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# Evaluation of osteoporosis and related factors and quality of life of patients with juvenile idiopathic arthritis and burnout status of parents

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**Ethics Committee Approval**
This study was approved by the Ethics Committee of Dr. Sami Ulus Gynecology and Childhood Health and Diseases Training and Research Hospital (Approval number: 06.2009/047).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

**Conflict of Interest**
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## Abstract

**Background/Aim:** Juvenile idiopathic arthritis (JIA) can negatively influence the lives of children and parents. Because it is a chronic disease, a complete recovery is not expected; additionally, children with JIA and their parents must cope with problems such as chronic pain, physical disability, school absenteeism, and social communication disorders. Children's quality of life (QoL) may be affected by all these problems. Also, prolonged exposure to stress and failure to cope with stress may cause burnout syndrome in parents. The study aims to evaluate osteoporosis, QoL of children with JIA and the burnout status of caregivers.

**Methods**: In this prospective, cross-sectional study, 30 patients aged 4–18 years, who were followed up for at least 6 months with the diagnosis of JIA, were included. Demographic, clinical, and laboratory characteristics were recorded retrospectively. Daily dietary calcium intake and daily activity levels were questioned. The patients' bone mineral densities (BMD) were measured by the Dual Energy X-ray Absorptiometry method. Z scores below -2 were classified as the osteoporosis group, and those above -2 were classified as the non-osteoporosis group. The Turkish Pediatric Quality of Life Inventory validated and reliable in Turkish children was used to evaluate the QoL. Maslach Burnout Inventory was used to evaluate the burnout status of parents.

**Results**: The mean age of patients was 12.6 (4.3) years. Osteoporosis was detected in 46.7% (n=14) cases. The mean age was higher (14.5 [3.7] in the osteoporosis group and 10.9 [4.1] in the non-osteoporosis group) ($P$=0.032) and the rate of oligoarticular JIA (7.1%), daily calcium intake (288 [168-456] mg/kg), and duration of activity (3 [2-6] hours) were lower in the osteoporosis group ($P$=0.039, $P$=0.043, $P$<0.001, respectively). Among the QoL indicators, the physical health total score was the lowest. Emotional functionality scores decreased as the age increased ($P$=0.037) and increased as the BMD z-score increased ($P$=0.024). Emotional burnout, one of the parental burnout indicators, increased as the duration of illness increased ($P$=0.003), and the BMD z-score decreased ($P$=0.003). Depersonalization increased as the age increased ($P$=0.010) and the duration of the disease prolonged ($P$<0.001) and increased as daily activity duration ($P$=0.032) and BMD z-score values decreased ($P$=0.002). Personal achievement decreased as the age increased ($P$=0.025) and the duration of illness ($P$=0.014), and the time spent watching television increased ($P$=0.030). Emotional exhaustion and depersonalization of the parents increased as the scores in any of the indicators of QoL decreased ($P$<0.05 for each). The personal success of the parents increased as the scores in any of the indicators of QoL increased ($P$<0.05 for each). All QoL indicators, except for social functionality and psychosocial health total score, were significantly lower in the group with osteoporosis. In addition, parents of children with osteoporosis had higher emotional burnout and depersonalization scores and lowered personal achievement scores ($P$<0.05 for each).

**Conclusion**: In the current study, we observed a decrease in the QoL of the children and burnout syndrome in the parents. It was found that the deterioration in children's QoL indicators affected the burnout indicators of parents, and the presence of osteoporosis affected both QoL and parental burnout. Awareness of modifiable risk factors in children with JIA is very important. The disease and osteoporosis secondary to this disease can impair children's QoL and cause burnout in parents.

**Keywords:** osteoporosis, quality of life, burnout syndrome, juvenile idiopathic arthritis

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## Introduction

Juvenile idiopathic arthritis (JIA) is a chronic inflammatory, rheumatic disease that can result in permanent joint deformities and physical disability [1]. A complete recovery is not expected in JIA. Children with JIA experience absenteeism from school due to frequent hospital admissions decreased participation in activities, impaired peer communication, and deterioration of quality of life [2,3]. Children with JIA may feel incompetent regarding self-esteem, social acceptance, physical competence, and attractiveness, even after controlling disease severity [4].

