Received: 15 May 2024 | Accepted: 26 July 2024

DOI: 10.1111/jnu.13012

JOURNAL OF NURSING SCHOLARSHIP

HEALTH POLICY AND SYSTEMS

Prevalence and incidence of pressure injuries among nursing home residents with darker skin tones: A prospective cohort study

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Funding information
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Abstract

Aim: To measure the prevalence and incidence of nursing home-acquired pressure injuries in older adults residing in Sri Lankan nursing homes.

Background: Pressure injury prevalence and incidence are indicators of safety and quality of care. A significant portion of the global population has a skin color dominated by the presence of melanin. Yet, the number of nursing home residents with darker skin tones who develop pressure injuries in nursing homes is relatively unknown.

Design: Prospective multisite cohort study conducted in nine nursing homes in Sri Lanka. The sample comprised 210 residents aged ≥60 years old.

Methods: Semi structured observations and chart audits were used to gather data from July to October 2023. Head-to-toe visual skin assessment to check for nursing home- acquired pressure injuries, Braden pressure injury risk scale and Fitzpatrick skin tone assessments were conducted on all recruited residents at baseline. All recruited residents were followed-up weekly for 12 weeks until detection of a new pressure injury, death, discharge, or transfer.

Results: Pressure injury point prevalence at baseline was 8.1% (17/210). Cumulative incidence was 17.1% (36/210). Incidence density was 15.8 per 1000 resident weeks. Most nursing home-acquired pressure injuries were located on the ankle at baseline (29.4%; 5/17) and in the follow-up period (27.8%; 10/36). Stage I pressure injuries were most common: 58.8% (10/17) and 44.4% (16/36) at baseline and during follow-up respectively.

Conclusions: About one in six nursing home residents developed a new pressure injury over the 12-week follow-up period. Despite staff and resource constraints, there remains a need to focus on the prevention of pressure injuries in Sri Lankan nursing homes.

Clinical Relevance: Studies on the burden of pressure injuries among darker skin tone nursing home residents are lacking and the current evidence available are

predominantly from Western countries. The findings of this study highlight the need of targeted preventive measures for nursing home residents with darker skin tones.

KEYWORDS
elder care, incidence, nursing homes, pressure injury, prevalence

INTRODUCTION

A pressure injury (PI) is defined as a "localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device" (EPUAP, NPIAP, PPPIA, 2019, p. 16). Pressure injuries can present as non-blanchable intact red skin or an open ulcer and are staged in increasing severity from I to IV and two additional categories (suspected deep tissue injury and un-stageable) (EPUAP, NPIAP, PPPIA, 2019, p. 19). The physical and psychological impacts of pressure injuries on older people are profound and include diminished quality of life, increased pain, a high risk of mortality and an increased risk for mental health issues such as depression (Jackson et al., 2017; Jackson et al., 2018). Although some pressure injuries are unavoidable, evaluating individuals' clinical conditions and risk factors, implementing preventive interventions, and evaluating their impact, or revising the interventions as needed can avoid their occurrences in some instances (Sibbald & Ayello, 2020). Understanding current PI rates can provide the foundation for quality improvement and evidence-based practice.

Pressure injuries are a patient safety issue (Blatter et al., 2024; Simmons et al., 2016), yet there is limited evidence on PI rates in older people living in nursing homes in countries with low income or lower-middle-income economies. According to a 2024 review, pressure injuries are one of the five post-pandemic patient safety priorities (Sacramento, 2024). Pressure injuries are potentially life-threatening wounds that can cause serious complications such as cellulitis, osteomyelitis, necrotizing fasciitis, gas gangrene and septicaemia (Sacramento, 2024). Focusing on understanding pressure risk and prevention is needed in low and lower-middle-income countries because nursing homes often lack basic equipment such as pressure relieving mattresses and skin care products and resident-to-nurse ratios are typically high (Zakrasek et al., 2015).

Successful PI prevention planning depends on the accurate collection of data and interpretation of results. Prevalence data can be used to estimate resource requirements when planning PI prevention and treatment options (Baharestani et al., 2009). Prevalence studies provide cross sectional estimates of the burden of disease (Baumgarten, 1998). One Italian cross-sectional study of 2223 older people (median age 84 years) receiving home care services identified a PI prevalence of 26% (Bottega et al., 2023). Incidence studies are mostly used to estimate the effectiveness of PI prevention protocols (Baharestani et al., 2009). A systematic review including 47 primary studies published from 2000 to 2022, found that the prevalence and incidence of any stage pressure injuries among older people living in nursing homes were 11.6% (95% confidence interval 9.6%–13.7%) and 14.3% (95% confidence interval 5.5–26.2) (Sugathapala et al., 2023). This suggests the burden of PI in nursing homes is similar to that of hospitals and is thus a major clinical and safety issue (Sugathapala et al., 2023). Most studies in the review were conducted in Europe, and North America but, none of the studies included in the meta-analysis were from low and lower-middle-income countries and notably, none were from Sri Lanka. It is clear there is a paucity of PI prevalence and incidence data from some regions, especially in low and lower-middle-income countries (Anthony et al., 2019; Sugathapala et al., 2023).

Additionally, much of the available evidence on PI rates has been gathered on Caucasians (Oozageer Gunowa et al., 2018) even though there are many other broader groups of population in the world based on race, ethnicity or skin phototype classifications (Rawlings, 2006). This is of concern because evidence confirms detecting early signs (erythema) of PI in a dark-skinned person is more difficult for nurses, resulting in under-reporting and the potential for increased harm and delayed prevention and/or treatment (Black et al., 2023). To address this evidence gap, the current study aimed to identify the prevalence and incidence of nursing home-acquired pressure injuries among older people living in Sri Lankan nursing homes. This will provide empirical evidence on this under-represented population and may raise awareness of the magnitude of the problem to health consumers, healthcare professionals', researchers, and government stakeholders. It may then sharpen the focus on the importance of PI prevention in nursing home settings in Sri Lanka, where resources are scarce. In addition, the findings may contribute to a more nuanced approach for the development and implementation of future PI prevention clinical practice guidelines.

