

**CHARACTERISTICS OF MUSCULOSKELETAL DISORDERS
AMONG PEACEKEEPING FORCES AT VIETNAM'S LEVEL-2
FIELD HOSPITAL IN SOUTH SUDAN**

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Abstract

Objectives: To describe the characteristics of musculoskeletal disorders (MSDs) among peacekeeping forces in the Unity Sector of the United Nations Mission in South Sudan (UNMISS). **Methods:** A retrospective, descriptive study was conducted on 1,638 patients who presented to Vietnam's Level-2 Field Hospital (VNL2H) in South Sudan and were diagnosed with MSDs from 2020 to 2024. Study variables included age, unit, diagnosis (classified according to ICD-10), anatomical site of injury, and surgical intervention. **Results:** Between January 1, 2020 and December 31, 2024, VNL2H managed 7,077 patients, of whom 1,638 (23.2%) presented with MSDs. Diseases of the musculoskeletal system and connective tissue represented 63.6% of cases, with dorsopathies accounting for 33.0%. Injuries accounted for 36.4%, of which soft tissue trauma represented 26.4%. Joint disorders and soft tissue injuries were most prevalent among the Ghanaian Force Police Unit (GHANAFPU), whereas dorsopathies, soft tissue trauma, wounds, fractures, and animal bites were more common among the UNMISS Assistance Force (AssUNMISS). **Conclusion:** MSDs were common among peacekeeping forces in the Unity Sector of UNMISS. Arthropathies and dorsopathies were the most prevalent among musculoskeletal conditions, while soft tissue trauma was the most frequent type of injury.

Keywords: Musculoskeletal disorders; Field hospital; Peacekeeping forces.

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INTRODUCTION

In modern warfare, MSDs are the leading causes of reduced combat strength [1]. A study conducted in the United States on MSDs among military personnel reported that up to 82% were attributed to inflammatory conditions and overuse-related joint pain. Spinal and lower extremity injuries accounted for the highest proportions, representing 40% and 39%, respectively. These conditions prevented soldiers from running, marching, dismounting from vehicles, or carrying backpacks [2]. In 2012, David G et al. reported on MSDs among peacekeeping forces in Afghanistan, showing that 75% of soldiers experienced at least one episode of MSDs during a 6-month deployment. Low back pain and shoulder pain accounted for 34%, while lower extremity disorders represented 14% [3].

The VNL2H, based in Unity Sector under the UNMISS, is responsible for providing healthcare to more than 3,500 United Nations (UN) personnel. These include Mongolian Infantry Battalion (MONBATT), Ghanaian Infantry Battalion (GHANBATT), GHANAFPU, Pakistani Military Engineering Task Force (PAKMETF), VNL2H, UN Police, and other AssUNMISS. To the best of our knowledge, no study has yet been published on the characteristics of MSDs among these groups of personnel. Such information is highly important for planning medical resource allocation

and serves as a basis for raising awareness among soldiers and unit commanders regarding the impact of musculoskeletal health on operational readiness. Therefore, we conducted this study to: *Describe the characteristics of MSDs among peacekeeping forces in Unity Sector, UNMISS.*

MATERIALS AND METHODS

1. Subjects

Including 1,638 patients who presented to the VNL2H in South Sudan and were diagnosed with MSDs during a 5-year period from 2020 to 2024.

2. Methods

* *Study design:* A retrospective, descriptive study.

* *Study variables:* Age, unit, diagnosis (classified according to ICD-10), anatomical site of the lesion, and surgical intervention.

* *Data collection procedures:* The hospital's patient information management system was used to generate a list of patients who attended consultations between January 1, 2020 and December 31, 2024. Data were extracted for patients who presented with and were treated for MSDs, while those with incomplete records or not involving UN personnel were excluded. Study variables were then collected. The diagnosis of MSDs was based on medical history, injury mechanism, clinical examination, blood and urine tests, ultrasound, and X-ray imaging.

