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Research Article

Osteoporosis Awareness in Asthma Patients Using Inhaled Corticosteroids: A Cross-Sectional Study

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Objective: The aim of this study was to assess osteoporosis awareness in asthma patients using inhaled corticosteroids (ICS) and to identify the influencing factors.

Materials and Methods: A total of 109 asthma patients using ICS (10 male, 99 female; mean age: 50.30±12.04 years) were included in the cross-sectional study. Demographic data regarding age, gender, education level, marital status, occupation and disease duration of all participants were recorded. General knowledge questions about osteoporosis, diet and exercise were asked. Osteoporosis awareness was assessed using the Osteoporosis Awareness Scale (OAS).

Results: Osteoporosis awareness in asthma patients using ICS were found to be low. Eight of the participants included in the study (7.3%) were aware that they were at risk for osteoporosis, while 101 (92.7%) were unaware. The total OAS score was 51.32±15.70. The sub-score risk factor scores in postmenopausal women were significantly higher than those in premenopausal women ($p< 0.05$). The exercise, preventive behaviour, risk factor scores, the characteristics of OP scores and total score of participants who had heard of osteoporosis were statistically significantly higher than those who had not heard of it ($p<0.05$). The proportion of participants who had not heard of osteoporosis and were primary school graduates was significantly higher (68.1%) compared to those who had heard of osteoporosis (38.7%). The sub-score risk factor and preventive behavior scores were significantly higher for participants taking vitamin D compared to those not taking it ($p<0.05$). Additionally, the total and sub-score characteristics of OP, along with risk factor scores, were significantly higher in participants with a family history of fractures ($p<0.05$).

Conclusions: Asthma patients using ICS have low levels of osteoporosis awareness. The menopausal status, vitamin D intake, family history of fractures and having heard OP before affects the osteoporosis awareness. In order to reduce the incidence of osteoporosis, morbidity and mortality, patient education programs should be organized especially for asthma patients especially using ICS in the risk group.

Keywords: Asthma, Awareness, Corticosteroids, Osteoporosis

1. INTRODUCTION

Asthma is a chronic inflammatory disease characterized by airway obstruction and bronchial hyper-reactivity.[1] It impacts both children and adults, with an estimated 300 million asthma sufferers globally.[2,3] The main symptoms include wheezing, shortness of breath, coughing and chest tightness, which can vary over time in terms of intensity and frequency.[5] Inhaled corticosteroids (ICS) are the most effective anti-inflammatory medications for the treatment of asthma.[6]

Inhaled corticosteroids are generally considered to have minimal systemic bioavailability, but side effects can occur, particularly in individuals using high doses.[1] According to the Osteoporosis and Metabolic Bone Diseases Diagnosis and Treatment Guidelines from the Turkish Society of Endocrinology and Metabolism, some studies suggest that bone loss may increase with high doses of ICS.[6] Additionally, there are studies indicating significant bone mineral density (BMD) loss even with long-term or low-dose ICS use.[6,7] Significant decrease in bone formation and increase in bone resorption markers have been reported as early as 1-4 weeks of treatment with ICS. The changes in bone turnover markers did not differ between patients receiving low versus high ICS dose.[4] However, the specific low-dose

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threshold and duration for long-term ICS use have not been clearly defined, nor has the specific type of ICS been identified. Literature on the effects of ICS on bone health in asthma patients is limited.[8]

Previous studies investigating the effects of ICS on osteoporosis (OP) have yielded controversial results. Sideroff et al. reported that the risk of osteoporotic vertebral fractures in men using ICS is doubled.[9] A reduction of 0.1 g/cm^2 in spine BMD may be related to doubling spine fracture rate. Chalitsios et al. reported that ICS negatively impacts the risk of OP and fractures, suggesting that ICS users may experience fractures even at higher BMD levels, similar to oral corticosteroid users.[8] The authors further emphasized that the risk of OP and OP-related fractures is higher in individuals with asthma, even at normal BMD levels, and recommended bone density screening and management in accordance with available guidelines, including lifestyle changes or pharmacologic preventive treatments.[8] Kong et al., in a retrospective study, emphasized the importance of considering bone health when managing asthma, especially in older patients.[10]

According to our literature research, there are several studies assessing the knowledge and awareness of OP in chronic diseases, however, there were no studies assesing the knowledge and awareness of OP in asthma patients using ICS through standardized scales.[11,12] In this study, we aimed to assess the awareness of OP among asthma patients using ICS.

