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ORIGINAL ARTICLE

Depression, Quality of Life, and Self-Esteem of Moroccan Postmenopausal Women with Osteoporosis before the Occurrence of Fractures

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Objectives: Previous researches have investigated depression in postmenopausal women (PMW) with osteoporosis and fractures, but little is known regarding Moroccan PMW without fractures. We investigated depression prevalence and severity in Moroccan PMW with osteoporosis without fractures and its relationship with quality of life (QoL) and physical and psychological state.

Methods: This cross-sectional study enrolled 100 PMW with osteoporosis without fractures. Depressive symptoms, QoL, self-esteem, and fatigue were evaluated using the Patient Health Questionnaire-9 (PHQ-9), Arabic version of ECOS-16 questionnaire, Rosenberg self-esteem scale, and Arabic version of the Multidimensional Assessment of Fatigue scale, respectively. A questionnaire including sociodemographic factors, bone density features, pain intensity, and sleep disturbance was completed.

Results: Overall, 58% patients suffered from depression and 55% from pain (63.8% depressed women vs. 42.9% nondepressed patients; $P = 0.03$). Bone mineral density, lumbar spine T-score, ECOS-16, and self-esteem in depressed and nondepressed women were 0.791 (0.738–0.840) vs. 0.835 (0.790–0.866); –3.25 (–3.8 to –2.875) vs. –2.9 (–3.425 to –2.700), $P = 0.02$; 2.338 ± 0.605 vs. 1.638 ± 0.455; and 13.517 ± 5.487 vs. 18.404 ± 5.771, $P < 0.0001$, respectively. Depression severity correlated with pain, QoL, self-esteem, and fatigue ($r = 0.367$, $r = –0.390$, $r = –0.390$, and $r = 0.369$, respectively; $P < 0.0001$) as well as lumbar spine bone mineral density and T-score ($r = –0.258$ and $r = –0.255$, respectively; $P = 0.01$). Multiple linear regression analysis revealed impaired QoL ($\beta = 0.526$; $P < 0.0001$), fatigue ($\beta = 0.177$; $P = 0.02$), and lower self-esteem ($\beta = –2.170$; $P = 0.005$) as the strongest risk factors of depression.

Conclusions: Our study shows that even without fractures, Moroccan PMW with osteoporosis suffered from depression, pain, impaired QoL, and lower self-esteem.

Key Words: Depression, Osteoporosis, Postmenopausal, Quality of life, Self esteem

INTRODUCTION

Osteoporosis is a systemic disease in which bone mineral density (BMD) is reduced with increased vulnerability to fractures. Social consequences, psychological difficulties and an impact on quality of life (QoL) with and without fractures can be observed [1-6]. Osteoporosis, as a vulnerable transition period, may induce pain, lead to mobility reduce and daily activities limitations. Consequently, patients can suffer from social isolation, anxiety and depression with decreased QoL and lower self-esteem.

The World Health Organisation (WHO) define the osteoporosis as "a systemic skeletal disease characterized by a low bone mass and bone architectural derangements, leading to an increased fracture risk" and set the threshold of bone loss for post-menopausal osteoporosis at a T-score value of –2.5 measured by dual-energy X-ray absorptiometry (DXA) [3,4].

The evaluation of the QoL had an important role

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to estimate the physical disability, psychological and social handicaps resulting from osteoporosis, even without fractures [2]. Pain and depression are both associated with impaired QoL but few articles indicating pain prevalence and QoL in postmenopausal women (PMW), are published [5,6]. Osteoporosis remains the most prevalent metabolic bone disease in older adults and a major public health problem. Although management of osteoporosis through diet, exercise, and medication has improved, little is known about the psychosocial impact of the disease in absence of fractures [4].

Previous researches suggested a significant correlation between depression and osteoporosis [7,8], but there is no available information on depression during menopause in Moroccan elderly population in absence of fractures.

We investigated the prevalence and severity of depression in Moroccan PMW with osteoporosis, independently of fractures; and we evaluated the relationship between depression, BMD parameters, physical and psychological functions.

MATERIALS AND METHODS

Patients

In this cross-sectional study, one hundred PMW with osteoporosis from the Regional Public Hospital of Specialities, Tanger, during 9 months (from June 2018 to March 2019), were included. The study protocol was approved by the Ethics Committee of Medical University of Rabat and in accordance with the ethical standards laid down in the 1964 Helsinki declaration and its later amendments. Informed consent was obtained from all patients before inclusion.

