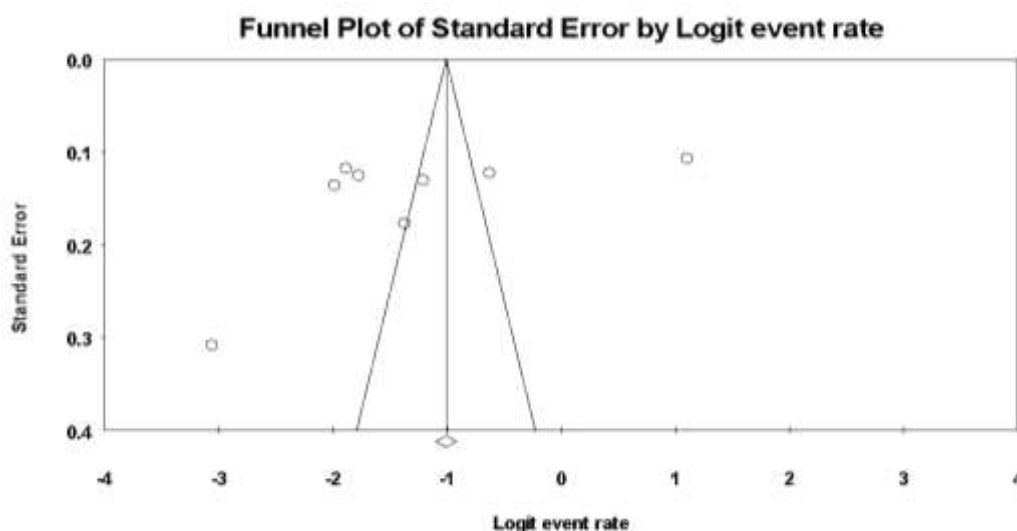


Fig. 3: Publication bias for the prevalence of flat feet in girls

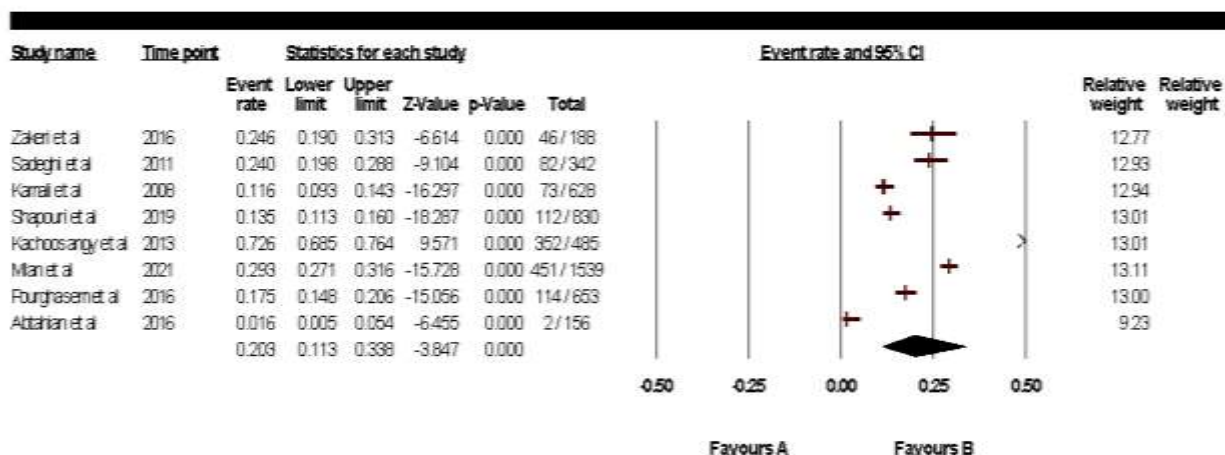


Fig. 4: Prevalence of flat feet in boys

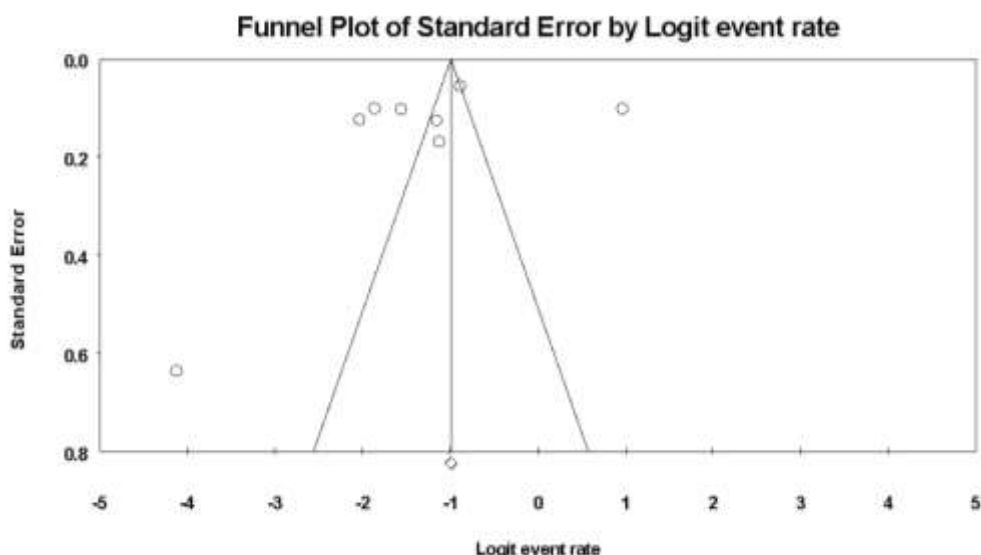


Fig. 5: Publication bias for the prevalence of flat feet in boys

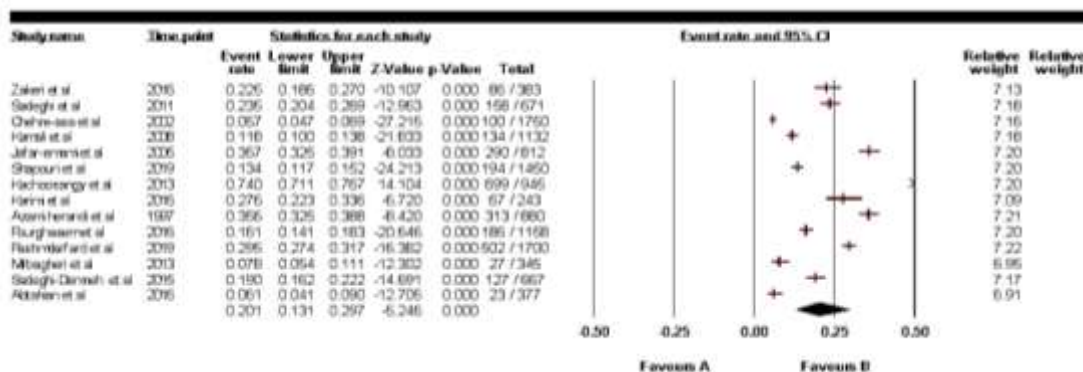


Fig. 6: Prevalence of flat feet in pediatrics

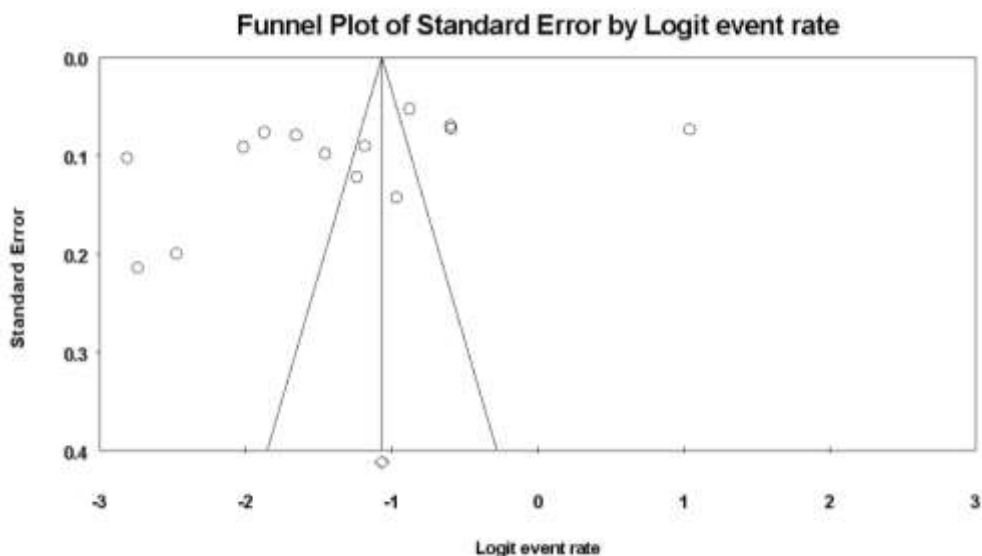