This study had three research questions:

1. What is the point prevalence of pressure injuries among older nursing home residents?
2. What is the cumulative incidence and incidence density of pressure injuries among older nursing home residents over 12-weeks?
3. What are the most frequent stages and locations of pressure injuries among older nursing home residents?

METHODS

Study design

A prospective multisite cohort study of older people living in Sri Lankan nursing homes was conducted from July to October 2023. Observational and chart audit data were collected. It included a

head-to-toe visual skin and soft tissue assessment at baseline and weekly follow-up assessments for 12 consecutive weeks or until a new PI developed, death, or discharge/transfer to another setting such as a hospital-which ever occurred first. The reporting of this study's findings followed the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines (von Elm et al., 2014).

Setting and participants

The study was conducted in nine Sri Lankan nursing homes, also known as elderly care homes. To obtain a wide representation, four were private nursing homes and others were not-for-profit homes run by voluntary organizations. Across the nine sites, residents who met the study inclusion criteria were approached for recruitment. A consecutive sample of consenting residents (≥60 years old) with or without a PI were recruited. Residents receiving palliative care or planned discharge were excluded. The sample size was calculated for cumulative incidence using the statistical formula $n = 4z_{\frac{\alpha}{2}}$ 2 P (1-P)/w^2 in which: $z_{\frac{\alpha}{2}}$ = critical value for two-tailed alpha (1.96 for 95% confidence interval), P = expected cumulative incidence, w = total width of 95% confidence interval (0.10) (Baumgarten, 1998). Given an expected cumulative incidence of 14.3% (Sugathapala et al., 2023), the target sample size was 188. After accounting for a 10% refusal rate, the target sample size was 207, thus we aimed to recruit about 210 participants.

Variables of interest

Residents' baseline demographic and clinical data were collected. This included age, sex and body mass index (BMI), presence of pressure injuries using a head-to-toe visual skin assessment, skin tone and PI risk assessment score using the Braden scale. The main study outcome was PI of any stage, based on the classification system outlined in international clinical practice guidelines on pressure injuries (EPUAP, NPIAP, PPPIA, 2019). We assessed skin tone using the Fitzpatrick scale (Fitzpatrick, 1988). It contains six skin phototypes based on ultraviolet radiation exposure (pale white skin, white skin, light brown skin, moderate brown skin, dark brown skin and deeply pigmented dark brown to black skin). During weekly follow-up, a head-to-toe visual skin assessment was conducted to identify a new pressure injury including its stage and location.

Data collection methods

Two data collection methods were used: observations using two semi structured data collection forms, one each for baseline data and weekly assessments, and chart audits. Data collection forms were developed by the first author based on current evidence and validated by an international expert panel consisting of a wound care expert, a clinical nurse researcher working in the area of wounds and four academic researchers with experience in wounds. Minor adjustments were made such as removing 'not applicable' from some questions. The forms were pilot tested after ethics approval with 10 nursing home residents before finalizing them, but no major changes were required. A separate data dictionary that explained each variable, including their definitions and whether variables were collected from direct observation or chart audit was developed and used during the data collection.

Training of research assistants

Data were collected by the first author and four Sri Lankan registered nurses who were recruited and specifically trained for data collection for this study. Two weeks prior to participant recruitment, a study-specific training module was delivered by the first author and one academic researcher. The group training module was delivered through two lectures, a group discussion in the classroom setting, and a practical session in the research setting. The content included PI identification, staging particularly among darker skin tone populations, Fitzpatrick skin tone assessment, PI risk assessment using the Braden scale, ethical considerations associated with data collection and an overview of observational data collection forms and data dictionary. The training materials were prepared based on current clinical practice guidelines on pressure injuries (EPUAP, NPIAP, PPPIA, 2019) and various resources from the literature that included assessing skin of dark pigmented individuals (Dhoonmoon et al., 2023; Stankiewicz et al., 2016).

The four research assistants were then trained in the nursing home settings by the first author. In addition, the first author independently monitored and assessed their data collection and assessed inter-rater reliability. Percent agreement was obtained by counting the frequencies of the variables on the data collection forms between the research assistants and first author. There were slight variations in the percentage of agreement; 92%, 95%, 95%, and 96% for each research assistant. These minor variations were discussed, and consensus was reached.

Ethical considerations

Prior to the study commencement, ethical approval was obtained from the Ethics Review Committee, Faculty of Medicine, General Sir John Kotelawala Defence University, Sri Lanka (RP/2023/09) and Griffith University Human Research Ethics Committee, Australia (2023/420). Written permission was also obtained from the nursing homes managers to access the nine nursing homes. The baseline and weekly observations were collected without disruption to the nursing homes' routines. Informed written consent was obtained directly from residents and for those who could not provide written consent due to mental or physical problems, consent was obtained from their guardians or nursing home managers, as approved by the ethics committees. Residents were assured

about their anonymity, the confidentiality of their data and the right to withdraw at any time from the study without any penalties or disadvantages. To ensure anonymity, each participant was assigned a unique study code. During the baseline and weekly observations, nursing home staff were informed when a PI was detected so that local reporting, treatment, and management protocols could be implemented.

Data analysis

Data were entered and analyzed in the IBM Statistical Package for the Social Sciences—SPSS version 29 after cleaning and checking for accuracy. Descriptive statistics were used to summarize the sample characteristics. The number of residents with at least one PI at the time of recruitment was used to determine point prevalence. Cumulative incidence was calculated based on the number of residents with a new nursing home-acquired PI each week until end of 12 weeks. Incidence density (i.e., rate) was defined as the number of residents with a new PI per resident week. The numerator was the number of residents with a new PI, and the denominator was the number of resident weeks in each week of the 12 weeks. The specific operational definitions and formulas used for calculating the PI outcomes are in Table 1 and reflect previous research in the area (Baumgarten, 1998; Defloor et al., 2005).