Patients with fractures, prior history of depression, premenopausal stage, secondary osteoporosis or other metabolic bone disorders, rheumatoid disease, oral corticoids and alcohol use, cancer, chronic renal insufficiency, chronic respiratory diseases, cardio-vascular diseases including uncontrolled hypertension and diabetes, were excluded. Patients having articular or bone surgical history were also excluded.

Considering importance of illiteracy in our context, the data was collected by a woman researcher in Rheumatology and the study was conducted in the local Arabic language.

Osteoporosis diagnosis

The diagnosis of osteoporosis was made according to the WHO criteria on the basis of a reduction in BMD at spine and hip scan [4]. BMD was measured using DXA (Lunar Prodigy Vision; GE Healthcare, Madison, WI, USA). The results were expressed in absolute BMD values (g/cm^2) and T-scores [3,4].

Questionnaires

Patients were asked to answer a questionnaire describing their socio demographic characteristics (age, age and duration of menopause, bodyweight [kg], height [cm], body mass index [BMI; kg/m^2], educational level, occupation, matrimonial status, physical activity and monthly household income), features of osteoporosis (T-score and BMD at lumbar spine [L1-L4] and femoral neck) and pain intensity (generalized pain and back pain) during the last 6 months assessed by visual analogue scale [VAS; 0–100 mm]).

The Patient Health Questionnaire-9 (PHQ-9) was used for screening, diagnosing and measuring the severity of depression. Scores range from 0 to 27 with four degrees of severity (mild, 5–9; moderate, 10–14; moderately severe, 15–19; and severe depression, 20–27) [9]. QoL was assessed with the Arabic version of Health Related QoL (HRQL) in osteoporosis (ECO-16) [10]. ECOS-16 is a shorter questionnaire (16 items), each item is divided into 5 degrees of severity, varying from 1 (best HRQoL) to 5 (worst HRQoL). The health state is divided into 4 dimensions and 2 components. Physical component assesses physical function (5 items) and pain (5 items). Mental component includes fear of illness (2 items) and psychosocial function (4 items). These two components combined to provide a total score ranges varying from 1 (best HRQoL) to 5 (worst HRQoL). Sleep disturbance was assessed by the 5th item of ECO-16 questionnaire. Self-esteem was measured by the Rosenberg scale for self-esteem (RSE) with 10 items answered on a 4 point scale ranging from: strongly agree to strongly disagree. The scale ranges from 0 to 30. Scores below 15 suggest low self-esteem [11].

To evaluate fatigue, we have used the Arabic version of Multidimensional Assessment of Fatigue (MAF). The MAF is a self-administered questionnaire with 16 items developed to measure five dimensions of self-reported fatigue: degree (MAF1), severity (MAF2), distress (MAF3), impact on activities of daily living (household chores, cooking, bathing, dressing, working, socializing, sexual activity, leisure and recreation, shopping, walking, and exercising) (MAF4), and timing (over the

past week, when it occurred and any changes) (MAF5). A Global Fatigue Index (GFI) is calculated. GFI score ranged from 0 (no fatigue) to 50 (severe fatigue) [12].

Statistical analysis

Descriptive statistics included the range, mean, standard deviation for interval variables and frequency, percentage for categorical variables. Univariate analysis was examined using Mann–Whitney *U* test or Student's

