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ASSOCIATION OF PAIN AND QUALITY OF SLEEP DUE TO CALF TIGHTNESS IN SECURITY GUARDS

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ABSTRACT

Prolonged standing is a common occupational requirement for security guards and may contribute to various musculoskeletal problems, including calf muscle tightness, lower limb pain, and disturbances in sleep quality. These issues can negatively affect physical performance, occupational efficiency, and overall quality of life. This cross-sectional observational study was conducted to determine the association between calf muscle tightness, pain intensity, and sleep quality among security guards. The study was carried out in different institutions, including colleges and banks, and involved 134 male security guards aged 30 to 50 years who performed standing duties for at least 8 hours daily. A non-probability convenience sampling technique was used to recruit participants. Calf muscle tightness was assessed using the Silfverskiöld Test, pain intensity was measured through the Numeric Pain Rating Scale (NPRS), and sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). Descriptive and inferential statistical analyses were performed to examine the relationships among the study variables. The findings revealed a high prevalence of calf muscle tightness and musculoskeletal pain among participants, particularly in the lower leg region. Most participants reported poor sleep quality, suggesting that occupational demands may have a considerable impact on their physical and psychological well-being. Statistical analysis demonstrated a significant moderate positive correlation between pain intensity and sleep disturbance ($r = 0.589$, $p < 0.001$), indicating that higher levels of pain were associated with poorer sleep quality. These findings emphasize the importance of implementing preventive strategies.

Keywords: *Calf Muscle Tightness, Security Guards, Sleep Quality, Numeric Pain Rating Scale, Pittsburgh Sleep Quality Index.*

INTRODUCTION

The musculoskeletal system consists of bones, muscles, tendons, cartilage, ligaments, and connective tissues that are responsible for maintaining posture, movement, stability, and

balance. Among these structures, the calf muscles, mainly the gastrocnemius and soleus, play an important role in lower limb function, gait, standing balance, and body posture. The gastrocnemius is the larger superficial muscle responsible for activities such as running, walking, and jumping, whereas the soleus muscle mainly contributes to postural stability during standing. These muscles continuously work together to maintain body alignment and support body weight during standing and movement. Tightness of the calf muscles decreases the flexibility and elasticity of the gastrocnemius and soleus muscles, resulting in muscular rigidity, impaired ankle dorsiflexion, postural imbalance, gait disturbances, discomfort, and functional limitations (Karande et al., 2021).

Muscle tension in the calf is a common occurrence and is caused by excessive standing, repetitive motions, muscle fatigue, lack of stretching, dehydration, poor ergonomics, and occupational stress. Standing constantly together results in shortened recovery periods for the calf muscles, reduced blood flow, decreased oxygen, buildup of metabolic waste products (e.g. lactic acid) and increased muscular tension. Physiological changes reduce the elasticity and flexibility of the muscles, which makes it difficult to stretch and move the ankles (Nabi et al., 2024). While standing and walking, the calf muscles are active to keep the centre of gravity and stabilise the body. However, when the muscles are overused, there is more mechanical stress on the muscles and their surrounding fascia which can lead to stiffness, pain, muscle fatigue, and movement changes.

Biomechanically, calf tightness can have a major impact on posture and gait mechanics. The lack of ankle dorsiflexion will cause the body to adjust by using abnormal movements of the knee, hip, and lower back, resulting in muscle imbalance, overuse injuries, and abnormal weight distribution. Prolonged tightness can also cause the Achilles, plantar fascia, and knee extensor mechanism to be under increased mechanical stress, which can lead to plantar fasciitis, Achilles tendinopathy, patellofemoral pain syndrome, and lower back pain (Morar et al., 2022). Moreover, other factors like flat foot, forward leaning posture, wrong footwear, and standing for a long time on hard surfaces further create tension on lower limbs and calf muscles (Naeem et al., 2024).

It is known that musculoskeletal pain is one of the most prevalent occupational health issues on the world. The World Health Organization (WHO) defines musculoskeletal pain as pain and/or discomfort affecting muscles, tendons, ligaments, joints and nerves. Work-related musculoskeletal disorders are strongly related to occupation activities that involve prolonged standing, repetitive tasks, static posture and lack of ergonomic conditions (Singh et al., 2022). Musculoskeletal pain can be experienced in one area such as the calf, ankles, knees or lower back, or can be diffuse and impair physical function and quality of life. Musculoskeletal pain that persists over time has negative consequences on physical and mental health and is often linked to work-related stress and discomfort, fatigue and less productivity.