RESULTS

Participant recruitment and follow-up

A total of 286 residents were screened for eligibility; 210 (73.4%) met the study criteria and all (100%) were recruited. Recruitment and baseline data collection occurred from 17th August to 4th September 2023. Figure 1 illustrates the recruitment from the nine nursing homes, and the final sample. The loss to follow-up rate was 3.8% (8/210) due to death (0.5%; 1/210) or discharge (3.3%; 7/210) from the nursing home.

Sample characteristics and PI point prevalence

Table 2 contains an overview of the baseline characteristics of the sample and the two subgroups of those with and without a PI at baseline. The median age of the sample was 76.8 years (interquartile range; 72.6–82.9) and over three quarters (78.6%; 165/210) were female. The mean participant BMI was 20.3 ± 5.2, with a median BMI of 19.8 (interquartile range 16.3–23.1). Most participants (94.3%; 198/210) did not smoke or report a history of smoking. Based on the Fitzpatrick skin tone assessments the vast majority (96.7%; 203/210) of the sample had a light to dark brown colored skin tone. One-third (29.5%; 62/210) had mild, moderate, high, or severe risk of PI category as per the Braden Scale assessment. Of the 210 residents, 17 (8.1%) had at least one PI at recruitment, with 6 (2.8%) having more than one PI. Therefore, the point prevalence of PI was 8.1% (17/210) (95% confidence interval 4.8%–12.6%). At baseline, a total of 27 pressure injuries in the 17 residents were observed.

Incidence of PI

Among the 210 residents, with and without pressure injuries, who were followed up weekly for 12 weeks, 36 residents developed a new PI, resulting in a cumulative incidence of 17.1% (95% confidence interval 12.3%–22.9%) (Figure 2). The PI incidence density was 15.8 per 1000-resident-weeks (95% confidence interval 11.1–21.9 per 1000 resident weeks).

TABLE 1 Operational definitions for nursing home-acquired pressure injury outcomes.

PI outcome	Definition
Point Prevalence	The proportion of population with a NHAPI at a specific timepoint (e.g. Baseline). $\text{Point prevalence}\,(\%) = \frac{\text{Number of NH residents with one or more PI at a specific point of time}}{\text{Total number of NH residents at the same point of time}} \times 100$
Cumulative Incidence (CI)	The ratio of new NHAPI incident cases during a certain period (e.g. Follow-up period) to the at-risk population at the beginning of the observation period. $\text{CI}\,(\%) = \frac{\text{Number of residents with newly diagnosed NHAPI during a certain period}}{\text{Number of NH residents in the cohort at the beginning of the observation period}} \times 100$
Incidence density or incidence rate	The rate at which new NHAPI cases occur in a population. It is defined by the number of residents with a new NAHPI that arise during a specific period divided by the total amount of person time observed among individuals at risk. $\text{Incidence density} = \frac{\text{Number of residents developing new NHAPI}}{\text{Total person–weeks (sum of all the weeks over which each resident participated in the study)}}$

Note: Equations adapted from (Baumgarten, 1998) and (Defloor et al., 2005).

Abbreviations: CI, Cumulative incidence; NH, Nursing home, NHAPI, Nursing home-acquired pressure injury; PI, Pressure injury.

