CIÊNCIAS DA VIDA E DA SAÚDE
LIFE AND HEALTH SCIENCES
CIENCIAS DE LA VIDA Y LA SALUD

millenium

Millenium, 2(27)

en

SAÚDE DO PÉ E QUALIDADE DE VIDA DE ESTUDANTES DE ENFERMAGEM: ESTUDO EXPLORATÓRIO MULTIMÉTODO

FOOT HEALTH AND QUALITY OF LIFE OF NURSING STUDENTS: AN EXPLORATORY MULTIMETHOD STUDY

SALUD DE LO PIE Y CALIDAD DE VIDA DE LOS ESTUDIANTES DE ENFERMERÍA: UN ESTUDIO EXPLORATORIO MULTIMÉTODO

Rafael Bernardes[1,2] *https://orcid.org/0000-0003-2110-7483*
Sílvia Caldeira[1,2] *https://orcid.org/0000-0002-9804-2297*
Minna Stolt[3] *https://orcid.org/0000-0002-1845-9800*
Nuno Correia[4,5] *https://orcid.org/0000-0002-3713-0111*
Arménio Cruz[6,7] *https://orcid.org/0000-0003-3254-3176*

[1] Center for Interdisciplinary Research in Health (CIIS), Lisboa, Portugal
[2] Universidade Católica Portuguesa, Lisboa, Portugal
[3] University of Turku, Turku, Finland
[4] ciTecCare - Centro de Inovação em Tecnologias e Cuidados de Saúde, Leiria, Portugal
[5] Instituto Politénico de Leiria, Leiria, Portugal
[6] Nursing School of Coimbra (ESEnfC), Coimbra, Portugal
[7] Health Sciences Research Unit: Nursing (UICISA:E), Coimbra, Portugal

Rafael Bernardes - rbernardes@ucp.pt | Sílvia Caldeira - scaldeira@ucp.pt | Minna Stolt - minna.stolt@utu.fi | Nuno Correia - nuno.correia@ipleiria.pt | Arménio Cruz - acruz@esenfc.pt

Corresponding Author:
Rafael Bernardes
Palma de Cima
1649-023 – Lisboa - Portugal
rbernardes@ucp.pt

RECEIVED: 13th January, 2025
REVIEWED: 05th March, 2025
ACCEPTED: 31st March, 2025
PUBLISHED: 06th May, 2025

DOI: https://doi.org/10.29352/mill0227.39905

RESUMO

Introdução: A saúde do pé é frequentemente negligenciada nos cuidados de saúde, apesar da sua importância para estudantes de enfermagem, que passam longos períodos em pé e a caminhar.
Objetivo: Explorar a relação entre a saúde dos pés, a qualidade de vida e os conhecimentos dos estudantes de enfermagem em contexto de ensino clínico.
Métodos: Foi realizado um estudo exploratório multimétodo sequencial com 54 estudantes, selecionados por amostragem intencional em bola de neve. A avaliação ocorreu no mês 0 e no mês 5 para analisar alterações na exposição clínica.
Resultados: Identificaram-se mudanças na qualidade de vida, especialmente em "dor/desconforto" e "ansiedade/depressão". Problemas nos pés foram comuns, como pés frios (57,4%) e calos/calosidades (29,6%), com limitada consciência sobre deformidades estruturais. Destacaram-se correlações significativas, incluindo uma forte relação entre bolhas e "dor/desconforto" no mês 0 (0,614; $p < 0,05$), reduzindo-se no mês 5 (0,494; $p < 0,01$). A dor nos dedos apresentou uma correlação muito forte com "dor/desconforto" (0,926; $p < 0,01$), e a dor no tornozelo associou-se moderadamente a "problemas na realização das atividades habituais" (0,520; $p < 0,05$).
Conclusão: O estudo evidencia a relação entre a saúde dos pés e a qualidade de vida dos estudantes de enfermagem, recomendando intervenções ergonómicas e melhorias no calçado para promover o bem-estar físico e mental.

Palavras-chave: conhecimentos; atitudes e prática em saúde; qualidade de vida; doenças do pé; estudantes de enfermagem

ABSTRACT

Introduction: Foot health is often neglected in healthcare, despite its importance for nursing students, who spend long periods standing and walking.
Objective: To explore the relationship between foot health, quality of life, and knowledge among nursing students in a clinical education setting.
Methods: A sequential multimethod exploratory study was conducted with 54 students, selected through purposive snowball sampling. Assessments took place at month 0 and month 5 to analyze changes in clinical exposure.
Results: Changes in quality of life were observed, particularly in "pain/discomfort" and "anxiety/depression." Foot problems were common, including cold feet (57.4%) and calluses (29.6%), with limited awareness of structural foot deformities. Significant correlations emerged, including a strong association between blisters and "pain/discomfort" at month 0 (0.614; $p < 0.05$), which weakened at month 5 (0.494; $p < 0.01$). Toe pain showed a very strong correlation with "pain/discomfort" (0.926; $p < 0.01$), while ankle pain was moderately associated with "problems performing usual activities" (0.520; $p < 0.05$).
Conclusion: This study highlights the intricate relationship between foot health and the quality of life of nursing students, advocating for ergonomic interventions and footwear improvements to enhance physical and mental well-being.

