Training-associated injuries among Armed Forces trainees

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Injuries from traffic collisions, drowning, poisoning, falls or burns and violence from assault, self-inflicted violence or acts of war, kill >5 million people worldwide annually and cause harm to many more. They account for 9% of global mortality and for every death, there are dozens of hospitalisations, hundreds of emergency department visits, and thousands of doctors' appointments. A large proportion of people surviving their injuries incur temporary or permanent disabilities.¹ Of the estimated 10.3 million deaths that occurred in India in 2004, 1.1 million (11%) were due to injuries. However, for every death, nearly 20–30 people are likely to be admitted to hospital and 50–100 receive emergency care.² In the Armed Forces context, the injuries can be classified as either due to enemy action (EA) or non-enemy action (NEA). Injuries NEA form an important cause of morbidity, mortality, and invalidments in the Armed Forces all over the world. However, studies have consistently shown that a lower proportion of traumatic deaths occur in Armed Forces as compared to same-age civilian populations.³

Hospital-based data show that injuries NEA lead to a high rate of manpower wastage and the consequent load on the Armed Forces Medical Services. The implications of these injuries in terms of patient morbidity, attrition rates, and training costs for military personnel are staggering. In the year 2010, it formed approximately 16% of all hospital admissions with approximately 12 days of average duration of hospital stay per admission.⁴ Injuries have gained attention in the other armies too as the magnitude of the injury problem has become apparent. Injuries are the leading cause of hospitalisations, disabilities, outpatient visits, and manpower losses in the US military compared to all other causes of morbidity and mortality resulting in 5–22 times more days of limited duty than illnesses and accounting for >25 million limited duty days annually.^{5–7}

Reasons for NEA injuries among trained soldiers are motor vehicle including road traffic and other accidents whereas among trainees, training-related injuries are major causes of injury NEA. An important component of injuries in the Armed Forces is training-related injuries. In India, the problem is more severe amongst Recruits and Cadets (Trainees) as compared

to trained soldiers as it formed almost one-third of their total admissions.⁴ A prospective study published in this issue has shown that only for stress fractures (SF), which is one of the components of all injuries among trainees; the incidence was 7% over a period of five years in a training centre.⁸ In the US, training-related injuries are leading cause of healthcare facility visits and the cumulative risk of injury of the 8-week army basic training cycle was about 50% for women and 25% for men.^{9,10}

Risk factors for training injuries in various military populations have been identified.^{8,9} Initial physical stress among recruits for conditioning into the military causes bone remodelling, which may be stronger than the original long bone and more resistant to fractures. However, lack of rest in the third or fourth week of initiation of intense physical training produces a lag between bone resorption and bone deposition. This makes the bones more vulnerable to injuries.¹¹ Studies have implicated cigarette smoking as an important risk factor, when all other confounders were taken into consideration.¹² Gender also plays a role of risk factor with female army trainees being more prone to training-related injuries.¹⁰ Certain injuries like knee and other lower limb afflictions are related to previous history of injury to the same organ/site.¹³ The other risk factors include low levels of previous occupational and leisure time physical activity, previous injury history, high running mileage, high amount of weekly exercise, etc. Certain biomechanical factors like back and hamstring flexibility, high arches, bone geometry, genu valgum, low arches, restricted ankle dorsiflexion, and increased hind-foot inversion are known to make a person more prone to injuries. Quite a few of these biomechanical factors can be modulated through training, equipment, or footwear changes.⁹

Specific interventions that successfully reduce injuries without compromising training have been tested.^{14,15} Evaluation of a trial with intervention of reduction in the amount of running miles, gradual build-up of exercise and military hiking, and emphasis on aerobic activities in early training phases before progressing to anaerobic activities and strength conditioning demonstrated a significant reduction in all overuse type injuries. Another aetiological factor that may reduce training injuries is well-designed footwear including inexpensive orthotic inserted into the military combat boot.⁹ A 20% solution of aluminium chloride hexahydrate in anhydrous ethyl alcohol may be effective in reducing foot blisters during hiking.¹⁶ Certain studies have shown that benefit is achieved in applying prophylactic ankle taping or bracing to athletes and parachute jumpers with a history of ankle sprain, compared with those without previous sprains.¹⁷ A combination of interventions, like

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modified physical training, injury education, and a unit-based injury surveillance system have shown to contribute to a reduction in injuries keeping the improvements in physical fitness similar to traditional physical training programmes.¹⁸ Thus, various injury prevention approaches demonstrate that injuries are not an inevitable consequence of military training and can be successfully controlled.

As the trainees on entering the corridors of their first institution in the military may not be physically conditioned to take on the stressors of training without compromising health and fitness, scientifically designed training schedules must be prepared and implemented. This will remove the biases towards certain exercises and physical training that many instructors currently harbour. A period of rest during third or fourth week of the commencement of intense physical training has shown to prevent a substantial morbidity of SFs and other musculoskeletal injuries. After initial training, further exercise schedules can be tailor-made as per individual job profiles.

In the Indian Armed Forces, currently the specific cause of injury is not known in a majority of cases and suitable interventions have neither been planned nor implemented in a co-ordinated manner. Many small studies on various aspects of injuries among trainees have been conducted in past couple of decades. However, well-designed, methodologically sound, multicentric research needs to be conducted for comparing newer techniques with existing ones and for trying out various modalities of injury prevention as brought out by research conducted in other countries.

Additionally, a transparent reporting and surveillance system for injury monitoring in the Armed Forces in addition to the hospital-based data collection system that is already in place is required to get a clearer epidemiological picture of the problem. The major purposes of injury surveillance will be to assess health status, conduct research, determine priorities, and evaluate interventions and programmes. Injury surveillance has been shown to be critical to sustained efforts towards injury prevention by: identifying common and most severe injury problems; detecting emerging problems; setting objective and evidence-based priorities; monitoring and evaluating policies and programmes.¹⁹

To conclude, injuries are the biggest health problem of the military services for which medical care is sought. Nevertheless, where comparisons can be made with civilian population data, rates of injuries are lower than for the civilian population. This suggests that while prevention of injuries should be a top priority for the Armed Forces, the services are doing an excellent job of making military training and operations safe. In our continuous efforts to strive for excellence in the Armed Forces, the modern approach to training must address the trade-off between stimulating improvements in fitness and minimising injury while presenting trainees with the broad range of physical challenges needed to develop the range of critical capabilities. The increased breadth in physical challenges needed to produce the desired range of fitness increases the complexity of the problems that must be solved to design physical training programmes that are safe and effective.

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