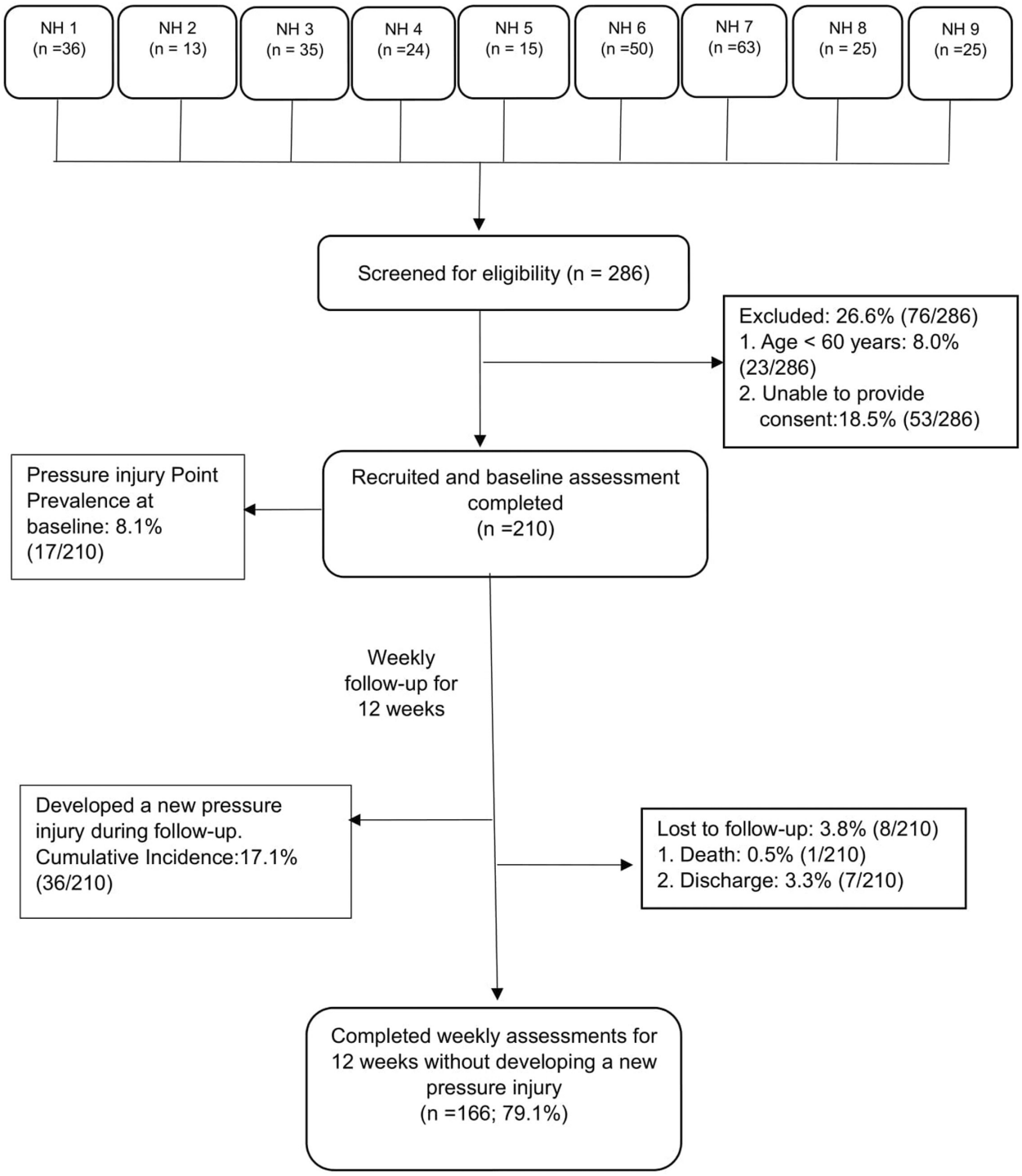

FIGURE 1 Flow of participants through the study.

Stages and location of pressure injuries

If a resident had two or more pressure injuries, the highest stage (most serious) PI was reported. Of the 17 residents who were observed to have PI at baseline, most were stage I (58.8%; 10/17) followed by stage III (23.5%; 4/17) and II (17.6%; 3/17). Of the 36 residents who were observed to have pressure injuries during the follow-up period, both stage I (44.4%; 16/36) and stage II (41.6%; 15/36) outnumbered stage III pressure injuries (13.8%; 5/36). Stage IV, unstageable or deep tissue pressure injuries were not observed either in the baseline or in the follow-up period. Most residents who were observed to have a PI had them located on the ankle at baseline (29.4%; 5/17) and follow-up period (27.8%; 10/36). Other common locations of PI in the follow-up period were the sacrum (22.2%; 8/36) and the elbow (19.4%; 7/36). The stages and locations of pressure injuries are shown in Table 3.

TABLE 2 Sample baseline characteristics and pressure injury point prevalence ($n = 210$).

		At baseline	
		No PI	PI
Characteristics	*n* (%)	*n* (%)	*n* (%)
Total	210 (100)	193 (91.9)	17 (8.1)
Age at recruitment (years)			
Median (Interquartile range)	76.8 (72.6–82.9)	76.3 (72.0–82.9)	82.4 (75.7–82.4)
Range	60–105	60–105	64–97
Body Mass Index			
Mean (SD) (95% CI for mean)	20.3 (5.2) (19.6–21.0)	20.4 (5.2) (19.6–21.1)	19.7 (4.7) (17.3–22.1)
Sex			
Female	165 (78.6)	150 (77.7)	15 (88.2)
Male	45 (21.4)	43 (22.3)	2 (11.8)
Smoking history			
Ex-Smoker/smoker	12 (5.7)	11 (5.7)	1 (5.9)
Non-smoker	198 (94.3)	182 (94.3)	16 (94.1)
Fitzpatrick Skin tone			
Deep black	7 (3.3)	6 (3.1)	1 (5.9)
Dark brown	55 (26.2)	53 (27.5)	2 (11.8)
Moderate brown	118 (56.2)	107 (55.4)	11 (64.7)
Light brown	30 (14.3)	27 (14.0)	3 (17.6)
White	0 (0)	0 (0)	0 (0)
Pale white	0 (0)	0 (0)	0 (0)
Braden Scale score			
Low PI risk (19–23)	148 (70.5)	144 (74.6)	4 (23.5)
Mild PI risk (15–18)	42 (20.0)	35 (18.1)	7 (41.2)
Moderate PI risk (13–14)	9 (4.3)	7 (3.6)	2 (11.8)
High PI risk (10–12)	4 (1.9)	4 (2.1)	0 (0)
Severe PI risk (≤ 9)	7 (3.3)	3 (1.6)	4 (23.5)

DISCUSSION

Principal findings

PI prevalence refers to the frequency of occurrence at a specific point in time and is associated with a cross-sectional sample (Spronk et al., 2019), which was the baseline in our study. The point prevalence of any stage pressure injuries in our sample was approximately 8% which is consistent with previously reported studies (Carryer et al., 2017; Hahnel et al., 2017) conducted with nursing home residents. Two observational studies included in a systematic review and meta-analysis reported a similar PI prevalence among older nursing home residents in Asia (8.1% [95% confidence interval 2.3–17.0]) (Sugathapala et al., 2023). However, the pooled PI prevalence among nursing home residents was 11.6% (95% confidence interval 9.6–13.7) and reflected data from mostly developed countries; (Sugathapala et al., 2023) slightly higher than in our study. Despite the challenges of limited human and material resources in the developing nation context, the 8% prevalence we found is encouraging, although it may reflect the underlying health, and low-PI risk of the residents.

In our cohort study, weekly skin assessments for 12 weeks, indicated that the PI incidence density was 15.8 per 1000 resident-weeks: corresponding to a cumulative incidence of 17.1%. Our findings were higher than the results of a recently published prior systematic review and meta-analysis, (Sugathapala et al., 2023) which reported a PI cumulative incidence of 14.3% in 10,643 residents. The residents in our study were over 60 years old (median age 77), however, at baseline skin assessment, approximately 70% were assessed as low-PI risk (Braden Score: 19–23). Given the constraints on resources, most residents were independent and active on enrolment in the nursing home. Yet with a PI incidence of 17.1%, this remains a concern for the future. This compelling evidence justifies the necessity for ensuring sufficient preventive care for pressure injuries in nursing homes in Sri Lanka and the need for future enhancements in the carers' capabilities and access to resources.