Keywords: health knowledge; attitudes and practice; quality of life; foot diseases; nursing students

RESUMEN

Introducción: La salud de lo pie suele ser descuidada en la atención sanitaria, a pesar de su importancia para los estudiantes de enfermería, quienes pasan largos períodos de pie y caminando.
Objetivo: Explorar la relación entre la salud de los pies, la calidad de vida y los conocimientos de los estudiantes de enfermería en el contexto de la enseñanza clínica.
Métodos: Se realizó un estudio exploratorio multimétodo secuencial con 54 estudiantes, seleccionados mediante muestreo intencional en bola de nieve. La evaluación se llevó a cabo en el mes 0 y el mes 5 para analizar cambios en la exposición clínica.
Resultados: Se identificaron cambios en la calidad de vida, especialmente en "dolor/malestar" y "ansiedad/depresión". Los problemas en los pies fueron frecuentes, como pies fríos (57,4%) y callosidades (29,6%), con una conciencia limitada sobre deformidades estructurales. Destacaron correlaciones significativas, incluida una fuerte relación entre ampollas y "dolor/malestar" en el mes 0 (0,614; $p < 0,05$), que se redujo en el mes 5 (0,494; $p < 0,01$). El dolor en los dedos mostró una correlación muy fuerte con "dolor/malestar" (0,926; $p < 0,01$), y el dolor en el tobillo se asoció moderadamente con "problemas en la realización de actividades habituales" (0,520; $p < 0,05$).
Conclusión: El estudio destaca la relación entre la salud de los pies y la calidad de vida de los estudiantes de enfermería, recomendando intervenciones ergonómicas y mejoras en el calzado para promover el bienestar físico y mental.

Palabras Clave: conocimientos sanitarios; actitudes y práctica; calidad de vida; enfermedades del pie; estudiantes de enfermería

DOI: https://doi.org/10.29352/mill0227.39905

1. INTRODUCTION

The well-being of healthcare professionals is essential, as their physical and mental health directly affects their quality of life (QoL) and patient care. Among healthcare students, foot health is often neglected, despite its critical role in daily life and work (Mbue & Wang, 2023). This is especially relevant for nursing students, who endure prolonged standing and walking during clinical training, placing significant strain on their feet (Almhdawi et al., 2017). Poor foot health may negatively impact QoL, productivity, and overall well-being (Bernardes et al., 2022), yet awareness of foot-related disorders remains limited.

QoL is a multidimensional concept, broadly defined by the World Health Organization (1995) as an individual's perception of their position in life in relation to their culture, goals, and expectations. It plays a crucial role in self-care and symptom relief, and self-reported QoL assessments are essential for care improvements (Haraldstad et al., 2019). Among nurses, musculoskeletal disorders (MSDs) are a major issue, particularly foot and ankle pain, which significantly affects physical health and work performance (Cordioli et al., 2020; Asuquo et al., 2021). MSDs are also linked to depression and anxiety, key components of QoL (Hohls et al., 2021).

Foot health disorders are common among nurses and students, with previous studies linking them to decreased QoL (López-López et al., 2018, 2021). Students are particularly vulnerable, as long clinical hours and stress can contribute to foot pain and other physical impairments (Abledu & Offei, 2015; Rodríguez-Sanz et al., 2018). These factors may create a downward spiral, increasing the risk of burnout and even dropout from nursing programs (Bakker et al., 2019). However, there is a notable gap in research exploring the interplay between foot health, QoL, and nursing students' knowledge of self-care. Addressing this issue is crucial for promoting health awareness and fostering effective self-care behaviors.

Additionally, nursing education plays a pivotal role in shaping students' knowledge, skills, and attitudes toward self-care. While some studies have explored health-promoting behaviors in undergraduate nursing students, the literature on foot health remains limited (Nevins et al., 2016). Given that nursing is both physically and emotionally demanding (Alzayyat & Al-Gamal, 2014), and clinical training environments often contribute to increased stress and lower QoL (Hamaideh et al., 2017; Labrague et al., 2018), it is imperative to address these factors to improve student well-being and academic performance.

Ensuring high QoL among nursing students is essential for enhancing learning outcomes, academic success, and ultimately, patient care. However, there is a lack of research focusing on foot health's role in QoL and self-care knowledge among nursing students. To fill this gap, this study aims to: (i) characterize nursing students' foot health and QoL in clinical settings, (ii) assess their knowledge of foot health, (iii) identify correlations among these factors, and (iv) explore students' perceptions of foot health's impact on their QoL. By addressing these gaps, this study seeks to contribute to improved health practices and nursing education

2. METHODS

2.1 Design and Sample

This sequential multimethod exploratory study was conducted in a Portuguese public Nursing School in January and July 2022. The project leader described the objectives and procedures for four classes. Each student delegate was mandated to collect all interested peers and manage their participation throughout the study. We used STROBE (von Elm et al., 2007) and COREQ (Tong et al., 2007) guidelines to structure and report data.

The initial phase of the study involved two assessment points—prior to (month 0) and following (month 5) exposure to standing environments in clinical settings. During these assessments, students were required to complete two instruments: the Portuguese version of the Self-Administered Foot Health Assessment Instrument (S-FHAI; Stolt et al., 2017) to evaluate current foot health, and the EQ-5D-5L (EuroQol Group, 1990) to assess Quality of Life (QoL).

The subsequent phase took place at the midpoint of the exposure period (Month 3), during which students responded to the Portuguese version of the Nurses' Foot Care Knowledge Test (NFKT; Stolt et al., 2015) and participated in a semi-structured interview.

Inclusion criteria were: (i) nursing students enrolled in a Nursing bachelor degree, at the moment of the study; (ii) nursing students that, at the moment of the recruitment phase, were not enrolled in a clinical setting. The exclusion criteria were being diagnosed with any chronic systematic diseases (e.g., rheumatoid arthritis), students that, at the moment of the recruitment phase, were also committed to a professional working activity or involved in high-competition sports, which might influence foot health (e.g., waitress, door-to-door delivery, among others), being under antipsychotics or other related drugs, and not fluent in Portuguese language.