Quality of life is described as the feeling of satisfaction of an individual about his/her life. On the other hand, health-related quality of life refers to the patient's perception of the effect of the illness and treatment process on their life [5]. 'Pediatric Quality of Life Inventory (PedsQL) is a quality of life scale. The validity and reliability studies have been conducted for all age groups in Turkish children. It is used to analyze children's and parents' perceptions of physical health, emotional functionality, social functionality, school functionality, and psychosocial health [5-7].

The parents feel stressed due to being diagnosed with a chronic disease to their child, the long treatment period, the unknown disease process, and frequent hospital visits [8]. Prolonged exposure to stress and failure to cope with stress may result in burnout syndrome [9]. Emotional exhaustion is the feeling of being overwhelmed with responsibilities, and depersonalization is the alienation of the person to whom he or she serves. The personal achievement dimension is used to evaluate the individual's feeling of inadequacy and helplessness in the face of his/her responsibilities [10].

Burnout syndrome was previously evaluated in professional groups such as teachers and nurses [11,12]. The literature has also described it in parents who care for children with diseases such as autism and brain tumors [13,14]. To our knowledge, there is no study evaluating burnout in parents caring for children with JIA.

This study aims to evaluate the presence of osteoporosis and related factors in children with JIA to examine the quality of life of children and the burnout of caregivers.

## Materials and methods

In this study, 30 patients aged 4–18 years who were followed up for at least 6 months with the diagnosis of JIA in the Pediatric Nephrology Clinic of Dr. Sami Ulus Gynecology and Childhood Health and Diseases Training and Research Hospital were included. The age, gender, comorbidity and fracture history of the patients were recorded. Disease type, age at diagnosis, duration of disease, and the use of corticosteroids, calcium, vitamin D, and bisphosphonate were obtained from hospital records. Daily calcium intake was calculated by evaluating the food frequency questionnaire. The average daily time spent sleeping, watching TV, and on the computer and the average daily activity were questioned. Participation in physical education classes, the duration of participation, and if the children were occupied with any branch of sports regularly, the type of sports and the duration and interval of the sportive activity were questioned.

In the physical examination, height measurements were made with a stadiometer standing up, and body weight measurements were measured with a 100 g sensitive digital adult weight meter. In laboratory examinations, serum calcium, phosphorus, ALP, parathormone, and 25 OH vitamin D levels were measured. Bone mineral densities of the patients were measured by Dual Energy X-ray Absorptiometry (DXA) method. Those with a z-score below -2 were considered osteoporosis, those between -1 and -2 were considered below the normal limit (osteopenia), and those above -1 were considered normal. While performing the statistical analysis, those with a z-score below -2 were classified as the osteoporosis group, and those above -2 were classified as the non-osteoporosis group.

### Evaluation of quality of life

The Turkish Pediatric Quality of Life Inventory (PedsQL), which has been validated for all age groups in Turkish children, was used to evaluate the patients' quality of life. The inventory includes self-report and parent forms prepared according to age groups. The questions measuring problems in physical, social, emotional, and school functionality are answered on a five-choice Likert-type response scale (0: never, 1: rarely, 2: sometimes, 3: often, 4: always). The scores procured from the items are converted to a value between 0 and 100 points (0: 100, 1: 75, 2: 50, 3: 25, 4: 0). Higher scores indicate higher quality of life.

### Evaluation of burnout syndrome

The burnout status of caregiving parents was evaluated by Maslach Burnout Inventory (MBI). The scale evaluates burnout in three areas: emotional exhaustion, depersonalization, and lack of personal accomplishment. Items in the inventory are answered on a five-choice Likert-type response scale (a: never, b: several times a year, c: several times a month, d: several times a week, e: every day where a is scored as zero, b as 1, c as 2, d as 3, and e as 4 points). A high score in the areas of depersonalization and emotional exhaustion and a low score in the area of personal achievement is defined as burnout.