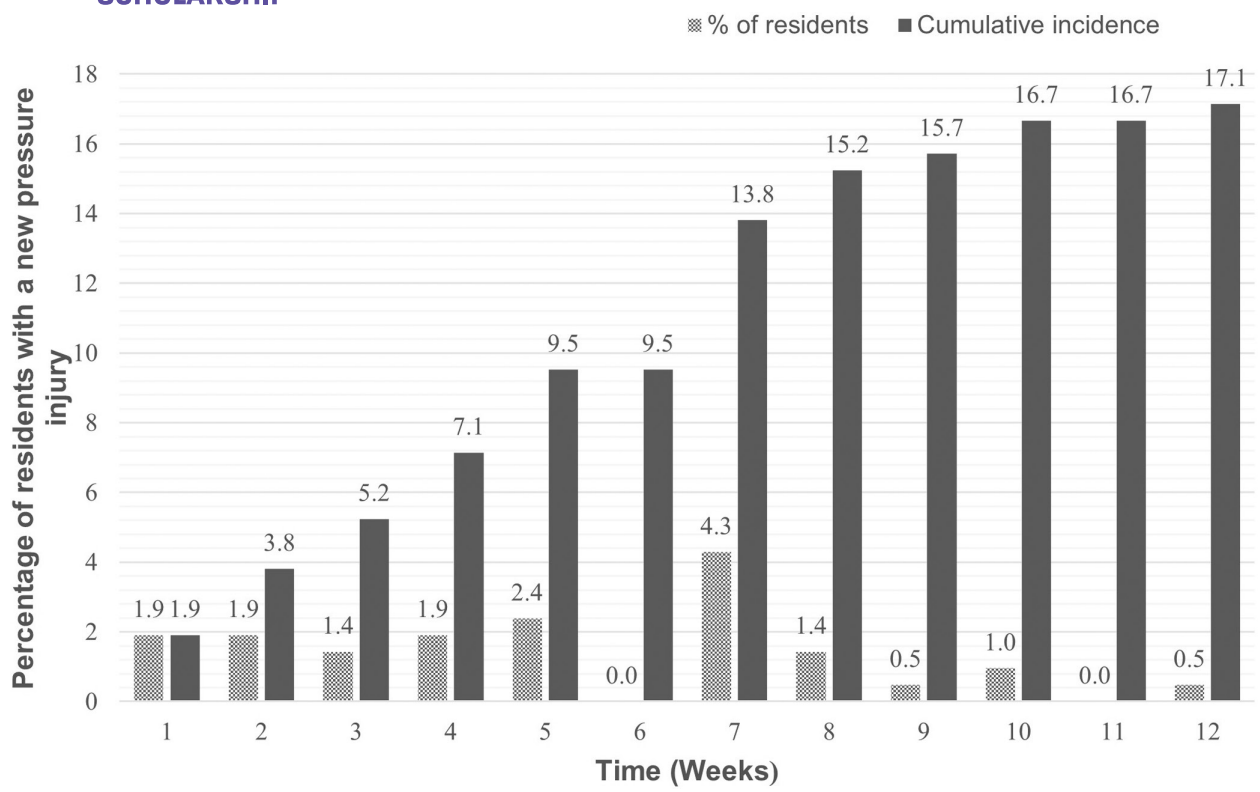

FIGURE 2 New nursing home-acquired pressure injuries each week over the 12-week follow—up period.

Our findings indicate that stage I pressure injuries were the most prevalent among the observed residents at baseline and follow-up, supporting previously published findings (Doupe et al., 2016; Edwards et al., 2017; Harms et al., 2014) and a systematic review (Sugathapala et al., 2023). Most residents in our sample had skin tones ranging from light brown to deep black and none had white skin color. Stage I PI manifests as intact skin with a localized area of non-blanchable erythema, often serving as the initial visible indicator of skin injury (Edsberg et al., 2016). Detecting stage I PI in individuals with darker skin tones poses challenges compared to those with lighter skin tones, as the areas of redness are less discernible on darker skin (Oozageer Gunowa et al., 2018). Conducting visual skin assessments for residents with darker skin tones necessitates additional effort, such as utilizing risk assessment tools and providing ongoing training and education (Black et al., 2023). Nevertheless, some studies have reported higher proportions of stage II pressure injuries than stage I (Stolt et al., 2019; Wei et al., 2021), indicating a disparity with our study results. Perhaps the recruitment of Sri Lankan registered nurses as research assistants who were experienced in caring for individuals with darker skin tones, coupled with the training we provided them, especially the focus on assessing darker skin toned individuals, resulted in more stage I pressure injuries being identified.

In our study, the most frequently affected sites were the ankle, sacrum, and elbow. Lower extremity pressure injuries including the ankle, heel and foot were predominantly reported PI sites. This may occur because of the combined effects of aging, leading to a significant reduction in muscle mass of the lower extremities over bony prominences. Apart from decreased mobility and skin fragility due to aging, there are multiple factors to be considered such as impaired circulation, chronic diseases, and sensory impairments. The development of lower extremity pressure injuries among older nursing home residents must be considered to prevent sepsis and prevent resultant morbidity and mortality. Our findings suggest the lower extremities should be regularly assessed and prevention strategies should be enacted based on the assessment findings.

Strengths and limitations

This study has several strengths. Firstly, use of validated data collection tools and carefully trained research assistants provides confidence in the accuracy of our findings. Secondly, the detailed information on PI stages based on the National PI Advisory Panel clinical practice guidelines enhanced the opportunity of comparing the results of similar studies. Thirdly, our detailed study procedures ensured we had very little loss-to-follow-up. We also acknowledge some limitations. Although our study was carried out in nine nursing homes, the results may not be generalized to other nursing homes such as those with higher or lower trained staff-to-resident ratios. Despite the extensive training and ongoing supervision of the research assistants, there is a possibility of missing some pressure injuries during the weekly assessments, but our findings are consistent with previous Asian results.

