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ASSESSMENT OF THE LEBANESE COMMUNITY PHARMACIST KNOWLEDGE, PRACTICE AND BARRIERS REGARDING THE PREVENTION OF OSTEOPOROSIS

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ASSESSMENT OF THE LEBANESE COMMUNITY PHARMACIST KNOWLEDGE, PRACTICE AND BARRIERS REGARDING THE PREVENTION OF OSTEOPOROSIS

Abstract

Osteoporosis is a silent skeletal disease that is often recognized when fractures occur as a result of minimal trauma. Limited studies have assessed the degree of pharmacists' involvement in osteoporosis prevention, risk-assessment/screening and physician referrals. To assess the Lebanese community pharmacists' knowledge, practice and barriers regarding osteoporosis prevention. Secondary aim is to assess the pharmacists' ability to identify high-risk patients who should be referred for bone mineral density (BMD) testing. A cross-sectional study was carried out in Beirut, Lebanon between September and October 2020 using self-administered questionnaire. Pharmacists completed a multi-component questionnaire that consisted of socio-demographic characteristics, practices, knowledge and barriers in relation to osteoporosis prevention and high-risk identification. Frequencies and proportions were used to describe the data. Simple and multiple linear regression analysis were used to examine the determinants of knowledge in the study population. The majority of pharmacists were rarely/never involved in counseling patients on osteoporosis risk factors (57.5%) and healthy lifestyle habits (62.5%) as well as engaging in risk-assessment (63.1%), screening using Fracture Risk Assessment Tool (FRAX) (0%) and physician referrals (sometimes-55.6%). In addition, pharmacists were also scarcely involved in reducing the risk of falls (55.1-59.4%). Pharmacists were knowledgeable about osteoporosis prevention however had important gaps in the diseases that increase osteoporosis risk as well as in FRAX tool, indications that require BMD testing and increased risk of fall medications. Significant predictors of knowledge were receiving postgraduate training on osteoporosis and earning the pharmacy degree from a university in Lebanon. Barriers to providing osteoporosis services included lack of time, staff, space, patients' interest in prevention activities and limited inter-professional collaboration. The study findings provided important insights on the practices, knowledge and barriers of pharmacists regarding osteoporosis prevention and high-risk identification. Concerted efforts of multiple stakeholders are needed to promote the active role of community pharmacists in order to reduce the risk of morbidity, mortality and health-care costs associated with osteoporosis and related fractures.

Keywords

Osteoporosis prevention, Knowledge, Practice, Barriers, Lebanon

1. INTRODUCTION

Osteoporosis is a silent progressive skeletal disease that is often recognized when fractures occur as a result of minimal trauma due to low bone mineral density (Tu et al., 2018). According to the International Osteoporosis Foundation, osteoporosis causes more than 8.9 million fractures annually in adults over the age of 50 worldwide (IOF, 2020). As for the prevalence in the Middle East region, specifically in Lebanon, a population-based study enrolled 432 elderly subjects from Beirut area and identified a prevalence of 33.0% in women and 22.7% in men (Baddoura et al., 2007). Hip fracture incidence rates for those over 50 years have been reported between 164 and 188/100 000 for females and between 88 and 107/100 000 for males per year. Moreover, total hip fractures alone were estimated to cost around \$10.2 million annually in year 2020 (El-Hajj Fuleihan et al., 2011).

Primary osteoporosis is related to aging and gonadal hormone deficiency, while secondary osteoporosis is caused by various drugs and/or diseases. Alcoholism, glucocorticoid use and hypogonadism are more common in men. On the other hand, the most common secondary causes in women were due to calcium metabolism disorders, hyperparathyroidism, hyperthyroidism, Cushing's disease, glucocorticoid and aromatase inhibitor use (Tu et al.; Gheita & Hammam, 2018). In the Middle East region, osteoporosis was also highly prevalent in rheumatoid arthritis and diabetic patients with 46% in the Egyptian and 29.4-34% in the Saudi population (Gheita & Hammam 2018). A Lebanese study also identified that 74.1% of the population took proton pump inhibitors for an unsuitable duration, thus causing concern of increased fracture risk on long-term use (Nawas et al., 2016).

