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PFPS-Defined Plantar Heel Pain Among Women Aged 40-60 Years Engaged in Prolonged Standing in Kerala, India: A Descriptive Cross-Sectional Online Survey

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Research Article

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Abstract

Background.

Plantar heel pain is a common foot complaint and may be especially relevant where work involves prolonged standing. The Plantar Fasciitis Pain/Disability Scale (PFPS) was developed to quantify pain and disability associated with plantar fasciitis and, in its original validation, to discriminate it from other heel pain in already-diagnosed patients; it is not a stand-alone diagnostic test.

Objective.

To estimate the proportion of women aged 40–60 years engaged in prolonged standing who met a pre-specified PFPS criterion (> 35) for PFPS-defined plantar heel pain, and to describe the distribution of pain and disability.

Methods.

Descriptive cross-sectional online survey of women aged 40–60 years in prolonged-standing roles in Kerala, India (mainly Kannur and Kozhikode), during a one-month period in 2023. Participants were recruited by non-probability voluntary/convenience sampling through a Google Form circulated by WhatsApp and email; 142 women were reached and 100 completed the questionnaire (completion proportion 70.4%). Pain and disability were measured with the PFPS, which incorporates a 0–100 visual analogue scale (VAS). The proportion scoring > 35 was calculated with a Wilson 95% confidence interval (CI); scores were summarised as mean (SD) and median (IQR).

Results.

Of 100 participants, 69 scored > 35 on the PFPS — 69.0% (95% CI 59.4–77.2%); four scored exactly 35 and 27 scored below 35. PFPS totals had a mean of 40.8 (SD 13.2) and median of 40.5 (IQR 33.0–51.3; range 15–67). VAS pain had a mean of 51.2 (SD 16.5) and median of 50 (IQR 40–60); categories were no pain 1%, mild 25%, moderate 65% and severe 9%.

Conclusion.

About seven in ten women in prolonged-standing roles met the pre-specified PFPS criterion for plantar heel pain, with predominantly moderate pain. Because the criterion is not a validated diagnostic threshold and no clinical examination or imaging was performed, the finding represents the symptom burden of PFPS-defined plantar heel pain in a self-selected sample, not the population prevalence of clinically confirmed plantar fasciitis.

1. Introduction

Plantar heel pain is one of the most frequently reported foot complaints in adults and a common reason for seeking foot care. It is an umbrella presentation with several possible causes; plantar fasciitis is the most common, but heel fat-pad disorders, nerve entrapment and calcaneal stress injury can produce similar symptoms. Current clinical guidance therefore emphasises history and physical examination — including plantar-medial heel tenderness, palpation and the windlass test — to classify plantar heel pain, and a symptom questionnaire alone cannot distinguish these entities[1].

Population estimates depend heavily on the definition and measurement method used. A 2024 analysis of the U.S. National Health and Nutrition Examination Survey reported plantar heel pain in 11.1% of adults, rising to 14.5% among those aged 50–65 years[2]. The distinction between symptoms and confirmed disease is important: in a 2024 survey of young women, 66% reported heel pain when wearing high heels, yet only about 6% had a plantar-fasciitis diagnosis[3].

Prolonged standing and repetitive weight-bearing load the plantar fascia and have been associated with plantar heel symptoms in occupational settings; a systematic review found low-quality evidence linking prolonged weight-bearing tasks with plantar fasciitis among workers[4], and contemporary occupational-footwear reviews continue to highlight foot discomfort among those who stand for long periods[5]. Recent research in women has also linked footwear habits to plantar-fasciitis symptoms[6]. Middle-aged women appear disproportionately affected, yet data describing PFPS-defined plantar heel pain among such women in Kerala, India, are limited.

The PFPS was developed to quantify pain and disability associated with plantar fasciitis and, in its original study, to discriminate plantar-fasciitis pain from other heel pain in patients who had *already received a clinical diagnosis*[7]. In that work, the value of “more than 35 points” described the mean difference in scores between the diagnosed and comparison groups — a between-group discriminative finding, not an individual diagnostic threshold with established sensitivity and specificity. Cross-cultural validations in Spanish and Turkish support its reliability and construct validity in clinically diagnosed populations[8,9], though they do not establish > 35 as a diagnostic threshold for an undiagnosed community sample. The PFPS is therefore best understood as a graded pain/disability instrument rather than a diagnostic screen.

This study aimed to estimate the proportion of women aged 40–60 years in prolonged-standing roles meeting a pre-specified PFPS criterion and to describe the distribution of pain and disability, framed explicitly as a symptom-burden survey rather than a diagnostic prevalence study. The **primary objective** was to estimate the proportion scoring > 35 on the PFPS, with a 95% confidence interval. **Secondary objectives** were to describe PFPS severity, VAS pain intensity, and selected symptom and activity-limitation characteristics.