Table 1. Socio-demographic variables of patients and osteoporosis features

Variable	All patients (n = 100)	Patients with depression (n = 58)	Patients without depression (n = 42)	*P* value
Age (y)	61.90 ± 8.39	61.62 ± 8.16	62.29 ± 8.77	NS
Number of parity	4 (2–6)	4 (1.75–6)	4 (1.75–6.25)	NS
Educational level (%)				NS
Illiterate	64	36 (62.1)	28 (66.7)	
Primary	20	14 (24.1)	6 (14.3)	
Secondary	11	7 (12.1)	4 (9.5)	
University	5	1 (1.7)	4 (9.5)	
Occupation (%)				NS
Employed	26	15 (25.9)	11 (26.2)	
Housewife	74	43 (74.1)	31 (73.8)	
Matrimonial status (%)				NS
Married	58	34 (58.6)	24 (57.1)	
Divorced	5	2 (3.4)	3 (7.1)	
Single	4	3 (5.2)	1 (2.4)	
Widowed	33	19 (32.8)	14 (33.3)	
Monthly household income (%)				NS
< 250 €	66	44 (75.9)	22 (52.4)	
250–300 €	19	9 (15.5)	10 (23.8)	
> 300 €	15	5 (8.6)	10 (23.8)	
Physical activity (%)				NS
Yes	77	44 (75.9)	33 (78.6)	
No	23	14 (24.1)	9 (21.4)	
Body mass index (kg/cm^2)	27.330 ± 3.860	27.460 ± 3.863	27.157 ± 3.896	NS
Normal (< 25)	25	14 (24.1)	11 (26.2)	
Overweight (25–30)	49	26 (44.8)	23 (54.8)	
Obese (> 30)	26	18 (31.0)	8 (19.0)	
Age of menopause (y)	49.52 ± 5.34	49.64 ± 4.92	49.36 ± 5.93	NS
Menopause duration (y)	12.380 ± 7.770	11.982 ± 7.158	12.928 ± 8.606	NS
Bone mineral density (BMD)				
Femoral neck BMD	0.806 (0.745–0.868)	0.809 (0.725–0.865)	0.802 (0.754–0.874)	NS
Spine BMD	0.817 (0.755–0.854)	0.791 (0.738–0.840)	0.835 (0.790–0.866)	0.02
T-score for the femoral neck	–1.6 (–2.1 to –1.1)	–1.55 (–2.175 to –1.1)	–1.7 (–2.100 to –1.175)	NS
T-score for the spine L1–L4	–3.1 (–3.6 to –2.7)	–3.25 (–3.8 to –2.875)	–2.9 (–3.425 to –2.700)	0.02

Data are presented as mean ± standard deviation, median (range), or number (%).
NS: not significant.

Table 2. Physical, psychological state and quality of life of postmenopausal women with osteoporosis

Variable	All patients (n = 100)	Patients with depression (n = 58)	Patients without depression (n = 42)	*P* value
Pain (%) (yes)	55	37 (63.8)	18 (42.9)	0.03
Generalized pain	56	38 (65.5)	18 (42.9)	0.02
Back pain	43	33 (56.9)	10 (23.8)	0.001
VAS pain (0–100)				
Generalized pain	40 (20–60)	50 (30–70)	30 (20–50)	0.006
Back pain	30.00 (12.50–60.00)	50.00 (20.00–61.25)	20.00 (7.50–35.00)	0.007
Fatigue (%) (yes)	75	58 (100)	17 (40.5)	< 0.0001
MAF (0–50)	29.805 ± 9.362	32.816 ± 9.498	25.647 ± 7.464	< 0.0001
MAF1 fatigue degree (0–10)	5.580 ± 2.344	6.224 ± 2.347	4.690 ± 2.054	0.001
MAF2 fatigue severity (0–10)	5.960 ± 2.373	6.620 ± 2.285	5.047 ± 2.208	0.001
MAF3 distress (0–10)	5.780 ± 2.254	6.362 ± 2.314	4.976 ± 1.918	0.002
MAF4 impact on activities of daily living (0–10)	6.038 ± 2.252	6.709 ± 2.339	5.111 ± 1.766	< 0.0001
MAF5 timing (0–10)	6.247 ± 1.799	6.727 ± 1.954	5.583 ± 1.315	0.001
RSE (0–30)	15.570 ± 6.163	13.517 ± 5.487	18.404 ± 5.771	< 0.0001
PHQ-9 score (0–27)	7.560 ± 5.997	11.569 ± 4.694	2.023 ± 1.439	< 0.0001
Depression (yes/no)		58 (58) (yes)	42 (42) (no)	
Depression severity (%)				
None (0–4)	42	-	42/100 (42)	
Mild (5–9)	22	22/58 (37.93)	-	
Moderate (10–14)	19	19/58 (32.75)	-	
Moderately severe (15–19)	14	14/58 (24.14)	-	
Severe (20–27)	3	3/58 (5.17)	-	
Altered quality of life (%)	54	43 (74.1)	11 (26.2)	< 0.0001
ECO-16 score (1–5)	2.030 ± 0.460	2.338 ± 0.605	1.638 ± 0.455	< 0.0001
Physical score				
Pain	1.740 ± 0.676	1.958 ± 0.671	1.447 ± 0.570	< 0.0001
Physical functioning	1.477 ± 0.573	1.639 ± 0.567	1.253 ± 0.507	0.001
Mental score				
Fear of illness	2.435 ± 1.523	2.870 ± 1.549	1.833 ± 1.276	0.001
Psychological functioning	2.052 ± 0.759	2.413 ± 0.695	1.553 ± 0.531	< 0.0001
Sleep disturbance (%)	19	6 (14.3)	13 (22.4)	NS
The 5th item of ECO-16 (sleep disturbance) (%)				
No disturbance	81	45 (77.6)	36 (85.7)	
One night per month	12	7 (12.1)	5 (11.9)	NS
Two nights	4	3 (5.2)	1 (2.4)	
Three nights	0	-	-	
Every night	3	3 (5.2)	-	

