ORIGINAL RESEARCH

Bunionette Deformity with Plantar Ulcers: Scarf Osteotomy as a Solution

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Received on: 23 November 2023; *Accepted on:* 15 December 2023; *Published on:* xxxx

Abstract

Aim of the study: Treatment of bunionette deformity with plantar ulcers is not well elaborated in the literature at present. Scarf osteotomy, as the most preferred mode of treatment in cases of bunionette deformity without ulcers, has been described. Our study is to analyze the efficacy of scarf osteotomy in treating bunionette deformity with different grades of plantar ulcers.

Materials and methods: Twenty patients with bunionette deformities with plantar ulcers (male—9, female—11) were included in the study. We retrospectively analyzed the functional score foot function index (FFI), clinical-healing time of the ulcers, and radiographic parameters—fourth/fifth intermetatarsal and lateral deviation angles (LDAs). Complications (three patients) were also reviewed during the follow-up. The patients were operated on between 2021 and 2023, with the most extended follow-up of 24 months.

Results: The average FFI score improved from 49.22 to 10.7, the 4–5 intermetatarsal angle (IMA) decreased from 11.2 ± 3.14 preoperatively to 4.97 ± 1.09, and the LDA decreased from 6.7 ± 3.42 preoperatively to 3.21 ± 0.42 at final follow-up, respectively. The average ulcer healing time recorded in this study was 44.5 days, and the average osteotomy healing duration was 90 days. The complications noted were infections, ulcer recurrence, and implant removal.

Conclusion: The scarf osteotomy can be an acceptable treatment modality for bunionette deformity with plantar ulcers, offering good results at midterm follow-up.

Keywords: Bunionette deformity, Plantar ulcers, Scarf osteotomy, Tailor's bunion.

Journal of Foot and Ankle Surgery (Asia-Pacific) (2023): 10.5005/jp-journals-10040-1333

Introduction

A bony prominence at the lateral aspect of the fifth metatarsal head is commonly referred to as a bunionette or tailor's bunion.[1] Traditionally, the term bunionette deformity or tailor's bunion is derived from the cross-legged sitting position of the tailors with the lateral edge of the feet in constant contact with the floor. The constant pressure over the lateral border of the foot predisposes to callus formation and subsequent pain over the lateral aspect of the foot.[2,3] The prominence of the metatarsal head, congenitally plantarflexed or dorsiflexed metatarsals increased 4–5 intermetatarsal angle (IMA), and lateral bowing of the metatarsal shaft are the significant anatomical factors contributing to the symptomatic painful bunionette deformities.[4,5] Bunionette deformity is reported to be more common in women when compared to men, and bilateral deformities are also common. Associated deformities, including hallux valgus, hallux rigidus, and hammertoe deformities, are reported at the rate of 30, 10, and 7%, respectively, along with bunionette deformity.[6] Management of the symptomatic bunionette deformity includes simple lateral condylectomy, distal osteotomies like chevron or Mitchell osteotomy, diaphyseal osteotomies like scarf or oblique osteotomy, and proximal osteotomies. The preferred osteotomy depends on the type of bunionette deformity based on the Coughlin classification.[4] Plantar ulcers associated with bunionette deformities are more common among the diabetic population 15% of the diabetic population develop foot ulcers leading to major causes of hospitalization among such patients. Almost two-thirds of diabetic patients with foot ulcers are associated with the triad of neuropathy, vasculopathy, and deformity. Foot ulcers are the predisposing factor for 85% of lower limb amputations among the diabetic foot population.[7–9] Scarf osteotomy as a solution for the management of symptomatic bunionette deformity has been reported earlier in the literature with satisfactory outcomes.[10] We analyze the effect of scarf osteotomy retrospectively in patients with symptomatic bunionette deformity associated with nonhealing plantar ulcers. The authors hypothesize that scarf osteotomy can provide good to satisfactory outcomes in the treatment of bunionette deformity with plantar ulcers.

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How to cite this article: Raja TV, Mavali SK, Mohan P, *et al.* Bunionette Deformity with Plantar Ulcers: Scarf Osteotomy as a Solution. J Foot Ankle Surg (Asia-Pacific) 2023;https://doi.org/10.5005/jp-journals-10040-1333.