2. Methods

2.1 Study design

Descriptive cross-sectional online survey, reported in accordance with the STROBE recommendations for cross-sectional studies[10].

2.2 Setting

The survey was conducted among women in Kerala, India, with most participants residing in Kannur and Kozhikode (Calicut). Data were collected over an approximately one-month period in 2023. Any later timestamps in the data file reflect subsequent data entry/import rather than participant response dates.

2.3 Participants

Participants were women aged 40–60 years engaged in prolonged standing who provided online informed consent.

2.4 Eligibility criteria

Inclusion: women aged 40–60 years meeting the prolonged-standing definition (§ 2.5). **Exclusion**: inability to complete the questionnaire; wheelchair dependence; pregnancy; a diagnosed neurological disorder affecting gait (e.g. stroke, cerebral palsy, Parkinson's disease); or a known psychiatric condition preventing valid self-report. Other causes of heel pain were not clinically screened out.

2.5 Operational definition of prolonged standing

Prolonged standing was defined — within the questionnaire, before data collection — as standing for more than 4 hours per working day and/or standing continuously for more than 1 hour without moving from the workstation. Eligibility was based on meeting this definition; individual daily standing hours were not retained for analysis, so exposure was treated as a binary eligibility criterion rather than a quantitative dose.

2.6 Sampling and recruitment

Participants were recruited by non-probability voluntary/convenience sampling. A Google Form containing the PFPS was circulated through WhatsApp and email using an existing contact list; eligible women self-selected to participate. No sampling frame or random-selection procedure was used. In total, 142 women were reached and 100 completed the questionnaire (completion proportion 70.4%).

2.7 Sample size

A convenience sample of 100 participants was analysed. No a-priori power calculation was performed; with n = 100 and a proportion near 69%, the 95% CI half-width is approximately ± 9 percentage points, which defines the achieved precision.

2.8 Outcome measure and PFPS scoring

The primary outcome was the proportion of participants scoring > 35 on the PFPS. The PFPS is a self-report pain/disability scale (0–100; higher = worse) incorporating a 0–100 VAS and items on symptoms and activities of daily living[7]. A score > 35 was used as a pre-specified study criterion for PFPS-defined plantar heel pain; it was not treated as a validated diagnostic threshold, and no clinical examination or imaging was performed.

2.9 VAS

Pain intensity was recorded on a 0–100 VAS and categorised as no pain (0–4), mild (5–44), moderate (45–74) and severe (75–100). Because the VAS is a component of the PFPS, it was treated as a descriptive component rather than an independent confirmatory measure.

2.10 Data collection

Data were collected through a self-administered Google Form after the study purpose and the PFPS were explained. Responses were exported for analysis.

2.11 Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. At the time of data collection the college did not have a formal institutional ethics committee; institutional permission to conduct the study was obtained from the Head of the Institution, and online informed consent was obtained from every participant before participation. Formal ethics-committee (IEC/IRB) approval was not obtained and no approval number is available; this is disclosed transparently and, where a target journal requires a formal ethics determination, is flagged as a pre-submission issue for editorial and institutional clarification.

2.12 Statistical analysis

The proportion meeting the PFPS criterion was reported with a Wilson 95% confidence interval; a pre-specified sensitivity analysis considered a ≥ 35 rule because four participants scored exactly 35. PFPS and VAS scores were summarised as mean (SD) and median (IQR); the Shapiro–Wilk test assessed distribution, and median/IQR were emphasised because both distributions were non-normal (PFPS $p = 0.009$; VAS $p = 0.019$). Categorical variables were summarised as n (%). No causal, risk-factor or quality-of-life analyses were undertaken, as exposure and confounder data were not available; accordingly, no association analyses are reported. Analyses were performed in Python (SciPy).

3. Results

3.1 Participant recruitment

Of 142 women reached, 100 completed the questionnaire (completion proportion 70.4%); all 100 had complete PFPS and VAS data and were included (Fig. 1). Reasons for non-completion were not recorded.

3.2 Participant characteristics

All 100 participants were women aged 40–60 years in prolonged-standing roles, mainly from Kannur and Kozhikode (Table 1). Two verified data-entry corrections were applied before analysis (an age recorded as 75 corrected to 55, and one record corrected from male to female); both records were retained, and neither field affects the PFPS or VAS results.

Table 1
Participant characteristics (N = 100).

Characteristic	Category	n (%)
Sex	Female	100 (100)
Age band, years	40–60	100 (100)
Occupational exposure	Prolonged standing (per § 2.5)	100 (100)
Region	Mainly Kannur and Kozhikode, Kerala	—
Recruitment	Online convenience (WhatsApp/email)	100 (100)

Data are n (%).