Data are presented as number (%), median (range), or mean ± standard deviation.
VAS: visual analogue scale, MAF: Multidimensional Assessment of Fatigue, RSE: Rosenberg self-esteem scale, PHQ-9: Patient Health Questionnaire-9, ECO-16: Health Related Quality of Life, NS: not significant.

t test for continuous variables and χ^2 for categorical variables. Correlations with Spearman coefficient rank R were also specified. Differences between depression severity groups were determined by single-factor analysis of variance (ANOVA). Multiple linear regression modeling was used to explore the relationship between depression, physical and psychological features. Analyses were performed using IBM SPSS Statistics for Windows (ver. 20; IBM Corp., Armonk, NY, USA). A value of $P < 0.05$ was considered statistically significant.

RESULTS

Mean age was 61.90 ± 8.39 years. Average age of patients at menopause was 49.52 ± 5.34. Half of our patients were over weighted. Number of pregnancies was 4 (2–6). BMD and T-score lumbar spine in depressed and non-depressed women were respectively 0.791 (0.738–0.840) vs. 0.835 (0.790–0.866) and –3.25 (–3.8 to –2.875) vs. –2.9 (–3.425 to –2.700); $P = 0.02$ (Table 1).

Fifty eight percent of patients suffered from depression and 55% from pain (63.8% of depressed women vs. 42.9% non-depressed patients; $P = 0.03$). Depression was mild, moderate, moderately severe, and severe in respectively 22%, 19%, 14%, and 3% (Table 2).

ECO-16 and self-esteem in depressed and non-depressed women were respectively 2.338 ± 0.605 vs. 1.638 ± 0.455 and 13.517 ± 5.487 vs. 18.404 ± 5.771; $P < 0.0001$. Global Fatigue Index was 29.805 ± 9.362 and all depressed women complained from fatigue. Sleep disturbance was observed in 19% of patients (Table 2).

Severity of depression correlated with generalized pain ($P = 0.03$), back pain ($P = 0.02$), patients' QoL ($P < 0.0001$), self-esteem ($P < 0.0001$), and fatigue ($P = 0.04$) (Table 3). The PHQ-9 score correlated with pain, patients' QoL, self-esteem, and fatigue (respectively r = 0.367, r = –0.390, r = –0.390, and r = 0.369; $P < 0.0001$) and with lumbar spine BMD and T-score (respectively r = –0.258 and r = –0.255; $P = 0.01$) (Table 4).

There was no significant relationship between depression severity and physical activity, matrimonial status, occupation, BMI, and educational level.

Multiple linear regression analysis revealed that impaired QoL (β = 0.526; $P < 0.0001$), fatigue (β = 0.177; $P = 0.02$), and lower self-esteem (β = –2.170; $P = 0.005$) were the strongest risk factors of depression in this population (Table 5).

DISCUSSION

Our study shows that depression, pain and impaired QoL are prevalent in Moroccan PMW with osteoporosis even without fractures and that lower self-esteem, fatigue and reduced QoL are the significant independent factors related to depression severity.