Security Guards are regarded as a high-risk occupational group for the reasons they must stand for long periods of time, are constantly alert, are not physically active, work shifts and have restricted rest periods. Security guards are frequently required to stand for 8–12 hours a day, many of which are on hard floors and in unsuitable footwear, causing extra strain to the lower limbs and muscular fatigue. Calf muscle tightness and lower limb pain are significant risk factors for security guards, with occupational factors like long hours, poor ergonomics, inadequate hydration, no stretching exercises, and static posture playing a major role in this (Bautista & Esmilla, 2025). Likewise, jobs that require repetitive stress on the lower limbs, combined with poor occupational ergonomic conditions are linked to foot pain, musculoskeletal discomfort and a decrease in work-related quality of life in physically demanding jobs (Naveed et al., 2025). Lower limb pain and discomfort is a common complaint among workers with occupations that require prolonged standing, but often these symptoms are overlooked until they become serious and interfere with the worker's ability to engage in daily activities (Irshad et al., 2025).

The physiology of standing a long time adds to understanding why calf muscle tightness and pain develop. When standing for a long time, the calf

muscles are in an isometric contraction, stabilising the posture and maintaining body balance. This sustained contraction results in an increase in intramuscular pressure which in turn will compress local blood vessels, thereby decreasing oxygen and nutrient delivery to the muscle fibres. This leads to metabolic waste products building up in the muscles and irritating pain receptors, resulting in tightness, cramping, soreness and fatigue. The muscles are also more prone to injury and chronic pain syndromes due to the reduced circulation, which slows down the recovery of the muscles (Karande et al., 2021).

Another important aspect closely linked to musculoskeletal health and recovery is sleep quality. There is a bidirectional relationship between sleep and pain, with poor sleep quality leading to heightened sensitivity to pain and inadequate sleep reducing sensitivity to pain and impairing tissue healing. Standing for long periods, fatigue, shift work and work stress are all potential factors that can affect the quality of sleep that security guards get. Studies have shown that among security guards, insomnia, daytime fatigue, sleep disturbance, and poor sleep quality are common complaints for those who work long and/or night shifts. This can cause ongoing pain and muscle discomfort, making it difficult to fall or stay asleep and shortening the amount of sleep. Low quality sleep has a detrimental effect on physical and psychological well-being. When you don't sleep well, your tissues don't heal, your muscles don't recover, your concentration is impaired, your coordination is off, you feel tired and fatigued, and your pain sensitivity is heightened, due to inflammatory and neurological processes. Chronic sleep disturbance can also lead to increased anxiety, stress, irritability and decreased work performance. Chronic pain, however, triggers hyperactivity of the sympathetic nervous system and elevated inflammatory cytokines which further impact normal sleep and set up a vicious cycle of pain and sleep disturbance (Tariq et al., 2020). This interplay between musculoskeletal pain and poor sleep quality has a clear impact on the quality of life, work efficiency and health of a security guard, who needs to be physically active and mentally alert during his/her job.

There are a number of other factors that affect calf muscle tightness and discomfort in security guards. Muscular stiffness and fatigue can be exacerbated by inadequate hydration and electrolyte balance, obesity, lack of physical activity, poor nutrition, exposure to extreme temperature, or extended shifts at night or inadequate recovery times. Mechanical stress to the lower limbs is further increased by seasonal changes and by standing on hard surfaces for long periods. If not managed, chronic calf tightness can over time lead to structural deformities, gait abnormalities, venous insufficiency, falls, and diminished occupational functioning (Singhania et al., 2024).

Understanding the relationship between calf muscle tightness, pain, and sleep quality is important for physiotherapy and occupational health management. Early identification of these problems may help in designing effective interventions such as stretching exercises, strengthening programs, ergonomic modifications, hydration strategies, footwear recommendations, and preventive physiotherapy management. These interventions may reduce pain, improve muscle flexibility, enhance sleep quality, and improve occupational performance among security guards (Naeem et al., 2024).

Previous literature has explored prolonged standing, musculoskeletal disorders, lower limb pain, and sleep quality separately among security guards and other occupational populations. However, limited evidence specifically examines the association between calf muscle tightness, pain intensity, and sleep quality among security guards exposed to prolonged standing. Therefore, the present study was conducted to investigate the association between calf muscle tightness, pain intensity, and sleep disturbance among security guards.

AIMS AND OBJECTIVE:

The aims and objective of the study were:

- To examine the association between pain and quality of sleep among security guards with calf muscle tightness.

HYPOTHESIS:

- **Null Hypothesis (H_0):** There is no significant association between pain and sleep disturbance caused by calf muscle tightness in security guards.
- **Alternative Hypothesis (H_1):** There is a significant association between pain and sleep disturbance caused by calf muscle tightness in security guards.