2. MATERIALS AND METHOD

This cross-sectional study was performed after approval was obtained from the Hamidiye University of Health Sciences Scientific Research Ethics Committee (approval number: 24/715). All participants provided written informed consent. The study was conducted according to the principles of the Declaration of Helsinki. This study was conducted among asthma patients using ICS who applied to Pulmonology outpatient clinic between December 1, 2024 and January 1, 2025. The inclusion criteria were participants with asthma diagnosed and treated ICS, not being diagnosed with OP before, having normal cognitive functions. The exclusion criteria were history of OP treatment or other chronic bone diseases, abnormal cognitive functions, not being volunteer.

2.1. Patient information form

Demographic information such as age, gender, body mass index (BMI, kg/m^2), marital status, education level, chronic disease, occupation, and disease duration has been recorded. Additionally, data on sources of OP information, history of fractures, family history of OP-related fractures, awareness of OP, screening status, knowledge of ICS as a risk factor for OP, alcohol consumption, coffee intake, dairy product consumption, exercise habits, smoking habits, vitamin D use and frequency of sun exposure has been collected.

2.2. Osteoporosis Awareness Scale (OAS)

The "Osteoporosis Awareness Scale" (OAS), which has been validated for Turkish, were administered to assess patients' knowledge and awareness of OP.[13] The OAS consists of 31 questions answered on a four-point Likert scale: "I know very well (4)," "I know (3)," "I know a little (2)," and "I do not know at all (1)." As the total score from the scale (minimum = 31, maximum = 124) increases, so does the awareness of OP. Although the scale has no reverse item or cut-off point, as the score obtained from the scale increases, the awareness of OP increases. The scale includes 5 sub-dimensions such as the bone physiology (items 22, 23, 24, 25, 26, 27), the preventive behaviours (items 4, 5, 7, 8, 9, 10, 21), the risk factors (items 11, 12, 13, 14, 15), the exercise (items 1, 2, 3, 6) and the characteristics of OP (items 16, 17, 18, 19, 20).[13] The Cronbach alpha reliability coefficient of the scale is 0.949; cronbach's alpha reliability coefficient in this study was calculated as 0.942.

2.3. Sample size

The sample size was calculated using the G-Power 3.1.9.6 program. In the reference and pilot study results, the effect size of the parameter examined was found to be 0.3. Assuming a statistical significance coefficient of 0.05 at this effect size level, a minimum sample size of 64 was calculated to achieve 80% power.[14] Based on this, a total of 109 participants were enrolled in this study.

2.4. Statistical methods

The findings were evaluated using the IBM SPSS Statistics 22 software for statistical analysis. The normality of the parameters were assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. While evaluating the study data, descriptive statistical methods (mean, standard deviation, frequency) were utilized. For comparing quantitative data, Student's t-test were used for normally distributed parameters and the Mann-Whitney U test were applied for parameters that do not exhibit normal distribution. Pearson correlation analysis were used to examine relationships between normally distributed parameters, while Spearman's rho correlation analysis were employed for non-normally distributed parameters. The Chi-square test were used for comparing qualitative data. The Cronbach's alpha coefficient was calculated for scale reliability. Significance were considered at the $p < 0.05$ level.

3. RESULTS

A total of 109 adult participants with asthma (10 male, 99 female) were included in the study. The mean age of the participants was 50.30±12.04 (range, 25-76) years and disease duration was 8.88±7.06 years. Baseline characteristics are shown in Table 1.

The total OAS score was 51.32±15.70. The OAS sub-dimensionsand total scores are presented in Table 1.

Table 1.