3.3 Primary outcome

Sixty-nine of 100 participants scored above the PFPS criterion — 69.0% (95% CI 59.4–77.2%). Four participants scored exactly 35 and 27 scored below 35 (Table 2, Fig. 2). In the pre-specified sensitivity analysis, a ≥ 35 rule yielded 73.0% (95% CI 63.6–80.7%), indicating that the estimate is modestly sensitive to the criterion definition.

Table 2
Distribution of PFPS scores and the pre-specified criterion (N = 100).

Measure	Value	95% CI (Wilson)
PFPS, mean (SD)	40.8 (13.2)	—
PFPS, median (IQR)	40.5 (33.0–51.3)	—
PFPS, range	15–67	—
PFPS > 35, n (%) — primary outcome	**69 (69.0)**	**59.4–77.2**
PFPS = 35, n (%)	4 (4.0)	—
PFPS < 35, n (%)	27 (27.0)	—
Sensitivity: PFPS ≥ 35, n (%)	73 (73.0)	63.6–80.7

SD, standard deviation; IQR, interquartile range; CI, confidence interval.

3.4 PFPS distribution

PFPS totals ranged from 15 to 67, with a mean of 40.8 (SD 13.2) and a median of 40.5 (IQR 33.0–51.3) and a mild left skew (Fig. 3).

3.5 VAS distribution

VAS pain intensity ranged from 1 to 85 (mean 51.2, SD 16.5; median 50, IQR 40–60). Most participants reported moderate pain: no pain 1%, mild 25%, moderate 65% and severe 9% (Table 3, Fig. 4).

Table 3
VAS pain-intensity distribution (N = 100).

VAS category (0–100)	n	%
No pain (0–4)	1	1.0
Mild (5–44)	25	25.0
Moderate (45–74)	65	65.0
Severe (75–100)	9	9.0
Total	**100**	**100.0**

VAS, visual analogue scale. Continuous VAS: mean 51.2 (SD 16.5); median 50 (IQR 40–60); range 1–85. The VAS is a component of the PFPS.

3.6 Relationship between PFPS and VAS

PFPS total scores were positively associated with VAS pain intensity (Spearman $\rho = 0.66$, $p < 0.001$; Fig. 5). Because the VAS is a component of the PFPS total, the two overlap by construction and this association is expected rather than an independent validation.

3.7 Selected symptom and activity characteristics

Among item-level responses, pain was more often described as deep than superficial (80% vs 20%) and most commonly localised to the bottom of the heel (60%); pain on descending stairs, standing on the toes and standing after prolonged activity was frequently moderate-to-severe (Table 4). These descriptive item findings are not treated as independent diagnostic tests.

Table 4
Selected PFPS item-level responses (N = 100).

Item	Response	n (%)
Pain quality	Deep	80 (80)
	Superficial	20 (20)
Pain location	Bottom of heel	60 (60)
	Other sites	40 (40)
Pain standing on toes	None / very little	38 (38)
	Moderate	42 (42)
	Severe	20 (20)
Pain descending stairs	None / very little	33 (33)
	Moderate	34 (34)
	Severe	33 (33)
Pain standing after prolonged activity	None / very little	42 (42)
	Moderate	35 (35)
	Severe	23 (23)

Data are n (%); with N = 100, counts equal percentages. Only items with internally complete response distributions are shown; the full item set is available as supplementary material.

4. Discussion

4.1 Principal findings

The principal finding was that 69.0% (95% CI 59.4–77.2%) of women aged 40–60 years in prolonged-standing roles met the pre-specified PFPS criterion for plantar heel pain, with most reporting moderate pain and disability affecting weight-bearing activities.

4.2 Comparison with previous research

This estimate should not be read as a population prevalence of clinically defined plantar fasciitis. For context only, the 2024 NHANES analysis reported plantar heel pain in 11.1% of U.S. adults and 14.5% at ages 50–65[2]; those are symptom prevalences in unselected, population-based samples, whereas the present figure is a symptom-criterion proportion in a self-selected, higher-risk group and is expected to be higher. The gap between symptoms and diagnosis is illustrated by the finding that 66% of young women reported heel pain with high heels but only about 6% had a diagnosis[3].

4.3 Interpretation

The 69% represents participants scoring above a questionnaire criterion, not confirmed cases. Because ">35" derives from a between-group discriminative comparison in already-diagnosed patients[7] and no clinical examination or imaging was performed, the estimate cannot be equated with clinical plantar-fasciitis prevalence; the sensitivity analysis (73% at ≥ 35) reinforces that the figure depends on the chosen criterion.

4.4 Occupational context

The high proportion is consistent with the sample being defined by prolonged-standing exposure, which has been associated with plantar heel symptoms[4–6]. However, exposure was an eligibility criterion rather than a measured gradient, and quantitative standing-exposure and confounder data were not available for analysis; the study therefore cannot examine a dose–response relationship or attribute the burden to standing.