REVIEW OF LITERATURE

Recent literature has consistently highlighted the high prevalence of musculoskeletal disorders, lower limb pain, and sleep-related problems among workers exposed to prolonged standing, particularly security guards and shift-based employees. Occupational demands such as standing for long hours, repetitive activities, poor ergonomics, inadequate footwear, and physically demanding duties contribute significantly to musculoskeletal discomfort, pain intensity, fatigue, and sleep disturbances.

Irshad et al. (2025) investigated the prevalence of Patellofemoral Pain Syndrome (PFPS) among security guards in Gujranwala, Pakistan. This cross-sectional study included 323 male security guards aged between 30 and 50 years. The study found a statistically significant association between age and PFPS severity, with 39% participants reporting moderate symptoms and the highest prevalence observed in the 45–50 years age group. The authors concluded that ageing and prolonged occupational knee loading significantly increase the risk of musculoskeletal disorders among security guards.

Similarly, Khan et al. (2024) examined the association between prolonged standing and lower limb musculoskeletal disorders among security personnel. The study included 120 male security guards and utilized the Nordic Musculoskeletal Questionnaire (NMQ) and Visual Analogue Scale (VAS) for pain assessment. The findings demonstrated a high prevalence of calf pain, ankle pain, and low back pain, with symptom severity strongly associated with prolonged standing duration. The authors emphasized the importance of ergonomic interventions and preventive occupational strategies to reduce lower limb musculoskeletal problems among security personnel.

Additional evidence regarding functional limitations caused by prolonged standing was reported by Ghadi et al. (2024), who assessed activity limitation and participation restriction among security guards. Their cross-sectional observational study included 260 security guards with prolonged standing exposure. Using the Lower Extremity Functional Scale (LEFS), SF-36, and ICF documentation tools, the study identified mild to moderate activity limitations in standing, squatting, kneeling, and daily occupational activities. The study concluded that prolonged standing negatively affects physical functioning and participation among security guards.

Research focusing on occupational pain and quality of life also supports these findings. Mulye et al. (2021) investigated the association between mechanical low back pain and quality of life among security guards and found that greater pain severity was associated with poorer physical, psychological, social, and environmental quality of life domains. Anderson et al. (2021) similarly reported that prolonged standing and inappropriate footwear significantly contributed to musculoskeletal disorders, particularly foot and lower limb pain, among workers exposed to prolonged standing occupations.

Additionally, Naveed et al. (2025) investigated the effects of foot pain caused by repetitive lower limb movements on work-related quality of life among tailors and reported that poor ergonomic conditions and repetitive occupational stress significantly contributed to musculoskeletal discomfort and reduced quality of life in physically demanding occupations.

Several studies have specifically explored lower limb pain, cramps, and muscle-related discomfort in relation to sleep disturbances. Sarah Khan et al. (2022) examined nocturnal leg cramps and associated sleep disturbances among middle-aged adults. The findings revealed that painful lower-limb muscle cramps were highly prevalent and commonly associated with sleep disturbance and stress. Likewise, Abandeh et al. (2024) reported a high prevalence of leg cramps among pregnant women and identified significant associations

between leg cramps, discomfort, and poor sleep quality.

Sleep quality among security personnel has also been widely investigated. Singh et al. (2022) conducted a study on the impact of shift work on sleep quality among security guards and reported that rotating and contractual shift workers experienced poorer sleep quality, greater sleep latency, and increased daytime dysfunction compared to permanent workers. Similarly, Singhania et al. (2023) compared day-shift and night-shift security guards and found significantly poorer sleep quality and higher insomnia prevalence among night-shift workers. Their later study in 2024 further confirmed that sleep disturbances and insomnia are highly prevalent among security personnel, especially those performing night duties.

Ganesan et al. (2024) also investigated the impact of rotating shift work on sleep, circadian rhythm, alertness, and performance among intensive care workers. The study demonstrated that night shifts significantly reduced sleep duration and impaired alertness and neurobehavioral performance. These findings indicate that irregular working schedules and prolonged occupational demands adversely affect sleep quality and physical recovery.

Research investigating muscle tightness and its association with pain and sleep quality is comparatively limited. Nabi et al. (2024) explored the relationship between hamstring tightness, pain intensity, disability, and sleep quality among individuals with chronic nonspecific low back pain. The study found significant positive associations between pain intensity, disability, and poor sleep quality. However, hamstring tightness itself was not significantly associated with sleep quality. Encarnación-Martínez et al. (2023) additionally reported that hamstring tightness negatively affected dynamic stability and physical performance among physically active young adults.