Demographic characteristics

Age (years) (mean ± SD)	50.30±12.04	
BMI (kg/m^2) (mean ± SD)	29.36±5.78	
Symptom duration (years) (mean ± SD)	8.88±7.06	
	N	(%)
Gender		
Female	99	90.8
Male	10	9.2
Marital status		
Married	94	86.2
Single	15	13.8
Education level		
Illiterate	18	16.5
Primary school	56	51.4
Secondary school	7	6.4
High school	18	16.5
University	10	9.2
Occupation		
Working	30	27.5
Not working	79	72.5
Chronic disease		
Yes	100	91.7
No	9	8.3
	Median (Minimum-maximum)	
OAS exercise	7 (4-16)	
OAS preventive behaviours	14 (7-28)	
OAS risk factors	8 (5-18)	
OAS characteristics of OP	9 (5-17)	
OAS bone physiology	11 (6-23)	
OAS total	51 (27-100)	

BMI: Body mass index, SD: Standard deviation, OP: Osteoporosis, OAS: Osteoporosis awareness score

When the sources of OP information were questioned in participants, the results were as follows: health institution (54.1%), television-radio-internet (33%) and relatives-friends (11%) and were in the first place, followed by newspapers and magazines (0.9%) and school (0.9%) (Table 2).

Data on sources of OP information, history of fractures, family history of OP-related fractures, heard of OP before, screening status, knowledge of ICS as a risk factor for OP, alcohol consumption, coffee intake, dairy product consumption, exercise habits, smoking habits, vitamin D use and frequency of sun exposure is presented in Table 2.

Table 2.

Osteoporosis risk factors of participants

	N	(%)
Alcohol consumption		
Yes	4	3.7
No	105	96.3
Coffee		
None	47	43.1
1-3 cups/day	61	56
More than 4 cups/day	1	0.9
Smoking		
Yes	36	33
No	73	67
Consumption of dairy products		
None	27	24.8
1-3 portion/day	69	63.3
≥3 portion/day	13	11.9
Exercise frequency		
None	57	52.3
Once a week	21	19.3
1-2 days/week	15	13.8
≥3 days/week	16	14.7
Vitamin D intake		
Yes	60	55
No	49	45
Sunbathing frequency		
Almost never	30	27.5
1-3 times a month	7	6.4
1 times a month	11	10.1
1-3 times a week	32	29.4
Everyday	29	26.6

Table 2. (Continued)

History of fracture		
Yes	29	26.6
No	80	73.4
Family history of fracture		
Yes	14	12.8
No	95	87.2
Have you ever heard of osteoporosis?		
Yes	62	56.9
No	47	43.1
Do you think you are at risk of osteoporosis?		
Yes	8	7.3
No	101	92.7
Osteoporosis screening status		
Yes	26	23.9
No	83	76.1
Source of information about osteoporosis		
Television- radio-internet	36	33
Relatives-friends	12	11
Newspapers and magazines	1	0.9
Health institution	59	54.1
School	1	0.9

Eight of the participants included in the study (7.3%) had knowledge of ICS as a risk factor for OP, while 101 (92.7%) did not. 62 (56.9%) of the participants had heard of OP, while 47 (43.1%) had never heard of it.

3.1. Correlation between age, symptom duration and OAS scores

No correlations were found between age, symptom duration and OAS subtotal scores the exercise, the preventive behaviours, the risk factors, the characteristics of OP bone physiology and total scores in asthma patients using ICS respectively for age (r:0.018, p:0.854; r:0.058, p:0.550; r:0.096, p:0.321; r:0.055, p:0.567; r:0.053, p:0.584; r:0.055, p:0.569) for symptom duration(r:-0.183, p:0.057; r:0.023, p:0.815; r:0.026, p:0.789; r:0.052, p:0.588; r:0.028, p:0.774; r:0.010, p:0.920).

3.2. Effect of gender, education level, menopausal status, OP screening status and obesity on OAS total and sub-scores

There was no statistically significant difference between the total and sub-scores of OAS based on gender, education level, OP screening status and obesity ($p>0.05$). The sub-score risk factor scores in postmenopausal women were significantly higher than those in premenopausal women ($p<0.05$). No statistically significant differences were found in other parameters based on menopausal status ($p > 0.05$) (Table 3,4).