4.5 Clinical and public-health relevance

A high symptom-criterion proportion identifies women in prolonged-standing roles as a group in whom screening and clinical assessment would be worthwhile, and supports workplace attention to footwear, rest and load management. Screening should not rely on the PFPS alone; confirmation requires history, examination (including palpation and the windlass test) and, where indicated, imaging[1].

4.6 Strengths

The study addresses an under-reported occupational group, uses a plantar-fasciitis-specific instrument, applies a pre-specified operational definition of prolonged standing, provides complete participant-level PFPS and VAS data for 100 women, and reports the primary outcome transparently with a confidence interval and an explicitly non-diagnostic interpretation.

4.7 Limitations

The following limitations should be considered:

- Cross-sectional design, precluding temporal or causal inference.
- Non-probability voluntary/convenience sampling via an online form with no sampling frame; selection and volunteer bias are likely, and women with heel pain may have been more inclined to respond.
- Online, self-administered data without supervision or verification of eligibility; reasons for non-completion (42/142) were not recorded.
- No clinical examination and no imaging; plantar fasciitis was not confirmed in any participant, and other causes of heel pain were not excluded.

- The > 35 PFPS value is a study criterion, not a validated diagnostic threshold; a ≥ 35 rule would change the figure to 73%.
- The PFPS was validated in already-diagnosed patients, so applying it to an undiagnosed community sample lies outside its validated use.
- Quantitative standing-exposure, anthropometric and other confounder data were not available for analysis, so no association or risk-factor analysis could be performed.
- The sample was confined to women aged 40–60 years in prolonged-standing roles, mainly in two districts of Kerala, limiting generalisability.
- Self-reported data are subject to recall and reporting bias; the VAS is a component of the PFPS and is not an independent measure.

4.8 Future research

Future studies should use probability-based recruitment where feasible, prospectively record quantitative standing exposure and confounders (e.g. body mass index, footwear, symptom duration), include a non-standing comparison group, and combine validated patient-reported outcomes with clinical examination-based case definition and, where indicated, imaging, to estimate confirmed plantar-fasciitis prevalence and its correlates.

5. Conclusion

Among women aged 40–60 years engaged in prolonged standing who responded to this online survey, 69.0% (95% CI 59.4–77.2%) met the pre-specified PFPS criterion for plantar heel pain, with predominantly moderate pain and activity limitation. Because the study did not include clinical diagnostic examination and PFPS > 35 is not a stand-alone diagnostic threshold, the finding should be regarded as the symptom burden of PFPS-defined plantar heel pain in a self-selected group, not as an estimate of clinically confirmed plantar-fasciitis prevalence. Larger studies using representative sampling and clinical diagnostic assessment are warranted.

Declarations

Ethics statement: This study was approved by the Institutional Review Board (IRB) of the Co-operative Institute of Health Sciences (CIHS), Thalassery, Kannur, Kerala, India. The IRB did not assign an approval/reference number for this study. Online informed consent was obtained from all participants prior to participation.

Ethics approval and consent to participate.

At the time of data collection the college did not have a formal institutional ethics committee. Institutional permission was obtained from the Head of the Institution before data collection, and online

informed consent was obtained from all participants before participation. No formal IEC/IRB approval number is available.

Consent for publication.

Not applicable; no individually identifiable participant information is reported.

Competing interests.

The authors declare no competing interests.

Preprint status.

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Availability of data and materials.

The participant-level PFPS and VAS data are available from the corresponding author on reasonable request.