** Data analysis:* Data were stored and analyzed using SPSS version 20.0. Continuous variables were expressed as $\bar{X} \pm SD$. Categorical variables were presented as percentages. The association between MSDs and military units was examined using the Chi-square test.

3. Ethics

The study was conducted in accordance with the regulations of the VNL2H, Vietnam Department of Peacekeeping Operations. The data used in this study were collected and analyzed with the approval of the VNL2H in South Sudan. The authors declare to have no conflicts of interest in this study.

RESULTS

During the period from January 1, 2020 to December 31, 2024, the VNL2H examined 7,077 patients, of whom 1,638 patients were diagnosed with MSDs, accounting for 23.2% of all cases. The mean age of these patients was 39.53 ± 8.12 years (range: 20 - 63 years).

Table 1. Distribution of patients by unit.

Unit	Frequency (%)	Number of MSDs/total unit visits (%)
MONBATT	105 (6.4)	105/558 (18.8)
GHANBATT	162 (9.9)	162/357 (45.4)
GHANAFPU	461 (28.1)	461/1,355 (34.0)
UN Police	122 (7.4)	122/894 (13.5)
VNL2H	20 (1.2)	20/103 (19.4)
AssUNMISS	676 (41.3)	676/3,539 (19.1)
PAKMETF	92 (5.6)	92/271 (33.9)
Total	1,638 (100)	1,638/7,077 (23.2)

Patients from AssUNMISS accounted for the highest proportion with 676 cases (41.3%), followed by GHANAFPU and GHANBATT, representing 28.1% and 9.9%, respectively. Patients from VNL2H comprised 20 cases (1.2%). Among these units, GHANBATT had the highest proportion of patients presenting with MSDs, with 162/357 visits (45.4%). In contrast, UN Police had the lowest proportion of musculoskeletal consultations, with 122/894 patients (13.5%).

Table 2. Classification of diseases and injuries.

Diseases and injuries		Frequency (%)	Total frequency (%)
Diseases of the musculoskeletal system and connective tissue	Arthropathies	247 (15.1)	1,042 (63.6)
	SCTD	31 (1.9)	
	Dorsopathies	541 (33.0)	
	STD	211 (12.9)	
	OAC	12 (0.7)	
Injuries	Trauma	433 (26.4)	596 (36.4)
	Wound	36 (2.2)	
	Fracture	68 (4.2)	
	Animal bite	48 (2.9)	
	Burn	11 (0.7)	
Total count (%)		1,638 (100)	1,638 (100)

(SCTD: Systemic connective tissue disorders; STD: Soft tissue disorders; OAC: Osteopathies and chondropathies)

Musculoskeletal diseases accounted for a high proportion, with dorsopathies representing 33.0%. Soft tissue trauma accounted for 26.4%.

Table 3. Anatomical distribution of major MSDs.

Diseases or injuries	Anatomy region	Frequency (%)	Total frequency (%)
Arthropathies	Shoulder	35 (14.2)	247 (100)
	Knee	125 (50.6)	
	Others	87 (35.2)	
Dorsopathies	Lumbar	437 (80.8)	541 (100)
	Cervical	95 (17.5)	
	Others	9 (1.7)	
Soft tissue disorders	Upper limb	88 (41.7)	211 (100)
	Lower limb	87 (41.2)	
	Others	36 (17.1)	
Trauma	Upper limb	148 (34.2)	433 (100)
	Lower limb	231 (53.3)	
	Others	54 (12.5)	

Among arthropathies, knee involvement was the most common. For dorsopathies, lumbar spine lesions predominated, with 437/541 cases (80.8%). In soft tissue

disorders, lesions of the upper and lower extremities were nearly equivalent, representing 41.7% and 41.2%, respectively. In contrast, soft tissue trauma occurred predominantly in the lower extremities, with 231/433 cases (53.3%).