Table 3.

Comparison of OAS scores between gender, menopausal status, osteoporosis screening status, obesity, vitamin D intake, family history of fracture, chronic disease and history of fracture in participants

	Gender			**Vitamin D intake**		
	Male N=10	**Female N=99**	**P value**	**Yes N=60**	**No N=49**	**P value**
	Median (Min-Max)	Median (Min-Max)		Median (Min-Max)	Median (Min-Max)	
OAS exercise	9.5 (4-14)	7 (4-16)	0.319	8 (5 - 10)	6 (4 - 9)	0.068
OAS preventive behaviours	13 (9-22)	14 (7-28)	0.971	15 (12 - 19)	13 (9 - 16)	**0.004***
OAS risk factors	7.5 (5-16)	8 (5-18)	0.426	9 (6 - 11.25)	7 (5 - 10)	**0.011***
OAS characteristics of OP	7 (5-15)	9 (5-17)	0.392	10 (6 - 13)	9 (6 - 11)	0.124
OAS bone physiology	12 (9-23)	11 (6-22)	0.381	12 (9 - 15)	11 (8 - 13)	0.052
OAS total	48 (35-90)	52 (27-100)	0.933	10 (6 - 13)	9 (6 - 11)	0.124
	Menopausal status			**Family history of fracture**		
	Premenopausal period N=42	**Postmenopausal period N=57**	**P value**	**Yes N=13**	**No N=95**	**P value**
	Median (Min-Max)	Median (Min-Max)		Median (Min-Max)	Median (Min-Max)	
OAS exercise	6.5 (4-12)	8 (4-16)	0.261	8 (7 - 10)	7 (4 - 10)	0.378
OAS preventive behaviours	14 (7-26)	14 (7-28)	0.157	16 (13 - 18)	14 (10 - 18.5)	0.481
OAS risk factors	7.5 (5-16)	9 (5-18)	**0.035***	11 (8 - 13)	8 (5 - 10)	**0.016***
OAS characteristics of OP	9 (5-17)	9 (5-16)	0.571	11 (10 - 13)	9 (6 - 12)	**0.011***
OAS bone physiology	11 (6-22)	12 (6-22)	0.351	13 (9 - 18)	11 (8.5 - 14)	0.197
OAS total	49 (27-92)	53 (27-100)	0.157	11 (10 - 13)	9 (6 - 12)	**0.011***

Table 3. (Continued)

	Osteoporosis screening status			**Chronic disease**		
	Yes N=26	**No N=83**	**P value**	**Yes N=100**	**No N=9**	**P value**
	Median (Min-Max)	Median (Min-Max)		Median (Min-Max)	Median (Min-Max)	
OAS exercise	6.5 (4 - 10.75)	7 (4 - 10)	0.888	7 (4 - 10)	10 (6 - 12)	0.255
OAS preventive behaviours	14 (11.25 - 19)	14 (10 - 18)	0.727	14 (10.75 - 18)	17 (11 - 20)	0.536
OAS risk factors	9 (6 - 13)	8 (5.5 - 10)	0.1	8 (5.75 - 11)	8 (7 - 9)	0.982
OAS characteristics of OP	10 (6.25 - 13)	9 (6 - 11.5)	0.13	9 (6 - 12)	12 (9 - 13)	0.387
OAS bone physiology	11 (7 - 15.5)	12 (9 - 14)	0.484	11 (8 - 14)	10 (9 - 16)	0.874
OAS total	10 (6.25 - 13)	9 (6 - 11.5)	0.13	9 (6 - 12)	12 (9 - 13)	0.387
	Obesity			**Histroy of fracture**		
	Yes N=81	**No N=28**	**P value**	**Yes N=29**	**No N=80**	**P value**
	Median (Min-Max)	Median (Min-Max)		Median (Min-Max)	Median (Min-Max)	
OAS exercise	7 (4 - 10)	7 (4 - 10)	0.714	6 (4-12)	8 (4-16)	0.426
OAS preventive behaviours	14 (11 - 19)	13.5 (10 - 17.25)	0.377	14 (7-26)	14 (7-28)	0.926
OAS risk factors	8 (6 - 11)	7 (5 - 10.25)	0.253	10 (5-16)	8 (5-18)	0.178
OAS characteristics of OP	9 (6 - 12)	9 (6.75 - 12.25)	0.867	9 (5-17)	9 (5-16)	0.316
OAS bone physiology	12 (9 - 14)	11 (8 - 14.25)	0.684	12 (6-22)	11 (6-23)	0.246
OAS total	9 (6 - 12)	9 (6.75 - 12.25)	0.867	54 (28-92)	49.5 (27-100)	0.484