TABLE 3 Stages and location of nursing home-acquired pressure injuries.

Stage/location of PI	Residents with PIs at baseline* $n=17$ n (%)	Residents who developed new NHAPIs during the follow-up period* $n=36$ n (%)
Total	17 (100)	36 (100)
Stage		
I	10 (58.8)	16 (44.4)
II	3 (17.6)	15 (41.6)
III	4 (23.5)	5 (13.8)
Location		
Ankle	5 (29.4)	10 (27.8)
Sacrum	2 (11.8)	8 (22.2)
Elbow	2 (11.8)	7 (19.4)
Heel	2 (11.8)	3 (8.3)
Occiput	1 (5.9)	–
Cheek	1 (5.9)	–
Scapula	1 (5.9)	–
Wrist or between Fingers	1 (5.9)	4 (11.1)
Inner thigh	1 (5.9)	–
Foot	1 (5.9)	1 (2.8)
Coccyx	–	1 (2.8)
Gluteus	–	1 (2.8)
Knee	–	1 (2.8)

*If residents had multiple pressure injuries the stage and location of the most serious pressure injury was used.

Implications for policy, clinical practice, and research

This study suggests three distinct clinical implications. These are (I) the need to conduct regular skin assessments in older residents to identify problems with skin integrity early (II) it should not be assumed that impaired skin integrity is a normal sign of the aging process, and necessary steps need to be taken to manage it, and (III) routine implementation of PI prevention strategies for older nursing home residents who are at risk of developing a PI is crucial. Given the trend of increasing age of the population worldwide, more elderly people may require nursing homes. However, whether PI prevention practices in nursing homes are sufficient, especially among the lower-or middle-income countries, despite the availability of various clinical practice guidelines is not known.

PI identification, management and prevention largely rely on "moderate or high technology" approaches, for example, use of sub epidermal moisture scanning as an adjunct to the skin assessment (Ousey et al., 2022) and the application of five-layer dressings for sacrum and heels (Padula et al., 2019). Such interventions are likely to be impractical or unaffordable in developing countries. Moreover, there are low-cost, substantiated procedures that could reduce the burden of pressure injuries such as skin check and risk assessment, repositioning, and assessment of nutrition. Therefore, it is vital to ensure quality PI care, which includes both resident and staff awareness of this problem. Skin assessment on admission to the nursing home and regularly thereafter, identifying at risk residents, implementing PI prevention programmes are some of the strategies that should be introduced (Lee et al., 2022; Rummel et al., 2021). Ultimately, raising awareness and improving PI prevention has the potential to enhance nursing home residents' quality of life by reducing the occurrences of pressure injuries and their associated complications such as pain and infection. Therefore, nursing home managers should ensure staff training and resource allocation.

Our study focused on skin assessment based on different skin tones, an area with many research implications. Only a few studies (Bates-Jensen et al., 2009; Bliss et al., 2015; Harms et al., 2014) have examined PI rates in darker skin toned individuals. A previous literature review suggested that the detection of pressure damage in people with darker skin tones has been mainly based on ethnic background or race (Oozageer Gunowa et al., 2018). In addition to race, we need to consider skin tone when conducting future studies. Most studies in this area have focused on stage II or above and excluded stage I pressure injuries as they are considered reversible as well as difficult to identify (Oozageer Gunowa et al., 2018). However, early identification of a PI despite the variations in skin tone is vital to prevent harm to the patient and if not detected, may result in a worse injury. The inclusion of PI data from all types of skin tones is essential when designing preventive practice guidelines and educational materials (Black et al., 2023; Oozageer Gunowa et al., 2018). Hence, our study findings can inform future studies of PI among darker skin toned populations.

In this study we did not exclude the residents who had pressure injuries at the baseline when calculating incidence; instead, we followed up the 210 residents weekly for 12 weeks and calculated cumulative incidence and incidence density based on the residents

who develop a new PI. We were interested in the development of new pressure injuries during the follow-up regardless of whether there were pre-existing pressure injuries. Plausibly, a resident with a PI in one location may be at greater risk of getting another PI in a different location. In future studies, researchers may consider a sample without pressure injuries as an inclusion criterion to determine the incidence of pressure injuries.

CONCLUSION

Pressure injuries impose a significant burden on healthcare systems, especially nursing homes that provide shelter and skilled care for the elderly. Pressure injuries occur in 8.1% of 210 older people living in nine nursing homes in Sri Lanka. The cumulative incidence of nursing home-acquired pressure injuries was 17.1%. Most pressure injuries occur in lower extremities and stage I pressure injuries were most common. Regular visual skin assessment with special attention to lower extremities is required. Even though the early identification of pressure injuries due to the darker skin tone is challenging, stage I pressure injuries were able to be identified through visual skin assessments. Having adequately trained staff in visual skin assessment and implementing PI prevention practices within the nursing homes is essential to safeguard our elderly population.

Clinical resources

European Pressure Ulcer Advisory Panel. (2019). National PI Advisory Panel and Pan Pacific PI Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline E. Haesler. EPUAP/NPUAP/PPPIA. https://internationalguideline.com/.