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Dr. Sami Ulus Gynecology and Childhood Health and Diseases Training and Research Hospital Ethics Committee (Approval number: 06.2009/047). An informed consent form was obtained from the patients and their parents.

### Statistical analysis

The data were analyzed by using SPSS for Windows 11.5 package program. The normality of the distribution of the continuous variables was tested using the Shapiro-Wilk test. Descriptive statistics were given as mean (standard deviation) or median (minimum-maximum) for continuous variables and the number of cases and percentage (%) for categorical variables.

When 30 individuals were included in this study, it was determined that the expected differences between the groups could be shown significantly with 84% power and 0.5 alpha value. Student's t-test evaluated the significance of the difference between the groups in terms of means, the significance of the difference between two groups in terms of median values was evaluated by the Mann-Whitney U test, and when the number of independent groups was more than 2, the Kruskal Wallis test was used. When the difference was found to be significant according to the Kruskal-Wallis test, a non-parametric multiple comparison test was used to detect the situations that caused the difference.

Nominal variables were evaluated by using Pearson's Chi-Square or Fisher's Exact Chi-Square test. Spearman's correlation test was applied to evaluate whether there was a statistically significant correlation between continuous variables.

The significance of the change in BMD level with calcium intake over time was evaluated using the Analysis of Variance in Repeated Measurements. Bonferroni Corrected Multiple Comparison test was used to determine the follow-up times that caused the statistical difference. A value of *P*<0.05 was considered statistically significant.

## Results

The evaluation was made of 30 patients who met the study criteria, comprising 15 females and 15 males. The mean age was 12.6 (4.3) years. Osteoporosis was detected in 14 (46.7%) patients. Demographic and clinical features of the cases according to osteoporosis groups are shown in Table 1. The mean age of the group with osteoporosis was significantly higher compared to the group without osteoporosis (*P*=0.032), while the height SDS was significantly lower in the group with osteoporosis (*P*=0.019). The disease duration was longer in the group with osteoporosis compared to the group without osteoporosis; however, the difference was not statistically significant (*P*=0.117). When the groups were compared according to disease type, it was found that the rate of oligoarticular JIA was significantly lower in the osteoporosis group (*P*=0.039). In addition, daily dietary calcium intake was also significantly lower in the osteoporosis group (*P*=0.043). When the groups were compared according to physical activity status, it was determined that the osteoporosis group was less active, and in terms of the duration of daily activity, the difference was statistically significant (*P*<0.001) (Table 1).

Descriptive statistics of child quality of life and parental burnout indicators of all cases are shown in Table 2. It was observed that the emotional functionality score decreased as the age increased (r=-0.382 and *P*=0.037) and increased as the BMD z-score increased (r=0.417 and *P*=0.024). There was no statistically significant correlation between other child quality of life indicators and clinical and demographic data (*P*>0.05). When the parental burnout indicators were evaluated, it was found that the emotional burnout score increased as the duration of illness was prolonged (r=0.531 and *P*=0.003), and the BMD z-score decreased (r=-0.517 and *P*=0.003). The depersonalization score increased as the age increased (*P*=0.010) and the duration of disease prolonged (*P*<0.001) and increased as daily activity duration (*P*=0.032) and BMD z-score decreased (*P*=0.002). Personal achievement scores decreased as the age increased (*P*=0.025), the duration of illness prolonged (*P*=0.014), and the time spent watching television daily increased (*P*=0.030). The correlation coefficients and significance levels between child quality of life, parental burnout indicators and age, duration of illness, duration of physical activity, and BMD z-score are shown in Table 3.

