


Original Research

# Assessment of osteoporosis medication adherence, quality of life, and treatment satisfaction among women with osteoporosis: A cross-sectional study

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## Abstract

**Background:** Osteoporosis is considered one of the most important postmenopausal problems. The absence of efficacy markers and intolerable side effects hinders treatment outcomes. This study aimed to assess adherence to medications, quality of life and treatment satisfaction among Lebanese osteoporotic women. **Methods:** This cross-sectional study was conducted between March-December 2020 in community and outpatient settings distributed in all Lebanese districts. A validated questionnaire was used to gather information through face-to-face and online interviews. Data was analyzed using a statistical package for social science (SPSS). **Results:** A total of 72 patients were recruited with a mean age of 60.40 of  $\pm$  8.86 years. Almost all women (94.40%) were menopause with a mean age of 48.97  $\pm$  4.78 years (mean  $\pm$  SD). The majority were married (83.30%), had 2 or more children (81.90%), and were educated (86.10%). The adherence score was positively and significantly associated with the duration of smoking ( $\beta=0.22$ , CI=0.03-0.41, P-value=0.027) and calcium intake ( $\beta=5.68$ , CI=1.56 - 9.80, p-value=0.009). On the other hand, a negative association was noted with vitamin D intake ( $\beta=-15.34$ , CI=-27.95, -2.73, p-value=0.019). **Conclusion:** Treatment satisfaction was significantly associated with the participant's age and menopause status. Proper education and awareness campaigns can help young women prevent the development of osteoporosis.

**Keywords:** Osteoporosis; Adherence; Quality of life; Medication-use; Lebanon

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## INTRODUCTION

Osteoporosis, a silent disease of low bone mass and density, is considered one of the most important postmenopausal problems. Currently, osteoporosis is considered a global health problem that occurs at high rates in Western countries, Asia, and Latin America<sup>1</sup>.

It is well documented that osteoporosis mainly affects older adults, with a higher prevalence among women<sup>2</sup>. Data from the International Osteoporosis Foundation indicates that 1 in 5 men and 1 in 3 women over 50 years may suffer an osteoporotic fracture at some point in their lives<sup>3</sup>. More specifically, women are at higher risk than men to develop osteoporosis and its associated complications since females have thinner and smaller bones compared to males<sup>4</sup>.

More particularly, postmenopausal women are at a higher risk than other women, with one-half of all postmenopausal women experience osteoporosis<sup>5</sup>. During the menopausal transition period, the average reduction in Bone Mineral Density is about 10%. Approximately half of women are losing bone even more rapidly, perhaps as much as 10%–20% in those 5–6 years around menopause. About 25% of postmenopausal women can be classified as fast bone losers, and they could be discovered by



the measurement of bone loss and bone resorption markers<sup>6</sup>. Therefore, postmenopausal women may develop pathological hip or vertebral fractures that potentially impact their everyday activities as well as increase the long-term morbidity and mortality complications<sup>7</sup>. Subsequently, osteoporotic fracture may lead to loss of mobility and autonomy, a reduction of the quality of life and development of serious complications such as pneumonia or thromboembolic disease which poses a considerable health and economic burden to public health<sup>8</sup>.

### Osteoporosis risk factors

Numerous epidemiological studies conducted internationally have thoroughly investigated and elucidated potential risk factors for osteoporosis. These factors encompass demographics, social factors, medical history, alcohol consumption, smoking habits, as well as maternal and paternal histories of bone fractures occurring after the age of 50<sup>9-11</sup>.

Risk factors for osteoporosis in postmenopausal women, such as lifestyle choices including calcium and vitamin D supplementation, physical activity levels, and body weight, have been extensively discussed<sup>12</sup>. Calcium and vitamin D are widely recognized as crucial elements for maintaining bone health<sup>13</sup>. Inadequate intake of these nutrients among postmenopausal women can hinder effective bone restructuring and heighten the risk of bone fractures<sup>14</sup>. Primary sources of calcium include dairy products like yogurt, cheese, milk, and leafy green vegetables<sup>14</sup>, while dairy products, vitamin D-fortified foods, and exposure to sunlight are the primary sources of vitamin D<sup>15</sup>. Growing evidence supports the efficacy of calcium and vitamin D supplementation in mitigating bone loss and reducing fracture risk in older individuals<sup>16-17</sup>.