OP: Osteoporosis, OAS: Osteoporosis Awareness Score, SD: Standard Deviation, Min-max: Minimum-maximum (*** $p<0.05$** Statistically significant)
Obesity: Body mass index (>= 30 kg/m^2)

Table 4.

Comparison of OAS scores between educational level in participants

Education level	**Illiterate N=18**	**Primary school N=56**	**Secondary school N=7**	**High school N=18**	**University N=10**	**P value**
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
OAS exercise	5 (4-14)	7 (4-16)	6 (4-13)	9.5 (4-12)	5.5 (4-12)	0.096
OAS preventive behaviours	12.5 (7-22)	14 (7-28)	15 (7-26)	15.5 (7-21)	14 (7-20)	0.409
OAS risk factors	6 (5-16)	8 (5-18)	10 (5-13)	9 (5-15)	6.5 (5-12)	0.354
OAS characteristics of OP	8 (5-15)	9 (5-17)	12 (5-15)	5-16 (10.5)	5-15 (11)	0.356
OAS bone physiology	11 (6-23)	11 (6-22)	9 (6-16)	13.5 (8-19)	12.5 (6-18)	0.060
OAS total	42 (27-90)	50.5 (27-100)	55 (27-76)	56.5 (33-81)	53.5 (27-74)	0.214

OP: Osteoporosis, OAS: Osteoporosis Awareness Score, SD: Standard Deviation, Min-max: Minimum-maximum (*** *p*<0.05** Statistically significant)

3.3. Effect of vitamin D intake, history of fracture, family history of fracture, and chronic disease on OAS total and sub-scores

There was no statistically significant difference between the total and sub-scores of OAS based on history of fracture and chronic diseases (p>0.05). The sub-score risk factor scores and preventive behaviours for participants taking vitamin D were significantly higher than those not taking vitamin D (p<0.05). The total and sub-score characteristics of OP, and risk factor scores for participants with a family history of fractures, were significantly higher than those without a family history of fractures (p<0.05). No statistically significant differences were found in other parameters based on vitamin D intake and family history of fracture (p>0.05) (Table 3).

3.4. Effect of have heard of OP before on OAS total and sub-scores

When subgroup analyses were conducted between participants who had heard of OP and those who had not, there was no statistically significant difference in terms of age and BMI, gender, and occupation between individuals who had heard of OP and those who had not (p>0.05). However, there was a statistically significant difference in terms of education levels between the two groups (p<0.05). The proportion of individuals who had not heard of OP and were primary school graduates was significantly higher (68.1%) compared to those who had heard of OP (38.7%)(p<0.05).

The OAS exercise, preventive behaviour, risk factor scores, the characteristics of OP and total score of participants who had heard of OP were statistically significantly higher than those who had not heard of it (p<0.05). There was no statistically significant difference in bone physiology scores between participants who had heard of OP and those who had not (p>0.05) (Table 5).

Table 5.