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Figures

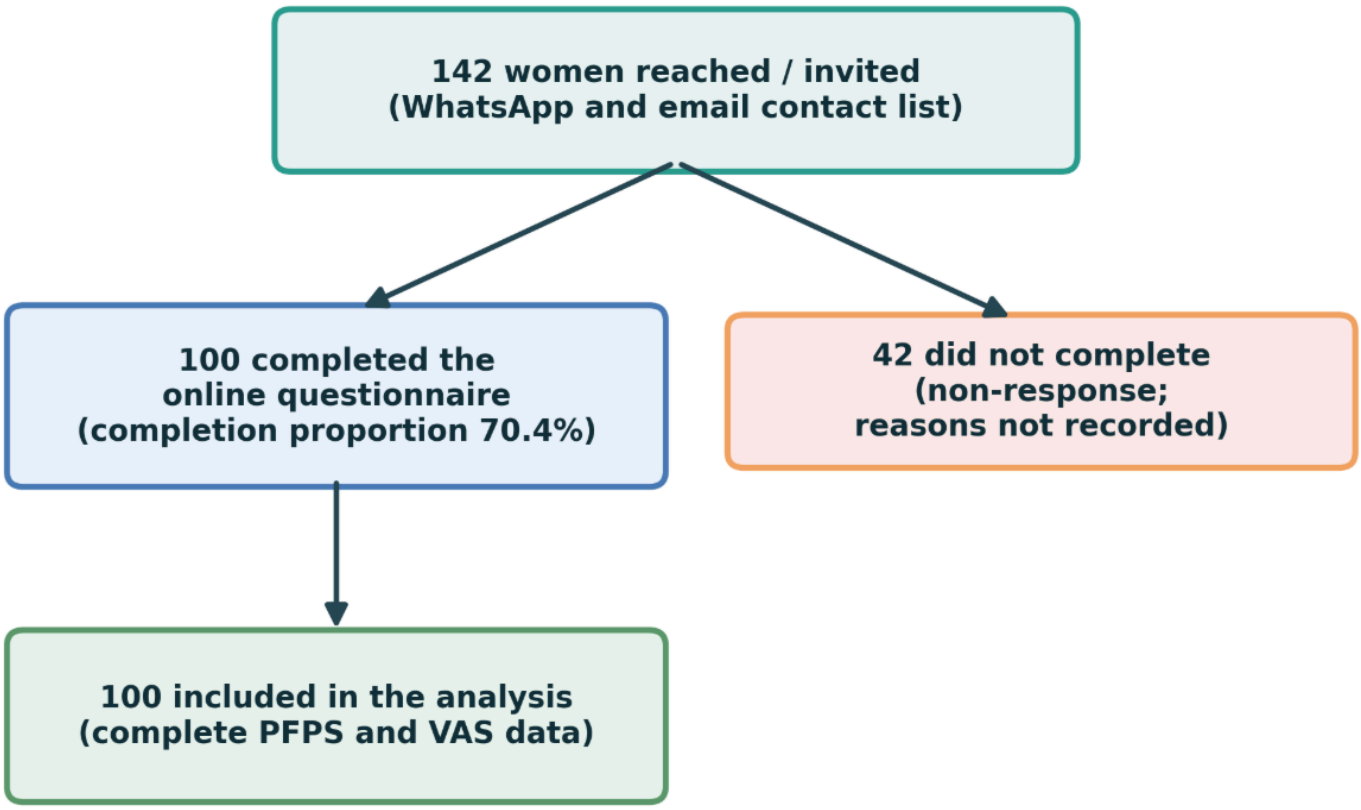


Figure 1

Participant recruitment and inclusion flow. Of 142 women reached through WhatsApp and email, 100 completed the online questionnaire (completion proportion 70.4%) and all 100 were analysed.