Table 1: Demographic and clinical characteristics of the patients with and without osteoporosis

| Variables | Osteoporosis (-) | Osteoporosis (+) | *P*-value |
|---|---|---|---|
| **Age, Mean (SD)** | 10.9 (4.1) | 14.5 (3.7) | 0.032* |
| **Age of diagnosis, Mean (SD)** | 7.1 (4.0) | 8.8 (2.7) | 0.190 |
| **Height SDS, Mean (SD)** | -0.88 (1.58) | -2.72 (1.80) | 0.019* |
| **Weight SDS, Mean (SD)** | -0.40 (1.31) | -2.03 (3.39) | 0.119 |
| **BMI SDS, Mean (SD)** | 0.36 (1.17) | -0.69 (1.87) | 0.086 |
| **Gender, n (%)** | | | |
| Male | 8 (50%) | 7 (50%) | 1.000 |
| Female | 8 (50%) | 7 (50%) | |
| **Comorbidity, n (%)** | 2 (12.5%) | 6 (42.9%) | 0.101 |
| **History of fracture, n (%)** | 1 (6.3%) | 1 (7.1%) | 1.000 |
| **Disease type, n (%)** | | | |
| Enthesitis related | - | 3 (21.4%) | 0.090 |
| Systemic | 1 (6.3%) | 5 (35.7%) | 0.072 |
| Polyarticular | 8 (50%) | 5 (35.7%) | 0.431 |
| Oligoarticular | 7 (43.8%) | 1 (7.1%) | 0.039* |
| **Use of Medication, n (%)** | | | |
| Corticosteroid | 14 (87.5%) | 14 (100%) | 0.485 |
| NSAID | 15 (93.8%) | 14 (100%) | 1.000 |
| DMARD | 15 (93.8%) | 14 (100%) | 1.000 |
| Calcium | 4 (25%) | 12 (85.7%) | <0.001* |
| **Activity status, n (%)** | | | |
| Regular sportive activity | 8 (50%) | 4 (28.6%) | 0.232 |
| Active participation in physical education classes | 8 (50 %) | 4 (28.6 %) | 0.232 |
| **Activity evaluation, Median (min-max)** | | | |
| Daily sleeping time (hours) | 8 (6-10) | 8 (5-11) | 0.525 |
| Daily activity time (hours) | 5.5 (3-9) | 3 (2-6) | <0.001* |
| Daily time spent on watching Tv | 4 (1-5) | 4 (2-6) | 0.257 |
| Daily time spent on computer | 0.5 (0-4) | 2 (0-4) | 0.580 |
| **Duration of illness** | 4 (1-9) | 6 (1-12) | 0.117 |
| **Cumulative Dosage of corticosteroids (mg)** | 8,062.5 (2,100-19,500) | 13,237.5 (1,800-22,500) | 0.150 |
| **Cumulative Dosage of corticosteroids (mg)** | 217.3 (78-696) | 303.1 (56-1,032) | 0.401 |
| **Dietary calcium intake (mg/kg)** | 455 (120-830) | 288 (168-456) | 0.043 |

* *P*<0.05 was accepted as statistically significant. SD: standard deviation, DMARD: Disease Modifying Anti-Rheumatic Drug, NSAID: Non-steroidal anti-inflammatory drug

Table 2: Descriptive statistics of pediatric quality of life and parental burnout indicators of all cases

| Variables | Mean | SD | Median | Minimum | Maximum |
|---|---|---|---|---|---|
| **Pediatric Quality of Life** | | | | | |
| Physical health total score | 55.6 | 19.7 | 54.7 | 12.5 | 96.9 |
| Emotional functioning | 62.7 | 20.9 | 65.0 | 5.0 | 100.0 |
| Social functioning | 70.8 | 15.7 | 70.0 | 35.0 | 100.0 |
| School functioning | 62.0 | 14.1 | 60.0 | 40.0 | 100.0 |
| Psychosocial functioning | 64.4 | 13.5 | 63.2 | 43.3 | 93.3 |
| Total scale score | 61.7 | 13.7 | 62.5 | 42.3 | 94.6 |
| **Parental burnout** | | | | | |
| Emotional exhaustion | 13.7 | 9.0 | 13.0 | 0.0 | 30.0 |
| Depersonalization | 5.8 | 5.6 | 3.0 | 0.0 | 18.0 |
| Personal accomplishment | 20.5 | 8.2 | 20.0 | 4.0 | 36.0 |

