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Original Research

Relationships Among Injury and Disordered Eating, Menstrual Dysfunction, and Low Bone Mineral Density in High School Athletes: A Prospective Study

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Abstract

Context: Prior authors have reported associations among increased risk of injury and factors of the female athlete triad, as defined before the 2007 American College of Sports Medicine position stand, in collegiate and adult club sport populations. Little is known about this relationship in an adolescent competitive sports population.

Objective: To examine the relationship among disordered eating, menstrual dysfunction, and low bone mineral density (BMD) and musculoskeletal injury among girls in high school sports.

Design: Prospective cohort study.

Setting: The sample consisted of 163 female athletes competing in 8 interscholastic sports in southern California during the 2003–2004 school year. Each participant was followed throughout her respective sport season for occurrence of musculoskeletal injuries.

Main Outcome Measure(s): Data collected included daily injury reports, the Eating Disorder Examination Questionnaire that assessed disordered eating attitudes and behaviors, a dual-energy x-ray absorptiometry scan that measured BMD and lean tissue mass, anthropometric measurements, and a questionnaire on menstrual history and demographic characteristics.

Results: Sixty-one athletes (37.4%) incurred 90 musculoskeletal injuries. In our BMD *z* score model of ≤−1 SD, a history of oligomenorrhea/amenorrhea during the past year and low BMD (*z* score ≤−1 SD) were associated with the occurrence of musculoskeletal injury during the interscholastic sport season. In our BMD *z* score

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model of ≤−2 SDs, disordered eating (Eating Disorder Examination Questionnaire score ≥4.0), a history of oligomenorrhea/amenorrhea during the past year, and a low BMD (*z* score ≤−2 SDs) were associated with musculoskeletal injury occurrence.

Conclusions: These findings indicate that disordered eating, oligomenorrhea/amenorrhea, and low BMD were associated with musculoskeletal injuries in these female high school athletes. Programs designed to identify and prevent disordered eating and menstrual dysfunction and to increase bone mass in athletes may help to reduce musculoskeletal injuries.

Keywords: adolescents, female athletes, menstrual status, musculoskeletal injuries, sports

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