ACKNOWLEDGMENTS

We acknowledge the residents, staff, and nursing home managers of nine nursing homes for their support and collaboration. Open access publishing facilitated by Griffith University, as part of the Wiley - Griffith University agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

This study was funded by the Griffith University Postgraduate Research Scholarship and Griffith University International Postgraduate Research Scholarship. The funder of this study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

CONFLICT OF INTEREST STATEMENT

The authors of this manuscript have nothing to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

Anthony, D., Alosoumi, D., & Safari, R. (2019). Prevalence of pressure ulcers in long-term care: A global review. *Journal of Wound Care*, *28*(11), 702–709. https://doi.org/10.12968/jowc.2019.28.11.702

Baharestani, M. M., Black, J. M., Carville, K., Clark, M., Cuddigan, J. E., Dealey, C., Defloor, T., Harding, K. G., Lahmann, N. A., Lubbers, M. J., Lyder, C. H., Ohura, T., Orsted, H. L., Reger, S. I., Romanelli, M., & Sanada, H. (2009). Dilemmas in measuring and using pressure ulcer prevalence and incidence: An international consensus. *International Wound Journal*, *6*(2), 97–104. https://doi.org/10.1111/j.1742-481X.2009.00593.x

Bates-Jensen, B. M., McCreath, H. E., & Pongquan, V. (2009). Subepidermal moisture is associated with early pressure ulcer damage in nursing home residents with dark skin tones: Pilot findings. *Journal of Wound, Ostomy, and Continence Nursing*, *36*(3), 277–284. https://doi.org/10.1097/WON.0b013e3181a19e53

Baumgarten, M. (1998). Designing prevalence and incidence studies. *Advances in Wound Care*, *11*(6), 287–293.

Black, J., Cox, J., Capasso, V., Bliss, D. Z., Delmore, B., Iyer, V., Massaro, J., Munro, C., Pittman, J., & Ayello, E. A. (2023). Current perspectives on pressure injuries in persons with dark skin tones from the National Pressure Injury Advisory Panel. *Advances in Skin & Wound Care*, *36*(9), 470–480. https://doi.org/10.1097/ASW.0000000000000032

Blatter, C., Osińska, M., Simon, M., & Zúñiga, F. (2024). The relationship between nursing home staffing and resident safety outcomes: A systematic review of reviews. *International Journal of Nursing Studies*, *150*, 104641. https://doi.org/10.1016/j.ijnurstu.2023.104641

Bliss, D. Z., Gurvich, O., Savik, K., Eberly, L. E., Harms, S., Mueller, C., Wyman, J. F., Garrard, J., & Virnig, B. (2015). Are there racial-ethnic disparities in time to pressure ulcer development and pressure ulcer treatment in older adults after nursing home admission? *Journal of Aging and Health*, *27*(4), 571–593. https://doi.org/10.1177/0898264314553895

Bottega, M., Tempesta, M., Piovesan, C., Rigo, F., Bordignon, J., Vedelago, D., Calo, L., Marchet, P., Dorigo, M., Scarpa, G., Barba, L. D., & Coppe, A. (2023). The risk and prevalence of pressure injuries in older people in the home care service: A cross-sectional study. *Journal of Wound Care*, *32*(10), ccxi–ccxviii. https://doi.org/10.12968/jowc.2023.32.ccxi

Carryer, J., Weststrate, J., Yeung, P., Rodgers, V., Towers, A., & Jones, M. (2017). Prevalence of key care indicators of pressure injuries, incontinence, malnutrition, and falls among older adults living in nursing homes in New Zealand. *Research in Nursing & Health*, *40*(6), 555–563. https://doi.org/10.1002/nur.21835

Defloor, T., Clark, M., Witherow, A., Colin, D., Lindholm, C., Schoonhoven, L., & Moore, Z. (2005). EPUAP statement on prevalence and incidence monitoring of pressure ulcer occurrence. *Journal of Tissue Viability*, *15*(3), 20–27. https://doi.org/10.1016/s0965-206x(05)53004-3

Dhoonmoon, L., Nair, H. K. R., Abbas, Z., Andrews, E., McConnie, S., Pearson, J., Waheed, M., & Wijeyaratne, M. (2023). International consensus document: Wound care and skin tone signs, symptoms and terminology for all skin tones. *Wounds International*. www.woundsinternational.com

Doupe, M. B., Day, S., McGregor, M. J., John, P. S., Chateau, D., Puchniak, J., Dik, N., & Sarkar, J. (2016). Pressure ulcers among newly admitted

nursing home residents: Measuring the impact of transferring from hospital. *Medical Care*, *54*(6), 584–591. https://doi.org/10.1097/mlr.0000000000000522

Edsberg, L. E., Black, J. M., Goldberg, M., McNichol, L., Moore, L., & Sieggreen, M. (2016). Revised national pressure ulcer advisory panel pressure injury staging system: Revised pressure injury staging system. *Journal of Wound, Ostomy, and Continence Nursing*, *43*(6), 585–597. https://doi.org/10.1097/won.0000000000000281

Edwards, H. E., Chang, A. M., Gibb, M., Finlayson, K. J., Parker, C., O'Reilly, M., McDowell, J., & Shuter, P. (2017). Reduced prevalence and severity of wounds following implementation of the champions for skin integrity model to facilitate uptake of evidence-based practice in aged care. *Journal of Clinical Nursing*, *26*(23–24), 4276–4285. https://doi.org/10.1111/jocn.13752

European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Injury Advisory Panel (NPIAP), and Pan Pacific Pressure Injury Alliance (PPPIA). (2019). Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline E. Haesler. EPUAP/NPIAP/PPPIA. https://internationalguideline.com/

Fitzpatrick, T. B. (1988). The validity and practicality of sun-reactive skin types I through VI. *Archives of Dermatology*, *124*(6), 869–871. https://doi.org/10.1001/archderm.124.6.869

Hahnel, E., Blume-Peytavi, U., Trojahn, C., & Kottner, J. (2017). Associations between skin barrier characteristics, skin conditions and health of aged nursing home residents: A multi-center prevalence and correlational study. *BMC Geriatrics*, *17*(1), 263. https://doi.org/10.1186/s12877-017-0655-5

Harms, S., Bliss, D. Z., Garrard, J., Cunanan, K., Savik, K., Gurvich, O., Mueller, C., Wyman, J. F., Eberly, L., & Virnig, B. (2014). Prevalence of pressure ulcers by race and ethnicity for older adults admitted to nursing homes. *Journal of Gerontological Nursing*, *40*(3), 20–26. https://doi.org/10.3928/00989134-20131028-04