2.2 Instruments and Outcomes

The primary outcomes were Foot Health at five months, Quality of Life at five months, and Knowledge Level.

Foot Health was assessed using the Portuguese version (IAASP; Bernardes et al., 2024) of the Self-Administered Foot Health Assessment Instrument (S-FHAI), validated for European Portuguese. This self-reported tool measures foot health across four dimensions—Skin Health (11 items), Nail Health (4), Foot Structure (5), and Foot Pain (2)—with a total score ranging from 22 to 44, where higher scores indicate better foot health.

Quality of Life was evaluated using the EQ-5D-5L Portuguese version, which includes a five-dimension descriptive measure (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) and a visual analogue scale (EQ-VAS) ranging from 100 (best health) to 0 (worst health).

Knowledge Level was measured using the Portuguese version (TCE-CP) of the Nurses' Foot Care Knowledge Test (NFKT), which covers five dimensions with 11 questions each. The final score is expressed as the percentage of correct answers.

DOI: https://doi.org/10.29352/mill0227.39905

Students' perceptions were gathered through face-to-face semi-structured interviews, continuing until data saturation. A pilot interview with three students (excluded from the final sample) refined the guide, adjusting question sequence and incorporating prior experience inquiries.
A trained, independent researcher conducted interviews in a designated classroom under optimal conditions, ensuring privacy and minimal disruption. All participants provided explicit consent, and interviews—averaging 20 minutes—were recorded and transcribed verbatim.

2.3 Data analysis

Quantitative data was analyzed using SPSS v.26® (IBM Corp., Armonk, NY, USA), applying descriptive statistics to characterize demographics and Spearman correlation to assess variable relationships. IASSP-related variables were recoded to ensure higher values indicated better foot health.
Qualitative interview data was processed using ATLAS.ti v7, following three phases: pre-analysis, material exploration, and result interpretation. Categories were determined post hoc through an exhaustive reading process, ensuring no relevant elements were overlooked. Coding followed a structured approach—segment selection, enumeration, and categorization—conducted by two researchers. To ensure rigor, categories were validated through independent coding, team discussions, and peer review, with discrepancies resolved collaboratively. This iterative process strengthened coding accuracy and analytical reliability.

2.4 Addressing missing data and control of confounding

There was a high probability of having several students in very different clinical rotations, thus exposed to different environments. To control this, an additional exclusion criterion included only the students enrolled in acute medical-surgical wards. All students who happened to be registered in community settings or fixed clinical appointments in the hospital were not considered and the reasons were explained.
Regarding the effect of personal lifestyle behaviours, as a more sedentary lifestyle would generate different patterns of a more active lifestyle, each student was previously screened regarding their usual activities outside the Nursing School.
Of the 84 students successfully recruited, participation was entirely voluntary, and all students provided informed consent. However, 30 students did not complete the study, resulting in a 35.7% dropout rate. The primary reasons for attrition were scheduling conflicts with clinical placements (40%), voluntary withdrawal due to personal reasons (30%), and non-adherence to study requirements (30%). To assess the potential impact of dropout, we compared baseline characteristics between those who completed the study and those who withdrew, finding no significant differences in age, gender, baseline physical activity levels, or clinical rotation type ($p > 0.05$).
Additionally, while this study controlled for variations in clinical placements by restricting the sample to students in acute medical-surgical wards, we acknowledge that differences in specific work tasks and prior foot problems could have influenced the outcomes. Although these factors were not systematically recorded, their potential role as confounders is recognized, and future research should incorporate them into study designs to improve control over variability.

2.5 Ethics

Written informed consent was required prior to the study, and students were informed that they could drop out of the study whenever they wanted. The voluntary nature of participation was reinforced. To protect the identity of the participants, when transcribing the interviews, ID codes were used to refer to the interviewee (for example, 'student 22' is 'S22').
The study was ethically approved with the code nr. P799_07_2021 and is recorded in ClinicalTrials.gov on the number NCT05197166, and a research protocol was previously published (Bernardes et al., 2022).
The study findings were reported considering the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (von Elm et al., 2007).

3. RESULTS

A total of 54 students were successfully screened at 5 months. Their characteristics can be found in Table 1.

Table 1 – Sample Characteristics (n=54)

		n (%)	M	SD
Sex	Male	6 (11)		
	Female	48 (88.9)		
	Total	54 (100)		
Age			20.79	2.54
Weight at T0			64.00	11.39
Weight at T1			63.59	11.07
Height			165	7.48
BMI at M0			23.39	3.96
BMI at M5			23.09	3.46

Note: M = mean; SD = standard deviation; BMI = body mass index; T0 = month 0 (baseline); T1 = month 5

DOI: https://doi.org/10.29352/mill0227.39905

3.1 Quality of Life

Both QoL dimensions "pain/discomfort" (D4) and "anxiety/depression" (D5) changed at T1 (Table 2).

Regarding D4, at baseline (T0), only five students (9.3%) reported some pain, whereas, at the end of the clinical learning period (T1), one-fourth of the sample reported having pain (13; 24.1%).

Regarding D5, 25.9% (n=14) reported being severely anxious or depressed at baseline. At T1, the same number of students reported having these symptoms. Still, the severity levels slightly decreased, with only one student reporting this same degree of anxiety, 11 (20.4%) slight levels, and 3 (5.6%) moderate levels of anxiety/depression. Of those reporting being severely anxious or depressed at baseline, five declared no anxiety at T1, five were slightly anxious, and three reported moderate anxiety. Still, six students reported being slightly anxious for the first time at T1.