### Osteoporosis management

To overcome this problem and protect females from menopause-associated osteoporosis, various recommendations and treatment modalities have been evolved<sup>18</sup>. These modalities include non-pharmacological options as performing regular exercise, supplementing calcium and vitamin D, reducing risk of falls, and pharmacological options as prescribing anti-resorptive drugs mainly bisphosphonates<sup>19</sup>.

### Treatment adherence and satisfaction

The silent nature of osteoporosis, limited availability of treatment efficacy markers, and intolerable side effects lead to discontinuation of osteoporosis medications<sup>20</sup>. Additionally, patients may fail to adhere to post-menopausal osteoporosis medication regimens due to various factors, such as encountering or fearing adverse effects<sup>21-22</sup>, dealing with inconvenient or complicated dosing schedules<sup>23-24</sup>, perceiving a lack of benefits<sup>21</sup>, and lacking awareness of the consequences related to the disease<sup>23</sup>. Furthermore, according to studies, side effects are a major reason for treatment discontinuation which was highly reported among bisphosphonates<sup>25-27</sup>.

However, the BRAVO study reported increased satisfaction among females taking bisphosphonate on a monthly basis and for a short duration. Moreover, high levels of satisfaction were observed among nonsmokers<sup>28</sup>. Adding to that, studies indicate

that satisfaction with treatment plays a role in adherence to therapies for numerous chronic conditions, including osteoporosis<sup>29</sup>. Thus, raising knowledge and awareness about the medications are crucial to enhance patient's overall satisfaction and promote adherence<sup>30</sup>.

### Medication use patterns

In parallel to medication adherence, the decline in persistence in taking osteoporosis medications over time has been consistently shown<sup>31-32</sup>. In a systematic review covering 14 databases, Cramer et al. discovered that persistence with bisphosphonate treatment for osteoporosis ranged from 18% to 78% after 1 year<sup>31</sup>. Similarly, Kothawala et al. reported that typically, only 50% of women prescribed an anti-osteoporosis medications continue taking the medication 12 months later<sup>32</sup>.

Factors influencing persistence with therapy mirror those related to initiation<sup>21,33</sup>. Women diagnosed with osteoporosis or low bone mineral density<sup>33</sup>, as well as those with a history of fractures<sup>23</sup>, are more likely to persist with treatment. Younger women and those who believe in the effectiveness of the medication tend to be more persistent. Silverman et al. observed that women who do not adhere to medications "may not believe that they have osteoporosis or that they are not at much risk of fracture"<sup>34</sup>.

One study reported that only 36% of women with high-risk fractures were on osteoporotic medications<sup>34</sup>. Furthermore, studies reported that within a year of beginning osteoporosis medication therapy, around 75% of women had stopped taking the medication as directed, and later nearly 50% had stopped all medications<sup>35-38</sup>. Having noting that, the overall medication use pattern and adherence will be improved by informing the patients about the associated risks from medication non-adherence<sup>34,39</sup>.

### Osteoporosis and quality of life

A strong relationship exists between bone health, general health status and quality of life, considering that people living with osteoporosis present an impaired global functioning, particularly relating to the physical, psychological and social aspects, with highest risk of obesity, sedentary lifestyle and loss of work. Hence, it is crucial to thoroughly examine the quality of life of women with osteoporosis, even before fractures occur, to devise suitable interventions that enable patients to effectively cope with all phases of the disease<sup>40</sup>. A substantial amount of research has highlighted the adverse impact of fragility fractures on the health-related quality of life of individuals with osteoporosis<sup>41-42</sup>. On the other hand, findings from a Korean study indicated that osteoporosis prevention and treatment significantly improve the quality of life in elderly women<sup>43</sup>.