Source of support: Nil

Conflict of interest: None

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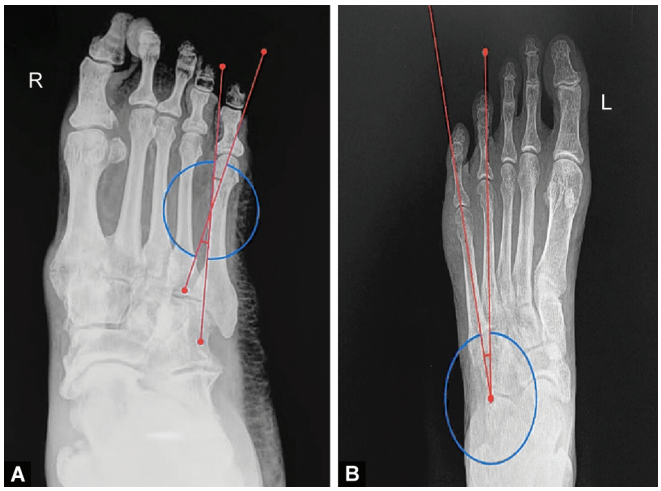
Materials and Methods

A retrospective analysis was performed between June 2020 and August 2023 in 20 patients with symptomatic bunionette deformity associated with nonhealing plantar ulcers. All patients underwent scarf osteotomy for the associated fifth metatarsal deformity. The senior author [T V Raja (TVR)], a fellowship trained in foot and ankle surgery, performed the surgeries on all the patients. The inclusion criteria consisted of a symptomatic painful bunionette deformity not responding to conservative treatment associated with nonhealing plantar ulcers. Type 2 and 3 were included in this study. Type 1 deformity, previous bunionette surgeries, patients with <1-year follow-up, and patients without plantar ulcers were excluded from the study. Weight-bearing anteroposterior and lateral X-rays were performed preoperatively and postoperatively at an interval of 3, 6, and 1-year follow-up. Preoperative ulcer grading and duration of ulcer healing were recorded. Preoperative and postoperative 4–5 IMA and lateral deviation angle (LDA) were recorded. The 4–5 IMA was determined by measuring the angle between the lines bisecting the fourth metatarsal longitudinal axis and the medial cortical margin of the proximal portion of the fifth metatarsal.[11] The LDA was determined by measuring the angle subtended by the lines bisecting the fifth metatarsal head and neck about the medial cortical margin of the fifth metatarsal shaft (Fig. 1).[11] The end point of the study was determined by improvement in 4–5 IMA, LDA, and ankle foot index scores. All the patients showed satisfactory improvement in the values.

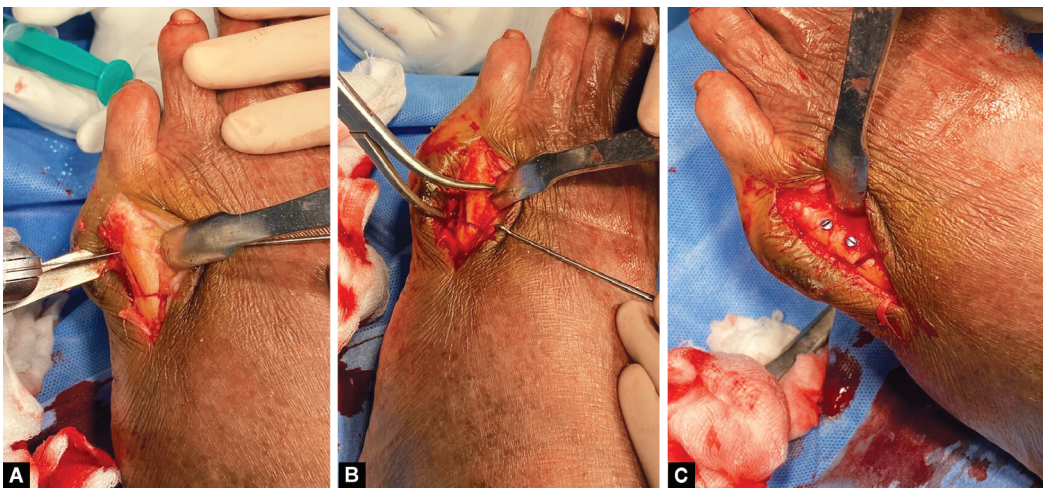


Figs 1A and B: Shows the radiograph illustrating the increased 4–5 IMA and LDA. (A) AP radiograph of the left foot showing increased LDA of 14.2°–type 2 bunionette deformity (normal approximately 2.6°); (B) AP radiograph of the right foot showing increased 4–5 IMA of 11.2°–type 3 bunionette deformity (normal 0–9°)