Emotional exhaustion (*P*=0.002 for physical health total score, *P*<0.001 for emotional functioning, *P*=0.023 for social functioning, *P*<0.001 for school functioning, *P*=0.006 for psychosocial functioning, *P*<0.001 for total scale score) and depersonalization of the parents (*P*<0.001 for physical health total score, *P*=0.015 for emotional functioning, *P*=0.014 for social functioning, *P*<0.001 for school functioning, *P*=0.012 for psychosocial functioning, *P*=0.003 for total scale score) increased as the scores in any of the child quality of life indicators decreased. As the scores increased in any of the child quality of life indicators (except for the social functionality score), the personal success score of the parents increased (*P*=0.002 for physical health total score, *P*=0.002 for emotional functioning, *P*=0.057 for social functioning, *P*=0.002 for school functioning, *P*=0.004 for psychosocial functioning, *P*=0.002 for total scale score). The correlation coefficients and significance level between parent burnout level and child quality of life indicators are shown in Table 4.

Table 3: Correlation coefficients and significance levels between child quality of life and parental burnout indicators and age, duration of illness, duration of physical activity and BMD z-score

| Variables | | Age | Duration of illness | Duration of sportive activity | Duration of sleeping | Duration of activity | Duration of watching Tv | Duration spent on computer | BMD z-score |
|---|---|---|---|---|---|---|---|---|---|
| **Physical health total score** | r | -0.193 | -0.294 | -0.234 | 0.103 | 0.133 | -0.136 | -0.106 | 0.341 |
| | *P* | 0.307 | 0.115 | 0.214 | 0.590 | 0.484 | 0.474 | 0.576 | 0.066 |
| **Emotional functioning** | r | -0.382 | -0.249 | -0.114 | 0.185 | 0.219 | -0.107 | 0.311 | 0.412 |
| | *P* | 0.037* | 0.184 | 0.550 | 0.328 | 0.245 | 0.573 | 0.094 | 0.024* |
| **Social functioning** | r | -0.042 | -0.258 | -0.142 | 0.020 | 0.035 | -0.334 | 0.134 | -0.038 |
| | *P* | 0.827 | 0.169 | 0.453 | 0.917 | 0.855 | 0.071 | 0.480 | 0.841 |
| **School functioning** | r | -0.025 | -0.228 | -0.061 | 0.210 | 0.120 | -0.114 | -0.009 | 0.417 |
| | *P* | 0.896 | 0.233 | 0.752 | 0.275 | 0.536 | 0.557 | 0.961 | 0.024 |
| **Psychosocial functioning** | r | -0.279 | -0.219 | -0.103 | 0.096 | 0.155 | -0.221 | 0.241 | 0.221 |
| | *P* | 0.136 | 0.244 | 0.590 | 0.612 | 0.414 | 0.240 | 0.200 | 0.241 |
| **Total scale score** | r | -0.192 | -0.280 | -0.290 | 0.251 | 0.121 | -0.105 | 0.090 | 0.280 |
| | *P* | 0.309 | 0.134 | 0.20 | 0.181 | 0.523 | 0.581 | 0.637 | 0.133 |
| **Emotional exhaustion** | r | 0.330 | 0.531 | 0.091 | -0.291 | -0.289 | 0.313 | 0.221 | -0.517 |
| | *P* | 0.075 | 0.003* | 0.633 | 0.119 | 0.122 | 0.092 | 0.240 | 0.003* |
| **Depersonalization** | r | 0.466 | 0.631 | 0.012 | -0.158 | -0.392 | 0.339 | 0.311 | -0.550 |
| | *P* | 0.010 | <0.001 | 0.951 | 0.405 | 0.032 | 0.066 | 0.094 | 0.002 |
| **Personal accomplishment** | r | -0.407 | -0.444 | -0.184 | 0.399 | 0.216 | -0.397 | -0.093 | 0.492 |
| | *P* | 0.025 | 0.014 | 0.331 | 0.029 | 0.252 | 0.030 | 0.626 | 0.006 |