Fig. 7: Publication bias for the prevalence of flat feet in pediatric cases

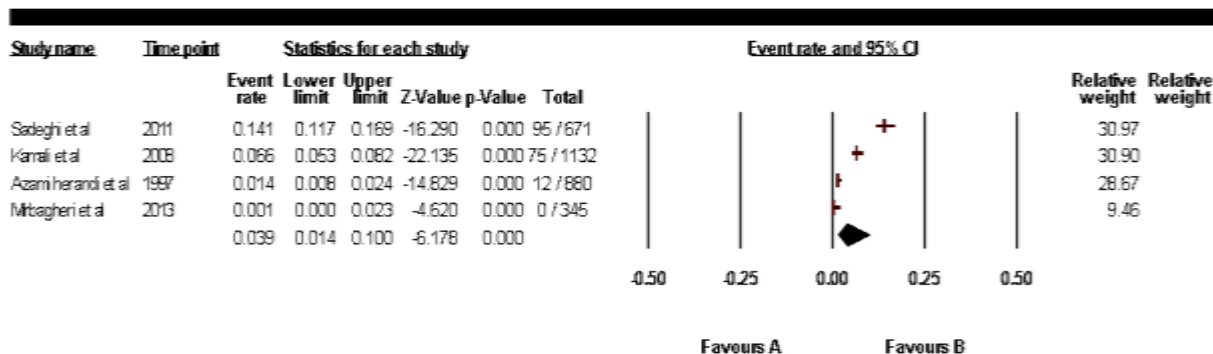


Fig. 8: Prevalence of flat feet on one side in pediatric cases

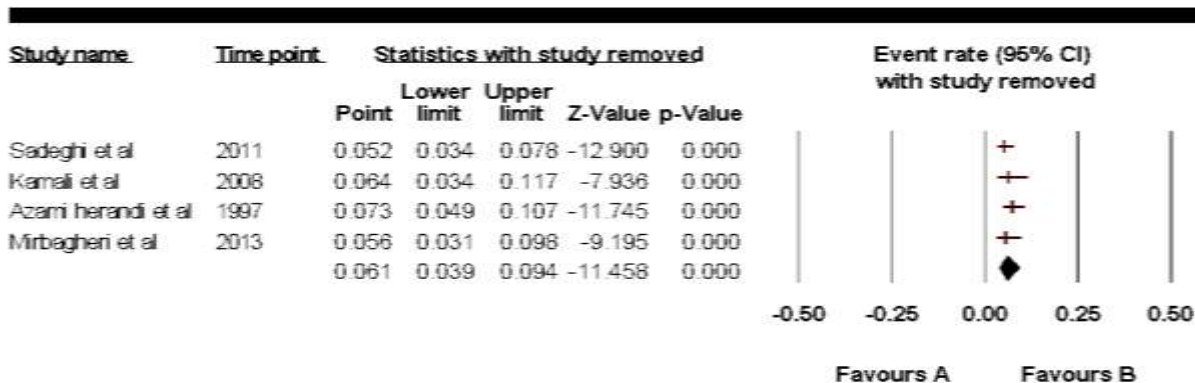


Fig. 9: Prevalence of flat feet on both sides in pediatric cases

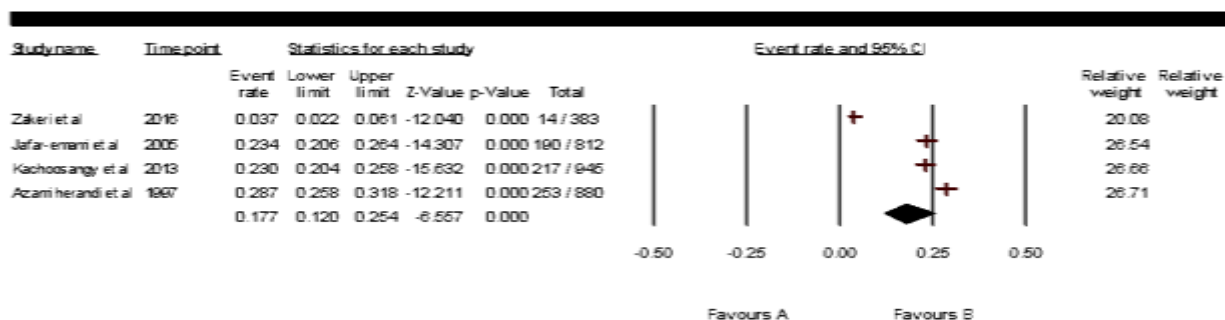


Fig. 10: - Prevalence of mild flat feet in pediatric cases

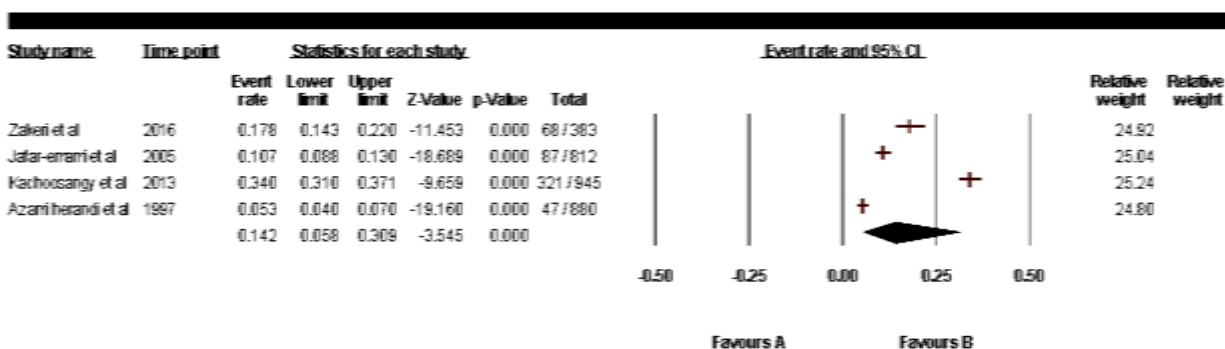


Fig. 11: Prevalence of Moderate flat feet in pediatric cases