Osteoporosis is one of major public health problem, responsible of low bone mass and bone fragility. This disease can induce pain and reduce physical activity leading to social isolation, depression and altered QoL [5,6,12-17]. Many studies are focused on assessing the

Table 3. Mean scores of physical, psychological parameters and quality of life according to depression severity

	None (0–4)	Mild (5–9)	Moderate (10–14)	Moderately severe (15–19)	Severe (20–27)	*P* value
PHQ-9	1.810 ± 1.350	6.384 ± 1.768	11.736 ± 1.368	16.785 ± 1.251	21 ± 1.732	< 0.0001
RSE	18.842 ± 5.659	14.653 ± 7.104	12.210 ± 4.442	14.000 ± 3.823	10.666 ± 3.055	< 0.0001
VAS generalized pain	34.32 ± 22.05	42.50 ± 23.80	50.53 ± 23.21	54.64 ± 26.05	50.00 ± 26.46	0.03
VAS back pain	26.84 ± 26.72	35.54 ± 23.76	41.58 ± 25.66	51.79 ± 31.72	53.33 ± 15.28	0.02
ECO-16	1.620 ± 0.453	2.024 ± 0.546	2.352 ± 0.538	2.616 ± 0.601	2.979 ± 0.485	< 0.0001
MAF	25.491 ± 7.465	30.340 ± 9.887	34.651 ± 9.256	32.771 ± 9.402	35.266 ± 7.332	0.04
Spine BMD	0.816 ± 0.628	0.804 ± 0.669	0.798 ± 0.628	0.776 ± 0.737	0.709 ± 0.421	0.09
Neck femoral BMD	0.801 ± 0.121	0.803 ± 0.877	0.816 ± 0.808	0.819 ± 0.110	0.726 ± 0.124	0.6
Spine T-score	–3.100 ± 0.531	–3.173 ± 0.605	–3.253 ± 0.504	–3.429 ± 0.673	–3.933 ± 0.289	0.07
Femoral neck T-score	–1.621 ± 0.862	–1.719 ± 0.716	–1.473 ± 0.685	–1.635 ± 0.680	–2.300 ± 1.050	0.5

Data are presented as mean ± standard deviation.
PHQ-9: Patient Health Questionnaire-9, RSE: Rosenberg self-esteem scale, VAS: visual analogue scale, ECO-16: Health Related Quality of Life, MAF: Multidimensional Assessment of Fatigue, BMD: bone mineral density.

Table 4. Univariate analysis defining factors associated with depression severity in postmenopausal women with osteoporosis

	R of Spearman	*t* of Student	*P* value
Age	–0.014		0.8
Parity	–0.024		0.8
Age of menopause	–0.04		0.7
Menopause duration	0.031		0.7
Matrimonial status			
Married			0.8
No		7.444 ± 5.606	
Yes		7.654 ± 6.348	
Divorced			0.5
No		7.652 ± 5.980	
Yes		5.800 ± 6.760	
Single			0.9
No		7.572 ± 6.098	
Yes		7.250 ± 2.986	
Widowed			0.9
No		7.582 ± 6.053	
Yes		7.515 ± 5.970	
Occupation			0.6
No		7.729 ± 6.270	
Yes		7.076 ± 5.214	
Physical activity			0.8
Yes		7.480 ± 6.146	
No		7.826 ± 5.589	
Educational level			
Illiterate			0.3
No		6.777 ± 4.799	
Yes		8.000 ± 6.570	
Primary			0.8
No		7.612 ± 6.204	
Yes		7.350 ± 5.224	
Secondary			0.6
No		7.662 ± 6.188	
Yes		6.727 ± 4.268	
University			0.2
No		7.715 ± 6.048	
Yes		4.600 ± 4.335	
Pain			0.008
No		5.823 ± 5.560	
Yes		8.981 ± 6.013	
VAS generalized pain	0.367		< 0.0001
No		5.704 ± 5.634	0.006
Yes		9.017 ± 5.916	
VAS back pain	0.322		0.001
No		5.500 ± 5.191	< 0.0001
Yes		9.860 ± 6.010	
Spine BMD	–0.258		0.01
Femoral neck BMD	–0.130		0.8
Spine T-score	–0.255		0.01
Femoral neck T-score	–0.024		0.8
MAF	0.369		< 0.0001
BMI	0.086		0.3
ECO-16	–0.390		< 0.0001
RSE	–0.390		< 0.0001

VAS: visual analogue scale, BMD: bone mineral density, MAF: Multidimensional Assessment of Fatigue, BMI: body mass index, ECO-16: Health Related Quality of Life, RSE: Rosenberg self-esteem scale.

