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Original Research

Descriptive epidemiology of deployment-related medical conditions and shipboard training-related injuries in a Chinese Navy population

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ABSTRACT

Objectives: To investigate the deployment-related medical conditions and shipboard tactical training-related injuries in a Chinese Navy population.
Study design: A retrospective study with the Chinese Navy was conducted.
Methods: The medical records of 1543 Navy crewmembers from 2011 to 2015 were collected. The distribution and incidence rate (IR) of different types of medical conditions were provided and compared between the Aden Gulf deployment and nondeployment periods. The occurrence of military training-related injuries in crewmembers receiving 12-week shipboard tactical training was compared with that of 956 marines and 4371 recruits receiving combat and physical training, respectively. The anatomic locations and types of training-related injury were analyzed.
Results: Compared with the nondeployment period, the percentages of the following injuries were significantly higher during deployment: injuries and certain other consequences of external causes (16.97% vs 7.76%), diseases of the musculoskeletal system and connective tissue (15.40% vs 10.34%) and mental and behavioral disorders (11.23% vs 3.45%); however, respiratory system diseases had a lower percentage (19.84% vs 28.35%). Far seas deployment significantly increased the IRs of acute upper respiratory infection, skin and eye infection, sprains and low back pain as well as aphthous ulcer, insomnia, and seasickness ($P < 0.05$, 0.01 or 0.001). Shipboard training induced higher IRs of injuries to the upper extremities, spine and back and head and face than physical training and a higher incidence of head and face injury than combat training ($P < 0.05$ or 0.001). Physical training had higher IRs of overuse injuries than shipboard and combat training ($P < 0.001$). The IR of fracture was higher during combat and physical training than shipboard training ($P < 0.01$ and 0.001).
Conclusions: The Chinese Navy has experienced novel health issues in crewmembers in recent years. Corresponding countermeasures should be taken to address deployment-related medical conditions and shipboard training-related injuries in the future.

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Introduction

Numerous studies have confirmed that disease and nonbattle injuries account for more losses to fighting forces than injuries caused by combat.[1,2] These medical issues in service members consume large amounts of medical resources worldwide.[3] In previous studies, the epidemiology of some types of medical conditions such as upper respiratory disease and musculoskeletal and soft-tissue injuries including both acute and overuse trauma was reported among deployed US Navy shipboard personnel.[4,5] Data on the hospitalizations aboard aircraft carriers from the US Navy have described the percentage distributions of the major types of illness during the Western Pacific and Mediterranean theaters' peacetime operations and Vietnam combat support deployments.[6] That study demonstrated that the spectrum of disease might be altered during deployment at sea and that more medical efforts should be made for shipboard personnel.

In addition to addressing far seas deployment as a factor that may affect the health of Navy crewmembers, military training should also be taken into account when preparing for injury prevention and treatment. In the US and western European countries, military training caused high incidences of musculoskeletal injuries, which were the leading contributor to days of limited duty in the army.[7–9] Nevertheless, previous studies have mainly focused on basic combat training and physical training-related injuries in recruits, marines or special forces; epidemiological investigations regarding military training-related injuries caused by shipboard tactical training in Navy crewmembers are scarce.[10,11] As different training characteristics and environments can lead to differences in injury type and anatomic location,[12,13] it is reasonable to hypothesize that the location of injury, injury type and number of days of limited duty (DLD) due to shipboard tactical training might differ from traditional combat and physical military training.

In the past decade, the Chinese Navy surface ship corps have participated in an international escort mission around the sea area of the Aden Gulf. As the duration of sea-going service is much longer than it has been before, crewmembers have faced substantial challenges due to the harsh foreign environment, and this might threaten the condition of their health. Moreover, during nondeployment periods, shipboard tactical training has been intensified to fulfill the requirements for far seas escorting duty. Thus, it has become important to survey health outcomes during long-term deployment at sea as well as injury characteristics during shipboard tactical training period in crewmembers while considering the resources and technology for health care services and military readiness. The purpose of this study was to describe the categories of medical conditions encountered in crewmembers of the Chinese Navy surface corps during far seas deployment around the sea area of the Aden Gulf and compare the results with the data recorded during the nondeployment period. We also investigated the occurrence of military training-related injuries in crewmembers receiving shipboard tactical training and compared these data with injuries in marines and recruits undergoing combat and physical military training. The distribution and incidence of the different types of injury, the anatomic locations and estimated DLD were described and analyzed in this article.

Methods

Subjects and ethnics

All subjects were active-duty male crewmembers, marines and recruits aged from 18 to 25 years in the Chinese Navy. The sample size depended on the deployment status and the training assignment of the corps. The crewmembers were officers or enlisted men on surface ships from five groups of the escort fleet deployed to the Aden Gulf from 2011 to 2015 ($n = 1674$). The 131 subjects who had been deployed two or more times were not eligible for further analysis. The crewmembers ($n = 1474$) who also received a 12-week shipboard tactical training program for weapons operation and damage control on warships during the nondeployment period (from May to July 2014) were investigated in the following military training-related injury survey. The occurrence of military training-related injuries was compared with that in marines ($n = 971$) and recruits ($n = 4508$) who received combat and physical training program, respectively, during the same 12-week period of time. The combat training program includes rifle marksmanship, hand-to-hand fighting and street combat skill training, while the physical training program includes endurance running, long-distance marching, calisthenics and obstacle courses. Thirty-two crewmembers, 15 marines and 137 recruits who stopped training for nonmedical reasons were excluded from the investigation.

The project protocol conformed to the ethical guidelines of the Declaration of Helsinki as well as the American Psychological Association's Ethical Principles of Psychologists and Code of Conduct (2002, including 2010 Amendments) and was approved by the Ethics Committee for the Second Military Medical University (Shanghai, PR China). Informed consent was obtained in writing from each participant after providing information about the intentions of the study and the publication of the relevant data.

Data acquisition

A retrospective study was conducted to investigate the occurrence of medical conditions and shipboard training-related injuries in Navy personnel. We acquired demographic information (age, body mass index and smoking history), medical records and diagnosis and physical examination data for each subject. To investigate deployment-related medical conditions, the medical records of shipboard crewmembers seeking medical treatment during deployment (181 consecutive days per person on average) were collected. We also reviewed each subject's nondeployment medical data in the same period of time from a year before. The diagnosis categories were identified using generally accepted International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) criteria. Injuries and certain other consequences of external causes as well as diseases of the musculoskeletal system and connective tissue that were diagnosed under combat or hostile situations during the