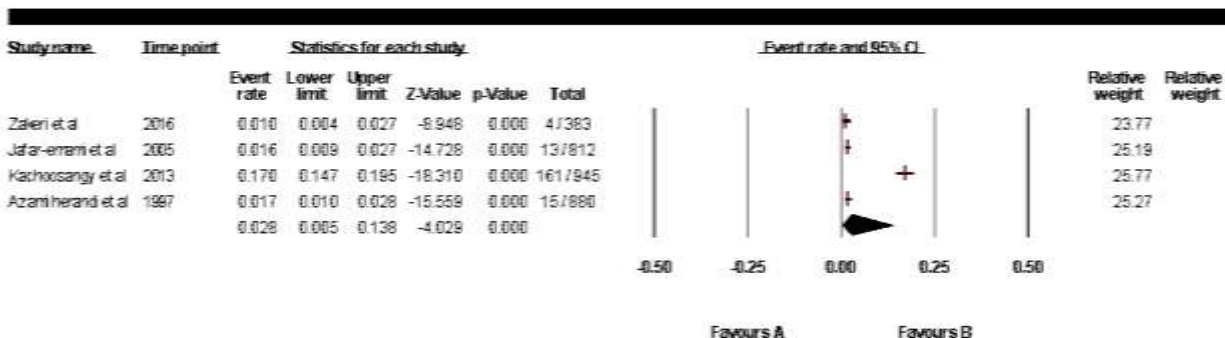


Fig. 12: Prevalence of Severe flat feet in pediatrics

Aenumulapalli et al. evaluated the prevalence of FF in 500 adults in India. The total prevalence of flexible FF was 13.6%, 12.8% in men and 14.4% in women (44).

The prevalence of FF in the results of the above studies was lower than that found in this study, which can be attributed to the

difference in the risk factors of FF; this study was conducted in Iran and the risk factors in the development of FF may be different from those in the studies conducted in other countries and it seems that this factor increases the prevalence of FF in the above studies.

5-CONCLUSION

Given the high prevalence of FF in Iran, it is suggested that necessary measures be taken to prevent FF while training parents about effective and risk factors.

6- CONFLICT OF INTEREST

None.

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