A moderate positive correlation was found between D4 and D5 (0.540; p=0.000), both having a moderate negative correlation with Global Health: -0.432 (p=0.001) and -0.409 (p=0.003), respectively.

Table 2 – Quality of Life – EQ-5D-5L Scores

		T0	T1
Mobility	I have no problems in walking about	54(100)	54(100)
Self-Care	I have no problems washing or dressing myself	54(100)	54(100)
Usual Activities (e.g., work, study, housework, family or leisure activities)	I have no problems doing my usual activities	54(100)	51(94.4)
	I have slight problems doing my usual activities		3(5.6)
Pain/Discomfort	I have no pain or discomfort	49 (90.7)	41 (75.9)
	I have slight pain or discomfort		12 (22.2)
	I have moderate pain or discomfort		1 (1.9)
	I have severe pain or discomfort	5 (9.3)	
Anxiety/Depression	I am not anxious or depressed	40 (71.1)	39 (72.2)
	I am slightly anxious or depressed		11 (20.4)
	I am moderately anxious or depressed		3 (5.6)
	I am severely anxious or depressed	14 (25.9)	1 (1.9)

Note: T0 = month 0 (baseline); T1 = month 5

3.2 Foot Health

Regarding foot health (Table 3), at baseline, more than half of the students (31; 57.4%) reported cold feet, followed by dry skin (26; 48.1%), corns and calluses (16; 29.6%) and sweating feet (13; 24.1%).

At T1, more students reported the presence of corns or calluses (21; 38.9%) and sweating feet (39; 72.2%). On the contrary, there was a dramatic decrease in cold feet (2; 3.7%). Furthermore, the following foot disorders increased or were reported for the first time: oedema (11; 20.4%), leg cramps (17; 31.5%), and pain in the feet (23; 42.6%).

Table 3 – Foot Health – IAASP Scores

	T0		T1	
	Yes	No	Yes	No
Skin breaks or maceration between toes	3 (5.6)	51 (94.4)	8 (14.8)	46 (85.2)
Dry skin	26 (48.1)	28 (51.9)	26 (48.1)	27 (50)
Fissures in the heels	4 (7.4)	50 (92.6)	8 (14.8)	46 (85.2)
Corns or calluses	16 (29.6)	38 (70.4)	21 (38.9)	33 (61.1)
Verrucae		54 (100)	1 (1.9)	53 (98.1)
Blisters	2 (3.7)	52 (96.3)	5 (9.3)	49 (90.7)
Oedema	3 (5.6)	51 (94.4)	11 (20.4)	43 (79.6)
Sweating feet	13 (24.1)	41 (75.9)	39 (72.2)	15 (27.8)
Burning feet	2 (3.7)	52 (96.3)	8 (14.8)	46 (85.2)
Cold feet	31 (57.4)	23 (42.6)	2 (3.7)	52 (96.3)
Leg cramps	7 (13)	47 (87)	17 (31.5)	37 (68.5)
Ingrown toenail	6 (11.1)	48 (88.9)	4 (7.4)	50 (92.6)
Thickened toenail	3 (5.6)	51 (94.4)	4 (7.4)	50 (92.6)
Color changes in the nails	4 (7.4)	50 (92.6)	5 (9.3)	48 (88.9)
Fungal infection of the nails	2 (3.7)	52 (96.3)	1 (1.9)	52 (96.3)
Hallux valgus	12 (22.2)	42 (77.8)	10 (18.5)	44 (81.5)
Taylor's bunion	7 (13)	47 (87)	5 (9.3)	49 (90.7)
Lesser toe deformities	3 (5.6)	51 (94.4)	7 (13)	47 (87)
Low foot arch	2 (3.7)	52 (96.3)	2 (3.7)	51 (94.4)
High foot arch	8 (14.8)	46 (85.2)	4 (7.4)	48 (88.9)
Pain in the last two weeks	6 (11.1)	48 (88.9)	23 (42.6)	29 (53.7)

Note: T0 = month 0 (baseline); T1 = month 5

DOI: https://doi.org/10.29352/mill0227.39905

Regarding pain, the sole of the foot (11; 20.49%) and the heel (10; 18.5%) were the most affected, followed by the thigh (7; 13%) and the knees (6; 11.1%). The more intense pain levels were felt at the sole of the foot (7; 13%) and the heel (4; 7.4%).

3.3 Relationshiop Between Foot Health and Quality of Life

The influence of foot disorders on the quality of life of nursing students is detailed in Table 4 and Table 5.

A strong positive correlation (0.614; p<0.05) was found between the presence of blisters and D4 – Pain/Discomfort at T0. Correlation is weaker after five months but still significant (0.494; p<0.01).

Moderate positive correlations can be found between the presence of oedema and D4 – Pain/Discomfort at baseline (0.480; p<0.01) and T1 (0.495; p<0.01).