Factors that increase the risk of osteoporosis are divided into two: non-modifiable and modifiable. Non-modifiable risk factors include certain comorbidities, family history of osteoporosis along with fracture in first degree relatives, advanced age, White or Asian race, female gender and menopause. Modifiable risk factors include certain medications, leanness (BMI < 20 kg/m²), physical inactivity, high caffeine intake, low calcium intake, vitamin D deficiency, smoking and alcoholism (Camacho et al., 2020; Watts et al., 2012; Gel-H et al., 2007; Ebeling et al., 2013).

Osteoporosis was once considered an inevitable consequence of aging, however now it is eminently preventable. The first step in prevention is being aware of its risk factors along with bone health optimization (Khosla & Hofbauer 2017). This includes weight control, physical activity (particularly weight-bearing and muscle-strengthening exercises), limitation of alcohol intake (≤ 2 drinks/day), smoking cessation, adequate calcium and vitamin D intake. The recommended daily intake of calcium in women aged over 50 and men over 70 years is 1200 mg, while 1000 mg is recommended to men aged between 50 and 70 years. Adequate calcium intake accompanied by caffeine restriction (less than 1-2 servings/day with 8-12 ounces/serving) offsets caffeine's detrimental effect on the bone (Camacho et al., 2020; Watts et al., 2012; Gel-H et al., 2007). On the other hand, insufficient dietary intake of calcium requires the need for calcium supplementation. All calcium preparations, except calcium citrate, depend on gastric acid secretion thus should be taken with food with a maximum of 500–600 mg of calcium per dose for optimal absorption (Sozen et al., 2017).

In Middle-Eastern countries, more particularly Lebanon, vitamin D deficiency appeared to be highly prevalent despite the abundance of sunshine. The reason was found to be multifactorial such as inadequate sun exposure, wearing of veils, high body mass index and genetic factors. This suggests the need for vitamin D supplementation (Chakhtoura et al., 2018; Gannage-Yared et al., 2008; Medlej-Hashim et al., 2015). Adults above 50 years require 1000-2000 IU/day to maintain a desirable serum 25(OH)D level of 20 ng/ml (Chakhtoura et al., 2014). Additionally, reducing the risk of falls is also essential, it can be achieved by implementing safety hazards at home along with adjusting medications associated with high-risk of falls (e.g. psychotropic drugs) (Camacho et al., 2020; Huang & Mallet 2016; Seppala et al., 2018).

Pharmacological therapies used for prevention include bisphosphonates, selective estrogen receptor modulators (e.g. raloxifene) and estrogen replacement therapy (Camacho et al., 2020; Chakhtoura et al., 2014). According to the Lebanese osteoporosis guidelines, definite indications for BMD testing include patients above 65 years, presence of vertebral deformity or radiologic evidence of low bone density, chronic use of glucocorticoids (>3-6 months) and the use of aromatase inhibitors or androgen deprivation therapy. For all other indications, Fracture Risk Assessment Tool (FRAX) should be used, it takes into account several risk factors such as age,

gender, race, body mass index, alcohol use, smoking history, prior personal or parental history of fracture, use of glucocorticoids, secondary osteoporosis, rheumatoid arthritis, and femoral neck BMD measurements to predict the 10-year probability of hip fracture and other major osteoporotic fracture (MOF). Therefore, it acts as a gatekeeper identifying individuals who would be candidates for BMD testing (if MOF risk estimates close to $10\% \pm 4\%$ margin error ie.6-14%) or pharmacological treatment ($>14\%$ and above age-specific threshold). BMD testing allows in the early detection of osteoporosis before fractures occur and in providing prophylactic or therapeutic treatment to high-risk patients (Chakhtoura et al., 2014).