### The present study

Although osteoporosis is common in the Middle East region, information on the pharmacologic treatment of osteoporosis, e.g., treatment rates, treatment satisfaction, and the effects of treatment on healthcare resource use and quality of life, is scarce. In Lebanon, a study reported that around 85% of



menopausal women were diagnosed with osteoporosis, while only 45% knew the true definition of osteoporosis<sup>44</sup>. It was revealed further that osteoporosis knowledge and perception are low among Lebanese women aged 50 years and older<sup>44</sup>. Most studies in Lebanon focused on the diagnostic scores and treatment guidelines about osteoporosis but there is rare information regarding patients' perceived response to anti-osteoporotic medications<sup>7,45</sup>. Additionally, little is known about the management of osteoporosis in Middle-East countries or about osteoporosis patients' experience with pharmacologic treatment. Therefore, this study aimed to assess the medication adherence, use patterns, quality of life, treatment satisfaction, and associated factors among Lebanese osteoporotic women.

## MATERIALS AND METHODS

### Study design & study population

A prospective cross-sectional study was conducted between March and December 2020 in community and outpatient settings from all Lebanese districts (Beirut, Bekaa, and South Lebanon). All the information was gathered through face-to-face interviews or through an online data-form to minimize social contact due to COVID-19 pandemic.

### Inclusion and Exclusion Criteria

The inclusion criteria included patients diagnosed with osteoporosis. Participants' eligibility was checked by the research team based on their medication profiles and confirmed through a physician diagnosis of osteoporosis. This screening process was overseen by our team of researchers, who thoroughly reviewed each participant's medication history to confirm their eligibility.

Exclusion criteria included participants who were unable to read or understand questions due to any neurologic disease or impairment, or those who were unable to tolerate oral formulations based upon a permanent physiologic condition.

### Data collection

Data were collected from outpatient clinics and community settings after obtaining the approval of the Institutional Review Board (IRB number: 2020RC-005-LIUSOP) at the Research Committee at Lebanese International University. Written consent was obtained from all participants. During the interview, participants were asked to complete the questionnaire. On average, it took participants approximately 10 minutes to finish the questionnaire. The participants were provided with clear and standardized instructions. Prior to the interview, each participant was informed about the purpose of the study, the interview process, and the expected duration of the interview. Participants were encouraged to ask any questions or seek clarification as needed. The interviews were conducted in a private and comfortable setting, ensuring participants' confidentiality and ease of communication.

### Sample Size Calculation

The Epi info software calculated the minimum sample size, based on the bone mineral density among Lebanese women

aged 60-79 years and a 95% confidence interval, the minimal sample size required was 72 participants<sup>46</sup>.

### Questionnaire

In our study, we conducted a pre-test to validate the questionnaire used. The pre-test involved a small group of individuals who were not part of the main study population but were demographically similar to our target participants. This pre-test allowed us to assess the clarity, comprehensibility, and relevance of the questionnaire items, as well as to identify any potential issues or ambiguities in the questions.

The first part of the questionnaire collected demographic characteristics of patients, associated factors such as smoking, alcohol consumption, menopausal age, physical activity, comorbidities (diabetes mellitus, hypertension, dyslipidemia, previous or recent tumor), and concomitant classes of medications (antidiabetic, antihypertensives, statins, anticoagulants, chemotherapy, proton pump inhibitors, hormones, or anti-epileptics). In addition, we recorded osteoporotic drugs, including calcium and vitamin D supplements. The second part included the following scales:

#### **ADherence Evaluation of OSteoporosis treatment (ADEOS)**

questionnaire was used to determine adherence to osteoporosis treatments<sup>26</sup>. It is a twelve-item scale (e.g. My osteoporosis medication is important to my health; Do you ever forget to take your osteoporosis medication?); some of the questions in the ADEOS are being evaluated by "yes", "no", and "I don't know" and other questions through "very motivated", "somewhat motivated", and "not at all". Higher scores indicate higher adherence to the treatment. The Cronbach's alpha of ADEOS was 0.80.