* *P*<0.05 was accepted as statistically significant

Table 4: Correlation coefficients and significance levels between parental burnout levels and child quality of life indicators

| Variables | Emotional exhaustion | | Depersonalization | | Personal accomplishment | |
|---|---|---|---|---|---|---|
| | *r* | *P*-value | *r* | *P*-value | *r* | *P*-value |
| **Physical health total score** | -0.539 | 0.002* | -0.558 | <0.001* | 0.550 | 0.002* |
| **Emotional functioning** | -0.573 | <0.001* | -0.440 | 0.015* | 0.534 | 0.002* |
| **Social functioning** | -0.414 | 0.023* | -0.443 | 0.014* | 0.352 | 0.057 |
| **School functioning** | -0.724 | <0.001* | -0.563 | <0.001* | 0.543 | 0.002* |
| **Psychosocial functioning** | -0.490 | 0.006* | -0.452 | 0.012* | 0.504 | 0.004* |
| **Total scale score** | -0.636 | <0.001* | -0.526 | 0.003* | 0.549 | 0.002* |

* *P*<0.05 was accepted as statistically significant

When the child quality of life and parental burnout level scores of the patients with and without osteoporosis were compared, all child quality of life indicators were significantly lower in the group with osteoporosis compared to the group without osteoporosis, except for social functionality and psychosocial health total scores (*P*=0.013 for physical health total score, *P*=0.007 for emotional functioning, *P*=0.697 for social functioning, *P*=0.003 for school functioning, *P*=0.085 for psychosocial functioning, *P*=0.017 for total scale score). In addition, parents of children with osteoporosis had higher emotional burnout (*P*<0.001) and depersonalization scores (*P*<0.001) and lower personal achievement scores (*P*=0.002) (Table 5).

Table 5: Comparison of child quality of life and parental burnout level in terms of osteoporosis

| Variables | Osteoporosis | Median | Minimum | Maximum | *P*-value |
|---|---|---|---|---|---|
| **Physical health total score** | No | 64.1 | 12.5 | 96.9 | 0.013* |
| | Yes | 48.4 | 25.0 | 81.2 | |
| **Emotional functioning** | No | 75.0 | 5.0 | 100.0 | 0.007* |
| | Yes | 55.0 | 30.0 | 90.0 | |
| **Social functioning** | No | 70.0 | 35.0 | 100.0 | 0.697 |
| | Yes | 70.0 | 50.0 | 90.0 | |
| **School functioning** | No | 65.0 | 50.0 | 100.0 | 0.003* |
| | Yes | 52.5 | 40.0 | 75.0 | |
| **Psychosocial functioning** | No | 68.8 | 43.3 | 93.3 | 0.085 |
| | Yes | 57.5 | 45.0 | 80.0 | |
| **Total scale score** | No | 68.9 | 43.4 | 94.6 | 0.017* |
| | Yes | 54.9 | 42.3 | 71.7 | |
| **Emotional exhaustion** | No | 6.5 | 0.0 | 24.0 | <0.001* |
| | Yes | 18.5 | 6.0 | 30.0 | |
| **Depersonalization** | No | 1.0 | 0.0 | 12.0 | <0.001* |
| | Yes | 10.0 | 0.0 | 18.0 | |
| **Personal accomplishment** | No | 26.0 | 13.0 | 36.0 | 0.002* |
| | Yes | 14.5 | 4.0 | 33.0 | |

* *P*<0.05 was accepted as statistically significant.

# Discussion

In our study, the prevalence of osteoporosis was 46.7%. Patients with osteoporosis have a higher average age and lower daily dietary calcium intake and activity level. Osteoporosis is significantly lower in the oligoarticular type. The factors affecting child quality of life and parental burnout indicators at varying rates include the child's age, duration of illness, daily activity level, daily television watching, and BMD z-score. The level of parental burnout is affected by the quality of life of children, and osteoporosis negatively affects both the child and the parents.