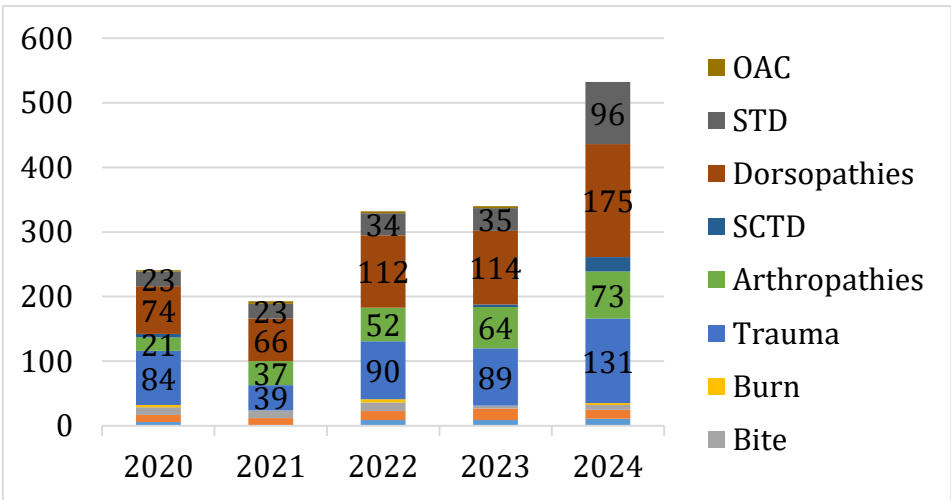


Figure 1. Distribution of MSDs by year.

Case numbers tended to increase over time, with the highest recorded in 2024 (532 cases) and the lowest in 2021 (193 cases), while soft tissue disorders and dorsopathies remained the most prevalent conditions.

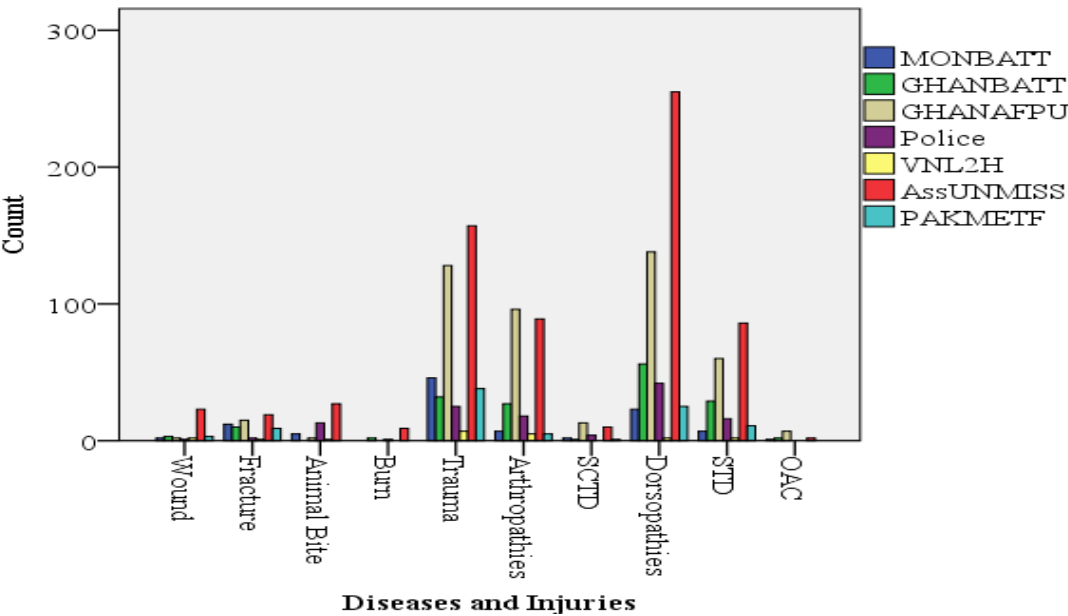


Figure 2. The association between MSDs and units.

There was a significant association between MSDs and unit ($p < 0.001$). Arthropathies and soft tissue trauma predominated in GHANAFPU personnel, whereas dorsopathies, soft tissue trauma, wounds, fractures, and animal bites were more frequent among AssUNMISS.