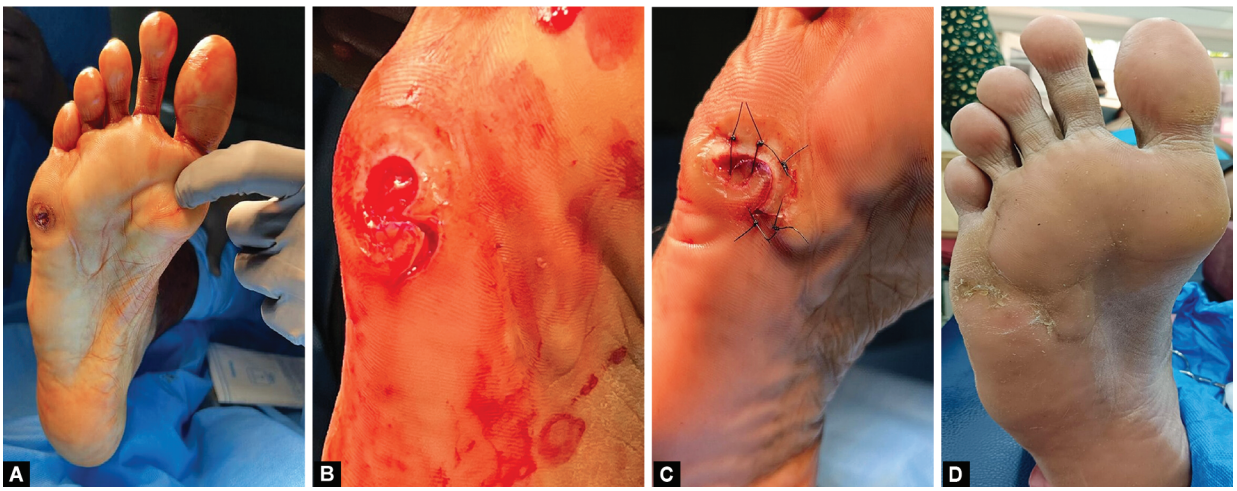
Surgical Technique

All the patients were operated on in a supine position under spinal/regional anesthesia with intraoperative fluoroscopy under tourniquet control by the senior author (TVR). A single-dose preoperative antibiotic (third-generation cephalosporin preferred) was administered. A 5 cm longitudinal dorsolateral incision centered over the fifth metatarsal shaft was used. The metatarsal shaft and head were exposed and the lateral hypertrophied fifth metatarsal head was excised. The scarf osteotomy was performed after the identification of reference points preoperatively. The proximal reference point was approximately 3 cm distal to the base of the fifth metatarsal and the distal reference point was approximately 2 cm proximal to the distal end of the metatarsal head, a longitudinal osteotomy was performed along the metatarsal shaft and a transverse cut was performed at an angle 60° to the previous longitudinal osteotomy. Inclination was performed in all the patients considering the plantar ulcers as a measure to offload the ulcer. The distal osteotomies fragment of the distal metatarsal shaft was mobilized medially and fixed with two 2.5 mm titanium cortical screws. The average length of the screws was measured between 10 and 14 mm (Fig. 2). Postfixation the hypertrophied lateral neck and shaft were excised and smoothened. Capsular repair of the fifth metatarsophalangeal joint was performed with an absorbable suture after correcting the adduction deformity of the fifth toe. The plantar ulcer was debrided and the unhealthy margins were excised. The debrided margins were approximated with nonabsorbable sutures.

