

Female Adolescent Athletes' Awareness of the Connection between Menstrual Status and Bone Health

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ABSTRACT

Study Objective: The aims of this study are to determine among female high school track athletes: (1) knowledge of the association between menstrual irregularity and bone health; (2) attitudes toward amenorrhea, specifically if amenorrhea is seen as a sign of athletic success; (3) the association between knowledge and attitudes based on athlete menstrual status.

Design: Cross-sectional survey.

Setting: Five public high schools in Texas.

Participants: 103 female high school track athletes ages 14–18 years.

Intervention: Participants completed a questionnaire that addressed menstrual history, details of track participation, knowledge of bone mineral density (BMD)/ menstrual status connection, and attitudes about the desirability of oligo/amenorrhea.

Outcome Measures: Frequencies of attitude and knowledge replies, summative knowledge score, and correlations between attitudes, knowledge, and menstrual status.

Results: Sixteen subjects (16.7%) met criteria for amenorrhea, 16 for oligomenorrhea (16.7%). Median summative knowledge score was one of six. Menstrual irregularity was associated with lower knowledge ($P = 0.035$). Incorrect answers about consequences of bone loss and the link to menstrual irregularity were given by $\geq 90\%$ of respondents. Lower knowledge was associated with a greater number of “don't know” replies to attitude questions ($P = 0.002$). Among more knowledgeable participants endorsing opinions, menstrual irregularity was not seen as a sign of athletic success.

Conclusions: The prevalence of irregular menses is high among adolescent track athletes and a larger-scale inquiry to clarify adolescent athletes' knowledge of and attitudes about the link between menstrual patterns and BMD is indicated. Education may provide one key to improved health behavior among this at-risk population.

Key Words: Amenorrhea, Oligomenorrhea, Menstrual irregularity, Adolescence, Athlete/athletics, Female athlete triad, Osteopenia, Osteoporosis, Bone mineral density

Introduction

Adolescence is a uniquely important period for bone mineral accretion. Approximately one quarter of maximum bone mass is accrued during the two years of peak skeletal growth, and by age 20 more than 90% of peak bone mass is acquired.^{1–3} Bone mineralization is estrogen dependent, and menstrual irregularity, including oligomenorrhea and amenorrhea, is associated with reduced bone mineral density (BMD).^{4–11} BMD not accrued during adolescence cannot be replaced later in life, although restoration of normal menses has been shown to retard the rate of further bone loss among adolescents.^{12–14}

Menstrual irregularity is a well documented attendant of athletic participation and when paired with bone loss, comprises two thirds of the “the female athlete triad.”^{9,10} Previous studies indicate that runners and participants in other “lean-build” sports have a 25.8–26.7% prevalence of menstrual irregularity and reduced BMD.^{10,11,15} Maximizing

bone density accrual during adolescence is essential, yet only 29–38% of Division I and III college female athletes, 31.5% of female university students, and 7.5% of junior high and high school females are aware of the link between oligo/amenorrhea and osteoporosis.^{16–18} To date there are no published data evaluating high school athletes' perceptions of the desirability of oligo/amenorrhea, their knowledge of the connection between menstrual status and BMD, and the association between menstrual status and knowledge and attitudes.

The primary aims of this study are to determine female high school track athletes' (1) knowledge of the association between menstrual irregularity and BMD, (2) attitudes towards oligo/amenorrhea, as a possible sign of athletic success, and (3) the association between athletes' menstrual status and knowledge/attitudes toward menstrual dysfunction.

Materials and Methods

Participants and Survey Sites

Female high school athletes participating on the track teams of five public high schools in Houston, Texas were

No conflicts of interest for any authors.

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offered study participation in spring, 2006. Inclusion criteria were: female, track team member, ability to read English, submission of a signed parental consent form, and participant assent. The research methodology was approved by the principal investigator's and school districts' Institutional Review Boards. Surveys were administered prior to regularly scheduled team practice.