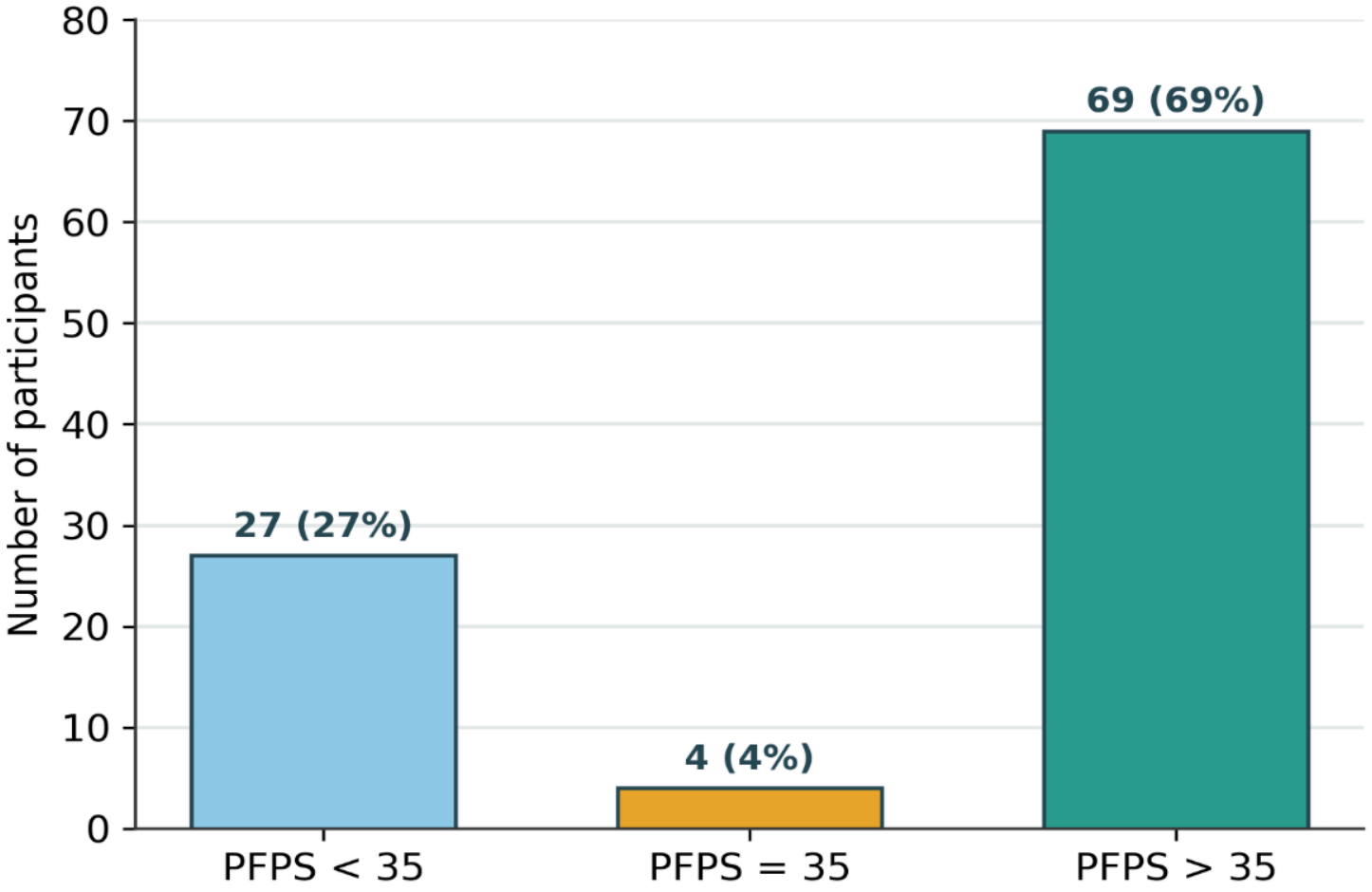


Figure 2

Distribution of participants according to the pre-specified PFPS criterion (n = 100): PFPS < 35, = 35 and > 35.