**MedUseQ** is used to assess a wide range of medication use problems and identify areas for education, intervention, or further assessment<sup>25</sup>. The medication use pattern, a twenty-four-item questionnaire, assessed by likert scale ranging from "never", "once in a while", and "often". Some of the questions assessed "How often have you had problems taking a medication as instructed because of changes in its color, size or shape"? The Cronbach's alpha of medication use pattern scale was 0.81.

#### **The Mini Osteoporosis Quality of Life Questionnaire (Mini-OQLQ)**

is a 10-item abbreviated form of the original 30-item OQLQ<sup>28</sup>. Nevertheless, the mini-OQLQ comprises five domains: symptoms, physical function, activities of daily living, emotional function, and leisure. The mini-OQLQ is a self-reported questionnaire that requires approximately 3 min to complete, assessed through a Likert scale ranging from "extremely difficult" to "not difficult". The Cronbach's alpha of OQLQ was 0.72.

#### **Osteoporosis Patient Treatment Satisfaction Questionnaire (OPSAT-Q)**

was used to assess satisfaction with bisphosphonate treatment in postmenopausal women<sup>25</sup>. The OPSAT-Q is a ten-item scale evaluated through the following options "very dissatisfied" to "very satisfied". We checked the frequency, duration of treatment, convenience, and confidence to maintain daily physical and work-related activities. Patients



were assessed for difficulties they face and their ability to incorporate osteoporotic drugs into their schedule. Treatment satisfaction addressed side effects such as heartburn, acid reflux, diarrhea, nausea, vomiting, or stomach pain of osteoporotic medications. The Cronbach's alpha of OPSAT-Q was 0.82.

### Statistical Analysis

The study data was analyzed using SPSS® version 24, with mean and standard deviation (S.D.) for continuous variables and frequency or percentages for categorical variables. Predictors for the study measures were tested using bivariate analysis. Variables with p-values <0.25 in the bivariate analysis were entered in the multiple linear regression model with independence checked using Spearman's correlation coefficient (r) less than 0.4 to ensure no multicollinearity between independent predictors. The multivariable regression analysis identified the independent variables associated with adherence scores, medication use pattern, satisfaction scores, and quality of life scores. P-value <0.05 considered statistically significant.

## RESULTS

### Sociodemographic Characteristics of patients

A total of 72 patients were enrolled in the study with a mean age of 60.40 of ± 8.86 (SD) years, mean age of menopause (± SD) of 48.97 of ± 4.78 years, and almost all (94.40%) were menopause. The majority were married (83.30%), had 2 or more children (81.90%), and had university educational level

(40.30%). Around 40.30% were physically inactive, 45.80% workout 2-3 times per week, and 90.30% took vitamin D and 75% took calcium supplements. The sociodemographic characteristics of the patients are represented in **Table 1**.

### Bivariate analysis

Bivariate correlation between different variables and patient's adherence score, medication use pattern, quality of life score and treatment satisfaction score are represented in **Table 2**.

### Adherence score

Our results showed that a significantly higher adherence was associated among calcium users with a p-value of 0.006. In addition, there was a significant positive association between adherence score and duration of smoking (P-value =0.018) and number of cigarettes (P-value =0.047).

### Medication use pattern

There was a significant association between height and medication use pattern (P-value =0.010). No other significant associations were observed with the other variables (for the duration of smoking in years, vitamin D intake, and calcium intake).

### Quality of Life

Participants' quality of life was significantly associated with calcium intake (P-value =0.044) and duration of waterpipe smoking in years and quality of life score (P-value= 0.009).

### Treatment Satisfaction

There is a significant association between treatment satisfaction

Table 1. Participants' Characteristics (N= 72)	
Variables	n (%)
Age (years)	60.40 ± 8.86
Age of menopause	48.97 ± 4.78
Achieving menopause	
No	4 (5.60)
Yes	68 (94.40)
Height	160.09 ± 6.90
Weight	72.18 ± 13.13
Marital Status	
Married	60 (83.30)
Single	6 (8.30)
Divorced/Widowed	6 (8.30)
Number of Children	
0	10 (13.90)
1	3 (4.20)
2 or more	59 (81.90)
Educational level	
Elementary	9 (12.50)
High school	34 (47.20)