Studies focusing on muscle quality and stretching interventions have further emphasized the possible relationship between muscle condition and sleep health. Yanwei You et al. (2023) reported that better muscle quality was associated with reduced sleeping difficulties among adults. Similarly, Alimoradi Mohammad et al. (2024) reviewed the effects of stretching exercises on sleep quality and suggested that stretching may improve sleep through muscle relaxation, improved circulation, stress reduction, and autonomic nervous system regulation, although evidence remains limited.

Other occupational health studies also demonstrate the physical burden experienced by security guards. Noor Bhai et al. (2023) reported poor physical fitness profiles, high blood pressure, obesity, and reduced muscular fitness among security guards working prolonged shifts. Nadeem et al. (2024) additionally found significant associations between prolonged duty hours, obesity, and plantar fasciitis among security guards, emphasizing the role of occupational standing in lower limb disorders.

Overall, previous literature demonstrates that prolonged standing, lower limb musculoskeletal pain, muscle-related discomfort, poor sleep quality, and occupational fatigue are highly prevalent among security guards and other physically demanding occupations. Although several studies have examined pain, sleep disturbance, shift work, and muscle tightness separately, limited evidence specifically explores the association between calf muscle tightness, pain intensity, and sleep quality among security guards exposed to prolonged standing. Therefore, the present study aims to investigate this association and contribute further evidence regarding occupational musculoskeletal health among security guards.

Methodology

A cross-sectional observational study was conducted to examine the association between pain and sleep disturbance caused by calf tightness in security guards. The study included security guards of different age groups working in different organizations. The study was completed in minimum six months. A sample size 134 was selected using a non-probability convenient sampling technique. Data was collected from colleges and banks. Calf tightness was assessed by using the Silfverskiöld Test. Pain levels were measured using the Numeric Pain Rating Scale (NPRS), while sleep disturbance was evaluated using the Pittsburgh Sleep Quality Index (PSQI). All data was analyzed using SPSS version 27,

applying descriptive statistics, correlation analysis, and relevant inferential tests to determine the relationship between calf muscle tightness, pain, and sleep disturbance.

Study Design
Study design was observational cross-sectional study (Nabi et al., 2024).

Study Setting
Data was collected from colleges and banks.

Duration of Study
The study took 6 months to complete after completion of synopsis (Nabi et al., 2024).

Sample Size
The sample size of 134 security guards was taken which was calculated by G POWER CALCULATOR.

Sampling Technique
The method of Non-probability convenient sampling technique was used(Naeem et al.,2024).

Sample Assortment Criteria
Inclusion criteria

- Security guards were participated (Nabi et al., 2024).
- Security guards aged 30 to 50 years was included Naeem et al.,2024).
- Security guards were working in different colleges and banks.(Bautista & Esmilla, 2025).
- Security guards with prolonged standing duties of 8 hours was included (Naeem et al., 2024).

Exclusion criteria

- Participants with recent history of trauma or fracture in previous two months ago. (Hasan et al., 2025)
- Any recent spinal injury was excluded.(Singh et al., 2022).
- Local and systemic infections were excluded(Naeem et al., 2024).
- Patient diagnosed with osteoarthritis were excluded.(Karnik Leena Zore, 2023).

Statistical Analysis
The statistical analysis was using SPSS version 27 (Statistical Package for Social Sciences). Correlation analysis was used to determine the association between calf muscle tightness, pain, and sleep disturbance.

Outcome Measures

- Calf muscle tightness was assessed using silfverskiold test
- Pain intensity was measured using the Numeric Pain Rating Scale (NPRS).
- Sleep disturbance / sleep quality was assessed with Pittsburgh Sleep Quality Index (PSQI).

Silfverskiöld test
Assessed using the Silfverskiöld test is a clinical exam used to determine whether limited ankle dorsiflexion is due to tightness of the gastrocnemius muscle alone or the combined gastrocnemius–soleus (Achilles tendon) complex. a reliable method to differentiating gastrocnemius tightness from soleus tightness. Increased ankle dorsiflexion with knee flexion indicates gastrocnemius tightness.
Normal Ankle Dorsiflexion

- Knee flexed: about 10°–20° dorsiflexion
- Knee extended: about 5°–10° dorsiflexion

Abnormal Findings

- Less than 10° dorsiflexion with knee extended may indicate gastrocnemius tightness
- Less than 10° even with knee flexed may indicate Achilles tendon or soleus tightness (Nabi et al., 2024).

- **Numeric pain rating scale (NPRS)**

Measured using the Numeric Pain Rating Scale (NPRS), a simple and widely used scale ranging from 0 (no pain) to 10 (worst possible pain) (Karande et al., 2021).

- **Pittsburgh sleep quality index (PSQI)**

Evaluated with the Pittsburgh Sleep Quality Index (PSQI), a self-rated questionnaire assessing sleep quality and disturbances over a 1-month period (Bhandare et al., 2020).