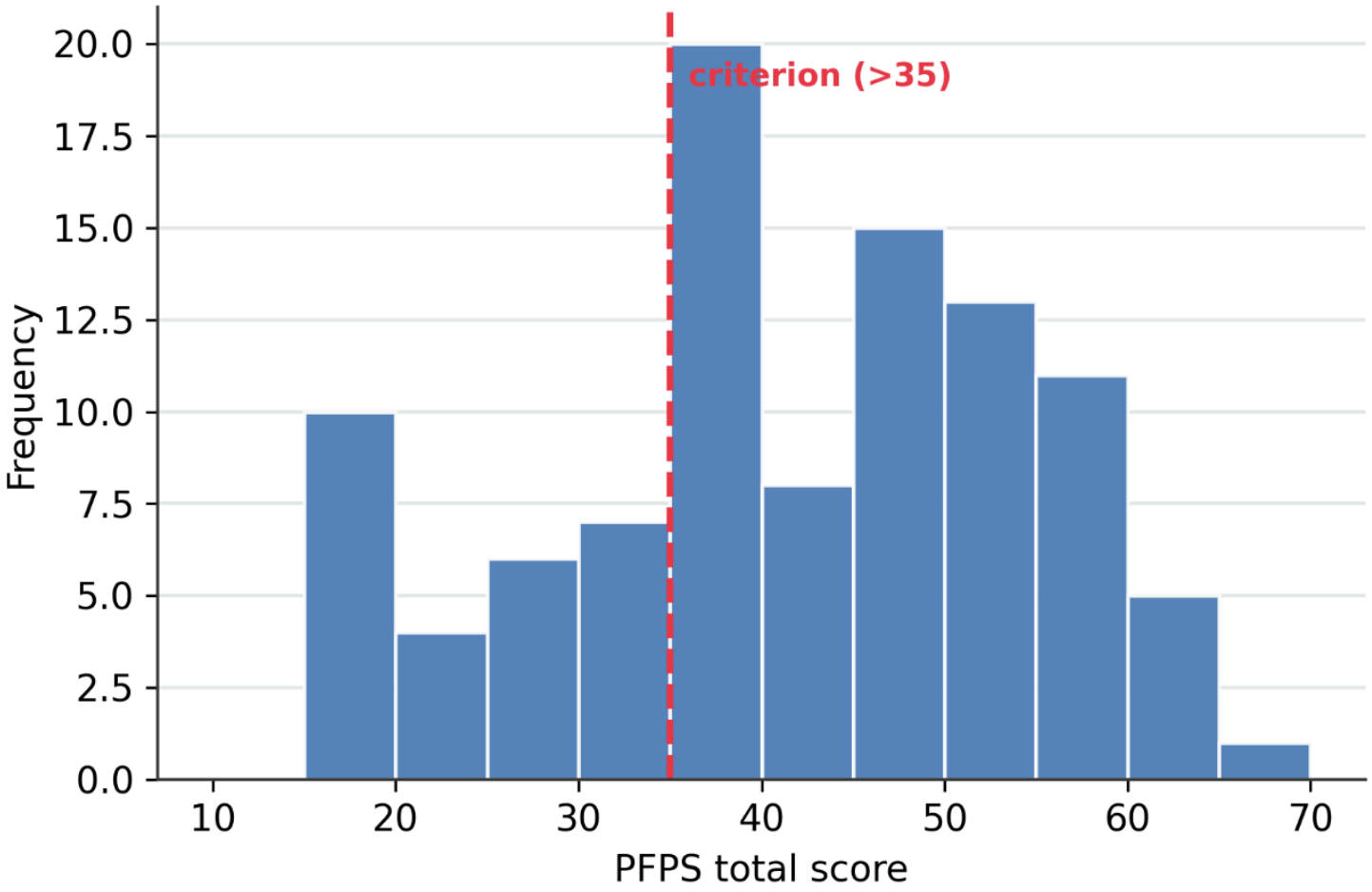


Figure 3

Histogram of PFPS total scores (n = 100). The dashed line marks the pre-specified study criterion (>35); it denotes the study criterion only and not a validated clinical diagnostic threshold.

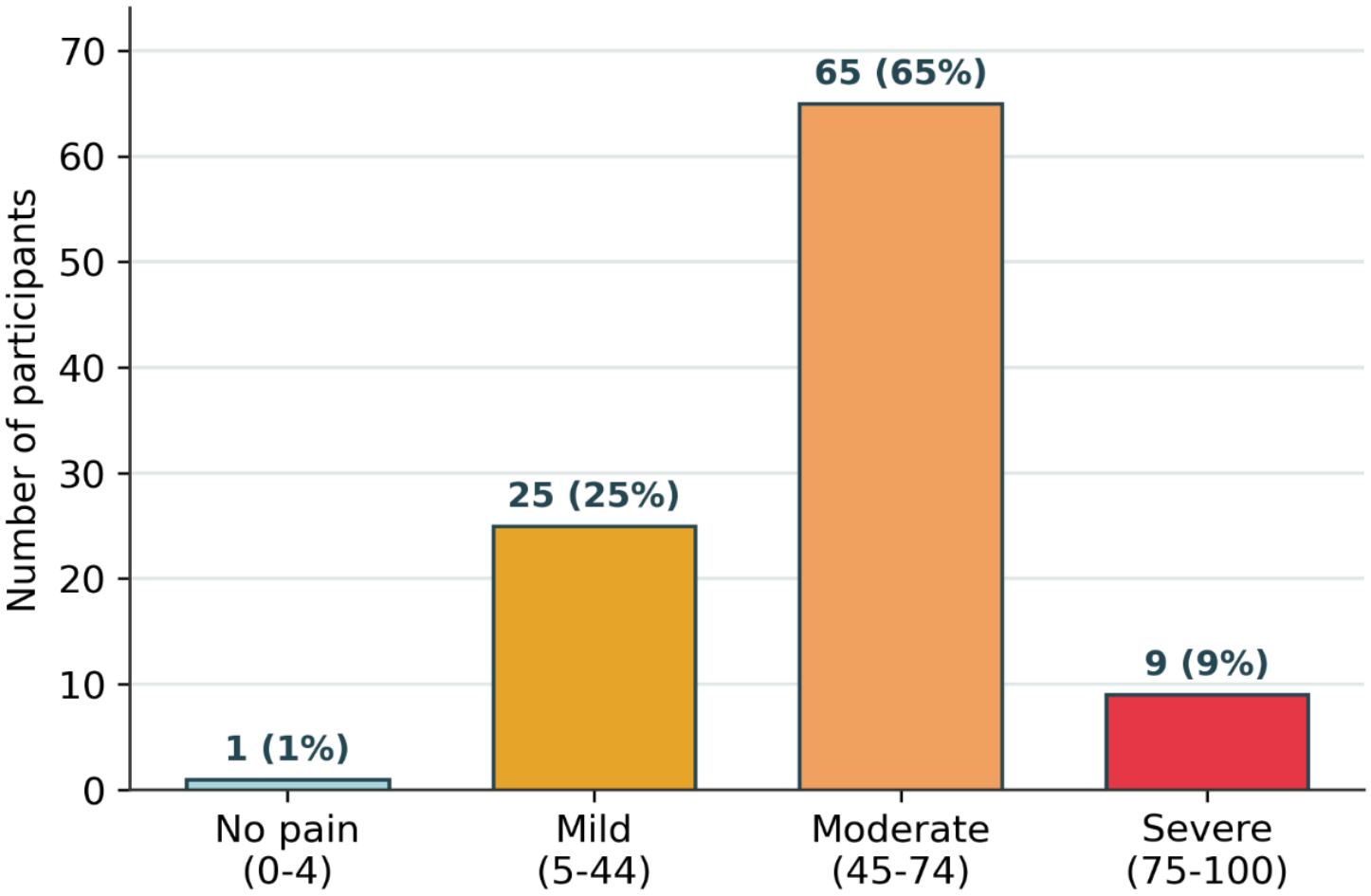


Figure 4

Distribution of participants across VAS pain-intensity categories (n = 100).