Table 4 – Correlations Between Skin Health and Foot Structure with Quality of Life at T0 and T1

	T0			T1		
			EQ-5D-5L			
	Pain/Discomfort	Anxiety/Depression	Health	Pain/Discomfort	Anxiety/Depression	Health
Skin Health						
Skin Breaks	0.201(0.144)	0.041(0.769)	-0.156(0.269)	0.319*(0.019)	0.157(0.256)	-0.234(0.089)
Dry Skin	0.331*(0.014)	0.276*(0.044)	-0.044(0.756)	0.245(0.077)	-0.045(0.749)	-0.059(0.673)
Blisters	0.614**(0.000)	0.331*(0.014)	-0.317*(0.022)	0.494**(0.000)	0.109(0.434)	-0.163(0.238)
Oedema	0.480**(0.000)	0.225(0.101)	-0.317*(0.022)	0.495**(0.000)	0.267(0.051)	-0.119(0.392)
Sweating Feet	0.119(0.391)	0.062(0.655)	-0.025(0.862)	0.336*(0.013)	0.034(0.807)	-0.204(0.139)
Burning Feet	0.276*(0.044)	0.331*(0.014)	-0.213(0.129)	0.428**(0.001)	0.080(0.565)	-0.043(0.758)
Foot Structure						
Low Foot Arch	-0.276*(0.044)	-0.108(0.438)	0.213(0.129)		-0.335*(0.014)	0.406**(0.003)

*p<0.05; **p>0.01

Foot pain in the last two weeks has a moderate negative correlation with global health (-0.432; p<0.01).

A very strong positive correlation was found between pain in the toes and D4 - Pain/Discomfort (0.926; p<0.01), and a moderate positive relationship (0.520; p<0.05) between pain in the ankle and D3 - Problems Performing Usual Activities (0.520; p<0.05) at baseline and T1. At M5, moderate positive correlations were found between pain in the knee and D4 – Pain/Discomfort (0.499; p<0.05), D5 – Anxiety/Depression (0.446; p<0.05) and a moderate negative correlation between pain in the thigh and global health (-0.509; p<0.05).

Table 5 – Correlations between Foot Pain and Quality of Life at T0 and T1

	T0			T1			
				E1-5D-5L			
	D4	S	D3	D4	D5	S	D3
Last 2 weeks	0.294*(0.031)	-0.432**(0.001)		0.384**(0.005)	0.235(0.093)	-0.215(0.127)	0.112(0.430)
Toes	0.926**(0.008)	0.000(1.000)		-0.025(0.909)	-0.233(0.272)	-0.039(0.856)	0.350(0.094)
Ankle	-0.316(0.541)	0.354(0.559)	0.520*(0.011)	0.245(0.260)	-0.238(0.274)	0.108(0.623)	0.520*(0.011)
Knee	0.632(0.178)	-0.354(0.559)		0.499*(0.013)	0.446*(0.029)	-0.248(0.243)	-0.196(0.258)
Thigh				-0.016(0.941)	0.193(0.367)	-0.509*(0.011)	0.067(0.756)

*p<0.05; **p>0.01

3.4 Students' Knowledge about Foot Health

The Nurses' Foot Care Knowledge Test (TCE-CP) was completed by 47 students (Table 6). In the "Foot Structural Deformities" dimension, 37 (78.72%) students scored below 50%, indicating a limited knowledge or ability to identify and recognize such signs and symptoms.

Interestingly, no significant correlations were observed between the knowledge scores (NFKT) and the foot health scores (IAASP). In general, positive scores in any dimension of knowledge are associated with positive scores in the remaining dimensions.

Table 6 – Students' Knowledge about Foot Health

		IAASP Scores				
IAASP Domain	Students Scoring below 50%	Skin	Nails	Foot Structural Deformities	Disease Specific Foot Problems	Footwear
Skin	6 (12.77%)	1	0.543**(0.000)	0.425**(0.003)	0.319*(0.029)	0.161(0.280)
Nails	10 (21.28%)	0.543**(0.000)	1	0.489**(0.000)	0.378**(0.009)	0.445**(0.002)
Foot Structural Deformities	37 (78.72%)	0.425**(0.003)	0.489**(0.000)	1	0.428**(0.003)	0.553**(0.000)
Disease Specific Foot Problems	16 (34.04%)	0.319*(0.029)	0.378**(0.009)	0.428**(0.003)	1	0.516**(0.000)
Footwear	9 (19.15%)	0.161(0.280)	0.445**(0.002)	0.552**(0.000)	0.516**(0.000)	1

*p<0.05; **p>0.01

DOI: https://doi.org/10.29352/mill0227.39905

A total of 22 interviews were conducted, revealing four main categories—risk factors, foot self-care, transition to clinical settings, and footwear characteristics—along with 17 subcategories.

Of the 22 students interviewed, only two lacked awareness of how clinical settings contribute to musculoskeletal disorders (MSDs). One participant admitted underestimating the impact of prolonged standing:

"I had that notion, but I didn't realize how exposed we are in these settings. I didn't think it would be as harsh as it was" (S49).

All students identified body regions affected by prolonged standing, with the lower back being the most frequently mentioned (19 students, 86.4%), followed by the feet (18 students). The knees and ankles were each cited by four students, while only one mentioned the hip and upper limbs. When asked which region most affects their quality of life, no student selected the feet, with 14 instead identifying the lower back:

"I think the lower back since it affects my daily life and work the most" (S76).

Despite reporting increased foot discomfort during and after clinical shifts, few students changed their foot self-care routines. However, many criticized the footwear provided by the Nursing School, citing issues with rigidity, poor insoles, and lack of ventilation:

"There must be ventilation. Our clogs are closed, and at the end of the day, my feet feel baked" (S08).

"The heel at the back isn't good. It keeps the foot rigid, and you can't move it" (S41).

One student highlighted how footwear affected their entire body:

"The heel area is terrible—too hard. The back squeezes, making it uncomfortable. The hallux overlaps the other toes, and a higher heel increases pressure in the front" (S90).

Finally, students' awareness of foot health issues fell into two categories: those who were always aware and those who only became aware after clinical exposure.