Data Collection Procedure

Data was collected from security guards working in colleges, and banks. Standardized assessment tools was Silfverskiöld TEST, NPRS, and PSQI questionnaire was used for data collection.

Parameters of Study

1. **Age**

These parameters help identify biological susceptibility, as muscle elasticity decreases with age and pain sensitivity can vary significantly between genders. (Nabi et al, 2024)

2. **Duration of Standing Hours**

This is the primary physical stressor, causing fluid pooling and muscle fatigue that lead to long-term musculoskeletal strain in security guards.(Nabi et al, 2024)

3. **Calf Muscle Tightness**

Measured by the Silfverskiöld Test, this represents the mechanical root of the problem by restricting movement and increasing leg tension. (Karnik Leena Zore et al, 2023)

4. **Pain Intensity**

Using the NPRS, this quantifies the physical burden which acts as the direct link between work-related strain and mental exhaustion.(Naeem et al, 2024)

5. **Sleep Quality**

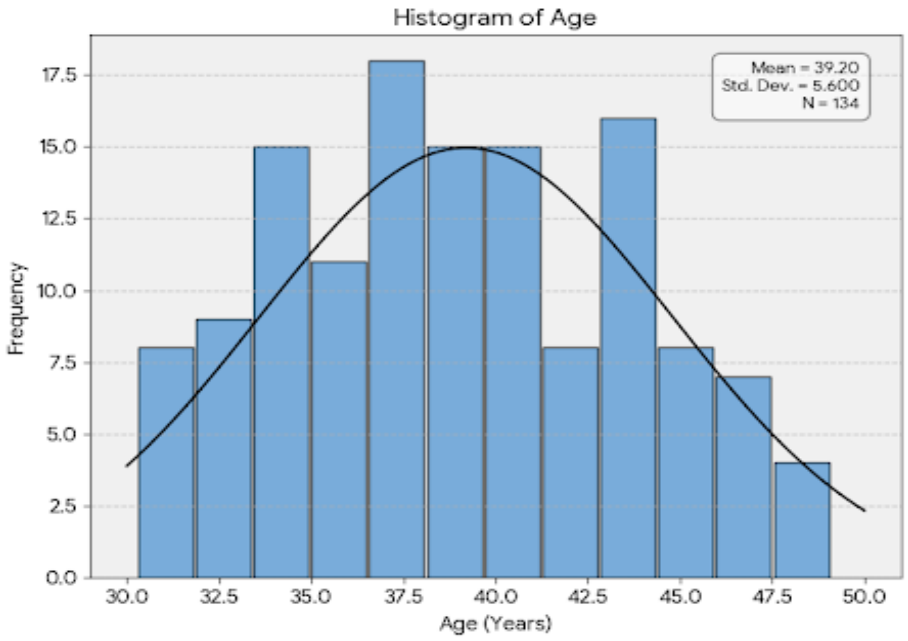
Assessed via the PSQI, this indicates the body's overall recovery level; poor quality prevents the repair of muscles stressed during shifts.(Karnik Leena Zore et al, 2023)

6. **Sleep Disturbance**

This tracks specific interruptions, like waking up from pain, and shows the direct correlation between physical agony and broken rest.(Karnik Leena Zore et al, 2023)