University	29 (40.30)
<b>Monthly income</b>	
Low	27 (37.50)
Moderate	41 (56.90)
High	4 (5.60)
<b>Dwelling region</b>	
Beirut	47 (65.90)
Bekaa	7 (9.70)
Mount Lebanon	6 (8.30)
South	7 (9.70)
Nabatieh	2 (2.80)
North	3 (4.20)
<b>Employment status</b>	
Jobless	48 (66.70)
Working	19 (26.40)
Retired	5 (6.90)
<b>Work type</b>	
Medical	2 (7.70)
Non-medical	24 (92.30)
<b>Number of Cigarettes smoked per day</b>	28.27 ± 5.33
<b>Duration of cigarette smoking (years)</b>	33.66 ± 10.58
<b>Number of waterpipe smoked per day</b>	1.67 ± 0.98
<b>Duration of waterpipe smoking (years)</b>	8.58 ± 8.60
<b>Alcohol consumption (cups per day)</b>	
Zero	67 (93.10)
Less than 2	120 (96.0)
<b>Physical Activity</b>	
None	29 (40.30)
2-3 times per week	33 (45.80)
4-5 times per week	10 (13.90)
<b>Exercise duration in minutes</b>	
30	33 (71.70)
60	9 (19.60)
>60	4 (8.70)
<b>Intake of vitamin D</b>	
No	7 (9.70)
Yes	65 (90.30)
<b>Intake of Calcium</b>	
No	18 (25)
Yes	54 (75)
<b>Type of exercise</b>	
Neuromuscular	3 (6.80)
Aerobic	26 (59.10)
Flexibility	2 (4.50)
Muscle strengthening	2 (4.50)
Walking	11 (25)



**Table 2.** Association of adherence score, medication use pattern, quality of life score and treatment satisfaction score with different patients' sociodemographic characteristics.

Variables	Adherence score		
	n (ρ)	n (mean ± SD)	P-value
"Age"	27 (-0.007)		0.004
"Duration of smoking in years"	27 (0.217)		0.018
"Number of cigarettes"	27 (0.062)		0.047
"Vitamin D intake"		27 (0.96 ± 0.19)	0.159
"Calcium intake"		27 (0.85 ± 0.36)	0.006
	Medication Use Pattern		
"Height"	27 (-0.305)		0.01
"Duration of smoking in years"	27 (-0.111)		0.051
"Vitamin D intake"		27 (0.96 ± 0.19)	0.322
"Calcium intake"		27 (0.85 ± 0.36)	0.082
	Quality of life score		
"Duration of waterpipe smoking in years"	12 (0.66)		0.009
"Calcium intake"		12 (0.42 ± 0.51)	0.044
	Treatment satisfaction score		
"Age"	27 (0.628)		0.006
"Duration of smoking in years"	27 (-0.26)		0.274
"Height"	27 (-0.098)		0.239
"Achievement of menopause"		27 (0.96 ± 0.19)	0.042
"Calcium intake"		27 (0.85 ± 0.36)	0.368

ρ: Spearman correlation coefficient; SD: standard deviation. Numbers in bold indicate significant p-values <0.05.

score and age (P-value =0.006). Also, menopausal women had a higher level of treatment satisfaction score compared to non-menopause with a p-value of 0.042. No other significant associations were noted with other variables (for duration of smoking in years, height, and calcium intake).

#### Predictors affecting the study measures (Multiple linear regression analysis)

Multiple linear regression was conducted for the adherence score and duration of smoking (years), number of cigarettes, vitamin D intake, and calcium intake. The adherence score was positively and significantly affected by the duration of smoking (beta=0.22, CI=0.03-0.41, P-value=0.027) and calcium intake (beta=5.68, CI=1.56-9.80, P-value=0.009) however, it was negatively associated with vitamin D intake (beta=-15.34, CI=-27.95- -2.73, P-value=0.019).

The medication use pattern was negatively associated with height (beta=-0.40, CI= -0.58 - -0.02, P-value=0.034). However, the quality of life was not affected significantly by any of the measured variables (duration of waterpipe smoking in years and calcium intake).