QoL and depression in osteoporotic elderly women with fractures but few researches are published about physical and psychological status in PMW with osteoporosis in absence of fractures [8,17-25]. Previous researches indicated a higher probability of depression in osteoporotic elderly women. The highest prevalence of depression was observed in the POWER (Premenopausal, Osteopenia/Osteoporosis, Women, Alendronate, and Depression) study [15]. In this study, 88.6% patients suffered from depression with lower QoL and experienced pain more frequently than controls. Similar finding (81.6%) was also presented by Bashar et al. [14]. In the CODE (Connections between the outcomes of osteoporotic hip fractures and depression, delirium or dementia in elderly patients) study, a higher prevalence of depression in osteoporotic elderly people was also reported (69.1%) [13]. Prevalence of depression in our patients without cognitive problems and in absence of fractures was 58%. Our result joins that reported by Bianchi et al. [1] (42%) and Drosselmeyer et al. [16] (33%).

As other findings, depression severity correlated significantly with spine BMD and T-score [8,19-22]. There was no significant relationship with depression severity and femoral neck BMD and T-score. This finding may be due to the visible deleterious impact of bone density loss in the spine. In fact, spine bone mass decline

Table 5. Multivariate linear regression with depression score as dependent variable and bone mineral density parameters, physical and psychological factors as independent variables

	β (t value)	95% CI	*P* value
MAF	0.177 (2.325)	0.017 to 0.210	0.02
ECO-16	0.526 (5.945)	3.254 to 6.518	< 0.0001
RSE	–2.170 (–2.858)	–0.357 to –0.064	0.005
VAS back pain	–0.015 (–0.108)	–0.066 to 0.059	0.9
VAS generalized pain	0.013 (0.096)	–0.063 to 0.070	0.9
Spine BMD	–0.194 (–0.607)	–74.180 to 39.453	0.5
Spine T-score	0.040 (0.126)	–6.194 to 7.031	0.9

MAF: Multidimensional Assessment of Fatigue, ECO-16: Health Related Quality of Life, RSE: Rosenberg self-esteem scale, VAS: visual analogue scale, BMD: bone mineral density, CI: confidence interval.

increases the risk of weakened and collapsed vertebrae which can induce loss of height, tension in muscular structures, joint imbalance and rounded hump with consequent axial kyphosis [23,24]. Consequently, patients with low bone density in the spine (with potential kyphotic posture, axial deformities and muscle atrophy) experienced more severe depression. Despite that the causal link remains still controversial and unclear, this result suggests a higher risk of bone loss in depressed patients [8,19,20]. Therefore; depression must be considered and investigated in the screening of women with low bone density [8,19,20] specifically in spine.

Previous studies demonstrated that vertebral fractures reduce patients' QoL and affect negatively physical and emotional status but few data was published in depressed osteoporotic women without fractures [10,13]. In Abourazzak et al's study [10], QoL assessed by ECO-16 was reduced in osteoporotic women with vertebral fractures and 41% of women showed a reduced QoL in Bianchi et al's report [1]. Also, Dhillon et al. [21] and Garip et al. [22] demonstrated that women with osteoporosis suffered from depression and reduced QoL independently of prior fractures. In our findings, 54.0% (54/100) of patients have impaired QoL and 74.1% (43/58) of them suffered from depression. Both physical and psychological functions were affected. Higher ECO-16 scores were observed in patients with moderate and severe depression. Although, the presence of a therapy for osteoporosis, reduced QoL and deteriorated well-being were reported [21]. Osteoporotic medication was not able to completely eliminate the impact of the disease on the QoL [1].

Osteoporosis is generally an asymptomatic disease until occurring fractures, however; osteoporosis and pain are often associated. Actually, patients monitored for osteoporosis; perceived that the disease is affecting their personnel lives with a chronic pain estimated respectively in Bianchi et al's study [1] and Bashar et al's study [14] to 40% and 35.9%. Pain was reported by 57% of patients in Hartman et al's research [15] and by 55% women in our study. Depressed women suffered from generalized and back pain more than other patients. In addition, pain intensity correlated significantly with severity of depression. Theoretically, before the occurrence of fractures, osteoporosis is considered as a silent disease with no pain. However, we found, as other authors [1,22-25], that osteoporotic patients can complain from generalized and back pain. Even without known fractures, patients suffered not only from pain but also from proximal muscle weakness, postural instability and skeletal deformities, due to concomitant vitamin D deficiency, osteomalacia and musculoskeletal injuries [1,22-25]. Postural alterations, muscle atrophy and skeletal deformities contribute to induce chronic pain in osteoporotic patients before fractures [23-25] and in absence of other painful comorbidities. This chronic pain can lead to mobility restrictions that interfere with daily activities and being responsible of patient's depression and decreased self-esteem [1,22]. Chronic pain in osteoporosis is still underestimated and poorly investigated in the absence of fractures. This unrecognized pain can lead to subclinical or clinical depression. Consequently, chronic pain must be considered in the management of osteoporosis even without fractures or concomitant active osteoarthritis [1,22-25].