4. DISCUSSION

This study explored the relationship between foot health, knowledge, and quality of life among undergraduate nursing students. The observed increase in pain/discomfort and anxiety/depression highlights the complex challenges faced during academic and clinical training. Long hours of study, demanding clinical rotations, and high-stress situations likely contribute to both physical and psychological distress (Wedgeworth et al., 2020). The prevalence of anxiety and depression aligns with previous studies (Ahmed et al., 2023) but suggests that these conditions are not solely due to physically demanding environments. Personal predispositions and external pressures may also play a role, warranting further investigation (Sousa et al., 2022).

Encouragingly, anxiety levels decreased over time, possibly due to growing familiarity with the clinical environment, better coping mechanisms, and increased self-confidence (Savitsky et al., 2020). However, the emergence of six new anxiety and depression cases underscores the fluctuating nature of mental health in nursing students. Identifying early triggers and warning signs is crucial for timely interventions.

Regarding foot health, new disorders such as corns, calluses, excessive sweating, and pain highlight the physical strain of clinical practice. Foot pain increased 3.8-fold from baseline, exceeding previous reports of a 1.7-fold rise (Anderson et al., 2018). Many students prioritized lower back pain over foot health, which may contribute to a lack of preventive care. Addressing these issues through ergonomic interventions and education is essential.

The high prevalence of pain in the sole and heel highlights the impact of prolonged standing and walking during clinical rotations on students' foot health. Pain, strongly linked to long working hours (Mbue & Wang, 2023), is often identified as plantar fasciitis, a common chronic condition among nurses (Sung et al., 2020). This discomfort can reduce mobility and overall quality of life, underscoring the need for ergonomic improvements in clinical settings and better footwear options.

Our study also found a strong correlation between blisters, foot oedema, and pain/discomfort, reinforcing the connection between foot health and overall well-being. Previous research linked poor quality of life to inadequate foot self-care (Rodríguez-Sanz et al., 2018), highlighting the importance of proactive foot care strategies. Additionally, ankle pain was negatively associated with performing daily activities, mirroring findings in professional nurses (Stolt et al., 2017). This suggests that nursing students experience early signs of conditions they may face later in their careers, emphasizing the need for preventive education.

Interestingly, increasing thigh pain was associated with lower global health scores, suggesting that students may adjust their posture or gait to compensate for foot discomfort. While this adaptation provides temporary relief, it may contribute to musculoskeletal issues. Gait deviations in individuals with plantar heel pain (Phillips & McClinton, 2017) and hallux rigidus (Stevens et al., 2022) suggest the need for a holistic approach to foot health, including educational programs on strategic posture and self-care interventions.

While some students lacked awareness of foot and ankle disorders, most recognized the importance of proper footwear. Suggestions such as improved cushioning and ventilation align with previous findings on comfort in standing environments (Anderson et al., 2017). Implementing these features in institutional footwear policies could enhance foot health during clinical training.

DOI: https://doi.org/10.29352/mill0227.39905

The study also revealed inconsistencies between students' health knowledge and foot health scores, suggesting that awareness does not always translate into effective self-care practices (Ross et al., 2017). Addressing this gap through targeted education and preventive strategies is essential to improving foot health and overall well-being among nursing students.

Although it is an exploratory study of a poorly focused topic, some limitations are worth mentioning. The small and localised sample size prevents an adequate extrapolation to other realities, as educational cultures can vary. The short follow-up period of five months might have contributed to a decrease in the richness of the study. Furthermore, although preventive measures to control bias were taken, we could not be sure of some extracurricular activities that could influence foot health. Hence, a direct and sole causality between clinical rotations and decreased foot health cannot be stated, but the correlation is still a reliable conclusion in this context. Moreover, certain inherent biases remained uncontrollable in the context of diverse clinical settings, encompassing varied activities, interventions, and distances traversed. Future studies should increase the follow-up time, provide a more controlled environment of influencing factors and increase sample size to allow for a robust causality inference on the findings, also designing experimental studies.

CONCLUSION

This study aimed to highlight the often-overlooked importance of foot health among nursing students and emphasize proactive foot care as a vital component of holistic healthcare education. By examining the prevalence of foot-related issues, their impact on academic and clinical performance, and potential prevention strategies, we provide valuable insights into student well-being and healthcare education.

The findings underscore the complex relationship between foot health and quality of life, stressing the need for a comprehensive approach that integrates both physical and mental well-being. Nursing schools, educators, healthcare institutions, and policymakers should implement targeted interventions, raise awareness, and introduce ergonomic improvements in clinical settings and footwear to better support students. Further research is essential to develop evidence-based strategies that enhance student well-being and, ultimately, the quality of care they provide.

ACKNOWLEDGEMENTS

This research was funded by Fundação para a Ciência e a Tecnologia (FCT), with a grant with the reference number UI/BD/151102/2021.

AUTHORS' CONTRIBUTION

Conceptualization, R.B., S.C. and A.C.; data curation, R.B. and A.C.; formal analysis, R.B., M.S., N.C. and A.C.; funding acquisition, R.B. and A.C.; investigation, R.B., S.C., M.S., N.C. and A.C.; methodology, R.B., S.C. and A.C.; project administration, R.B. and A.C.; resources, R.B, S.C. and A.C.; software, R.B.; supervision, S.C., M.S. and A.C.; validation, S.C. and A.C.; visualization, S.C. and M.S.; writing-original draft, R.B., M.S. and N.C.; writing-review and editing, R.B., S.C., M.S. and A.C.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Abledu, J. K., & Offei, E. B. (2015). Musculoskeletal disorders among first-year Ghanaian students in a nursing college. *African Health Sciences*, 15(2), 444–449. https://doi.org/10.4314/ahs.v15i2.21