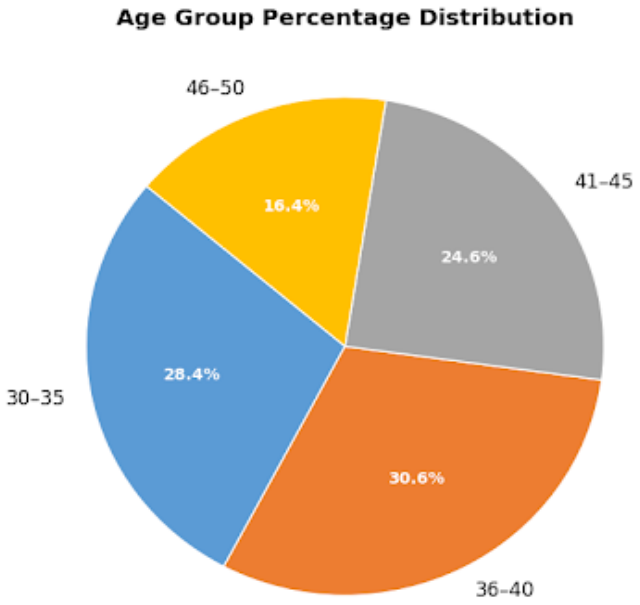
RESULTS

Age



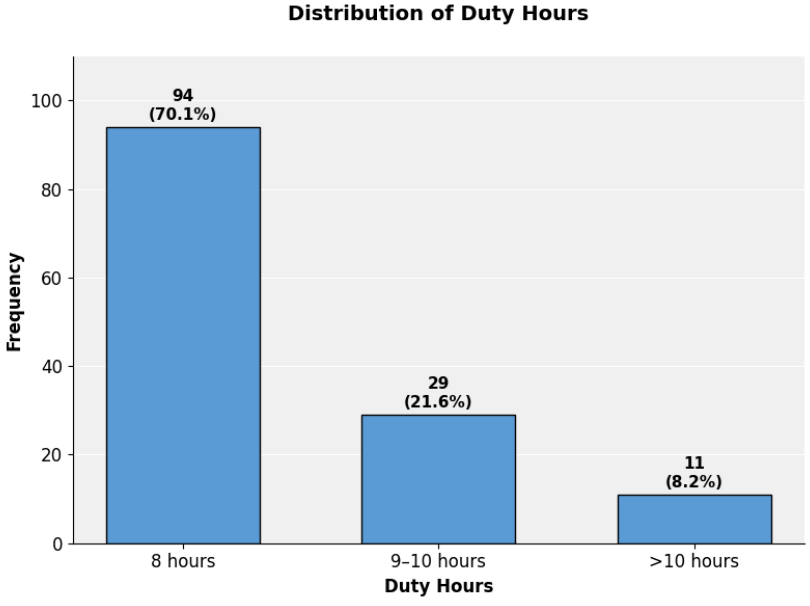
The age histogram illustrates that the majority of security guards are between the ages of 35 and 45. The distribution is normal (bell-shaped), with a mean age of 39.2 ± 5.6 years.

Age Group distribution



The age group distribution indicates that the majority of participants were between 36–40 years (30.6%), followed by 30–35 years (28.4%). A slightly lower proportion belonged to the 41–45 years group (24.6%), while the smallest percentage was observed in the 46–50 years group (16.4%).

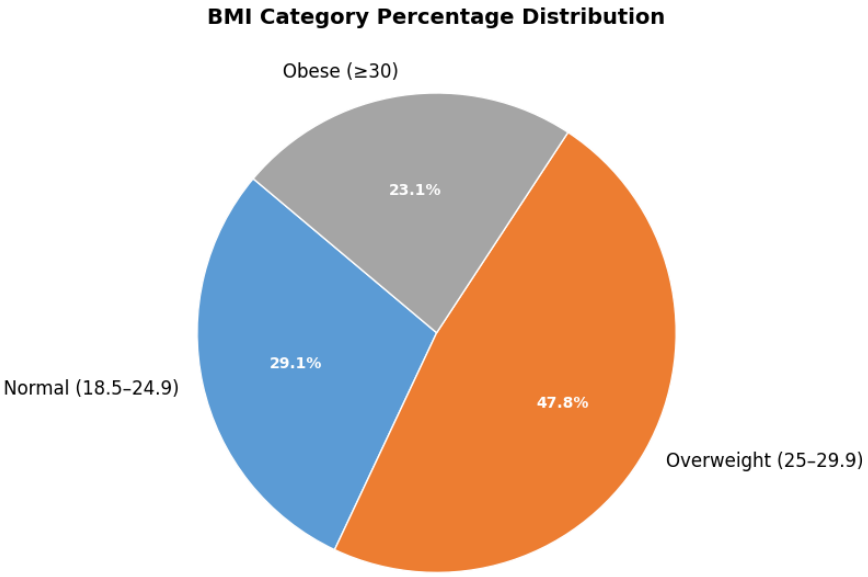
Duty Hours



The duty hours distribution shows that the majority of security guards (70.1%) worked 8 hours per day, which represents the standard shift duration. However, a considerable proportion of participants worked extended hours, with 21.6%

working 9–10 hours and 8.2% working more than 10 hours daily.

BMI Categories



The BMI distribution shows that the majority of security guards were overweight (47.8%), followed by obese (23.1%), while only 29.1% had a normal BMI.

Numeric Pain Rating Scale (NPRS) Total Score

Variable	Mean ± SD	Minimum	Maximum
NPRS Total Score	5.8 ± 2.1	1	10

The Numeric Pain Rating Scale (NPRS) total score demonstrated a mean pain intensity of 5.8 ± 2.1, with scores ranging from 1 to 10. These findings indicate that, on average, participants experienced moderate pain intensity, although variability in pain perception was observed across the sample.