Furthermore, researches show that PMW with depression, experience both fatigue and sleep disturbance [14,15]. Patients with depression are suffering from prolonged fatigue that does not improve with rest and

may be worsened by physical and mental activity. In consequence, they report feeling discouraged and depressed because lack of energy. Also, pain intensity is aggravated by fatigue which may lead to major depression [15]. Fatigue was estimated respectively at 81.6% and 55.7% in Bashar et al.'s findings [14] and Hartman et al.'s findings [15]. Similarly, in our study, fatigue was reported by 75% of patients and was strongly associated with high levels of depression.

In the other hand, disturbed sleep is known to increase pain and fatigue sensation. Depressed patients experience poor sleeping quality regardless sleep duration. Some studies demonstrated this finding in PMW (59.2% reported by Bashar et al. [14] and 11.4% by Hartman et al. [15]) particularly in those suffering from depression. In our study, 19% of patients complained from sleep disturbance, but no correlation with depression severity was found. Divergence between these findings may be explained by personal behaviors and habits and sociocultural context which are different between Western, Asiatic and African populations.

Besides, depression can reduce physical ability and emotional motivation to practice daily activities; it can also lead to loneliness and affected mental abilities with restricted participation in social life and self-esteem loss. Self-esteem, in PMW with osteoporosis, is negatively influenced by fear of illness and fall, which is exacerbated by muscle atrophy, persistent pain, fatigue and fear of fractures. Impaired self-esteem was observed in our PMW with osteoporosis suffering from depression even without fractures. The perceived negative appearance modifications related to osteoporosis (protruding abdomen, flattening lordosis, curved low back, etc.), alter self-body image, affect patients' participation in social life and reduce physical function and self-esteem [26].

The present study highlighted the significant prevalence and severity of depression in PMW with osteoporosis before the occurrence of fractures. Patients suffered from pain, fatigue and sleep disturbance with lower self-esteem and QoL. Reduced QoL and impaired physical and psychological functions were strongly associated with depression severity. Consequently, depression, pain and QoL assessment must be taken into consideration regardless of absence of fractures. A better understanding of pain mechanisms and the management of both physical and psychosocial factors in PMW with osteoporosis will ameliorate their QoL and reduce depressive risk and loss self-esteem [18,20]. Patients with decreased BMD should be considered for screening for depression.

The main limitation of our study is the small sample size with no control group. Also, because of the high percentage of illiteracy in our population, the data was collected by a "face to face" interview to explain the question to the patient in case of non-understanding and to collect detailed information; which can increase bias incidence. Furthermore, the lack of evaluation of patients in terms of concomitant fibromyalgia may contribute to higher incidence of pain. A psychotherapist participation in this study would be very interesting in broaching psychological and self-esteem topic. It seems to be very useful to cooperate with the psychotherapist to manage psychosocial difficulties and self-esteem loss in PMW with osteoporosis. These limitations are our guidelines for future researches. Further studies are clearly warrantable and should include other facets of this subject, particularly metabolic and hormonal factors.

In conclusion, osteoporosis was perceived by our patients as a disabling disease leading to severe discomfort and affecting both physical and psychological functions. Our PMW with osteoporosis suffered not only from depression but also from pain, fatigue, sleep disturbance, reduced physical ability and poor well-being and self-esteem. This study demonstrates that assessment of depression, pain and QoL may be important in the clinical evaluation of PMW with osteoporosis and must be considered even before the occurrence of fractures in order to develop the appropriate counselling, support and care [1]. Patients with osteoporosis should be considered in providing integrated and effective treatment, not only for prevention of fractures and management of pain and fatigue but also for psychological interventions that address self-esteem decline and depressive symptoms. Future interventions must be conducted to help preventing physical and psychological impairment related to osteoporosis through detection and referral undiagnosed depressive and painful patients to receive the adequate medical and mental health care.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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