25 patients required surgical intervention, comprising 10 major and 15 minor procedures.

DISCUSSION

This study examined the characteristics of MSDs among peacekeeping forces in the Unity Sector, UNMISS. The findings highlight the burden of MSDs within this population and the association of these disorders with different units in the sector. This study provides a foundation for clinicians and policymakers to develop preventive measures, ensure the supply of medications and medical supplies, and allocate sufficient manpower to effectively deliver healthcare services to peacekeeping personnel.

Annually, the VNL2H manages between 1,000 and 2,000 patient visits. In our study, AssUNMISS and GHANAFPU had the highest number of MSD consultations. However, when comparing the proportion of MSD consultations relative to total visits, GHANBATT, GHANAFPU, AssUNMISS, and PAKMETF had the highest rates, ranging from 34 - 45.4%. Personnel

from GHANBATT and GHANAFPU frequently carry body armor, helmets, and patrol equipment, while AssUNMISS and PAKMETF regularly perform heavy lifting. These occupational demands likely contribute to their elevated rates of MSDs. MSDs are among the most common conditions affecting peacekeeping forces. A study by David G et al. (2012) on Swedish personnel deployed in Afghanistan reported that 75% of soldiers experienced at least one musculoskeletal disorder during a six-month deployment [3]. These findings highlight the need to improve working conditions for AssUNMISS personnel and to reduce the weight of equipment carried by infantry and police during patrols, aiming to decrease the incidence of MSDs.

In our study, diseases of the musculoskeletal system and connective tissue accounted for a high proportion, with 1,042/1,638 cases (63.6%). These conditions are primarily caused by repetitive micro-traumas, which can also exacerbate, prolong, or trigger the recurrence of pre-existing injuries. Such micro-traumas are associated with activities including overtraining, excessive exertion, repetitive movements, vibratory forces, extreme joint positions, and prolonged static postures [2]. A study by Le Viet Anh et al. (2024) reported that during a deployment from May 2022 to

July 2023, 37.37% of patients presented with MSDs, with musculoskeletal diseases representing 59.5% of those cases. Similar to our findings, lumbar spine and knee disorders were the most common conditions within the musculoskeletal diseases group [4]. In our cohort, 36.4% of MSD consultations were due to injuries, indicating that peacekeeping forces face a high risk of occupational and sports-related injuries, while combat-related injuries are rare. Over our 5-year study period, only one case involved a gunshot wound to a finger. Likewise, in Le Viet Anh's 14-month study, a single patient sustained a gunshot wound to the thigh, but the patient was transferred to a higher-level hospital (Level-2 plus) without treatment at the VNL2H. These findings are consistent with a study by the UK Military Medical Service (2017), which reported no combat-related injuries among 286 cases treated over three months at the Level-2 Field Hospital in Unity Sector, UNMISS [5]. The number of MSD consultations showed an increasing trend over the years, with arthropathies, dorsopathies, and soft tissue trauma consistently representing the highest proportions.

Our study of anatomical injury sites showed that knee joints were the most commonly affected in arthropathies, while lumbar spine lesions predominated

among dorsopathies. These results are consistent with the study by Le Viet Anh et al. (2024), in which knee and lumbar spine disorders accounted for 63.11% of all MSDs. Similarly, a study in 2006 on 224 US soldiers deployed in Iraq reported that the lumbar spine, shoulder, and knee were the most frequent sites of injury [7]. The knee, shoulder, and lumbar spine are subjected to significant mechanical stress during heavy load carrying and long-distance marching. Peacekeeping personnel, including police and infantry, frequently patrol while carrying heavy equipment, while locally contracted civilian staff often perform heavy lifting. These activities are key contributors to the onset or recurrence of musculoskeletal diseases. During the five-year study period, the Unity Sector, UNMISS experienced no major conflicts, and thus injuries were primarily soft tissue trauma, accounting for 26.4% of MSDs. However, in conflict settings, the proportion of combat-related injuries is expected to be much higher. For example, a report by Yongqiang Z et al. (2018) from the Chinese Level 2 Field Hospital in MINUSCA, Mali, found that among 217 injured patients during conflict, 176 cases were combat-related, of which 175 required surgical intervention [6]. Therefore, field hospitals must always be prepared to treat combat-related injuries if unexpected conflicts occur. In