In addition, the age of the participants was positively associated with the treatment satisfaction (beta=0.63, CI=0.29 - 0.96, P-value=0.001) and negatively associated in women who achieved menopause (beta=-20.13, CI=-34.99 - -5.26, P-value=0.01). **Table 3** depicts the linear regression analysis.

## DISCUSSION

This study aimed to evaluate patients' adherence, medication use pattern, satisfaction and quality of life among Lebanese osteoporotic patients. Since postmenopausal bone loss related to estrogen deficiency is the main contributor to osteoporosis, various recommendations are being developed to prevent, reduce, and treat this issue. As a result of osteoporosis, postmenopausal females are at higher risk to develop bone fractures and suffer from the associated long-term complications. Therefore, the primary goal in treating osteoporosis is to prevent fractures by preventing further bone loss, maintaining bone strength, and eliminating factors that lead to fractures. According to "Management of Osteoporosis in Postmenopausal Women", a significant association between treatment satisfaction and menopause achievement was noted. This area has been further investigated by Hill et al. 2007 revealing the significance of such correlation between menopause and medication satisfaction<sup>47</sup>.

#### Calcium and Vitamin D intake and Medication adherence

Our results showed that a significantly higher adherence was associated among calcium users. The management of osteoporosis starts with some nonpharmacological measures such as regular exercise, smoking cessation, and adequate intake of vitamin D and Calcium<sup>20</sup>. In terms of calcium and vitamin D intake, these nutrients are important for bone health



**Table 3.** Regression analysis for the predictors of adherence score, medication use pattern, quality of life score and treatment satisfaction score.

Variables	$\beta$ (95%CI)	P-value
<b>Adherence score</b>		
Duration of smoking in years	0.22 (0.03; 0.41)	0.027
Number of cigarettes	0.06 (-0.033; 0.16)	0.189
Vitamin D intake	-15.34 (-27.95; -2.73)	0.019
Calcium intake	5.68 (1.56; 9.80)	0.009
<b>Medication use pattern</b>		
Height	-0.403(-0.585, -0.025)	0.034
<b>Quality of life score</b>		
Duration of waterpipe smoking in years	0.66 (-0.06; 1.38)	0.068
Calcium intake	0.263(-6.727; 17.311)	0.345
<b>Treatment satisfaction score</b>		
Age	0.63 (0.29; 0.96)	0.001
Achievement of menopause	-20.13 (-34.99; -5.26)	0.01
$\beta$ , Beta; CI, confidence interval.		
Regression takes the identification of adherence score, quality of life score, and treatment satisfaction score as the dependent variables and sociodemographic factors as independent variables. Numbers in bold indicate significant p-values <0.05.		

and may play a role in the treatment of osteoporosis, especially in the postmenopausal women<sup>48-49</sup>. Patients who do not get enough calcium and vitamin D may have poor bone health, which can lead to more fractures<sup>50</sup>. However, adherence to calcium and vitamin D supplements can also be challenging<sup>51</sup>. Some patients may not like the taste or texture of supplements, while others may be non-adherent. It is important for patients to discuss with their healthcare providers challenges they are experiencing with their medication or supplement regimen, as there may be strategies that improve adherence<sup>51-52</sup>. According to previous studies, 40% of the patients were physically inactive and 75% were adherent with their osteoporotic medication. On the other hand, the pattern was similar regarding the positive effect of calcium intake and adherence, however, the relation was negative regarding vitamin D intake. Studies have also shown that calcium and vitamin D supplementation combined with prescription medication, promote appropriate treatment and reduce anxiety about the disease and treatment<sup>53-54</sup>.

### Smoking and Medication adherence

In this study, there was a positive significant association between duration of smoking and adherence to osteoporosis medication. In contrast, according to the randomized prospective study carried out by Gonnelli et al. in 2016, comorbidities, aging, and smoking attitude were identified as factors that worsen adherence to osteoporosis therapy. This is likely because these conditions may express patients decreased attention to their state of health<sup>55-56</sup>. Further studies with a larger sample are recommended in order to study in depth our results.