Survey Instrument and Data Collection

A novel self-report questionnaire was developed with modified items from the Adolescent Menstrual Attitude Questionnaire and new items specific to the research aims.¹⁹ Data collected as independent variables included grade, years on the track team, mileage run per week rated on an ordinal scale of 10 mile increments, age at menarche, date of last menstrual period (LMP), total number of menses in the previous 12 months, number of consecutive menses missed in the previous 12 months, and any medication taken for menstrual regulation or birth control. The dependant variables of knowledge of and attitudes toward menstrual irregularity and its link to BMD were assessed with 11 items listed in Fig. 1. The six knowledge questions covered normal

menstrual patterns, awareness of the long-term impact of adolescent osteopenia/osteoporosis, the relationship between missed menses and stress fractures, and the link between aggressive training and menstrual irregularity. The five attitude items addressed acceptability and desirability of missing menses and the impact missed menses has on an athletes' planned training regimen. All items were graded on a 4-point Likert scale ranging from "strongly agree" to "strongly disagree" with a fifth "don't know" option. The instrument was reviewed by four experts in the fields of adolescent medicine and bone health and was piloted with three adolescents who met eligibility criteria. Pilot participants' data are not included in the final analysis. A summative knowledge score was tallied for each participant based on the number of correct answers. A summative attitude score was not created given low knowledge and the impact this was found to have on attitudes.

Menstrual Status

Amenorrhea was defined as ≥90 days since LMP or having missed ≥3 consecutive cycles in the 12 months preceding the study. Oligomenorrhea was defined as ≤9

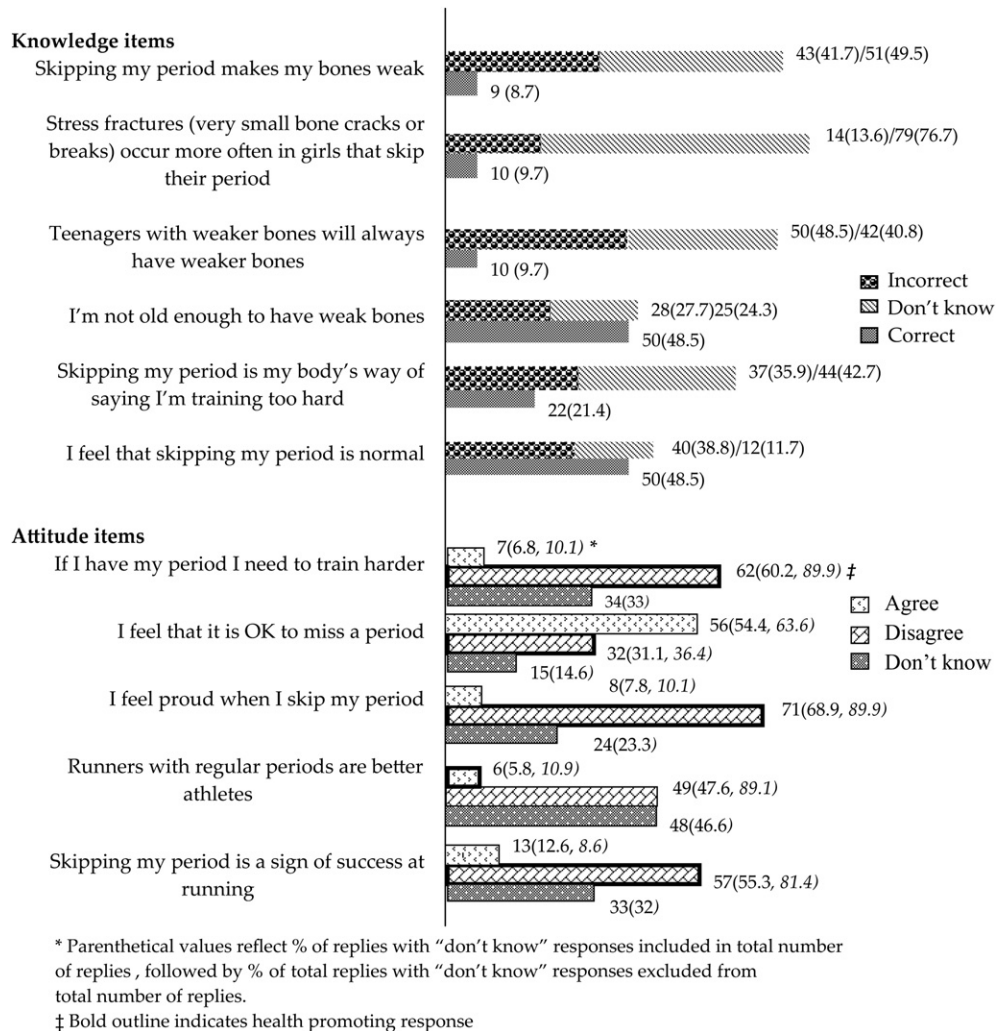


Fig. 1. Distribution of replies to knowledge and attitude items, N(%).

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