our study, surgical intervention was rare, with only 25/1,638 cases requiring surgery. Among soft tissue trauma, the lower limbs accounted for 53.3% of cases. This finding is consistent with a study by Henri T et al. (2009) in Finnish soldiers, with 61% of musculoskeletal injuries affecting the lower limbs [8]. A notable observation in our study was animal bites. Over the five-year period, we recorded 48 cases caused by insects and animals, including bees, dogs, monkeys, scorpions, snakes, and unidentified species. Only one case involved a snake bite, which was non-venomous and did not pose a life-threatening risk. South Sudan hosts several highly venomous snakes; therefore, UN field hospitals are required to maintain antivenom supplies for African snake venom. A study by Le Quang Dao et al. (2025) reported that between 2018 and 2023, the VNL2H treated 33 cases of dog bites, most of which were caused by stray dogs [9].

In the field hospital setting, we relied on clinical experience and basic tests for diagnosis, which represents a limitation of this study. For cases requiring more advanced diagnostic tests, patients were referred to higher-level hospitals.

CONCLUSION

MSDs were common among peacekeeping forces in the Unity Sector of UNMISS. Arthropathies and dorsopathies were the most prevalent among

musculoskeletal conditions, while soft tissue trauma was the most frequent type of injury. It is essential to maintain adequate medications, medical supplies, and appropriately trained personnel to ensure timely emergency care and effective management of musculoskeletal conditions during peacekeeping operations.

REFERENCES

1. Hoeffler DF, Melton LJ. Changes in the distribution of Navy and Marine Corps casualties from World War I through the Vietnam conflict. *Mil Med.* 1981; 146(11):776-779.
2. Hauret KG, Jones BH, Bullock SH, et al. Musculoskeletal injuries-description of and under recognized injury problem among military personnel. *Am J Prev Med.* 2010; 38(1 Suppl):S61-S70.
3. David G, Eva S, Lena WH. The occurrence and severity of musculoskeletal disorders in Swedish military personnel during peacekeeping operations in Afghanistan. *Eur Spine J.* 2012; 21:739-744.
4. Lê Việt Anh, Hồ Hữu Phước, Phạm Mạnh Cường và CS. Kết quả thu dung và điều trị của Bệnh viện Dã chiến cấp 2 số 4 Việt Nam tại Phái bộ Gìn giữ Hòa bình Liên Hiệp Quốc Nam Sudan. *Tạp chí Y Dược học Quân sự.* 2024; Số đặc biệt:97-108.
5. Bailey MS, Gurney I, Lentaigne J, et al. Clinical activity at the UK Military Level 2 Hospital in Bentiu, South Sudan during Op TRENTON from June to September 2017. *BMJ Mil Health.* 2017; 167(5):304-309.

6. Yongqiang Z, Dousheng H, Yanning L, et al. Peacekeepers suffered combat-related injuries in Mali: A retrospective, descriptive study. *J R Army Med Corps*. 2018; 0:1-6.

7. Rhon DI. Aphysical therapist experience, observation, and practice with an infantry brigade combat team in support of Operation Iraqi Freedom. *Mil Med*. 2010; 175(6):442-447.

8. Henri T, Jaana S, Harri P, et al. Musculoskeletal disorders in physically active conscripts: A one-year follow-up study in the Finnish Defence Force. *BMC Musculoskeletal Disorders*. 2009; 10(89).

9. Lê Quang Đạo, Nguyễn Bá Ngọc, Vũ Minh Dương và CS. Đặc điểm tổn thương và kết quả điều trị vết thương do chó cắn tại Bệnh viện Dã chiến cấp 2 Việt Nam tại Nam Sudan. *Tạp chí Y Dược học Quân sự*. 2025; 50(2):165-173