### Calcium intake and Quality of life

Additionally, our findings revealed that calcium intake was significantly associated with improved quality of life. As

mentioned, calcium is an essential mineral that plays a vital role in maintaining optimal health and well-being. Studies have shown that individuals with higher calcium intake tend to have better mental health manifested by lower levels of depression and anxiety<sup>1-3</sup>. Additionally, calcium intake has been linked with improved cardiovascular health, including lower blood pressure and reduced risk of heart disease. Furthermore, adequate calcium intake may also improve muscle function and reduce the risk of falls in older adults<sup>4,51,55</sup>. Overall, these findings suggest that calcium intake can have a significant impact on an individual's quality of life and highlight the importance of incorporating calcium-rich foods into a healthy diet. In-addition, adequate intake of these supplements was recommended to prevent and reduce the risk of treatment-induced hypocalcemia<sup>4,51,55</sup>. Furthermore, according to osteoporosis studies, patients' attitudes towards the condition and its management and their views of the treatment importance have significant impact on how well they comply with it<sup>57</sup>. Patient's knowledge and perception, social environment, and personal experiences influence health-related behaviors<sup>58</sup>. In fact, it is extremely vital to adopt healthy behaviors like adherence to ensure optimal therapeutic outcome<sup>59</sup>. Adherence to treatments, intake of calcium and vitamin supplements, treatment perception exert positive influence on patients<sup>59</sup>.

### Age and Treatment satisfaction

Our findings showed that the age of the participants was positively associated with the treatment satisfaction, in line with previous studies<sup>60-62</sup>. The maturational explanation suggests that older individuals are more satisfied with treatment because they have greater familiarity with the processes of care and greater familiarity with potential shortcomings in the treatment and health care delivery system<sup>62</sup>.



### Clinical Implications

In summary, assessing osteoporosis medication adherence, use pattern, quality of life, treatment satisfaction, and associated factors among osteoporotic women is crucial for improving their overall health and well-being. The findings of such assessments can help healthcare providers identify patients who may be at higher risk of non-adherence and develop tailored interventions to improve quality of life. Moreover, understanding the factors associated with treatment satisfaction assist healthcare providers to address patient concerns and improve treatment outcomes. Ultimately, by prioritizing the assessment of medication adherence and quality of life among women with osteoporosis, healthcare providers can implement a proactive approach to managing chronic conditions and ensure the best possible outcomes for their patients.

### Limitations

The study has some limitations. Firstly, use of an online survey may have introduced selection bias by excluding those without internet access or less active on social media. This could have skewed the results, leading to mainly underestimation of outcomes including medication adherence and quality of life especially which was hindered more during COVID-19 pandemic potentially not reflective of the broader population's experiences. Secondly, it is a cross-sectional design which limits the ability to infer causality from the associations observed and affects the generalizability of the findings. Additionally, there is a possibility of information bias since the data was self-reported by participants. Also, our study might have the change for response bias since the survey was collected online although we mentioned in the survey that the link should be filled without any assistance. In-addition, postmenopausal

women who tend to be older needed more help in explaining and filling out the survey rather than doing it on their own, which eventually led to a small sample size. This opens the opportunity for further studies to enroll a larger sample size for more proper assessment. Finally, a social desirability bias is a risk, since the data is dependent on self-reported measures.

### CONCLUSIONS

Our study showed that quality of life, adherence, treatment satisfaction, and medication use pattern play a crucial role in women with osteoporosis. Furthermore, women should be counseled to quit smoking and carry out physical activity as it exerts a potential benefit among osteoporotic women. Proper education and awareness campaigns can help young women prevent the development of osteoporosis.

### AUTHOR CONTRIBUTIONS

For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, DM; methodology, DM; software, DM; validation, DM, SH, SO; formal analysis, SH; investigation, DM, MED; resources, DM, MB, MED; data curation, MR, NAM, BO; writing—original draft preparation, EF, RT, NG; writing—review and editing, visualization, SEK; supervision, DM; project administration, DM. All authors have read and agreed to the published version of the manuscript."

### CONFLICTS OF INTEREST

The authors report there are no competing interests to declare.

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