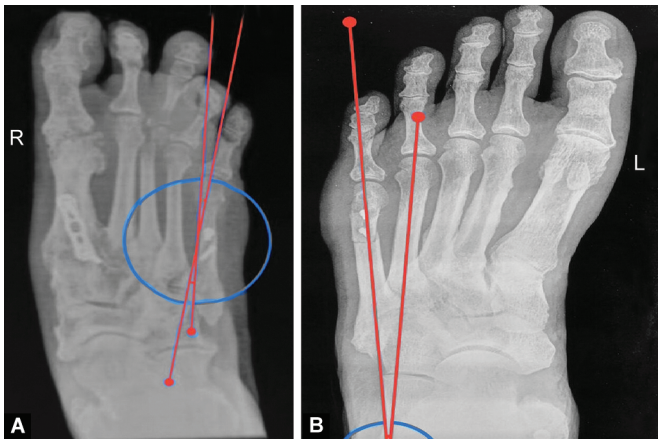
The operated foot was protected with a slab over 2 weeks. Measures to reduce local swelling and inflammation were initiated after surgery and low molecular weight heparin was used for



Figs 2A to C: Shows intraoperative images of scarf osteotomy. (A) Scarf osteotomy is made with an oscillating saw; (B) Medicalization of the capital segment with dorsal displacement; (C) Osteotomy fixed with two 2.5 mm cortical screws



Figs 3A to D: Shows the progression of the ulcer from preoperative to 3 months postoperative status. (A) Preoperative status of the plantar ulcer; (B) Intraoperative picture showing rotation flap after debridement of the ulcer; (C) Status after wound closure; (D) Wound fully healed 3 months postoperative



Figs 4A and B: Shows postoperative correction of 4–5 IMA and LDA. (A) AP radiograph of the foot showing LDA corrected to 4°; (B) AP radiograph of the foot showing 4–5 IMA corrected to 7.7°

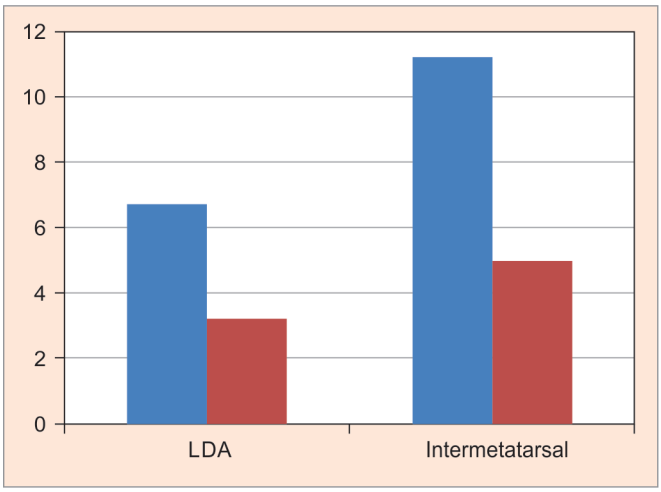


Fig. 5: Graph showing improvement in improvement in LDA and 45IMA postoperatively

prevention of thromboembolism. Crutch-assisted nonweight-bearing ambulation was commenced after surgery till the 2nd week. The debrided ulcer over the plantar aspect was inspected and the regular dressing was carried out every 3 days till complete healing (Fig. 3). Following suture removal and slab removal after 2 weeks patient was encouraged for heel walking. Full weight bearing without assistance was initiated after the clinical and radiological union (average 6–10 weeks).

Results

Follow-up was performed in 20 patients for an average of 12 months (6–24 months) (Table 1). All cases were unilateral. The average age was 50.25 ± 8.123 (range from 36 to 65). There were nine (45%) males and 11 (55%) females. The operative side included 12 (60%) right and eight (40%) left feet. The average foot function index (FFI) score improved from 49.22 to 10.7. Preoperatively the mean 4–5 IMA and LDA were 11.2 ± 3.14 (range 5–14.3) and 6.7 ± 3.42 (range 3.2–14.2), respectively. Six (30%) patients had type 2 deformities and 14 (70%) patients had type 3 deformities. Postoperatively at 1 year the mean 4–5 IMA and LDA was corrected to 4.97 ± 1.09 (range 3.5–7.7) and 3.21 ± 0.42 (range 2.4–4) (Fig. 4). Complications included one (5%) screw removal for an infected implant and two (10%) ulcer recurrence (Table 2). The patients were evaluated based on the improvement in 4–5 IMA, LDA, and AFI scores. All the patients showed satisfactory improvement in scores (Fig. 5).