Pain Intensity Classification (NPRS)

Category	Score Range	Frequency	Percentage (%)
Mild Pain	1–3	29	21.6
Moderate Pain	4–6	63	47.0
Severe Pain	7–10	42	31.3

The pain intensity classification revealed that the majority of participants experienced moderate pain (47.0%), followed by severe pain (31.3%), while 21.6% reported mild pain. These findings indicate that nearly four-fifths of the participants experienced moderate-to-severe pain intensity, which may negatively affect daily functioning and overall well-being.

Radiating Pain

Response	Frequency	Percentage (%)
Yes	79	59.0
No	55	41.0

A majority of participants (59%) reported radiating pain, while 41% did not. This finding suggests that pain symptoms may involve nerve-related components in a considerable proportion of the sample.

Pittsburgh Sleep Quality Index (PSQI) Total Score

Variable	Mean ± SD	Minimum	Maximum
PSQI Total Score	9.4 ± 3.8	1	19

The mean Pittsburgh Sleep Quality Index (PSQI) score was 9.4 ± 3.8, with scores ranging from 1 to 19. Since PSQI scores greater than 5 indicate poor sleep quality, the average score suggests that most participants experienced impaired sleep quality.

Sleep Quality Classification (PSQI)

Category	Score Range	Frequency	Percentage (%)
Good Sleep Quality	≤5	32	23.9
Poor Sleep Quality	>5	102	76.1

The PSQI classification demonstrated that the majority of participants (76.1%) had poor sleep quality, while only 23.9% reported good sleep quality. This indicates that sleep disturbances are highly prevalent among security guards in the sample population.

Sleep Latency

Time to Fall Asleep	Frequency	Percentage (%)
≤15 minutes	26	19.4
16–30 minutes	41	30.6
31–60 minutes	39	29.1
>60 minutes	28	20.9

Approximately half of the participants required more than 30 minutes to fall asleep, with 29.1% taking 31–60 minutes and 20.9% taking more than one hour. Only 19.4% fell asleep within 15 minutes. These findings suggest that difficulty initiating sleep is common among the participants.

Sleep Duration

Hours of Sleep	Frequency	Percentage (%)
>7 hours	35	26.1
6–7 hours	50	37.3
5–6 hours	32	23.9
<5 hours	17	12.7

Most participants slept 6–7 hours per night (37.3%), while 26.1% reported sleeping more than 7 hours. However, 36.6% slept 6 hours or less, indicating insufficient sleep duration in a substantial proportion of the sample.

Sleep Efficiency

Efficiency (%)	Frequency	Percentage (%)
>85%	40	29.9
75–84%	48	35.8
65–74%	30	22.4
<65%	16	11.9

Reduced sleep efficiency was observed among many participants. Specifically, 22.4% had sleep efficiency between 65–74%, while 11.9% had efficiency below 65%. Overall, approximately one-third of participants experienced poor sleep efficiency, reflecting fragmented or restless sleep.

Sleep Disturbances

Disturbance Type	Mean ± SD
Waking up during the night	1.9 ± 0.7
Bathroom visits	1.7 ± 0.6
Pain-related awakenings	2.1 ± 0.8
Breathing difficulties	1.4 ± 0.5
Other disturbances	1.6 ± 0.6

Among the reported sleep disturbances, pain-related awakenings showed the highest mean score (2.1 ± 0.8), followed by waking up during the night (1.9 ± 0.7) and bathroom visits (1.7 ± 0.6). Breathing difficulties were the least commonly reported disturbance (1.4 ± 0.5). These findings indicate that pain is a major contributor to disturbed sleep among the participants.

Correlation Between NPRS and PSQI

Variables	r-value	p-value
NPRS Total & PSQI Total	0.589	<0.001

The correlation analysis between Numeric Pain Rating Scale (NPRS) scores and Pittsburgh Sleep Quality Index (PSQI) scores revealed a moderate positive correlation ($r = 0.589$, $p < 0.001$). This indicates that higher pain intensity was associated with poorer sleep quality among the participants. The statistically significant relationship suggests that increasing pain levels may contribute substantially to sleep disturbances in security guards.

DISCUSSION

The current study was carried out with the purpose of exploring the connection between pain and sleep problems caused by tight calf muscles in guards working under the conditions of prolonged standing. The results revealed that most subjects suffered from moderate and severe levels of pain intensity and poor quality of sleep, indicating a statistically significant positive correlation between pain intensity and sleep disturbance. It can be concluded that prolonged standing and tight calf muscles have an adverse impact on both musculoskeletal and sleep health in guards (Nabi et al., 2024).

The results obtained from demographic data indicated that majority of participants had an age range of 35-45 years old with a mean age of 39.2±5.6 years. These findings were similarly supported by Nabi et al. (2024), who noted that middle aged workers working in a standing position for prolonged time suffered from musculoskeletal disorders and fatigue. Moreover, the current study showed that 70.1% of participants worked an 8-hour shift whereas others worked for more hours. Standing at work has been found to be a risk factor associated with low back pain and fatigue among workers who keep a static posture for a long time (Naeem et al., 2024).