Ahmed, F. A., Alrashidi, N., Mohamed, R. A., Asiri, A., Al Ali, A., Aly, K. H., Nouh, W. G., Demerdash, N. A., Marzouk, S. A., Omar, A. M., Marzouk, M. M., Alkalash, S. H., Moursy, S. M., Fadila, D. E., Eldin, S. S., & Almowafy, A. A. (2023). Satisfaction and anxiety level during clinical training among nursing students. *BMC Nursing*, 22(1), 187. https://doi.org/10.1186/s12912-023-01182-y

Alhmdawi, K. A., Mathiowetz, V., Al-Hourani, Z., Khader, Y., Kanaan, S. F., & Alhasan, M. (2017). Musculoskeletal pain symptoms among allied health professions' students: Prevalence rates and associated factors. *Journal of Back and Musculoskeletal Rehabilitation*, 30(6), 1291–1301. https://doi.org/10.3233/BMR-150513

Alzayyat, A., & Al-Gamal, E. (2014). A review of the literature regarding stress among nursing students during their clinical education. *International Nursing Review*, 61(3), 406–415. https://doi.org/10.1111/inr.12114

DOI: https://doi.org/10.29352/mill0227.39905

Anderson, J., Nester, C., & Williams, A. (2018). Prolonged occupational standing: The impact of time and footwear. Footwear Science, 10(3), 189–201. https://doi.org/10.1080/19424280.2018.1493766

Anderson, J., Williams, A. E., & Nester, C. (2017). An explorative qualitative study to determine the footwear needs of workers in standing environments. *Journal of Foot and Ankle Research*, 10, 41. https://doi.org/10.1186/s13047-017-0222-2

Asuquo, E. G., Tighe, S. M., & Bradshaw, C. (2021). Interventions to reduce work-related musculoskeletal disorders among healthcare staff in nursing homes: An integrative literature review. *Advances*, 3, 100033. https://doi.org/10.1016/j.advn.2020.100033

Bakker, E. J. M., Verhaegh, K. J., Kox, J. H. A. M., van der Beek, A. J., Boot, C. R. L., Roelofs, P. D. D. M., & Francke, A. L. (2019). Late dropout from nursing education: An interview study of nursing students' experiences and reasons. *Nurse Education in Practice*, 39, 17–25. https://doi.org/10.1016/j.nepr.2019.08.002

Bernardes, R. A., Caldeira, S., Parreira, P., Sousa, L. B., Almeida, I. F., Santos-Costa, P., Paiva-Santos, F., & Guardado Cruz, A. (2022). Baropodometric assessment of the podiatric profile of nursing students in clinical settings: A study protocol. *Frontiers in Public Health*, 10, 862048. https://doi.org/10.3389/fpubh.2022.862048

Bernardes, R. A., Caldeira, S., Parreira, P., Sousa, L. B., Apóstolo, J., Almeida, I. F., Santos-Costa, P., Stolt, M., & Guardado Cruz, A. (2023). Foot and ankle disorders in nurses exposed to prolonged standing environments: A scoping review. *Workplace Health & Safety*, 71(3), 101–116. https://doi.org/10.1177/21650799221093796

Bernardes, R. A., Caldeira, S., Stolt, M., Paiva-Santos, F., Santos-Costa, P., & Cruz, A. G**.** (2024). Adaptation and validation of the Self-Administered Foot Health Assessment Instrument for Portuguese undergraduate nursing students. *Journal of Nursing Measurement*. Advance online publication. https://doi.org/10.1891/JNM-2023-0095

Cordioli Junior, J. R., Cordioli, D. F. C., Gazetta, C. E., Silva, A. G. D., & Lourenção, L. G. (2020). Quality of life and osteomuscular symptoms in workers of primary health care. *Revista Brasileira de Enfermagem*, 73(5), e20190054. https://doi.org/10.1590/0034-7167-2019-0054

EuroQol Group. (1990). EuroQol—a new facility for the measurement of health-related quality of life. *Health Policy*, 16(3), 199–208. https://doi.org/10.1016/0168-8510(90)90421-9

Hamaideh, S. H., Al-Omari, H., & Al-Modallal, H. (2017). Nursing students' perceived stress and coping behaviors in clinical training in Saudi Arabia. *Journal of Mental Health*, 26(3), 197–203. https://doi.org/10.1080/09638237.2017.1294732

Haraldstad, K., Wahl, A., Andenæs, R., Andersen, J. R., Andersen, M. H., Beisland, E., Borge, C. R., Engebretsen, E., Eisemann, M., Halvorsrud, L., Hanssen, T. A., Haugstvedt, A., Haugland, T., Johansen, V. A., Larsen, M. H., Løvereide, L., Løyland, B., Kvarme, L. G., Moons, P., Norekvål, T. M., Ribu, L., Rohde, G. E., Urstad, K. H., & Helseth, S. (2019). A systematic review of quality-of-life research in medicine and health sciences. *Quality of Life Research*, 28(10), 2641–2650. https://doi.org/10.1007/s11136-019-02214-9

Hohls, J. K., König, H. H., Quirke, E., & Hajek, A. (2021). Anxiety, depression, and quality of life: A systematic review of evidence from longitudinal observational studies. *International Journal of Environmental Research and Public Health*, 18(22), 12022. https://doi.org/10.3390/ijerph182212022

Labrague, L. J., McEnroe-Petitte, D. M., Papathanasiou, I. V., Edet, O. B., Tsaras, K., Christos, K. F., Fradelos, E. C., Rosales, R. A., Cruz, J. P., Leocadio, M., & Lucas, K. V. S. (2018). A cross-country comparative study on stress and quality of life in nursing students. *Perspectives in Psychiatric Care*, 54(4), 469–476. https://doi.org/10.1111/ppc.12259