Comparison of demographics and OAS subtotal scores according to hearing of osteoporosis before

	Hearing of Osteoporosis Before		
	Yes (N=62)	**No (N=47)**	**P value**
Age, years (mean ± SD)	52.08±11.83	47.96±12.04	0.077
BMI (kg/m^2)	28.91±5.61	29.95±6.01	0.355
	N(%)	**N(%)**	
Gender			
Female	57(91.9)	42(89.4)	0.743
Male	5(8.1)	5(10.6)	
Education level			
Illiterate	13 (21)	5 (10.6)	**0.039***
Primary school	24 (38.7)	32 (68.1)	
Secondary school	5 (8.1)	2 (4.3)	
High school	14 (22.6)	4 (8.5)	
University	6 (9.7)	4 (8.5)	
Occupation			
Working	18 (29)	12 (25.5)	0.850
Not working	44 (71)	35 (74.5)	

Table 5. (Continued)

	Median (Min-Max)	Median (Min-Max)	
OAS exercise	8 (4-16)	6 (4-13)	**0.020***
OAS preventive behaviours	14.5 (7-28)	13(7-22)	**0.018***
OAS risk factors	9 (5-18)	7 (5-14)	**0.042***
OAS characteristics of OP	10 (5-17)	8 (5-15)	**0.003***
OAS bone physiology	11 (6-23)	12 (6-18)	0.572
OAS total	54 (27-100)	45 (27-74)	**0.018***

OP: Osteoporosis, OAS: Osteoporosis Awareness Score, SD: Standard Deviation, Min-max: Minimum-maximum (**p*<0.05 Statistically significant)

4. DISCUSSION

In this study, OP awareness in asthma patients using ICS was found to be low. 92.7% of participants did not know they were in the risk group. The OAS total score and subtotal scores of participants who had heard of OP were high. The proportion of individuals who had not heard of OP and were primary school graduates was significantly higher (68.1%) compared to those who had heard of OP (38.7%). The subtotal OAS risk factor scores in postmenopausal women were high. The certain subtotal OAS scores for participants taking vitamin D were higher than those not taking vitamin D. Those with a family history of fractures had higher total and certain subtotal OAS scores than those without a family history.

There are several studies evaluating OP awareness in Türkiye using the valid OAS.[15-18] Temel et al. reported patients with multiple sclerosis had an average OAS score of 59 ± 19.63.[15] Uyanık et al. found that OAS was 55.33 ± 17.02 in postmenopausal women with chronic diseases.[18] According to these literature, it can be concluded that Turkish asthma patients using ICS have a lower level of awareness about OP compared to these studies which have done among Turkish patients with chronic diseases. On the other hand, 91.7% of the participants in this study had a chronic illness, while 8.3% did not. No significant difference was found in OAS scores for chronic diseases. Similar to these studies, chronic diseases did not increase OP awareness, contrary to expectations. In the literature, there are studies that show high levels of OP awareness, as well as studies that show low levels.[19-23] In this study, participants who had heard of OP had notably higher OAS scores. This suggests that exposure to OP information may increase awareness. Studies have shown that individuals unfamiliar with OP tend to have lower knowledge scores.[20-24] Given OP's impact on quality of life,[25] raising awareness is essential for early diagnosis, treatment, and reducing OP-related morbidity and mortality.[26,27]

The high costs associated with treating osteoporotic fractures and the disability causes necessity for developing effective OP prevention strategies. Nutrition and lifestyle choices that positively influence bone metabolism. A diet rich in calcium and vitamin D, regular physical activity, and avoidance of smoking and excessive alcohol consumption can significantly reduce the risk of OP.[28-30] In this study, 24.8% of participants were taking no dairy products. 55 % of participants were taking vitamin D supplements. 27.5 % reported that they rarely sunbathed and 52.3% did not engage in any form of exercise. Asthma patients using ICS had limited knowledge about the protective role of nutrition and exercise in OP, which may be related to their low education level. Therefore, we believe that providing information, particularly about nutrition and exercise, will be effective in implementing preventive measures.

In studies conducted so far on OP awareness, it has been shown that awareness is generally negatively correlated with age.[15,17,31-33] This situation may be explained by the increased sensitivity to comorbidities related to OP, such as

fractures, with increased age. However, in this study no correlation was found with age. It may be associated with the relatively low average age of the participants included in this study.