Discussion

Bunionette deformity traditionally termed tailor's bunion is classified by Coughlin depending on certain radiographic parameters. The deformities are classified as type 1 having an enlarged fifth metatarsal head, type 2 involves increased lateral bowing of the fifth metatarsal head along with normal 4–5 IMA and type 3 patients demonstrate increased 4–5 IMA.[4] Out of the three types, type 3 is the most common and the increased 4–5 IMA is an important risk factor for symptomatic bunionette deformities.[12] Constricting tight footwear is the commonest reason for the pain and irritation in bunionette deformity due to the constant pressure and friction over the prominent lateral aspect of the fifth metatarsal. This constant pressure can lead to painful bursa formation with

Table 1: Treatment chart of bunionette deformity with plantar ulcers managed with scarf osteotomy

Sl No.	*Age/gender*	*Type*	*Ulcer grading*	*LDA*		*IMA*		*Ulcer healing time (days)*	*Osteotomy healing time (days)*	*Complication*	*FFI*	
				Preoperative	*Postoperative*	*Preoperative*	*Postoperative*				*Preoperative*	*Postoperative (1 year)*
1	60/male	Type 3	Grade 2	4	3.2	11.2	7.7	45	90	Nil	45.3	12.9
2	56/male	Type 2	Grade 3	10.8	3.4	6.8	4.3	42	90	Nil	51.6	19.5
3	62/female	Type 3	Grade 3	4.2	2.8	13.5	5.2	50	105	Nil	42.6	11.5
4	45/female	Type 3	Grade 2	5	3.5	14	6.7	60	180	Infected implant	48	10.6
5	52/female	Type 3	Grade 2	4.1	2.4	12.4	6	48	105	Nil	54.7	10.2
6	36/male	Type 2	Grade 3	9.7	2.6	7	5.3	45	105	Nil	48.9	11.2
7	46/female	Type 2	Grade 2	12.3	3.1	5	3.5	90	90	Ulcer recurrence	48.7	10.2
8	50/male	Type 3	Grade 3	4.8	3	12.3	4.3	50	90	Nil	54.3	9.5
9	52/female	Type 3	Grade 3	5	3.6	13.4	3.7	40	90	Nil	48.5	8.6
10	49/female	Type 3	Grade 3	5	3.8	13.6	4.2	44	105	Nil	52.8	10.7
11	47/female	Type 3	Grade 2	4.6	3.5	12.6	3.8	42	90	Nil	57.6	12.8
12	42/male	Type 2	Grade 2	14.2	4	7.2	5.4	42	90	Nil	38.9	7.6
13	55/male	Type 2	Grade 3	11.6	3.1	7.1	3.7	40	90	Nil	54.8	6.8
14	65/female	Type 3	Grade 2	5.6	3.6	13.5	4.8	60	120	Ulcer recurrence	53.7	13.9
15	39/male	Type 3	Grade 3	5.2	3.3	14	6.1	30	90	Nil	47.5	10.1
16	42/male	Type 3	Grade 3	4.1	2.9	14.3	5.8	36	90	Nil	40.3	6.5
17	52/female	Type 3	Grade 2	5	3.6	13.7	5.1	42	105	Nil	49.8	11.8
18	40/female	Type 3	Grade 3	3.2	2.8	12.6	4.3	42	105	Nil	50.5	11
19	59/female	Type 3	Grade 2	4.7	3.2	12.8	4.7	50	90	Nil	46	8.9
20	56/male	Type 2	Grade 2	11	2.8	7	4.9	49	90	Nil	49.9	10.4

Table 2: Distribution of age, sex, ulcer grading, and preoperative and postoperative radiograph results (mean ± standard deviation)—4–5 IMA, LDA ($N = 20$)

Distribution of age		
Age in years		
Mean (standard deviation)	50.25 (8.123)	
Distribution of gender		
Gender	Frequency (20)	Percentage
Male	9	45%
Female	11	55%
Distribution of types of deformity		
Types	Frequency (20)	Percentage
Type 2	6	30%
Type 3	14	70%
Distribution of ulcer		
Grades	Frequency (20)	Percentage
Grade 2	10	50%
Grade 3	10	50%
Preoperative	Mean	Standard deviation
LDA	6.7	3.42
IMA	11.2	3.14
Postoperative		
LDA	3.21	0.42
IMA	4.97	1.09
Median (interquartile range)		
Ulcer healing time	44.5 (42–50)	
Osteotomy healing time	90 (90–105)	
Distribution of different types of complications		
	Frequency (20)	Percentage
Infected implant	1	5%
Ulcer recurrence	2	10%
Nil	17	85%
Correction value	Mean	Standard deviation
LDA	3.49	3.38
IMA	6.22	3.02