Lin, S. C., Lin, L. L., Liu, C. J., Fang, C. K., & Lin, M. H. (2020). Exploring the factors affecting musculoskeletal disorders risk among hospital nurses*. PLoS One*, 15(4), e0231319. https://doi.org/10.1371/journal.pone.0231319

López-López, D., Becerro-de-Bengoa-Vallejo, R., Losa-Iglesias, M. E., Palomo-López, P., Rodríguez-Sanz, D., Brandariz-Pereira, J. M., & Calvo-Lobo, C. (2018). Evaluation of foot health-related quality of life in individuals with foot problems by gender: A cross-sectional comparative analysis study. *BMJ Open*, 8(10), e023980. https://doi.org/10.1136/bmjopen-2018-023980

López-López, D., Pérez-Ríos, M., Ruano-Ravina, A., Losa-Iglesias, M. E., Becerro-de-Bengoa-Vallejo, R., Romero-Morales, C., Calvo-Lobo, C., & Navarro-Flores, E. (2021). Impact of quality of life related to foot problems: A case-control study. *Scientific Reports*, 11(1), 14515. https://doi.org/10.1038/s41598-021-93988-2

Mbue, N. D., & Wang, W. (2023). Nurses' experience with chronic foot pain and their job—the national science foundation foot health survey. *Heliyon*, 9(3), e14485. https://doi.org/10.1016/j.heliyon.2023.e14485

Nevins, C. M., & Sherman, J. (2016). Self-care practices of baccalaureate nursing students. *Journal of Holistic Nursing*, 34(2), 185–192. https://doi.org/10.1177/0898010115602994

Phillips, A., & McClinton, S. (2017). Gait deviations associated with plantar heel pain: A systematic review. *Clinical Biomechanics*, 42, 55–64. https://doi.org/10.1016/j.clinbiomech.2017.01.002

DOI: https://doi.org/10.29352/mill0227.39905

Rodríguez-Sanz, D., Barbeito-Fernández, D., Losa-Iglesias, M. E., Saleta-Canosa, J. L., López-López, D., Tovaruela-Carrión, N., & Becerro-de-Bengoa-Vallejo, R. (2018). Foot health and quality of life among university students: Cross-sectional study. *São Paulo Medical Journal*, 136(2), 123–128. https://doi.org/10.1590/1516-3180.2018.0053220318

Ross, A., Bevans, M., Brooks, A. T., Gibbons, S., & Wallen, G. R. (2017). Nurses and health-promoting behaviors: Knowledge may not translate into self-care. *AORN Journal*, 105(3), 267–275. https://doi.org/10.1016/j.aorn.2016.12.018

Savitsky, B., Findling, Y., Ereli, A., & Hendel, T. (2020). Anxiety and coping strategies among nursing students during the COVID-19 pandemic. *Nurse Education in Practice*, 46, 102809. https://doi.org/10.1016/j.nepr.2020.102809

Sousa, K. H. J. F., Chagas, L. N., Silva, R. N., Sequeira, C. A. C., Gallasch, C. H., & Zeitoune, R. C. G. (2022). Positive mental health of undergraduate nursing students: Scoping review. *Psychological Studies*, 40, e210003. https://doi.org/10.1590/1982-4327e210003

Stevens, J., de Bot, R. T. A. L., Hermus, J. P. S., Schotanus, M. G. M., Meijer, K., & Witlox, A. M. (2022). Gait analysis of foot compensation in symptomatic hallux rigidus patients. *Foot and Ankle Surgery*, 28(8), 1272–1278. https://doi.org/10.1016/j.fas.2022.03.005

Stolt, M., Suhonen, R., Kielo, E., Katajisto, J., & Leino-Kilpi, H. (2017). Foot health of nurses: A cross-sectional study. *International Journal of Nursing Practice*, 23(4), e12539. https://doi.org/10.1111/ijn.12539

Stolt, M., Suhonen, R., Puukka, P., Viitanen, M., Voutilainen, P., & Leino-Kilpi, H. (2015). Nurses' knowledge of foot care in the context of home care: A cross-sectional correlational survey study. *Journal of Clinical Nursing,* 24(19–20), 2916–2925. https://doi.org/10.1111/jocn.12893

Sung, K. C., Chung, J. Y., Feng, I. J., Yang, S. H., Hsu, C. C., Lin, H. J., Wang, J. J., & Huang, C. C. (2020). Plantar fasciitis in physicians and nurses: A nationwide population-based study. *Industrial Health*, 58(2), 153–160. https://doi.org/10.2486/indhealth.2019-0136

The World Health Organization Quality of Life assessment (WHOQOL): Position paper from the World Health Organization. (1995). *Social Science & Medicine*, 41(10), 1403–1409. https://doi.org/10.1016/0277-9536(95)00112-k

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19(6), 349–357. https://doi.org/10.1093/intqhc/mzm042

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P.; STROBE Initiative. (2007). Strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *BMJ*, 335(7624), 806–808. https://doi.org/10.1136/bmj.39335.541782.AD

Wedgeworth, M. L., Ford, C. D., & Tice, J. R. (2020). "I'm scared": Journaling uncovers student perceptions prior to a psychiatric clinical rotation. *Journal of the American Psychiatric Nurses Association*, 26(2), 189–195. https://doi.org/10.1177/1078390319886407

Zhang, Y., ElGhaziri, M., Nasuti, S., & Duffy, J. F. (2020). The comorbidity of musculoskeletal disorders and depression: Associations with working conditions among hospital nurses. *Workplace Health & Safety*, 68(7), 346–354. https://doi.org/10.1177/2165079920918316