Moreover, some studies has been shown that OP awareness is usually positively correlated with education level.[15,17,32] In contrast, Shin et al. found no significant difference between OP awareness and education level in a study involving 1.114 osteoporotic participants.[34] In this study, no direct association has been found between OAS scores and education level. However, there was a statistically significant difference in terms of education levels between individuals who had heard of OP and those who had not. The proportion of individuals who had not heard of OP and were primary school graduates was significantly high.

There are conflicting studies in the literature regarding the relationship between gender and OP awareness. While some studies have found that women have more knowledge about OP than men, other studies claim that there is no significant difference between genders.[15,22,24,31] The reason for the higher awareness in women is thought to be possibly linked to the belief that OP is a condition predominantly affecting women.[12,31] This study found no gender-related differences between female and male participants. Gender differences in prevalence, and severity of asthma have been reported worldwide. After puberty, asthma becomes more prevalent and severe in women. Additionally, there are gender-related differences in the perception of asthma symptoms. Asthmatic women experience greater perception of dyspnea, and increased use of rescue inhalers compared to asthmatic men.[35] The number of male participants in this study was lower compared to females, which could have influenced results of this study. We believe that future research should include a higher number of male participants using ICS. Menopausal status may also affect skeletal impact of ICS, as postmenopausal women have been reported to have larger BMD decreases than premenopausal women.[36] In this study, subtotal OAS risk factor scores in postmenopausal women were higher than those in premenopausal women. This may be due to increased OP awareness during the postmenopausal period.

Obesity and OP are global health problems. The interaction between obesity and bone metabolism is not fully understood. Mechanical loading benefits bone health, however low-grade inflammation and increased bone marrow adipogenesis may decrease bone mass. [37,38] In this study, no significant differences in OAS scores were observed based on obesity. Obese individuals may have reduced OP awareness due to low exercise awareness and a sedentary lifestyle.[38]

To treat OP and prevent OP related disability bone scan have been offered for patients with appropriate indications in guidelines.[6] In this study, 23.9% of the participants had bone scan before and there were no significant differences in OAS scores based on OP screening status. The results of this study showed that it is inadequate in measuring BMD in asthma patients using ICS. In asthma patients, OP-related vertebral fractures can reduce vital capacity and worsen symptoms. Therefore, it is crucial to perform bone screening in asthma patients using ICS. Previous fractures or a family history of fractures is a risk factor for OP or related fractures.[30,39,40] Some studies found no relationship between fractures and OP awareness[12,41] similar to this study, while others found.[14,29] Due to the younger age group, previous fractures may not raise OP awareness in this study. However, participants with a family history of fractures had higher awareness scores in the total OAS and certain sub-scores. This may be related to familiarity with the diagnosis leads to increased selective interest in OP.

Vitamin D deficiency is a significant risk factor for OP and falls, as outlined in the diagnosis and treatment guidelines.[6] In this study, the certain subtotal OAS scores for participants taking vitamin D were high. Therefore it can be expected that patients taking vitamin D replacement will be more sensitive to the subject of OP.

In this study, when the sources of OP information were questioned in patients, the results were as follows: health instution (54.1%) and television-

radio-internet (33%) were in the first line. It is our belief that this situation may be related to asthma being a chronic disease and the fact that patients are regularly monitored at a healthcare facility. Healthcare professionals can provide direct information to asthma patients using ICS about OP and emphasize the importance of preventive steps.

This study has limitations, including the relatively small number of participants and the absence of a control group. Only patients who are regularly followed up due to an asthma chronic illness in outpatient clinic were included. Since this study has a cross-sectional design, the impact of regular follow-up on awareness level could not be standardized. This survey study presents notable strengths. This is the first study assessing awareness of OP in asthma patients using ICS through a well-established, validated scales.

In conclusion, this study found that asthma patients using ICS tend to have low OP awareness. The scores of participants who had heard of OP were high. Increasing OP awareness in these patients may help prevent OP and its complications. To reduce OP incidence, morbidity, and mortality, patient education programs tailored to asthma patients using ICS should be implemented. These programs could also lessen the financial burden on both patients and healthcare systems. Future studies could involve larger, diverse populations with long-term follow-up.

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