Children with JIA are exposed to many factors that negatively affect bone mineral density during childhood and adolescence when peak bone mass should be reached [15]. Many factors, such as age, duration of illness, disease activity, and inflammation processes, are responsible for osteoporosis development. It has been reported that osteoporosis starts earlier and progresses more severely when JIA starts at an early age [16,17]. In our study, contrary to the literature, the mean age of the group with osteoporosis was significantly higher than the group without osteoporosis, and the age of onset was greater. Although not statistically significant, this contradiction can be attributed to the fact that the group with osteoporosis had been exposed to disease activity for a longer duration due to the longer duration of the disease, and they received corticosteroid therapy for a longer period and at high doses. In addition, the significantly lower dietary calcium intake in the osteoporosis group is one of the factors contributing to this contradiction.

In children with JIA, significant losses in bone mass have been reported with DEXA in all subgroups. In addition, the lower bone mass has been reported, especially in patients with polyarticular JIA compared to the oligoarticular type [15,18]. In our study, when osteoporosis was evaluated according to the disease types, the difference between the types was significant only in the oligoarticular type. The osteoporosis rate was lower in children with oligoarticular JIA.

It has been shown in many studies that adequate physical activity during childhood positively affects cortical bone acquisition [19]. In the current study, the osteoporosis group's daily physical activity level was significantly lower than the group without osteoporosis. This result supports the positive effect of physical activity on bone mineralization in children with JIA.

In addition to its physical effects, JIA also affects the lives of children and their families psychologically and socially. Oliveira et al. reported that the health-related quality of life of children with JIA was worse regarding physical and psychosocial aspects than healthy children [20]. The current study determined the lowest mean of the quality-of-life indicators in the total physical health score. Emotional functionality scores decreased as age increased. We attribute this to the fact that functional limitations can be perceived better as age progresses. Being a parent of a child with a chronic illness can have various psychological consequences. Lindström et al. [21] reported that parents of children with chronic diseases experienced burnout at a higher rate than those of healthy children. Norberg [13] reported that burnout syndrome developed in parents caring for children with brain tumors, and Weiss [14] reported that burnout developed in parents caring for children with mental retardation and autism. We could identify no studies in the literature evaluating the burnout status of parents of children with JIA. In our study, we found that as the duration of illness increased, the parents' emotional exhaustion and depersonalization scores increased, and the personal achievement scores decreased. These results indicate those caregiver parents of children with JIA experience burnout, like other chronic diseases. In JIA, a long disease process and uncertainty may cause the families to lose hope that their children will get better and have longer exposure to problems, such as the restriction of social interaction due to frequent hospital admissions. Eventually, this may cause burnout symptoms to develop. In addition, it was found that the parents' emotional exhaustion and depersonalization scores increased as the scores in any of the child's quality of life indicators decreased and the personal success scores of the caregivers increased as the scores of the child's quality of life increased. Our findings show that the quality of life of children negatively affects both the children and the caregivers. Considering caregivers' contribution in treating children with JIA, we propose that patients should be evaluated together with their families.

In our study, the emotional functionality score of the children increased as the BMD z-score value increased, and the emotional exhaustion and depersonalization levels of the parents increased as the BMD z-score value decreased. In addition, it was determined that quality of life scores, especially in the children's physical health, emotional functionality, and school functionality, were lower, and the burnout and depersonalization levels of the parents were higher in the osteoporosis group compared to those without osteoporosis. In the adult literature, although it has been reported that osteoporosis negatively affects the quality of life of postmenopausal women, there is no study on the effect of osteoporosis on the quality of life of children with JIA [22].

### Limitations

One of the limitations of our study was that no statistically significant results could be obtained in terms of some risk factors associated with osteoporosis due to the small sample size. In addition, the children's quality of life and the parents' burnout status were not compared with the healthy control group. There is a need for randomized controlled studies with a larger sample.

### Conclusion

It is important to increase the quality of life in patients with JIA and to prevent the development of indifference and exhaustion in families over time. Minimizing the modifiable risk factors for osteoporosis may be important in improving patients' quality of life, increasing the perception of personal success, and reducing burnout symptoms in families.

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