Jackson, D., Durrant, L., Bishop, E., Walthall, H., Betteridge, R., Gardner, S., Coulton, W., Hutchinson, M., Neville, S., Davidson, P. M., & Usher, K. (2017). Pain associated with pressure injury: A qualitative study of community-based, home-dwelling individuals. *Journal of Advanced Nursing*, *73*(12), 3061–3069. https://doi.org/10.1111/jan.13370

Jackson, D. E., Durrant, L. A., Hutchinson, M., Ballard, C. A., Neville, S., & Usher, K. (2018). Living with multiple losses: Insights from patients living with pressure injury. *Collegian*, *25*(4), 409–414. https://doi.org/10.1016/j.colegn.2017.10.008

Lee, Y. N., Kwon, D. Y., & Chang, S. O. (2022). Bridging the knowledge gap for pressure injury management in nursing homes. *International Journal of Environmental Research and Public Health*, *19*(3), 1400. https://doi.org/10.3390/ijerph19031400

Oozageer Gunowa, N., Hutchinson, M., Brooke, J., & Jackson, D. (2018). Pressure injuries in people with darker skin tones: A literature review. *Journal of Clinical Nursing*, *27*(17–18), 3266–3275. https://doi.org/10.1111/jocn.14062

Ousey, K., Stephenson, J., & Blackburn, J. (2022). Sub-epidermal moisture assessment as an adjunct to visual assessment in the reduction of pressure ulcer incidence. *Journal of Wound Care*, *31*(3), 208–216. https://doi.org/10.12968/jowc.2022.31.3.208

Padula, W. V., Chen, Y. H., & Santamaria, N. (2019). Five-layer border dressings as part of a quality improvement bundle to prevent pressure injuries in US skilled nursing facilities and Australian nursing homes: A cost-effectiveness analysis. *International Wound Journal*, *16*(6), 1263–1272. https://doi.org/10.1111/iwj.13174

Rawlings, A. V. (2006). Ethnic skin types: Are there differences in skin structure and function? *International Journal of Cosmetic Science*, *28*(2), 79–93. https://doi.org/10.1111/j.1467-2494.2006.00302.x

Rummel, E., Evans, E. M., & O'Neal, P. V. (2021). Educating certified nursing assistants to communicate skin changes to reduce pressure injuries. *Journal of Gerontological Nursing*, *47*(8), 21–28. https://doi.org/10.3928/00989134-20210624-04

Sacramento, C. (2024). Hospital Quality Institute. https://psnet.ahrq.gov/issue/top-five-review-post-pandemic-patient-safety-priorities

Sibbald, R. G., & Ayello, E. A. (2020). Terminal ulcers, SCALE, skin failure, and unavoidable pressure injuries: Results of the 2019 terminology survey. *Advances in Skin & Wound Care*, *33*(3), 137–145. https://doi.org/10.1097/01.Asw.0000653148.28858.50

Simmons, S. F., Schnelle, J. F., Sathe, N. A., Slagle, J. M., Stevenson, D. G., Carlo, M. E., & McPheeters, M. L. (2016). Defining safety in the nursing home setting: Implications for future research. *Journal of the American Medical Directors Association*, *17*(6), 473–481. https://doi.org/10.1016/j.jamda.2016.03.005

Spronk, I., Korevaar, J. C., Poos, R., Davids, R., Hilderink, H., Schellevis, F. G., Verheij, R. A., & Nielen, M. M. J. (2019). Calculating incidence rates and prevalence proportions: Not as simple as it seems. *BMC Public Health*, *19*(1), 512. https://doi.org/10.1186/s12889-019-6820-3

Stankiewicz, M., Webster, J., Wallis, M., Tallot, M., & Chaboyer, W. (2016). An education program for pressure injury recognition and assessment utilising constructivism teaching method. *Wound Practice and Research*, *24*(2), 100–107. https://journals.cambridgemedia.com.au/wpr/volume-24-number-2/education-program-pressure-injury-recognition-and-assessment-utilising-constructivism-teaching-method

Stolt, M., Hjerppe, A., Hietanen, H., Puukka, P., & Haavisto, E. (2019). Local treatment of pressure ulcers in long-term care: A correlational cross-sectional study. *Journal of Wound Care*, *28*(6), 409–415. https://doi.org/10.12968/jowc.2019.28.6.409

Sugathapala, R. D. U. P., Latimer, S., Balasuriya, A., Chaboyer, W., Thalib, L., & Gillespie, B. M. (2023). Prevalence and incidence of pressure injuries among older people living in nursing homes: A systematic review and meta-analysis. *International Journal of Nursing Studies*, *148*, 104605. https://doi.org/10.1016/j.ijnurstu.2023.104605

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2014). The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *International Journal of Surgery (London, England)*, *12*(12), 1495–1499. https://doi.org/10.1016/j.ijsu.2014.07.013

Wei, M., Yang, D., Chen, L., Wu, L., Jiang, Q., Niu, N., & Yang, T. (2021). The prevalence and prevention of pressure ulcers: A multicenter study of nine nursing homes in eastern China. *Journal of Tissue Viability*, *30*(1), 133–136. https://doi.org/10.1016/j.jtv.2020.07.005

Zakrasek, E. C., Creasey, G., & Crew, J. D. (2015). Pressure ulcers in people with spinal cord injury in developing nations. *Spinal Cord*, *53*(1) (1476-5624 (Electronic)), 7–13, 7–13. https://doi.org/10.1038/sc.2014.179

How to cite this article: Sugathapala, R. D. U. P., Latimer, S., Gillespie, B. M., Balasuriya, A. & Chaboyer, W. (2024). Prevalence and incidence of pressure injuries among nursing home residents with darker skin tones: A prospective cohort study. *Journal of Nursing Scholarship*, *56*, 826–835. https://doi.org/10.1111/jnu.13012