LDA, lateral deviation angle; IMA, intermetatarsal angle

progression to ulcers.[13] Type 1 bunionette is managed with either simple exostectomies or distal osteotomy, while type 2 deformities require either distal osteotomy or diaphyseal osteotomy. Type 3 deformities are managed with diaphyseal or proximal osteotomy.

The prevalence of plantar ulcers is high among the diabetic population and it is estimated that 19–34% of the diabetic population develops foot ulcers in recent studies.[14] Peripheral neuropathy plays an important part in the development of foot ulcers in diabetes. The risk of ulcer formation increases when associated foot deformities and trauma are present.[9] The association of the symptomatic bunionette deformity as a cause of plantar nonhealing ulcers is not well elaborated in the present literature. Our study aims to establish the symptomatic bunionette deformity as a risk factor for plantar ulcers, especially in the diabetic population, and deformity-correcting osteotomy procedures can help in the management of the ulcers.

Scarf osteotomy demonstrated good outcomes in the management of symptomatic type 2 and 3 bunionette deformity in midterm and long-term outcome studies.[15] Scarf osteotomy, a sliding diaphyseal osteotomy has the advantage of being intrinsically stable, allowing rotation of the distal fragment and allowing early postoperative rehabilitation.[16] We highlighted the ability of the scarf osteotomy to off-load the plantar ulcers associated with bunionette deformity, enabling the healing of the chronic ulcers. Proximal-based osteotomy, though an option, has a higher risk of nonunion as it hampers the nutrient artery blood supply to the proximal diaphyseal/metaphyseal junction.[17]

We focused on determining the postoperative correction of the bunion deformity in serial X-rays and the time required for the resolution of the plantar ulcers. The average postoperative correction of 4–5 IMA and LDA in our study was 6.22 ± 3.02 and 3.49 ± 3.38, respectively. The Average healing time of the ulcers and osteotomy was reported to be 44.5 and 90 days, respectively. In our study, we encountered the recurrence of ulcers in two (10%) patients. The ulcer recurrence was managed with repeated debridement and offloading measures. Other complications included infection in one (5%) patient, need for implant removal in one (5%) patient, and delayed union in two cases (10%). The infected ulcer was managed with prolonged antibiotic therapy and serial debridement. None of the cases reported nonunion of the osteotomy site.

The scarf osteotomy is an inherently stable osteotomy that allows the correction of varying degrees of bunionette deformities. In our study we demonstrated scarf osteotomy can be an effective osteotomy in offloading the plantar ulcer, elevation of the capital fragment while performing the osteotomy provides good ulcer offloading. The advantages of the scarf osteotomy in treating bunionette deformity in treating plantar ulcers were early postoperative ambulation, increased ulcer healing rates, and lesser risk of nonunion of the osteotomy site. This is a single-center study, which is a limitation for this study and performed by a single surgeon. Multicenter study with long-term follow-up involving a larger group of study samples is required to assess the long-term results following the scarf osteotomy.

Conclusion

Scarf osteotomy demonstrated good healing of the plantar ulcers along with the correction of bunionette deformity. The biomechanically stable scarf osteotomy allows early postoperative ambulation as compared with other traditional osteotomies. All types of bunionette deformities were corrected with scarf osteotomy and the procedure can be used as an offloading measure enabling the healing of the associated chronic nonhealing plantar ulcers. Further long-term follow-up studies are required to assess the use of scarf osteotomy in preventing the recurrence of the plantar ulcers associated with bunionette deformity when compared with traditional osteotomies.

Declarations

Consent

Written informed consent was obtained from our patient for publication of this case series and any accompanying images.

Author's Contribution

- Author 1: Conceptualization, formal analysis, methodology project administration, supervision, validation.
- Author 2: Data curation, formal analysis, investigation, writing-original draft, writing-review, and editing.
- Author 3: Data curation, formal analysis.
- Author 4: Data collection and compilation.

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