ABSTRACT

Background: Decrease in bone mineral density (BMD) increases the risk of osteopenia and osteoporosis. It is common in older women, as the BMD tends to decrease with age, particularly after menopause. While age is the most well-established risk factor, other factors have been investigated for possible links to increase the risk of osteoporosis. These factors include dietary patterns and lifestyle. Aim: To explore the association between soft drink consumption and BMD. Method: This cross-sectional study included data from 1000 Qatari women aged 40+ years participated in the Qatar Biobank Study. BMD levels were measured using the Dual-Energy X-ray Absorptiometry (DEXA) scan and the soft drink consumption was assessed using a food frequency questionnaire. Multiple quantile regression models were used to explore the association between bone mineral density and soft drink consumption. Results: While most of the participants did not drink soft drinks (68%), around one third reported consuming soft drinks. A total of 16.4% of participants reported consuming soft drinks < 1 time/week and 15.6% of participants reported consuming soft drinks ≥ 1 time/week. There was an inverse association between BMD and soft drink consumption. Compared with non-consumers, participants who consumed soft drink ≥ 1 time/week had a [0.034 95%CI (-0.056, -0.012)] at 0.25 quantile for BMD after adjusting for age, BMI, menopausal status, smoking status, physical activity, milk intake, and fruit and vegetable consumption. Also, BMD was negatively associated with regular soft drinks, but not with diet soft drink and energy drink. Conclusion: High consumption of soft drink is inversely related to BMD among Qatari women. Further longitudinal and clinical studies are required before developing public health intervention to improve bone health by reducing soft drink consumption.

INTRODUCTION

The musculoskeletal disorders are one of the most common non-communicable diseases (NCDs) that lead to severe long-term physical disability, pain and decreased quality of life. With the rapid increase in longevity, osteoporosis, in particular, is viewed as a major threat to the health and well-being of individuals worldwide, due to high treatment costs and decreased quality of life. Thus, bone health has become an important public health priority. Osteoporosis is a disease characterized by low bone mineral density (BMD) and increased bone fragility, which increases the risk of fracture. The risk of fracture is highest in older women, as the BMD tends to decrease with age, particularly after menopause. While age is the most well-established risk factor, other factors have been investigated for possible links to increase the risk of osteoporosis. These factors include dietary patterns and lifestyle. In our study, those in the lowest quantile for BMD were assumed to represent women with low BMD while those in the highest quantile were assumed to represent women with high BMD. The results revealed a statistically significant inverse association in the 25th percentiles of the BMD distribution with the total soft drink consumption of more than one time per week. Each increase in soft drink consumption per week was associated with a BMD decrease of -0.034 (95%CI [-0.056, -0.012]) in the 0.25 quantile. Table 14 show the soft drink consumption was negatively associated with BMD only after adjusting for age and BMI in model 2. Sensitivity analysis shows that there was a significant inverse association between the regular soft drink consumption and the BMD at ≥ 0.25 quantile of the distribution.

METHODOLOGY

The study uses secondary data collected by Qatar Biobank (QBB) to explore the association between soft drink consumption and bone mineral density among Qatari women. A sample size of 1000 Qatari females aged ≥ 40 years was obtained from QBB for this study. The sample size was determined using NCSS PASS version 14 (NCSS LLC, Kaysville, Utah). The data collected primarily by well-trained QBB personnel using the most validated instruments available. Data collected using questionnaire included lifestyle, clinical information and further biological samples were also obtained from the participants. The inclusion criteria for this study were female Qatari participants, aged ≥ 40 years at the time of recruitment. Participants have been recruited within the last five years with no missing records on the primary outcome bone mineral density or the main predictor soft drink consumption. Any women who were pregnant at the time of the survey were also excluded. In the current study, the primary outcome of interest is total body BMD values (g/cm2) for each participant obtained using dual-energy X-ray absorptiometry (DEXA) scan. The primary predictor variable is the frequency of the soft drink consumptions that include regular soft drink, diet soft drink, and energy drink.

RESULTS

The study revealed that the highest consumption was seen among age group 40-50, while the lowest was among participants over 70. Contrarily, as the income increase the soft drink consumption among participants increased. Soft drink consumption was higher among participants with university degree or higher followed by those below secondary school education and lower among those with post-secondary. Participants diagnosed with rheumatoid arthritis, diabetes, gastrointestinal diseases, thyroid disease, kidney disease, osteoporosis, and asthma have low consumption of soft drink compared to those free of these disease. The main predictor and related dietary intake were described in Table 5. The mean consumption of fruits and vegetables was 5.4 times per week (33.0). The results showed that osteoporosis among Qatari postmenopausal women was 12.3% and the BMI was higher among postmenopause women compared to premenopausal women. The Framingham osteoporosis risk assessment tool revealed that Cola intake associated with significantly lower BMD hip site only among women. The results were similar in case of diet cola and weak for decaffeinated cola. Also, a study exploring the association between soft drink consumption and multiple morbidity among South Australian adults found a negative effect of soft drink consumption on range of health outcome including osteoporosis. Similarly, a study conducted on Arabian women sample found that T-score and Z-score of BMD were inversely associated with soft drink intake and positively with milk, and dairy products consumption, calcium, and vitamin D supplementation use, and exercise.

In our study, those in the lowest quantile for BMD were assumed to represent women with low BMD and in turn with high-risk of osteoporosis. Age, BMI, menopausal status, multivitamin or minerals use, consumption of milk and education level were found to be statistically associated with BMD in the univariate analysis and were included in the model building. The main predictor and the other clinically significant variables such as smoking status and fruit and vegetable consumption were also added to adjust for the model. Also, further adjustment for consumption of milk and leisure time physical activity to the previous model, the results revealed a statistically significant inverse association in the 25th percentiles of the BMD distribution with the total soft drink consumption of more than one time per week. Each increase in soft drink consumption per week was associated with a BMD decrease of -0.034 (95%CI [-0.056, -0.012]) in the 0.25 quantile. Table 14 show the soft drink consumption was negatively associated with BMD only after adjusting for age and BMI in model 2. Sensitivity analysis shows that there was a significant inverse association between the regular soft drink consumption and the BMD at ≥0.25 quantile of the distribution. These data were extracted from QBB food frequency questionnaire which measured the frequency of occurrence and quantity of consumption of various types of drinks, and eating habits. Other data about other covariates were collected via self-reported questionnaire. Multivariate linear regression was used first to explore the association, but most importantly, the effect of the soft drink consumption on lowest quantiles of BMD was evaluated using multivariate quantile regression models.

REFERENCES