From the present study, it can be observed that the

mean Numeric Pain Rating Scale (NPRS) was found to be 5.8 ± 2.1, implying moderate level of pain intensity amongst participants. Almost half of the participants suffered from moderate level of pain while about one-third of the participants experienced severe pain. These results are aligned with the results of the study performed by Naeem et al. (2024), wherein higher levels of pain in lower limb region were observed in security personnel owing to their prolonged standing position. Likewise, Hasan et al. (2025) observed that continuous standing resulted in muscle fatigue, poor circulation, and muscular pain amongst occupational workers. Higher incidence of radiating pain (59%) in the present study also indicates that extended stress on muscles can lead to nerve irritation (Hasan et al., 2025).

With regard to the sleep quality, results obtained from the present study showed that the average PSQI was 9.4 ± 3.8, suggesting that participants had poor quality of sleep. In addition, more than three-quarters of participants (76.1%) had poor quality of sleep, which shows the high prevalence of sleep disturbances amongst security guards. Similar results have been reported by studies carried out by Bautista and Esmilla (2025) where it was revealed that poor quality of sleep was linked to high workload and musculoskeletal discomfort. The same has been indicated by Singh et al. (2022).

Latency issues regarding sleep were also reported among the participants, since half of the sample size took more than 30 minutes before falling asleep. Lower efficiency of sleep and less hours of sleep were also common observations in the analysis. The most problematic sleep issue according to the mean score was pain awakenings. This means that pain is a major factor behind the interruption of sleep. A similar observation was made by Karnik Leena Zore (2023), who reported that musculoskeletal pain leads to interrupted sleep.

One of the crucial outcomes of this study is the existence of statistically significant moderate positive correlation between the NPRS and PSQI score ($r = 0.589$, $p < 0.001$). In other words, there was a direct relationship between increased levels of pain and sleep quality deterioration. These results are in line with existing literature showing the bidirectional nature of the association between pain and sleep disturbances. As Nabi et al. (2024) pointed out, the pain leads to an increase in nighttime awakenings and decreases the ability of having adequate rest, while at the same time, the lack of sleep intensifies the feeling of pain and muscle soreness.

Another reason why patients may experience pain and disturbed sleep in this study is the prevalence of overweight and obesity noted in the current study. Higher levels of body mass index exert additional physical stress on the lower limbs of an individual, which can cause muscle and joint pains. Overweight people have been found to be more susceptible to joint pains and low quality of sleep as a result of high biomechanical load (Singh et al., 2022).

In addition to this, the results of the current study can be attributed to the physiological changes associated with standing for extended periods of time. For example, it is known that standing for too long will result in poor blood circulation, fatigue, and stiffness of the gastrocnemius and soleus muscles leading to painful sensations in the leg area. In turn, the constant tension of the muscles can lead to some changes in posture and movements that increase the burden on other parts of the body. It has been shown previously that employees engaged in occupations that require standing for extended periods of time have more issues with lower limbs than others (Hasan et al., 2025; Naeem et al., 2024).

Moreover, sleep problems reported by the participants may have serious consequences for their physical and mental well-being. Sleep deprivation is linked to poor concentration, exhaustion, poor performance, and inability to cope with musculoskeletal strain. Security guards with insufficient sleep may also feel less alert during their working shifts, thus affecting the efficiency of their work negatively. The present results highlight the need for early identification and prevention of musculoskeletal disorders and sleep-related problems among occupationally exposed individuals. Utilization of workplace wellness practices, stretching, ergonomics, and physiotherapy rehabilitation may decrease calf tightness, severity of musculoskeletal pain, and

improve sleep quality in security guards (Bautista & Esmilla, 2025; Singh et al., 2022).

Generally, the results of the present study reveal a significant association between the tightness of calf muscles and the effects of prolonged standing with the increase of pain and poor sleep quality among the studied group of security guards. Occupational health measures including stretching, ergonomics, planned rest periods, and physiotherapy could help minimize the problem (Bautista & Esmilla, 2025).

CONCLUSION

The study concluded that there is a significant moderate positive correlation ($r = 0.589$, $p < 0.001$) between pain severity and sleep disturbance among security guards with calf muscle tightness due to prolonged standing. The findings indicate that security guards are at high risk for musculoskeletal pain and poor sleep quality, with many participants experiencing radiating pain and sleep impairment. Prolonged standing and calf tightness negatively affect both physical health and sleep quality, highlighting the need for preventive and rehabilitative interventions.

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