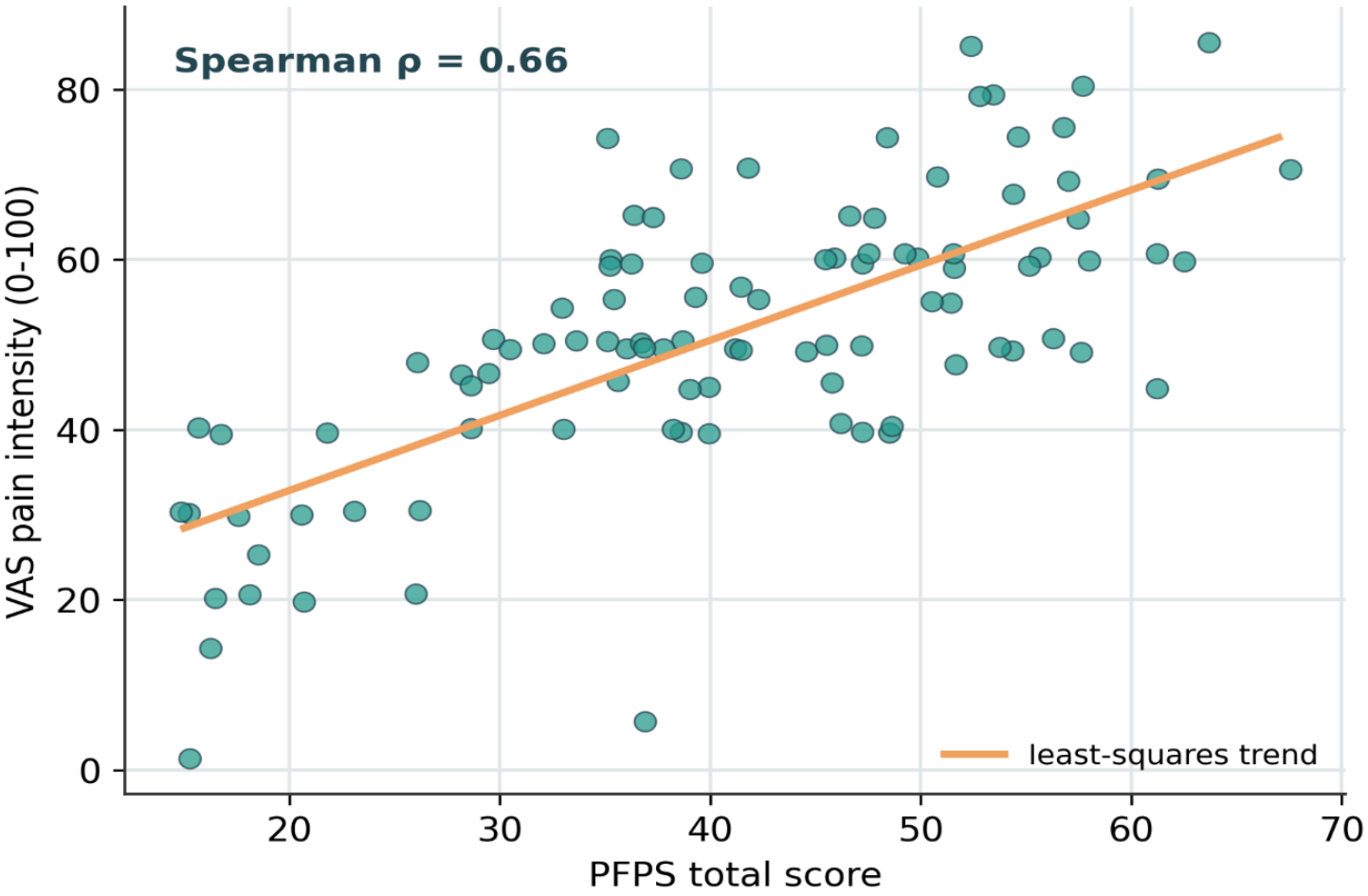


Figure 5

Scatter plot of PFPS total score against VAS pain intensity (n = 100), with least-squares trend line (Spearman ρ = 0.66). The VAS is a component of the PFPS, so the two measures are related by construction; the plot is descriptive and not an independent validation.