According to literature, multiple population-based studies have evaluated the knowledge on osteoporosis, the majority of which pointed at the need for further education (El-Tawab et al., 2016; El Hage et al., 2019; Sayed-Hassan et al., 2013; Gayathripriya et al., 2017; Haq et al., 2015). Scarce data on the other hand, have assessed osteoporosis knowledge among healthcare professionals. Limited studies were also available assessing the degree of pharmacists' involvement in osteoporosis prevention, risk-assessment/screening and physician referrals. (Al-Musa et al., 2013; Fogelman et al., 2016; Laliberté et al., 2013; Nik et al., 2016). Therefore, the aim of this study is focused on the assessment of the Lebanese community pharmacists' knowledge, practice and barriers regarding the prevention of osteoporosis. Secondary aim is to assess the pharmacists' ability to identify high-risk patients who should be referred for BMD testing.

2. METHODS

2.1 Study Design

This is a cross-sectional descriptive study conducted between September and October 2020 using self-administered questionnaire (hard-copy). Pharmacists practicing in community pharmacies in Beirut were invited to fill the questionnaire with no reward in return. The study was an observational one that respects the participant's confidentiality and autonomy. Accordingly, an exempt was issued from the institutional review board for being a low-risk study.

2.2 Inclusion and Exclusion Criteria

Inclusions were Lebanese community pharmacists who were: (1) licensed to practice by the Ministry of Public Health (MoPH), (2) registered in the Order of Pharmacists of Lebanon (OPL) (3) working as pharmacy owner or an employee in the community pharmacy and (4) have at least 1 year of work experience. Exclusions were: (1) pharmacists who do not meet inclusion criteria, (2) pharmacy technicians and (3) pharmacists working in hospitals and institutions.

2.3 Sample Size Calculation

The sampling unit for this study was the pharmacy. The number of community pharmacies was obtained from the OPL website which indicated the presence of 235 pharmacies in Beirut. Sample size calculations using Raosoft® online calculator showed that a total of 147 participants and above would be a representative sample size with a confidence level of 95% and a margin error of 5%.

2.4 Questionnaire Development and Data Collection

The questionnaire was written in English then translated to Arabic, the native language. The first section included sociodemographic information such as age, gender, highest educational level, whether the pharmacist received education/training related to osteoporosis during his/her university years, employment status, years of work experience, pharmacy location and the time period the pharmacy was open for. The second section consisted of two parts, the first part assessed the practices of pharmacists related to providing services with regards to osteoporosis prevention and high-risk identification, reducing the risk of falls and medication counselling. The second part included Yes/No questions related to the use of FRAX in current practice. The third section included barriers in providing osteoporosis services (Laliberté et al., 2013; Nik et al., 2016; Khan et al., 2013). The last section consisted of 14 questions that addressed the pharmacists' knowledge on osteoporosis risk factors, lifestyle modifications that improves bone health, therapies used in prevention, indications for BMD testing and increased risk of fall medications (Gheita & Hammam, 2018; Nawas et al., 2016; Camacho et al., 2020; Huang & Mallet 2016; Seppala et al., 2018; Chakhtoura et al., 2014; Al-Musa et al., 2013; Fogelman et al., 2016; Akande-Sholabi et al.,

2020;El-Tawab et al., 2016; El Hage et al., 2019; Sayed-Hassan et al., 2013; Gayathripriya et al., 2017;Haq et al., 2015). The questionnaire was tested for appropriateness by several experts and further adjustments were done after pilot testing with 10 pharmacists.

2.5 Data Analysis

The results were analyzed using Statistical Package for the Social Sciences (SPSS®) version 23. Descriptive statistics was used to summarize the data of the study participants. Additionally, for knowledge, a score was generated that corresponds to the sum of points of questions answered correctly. A score value of '1' was given for correct answer and '0' for incorrect or 'I do not know' answer. Provided that the knowledge section consisted of 14 questions, with the last two questions with a score out of '3' and '4', the knowledge score ranged between '0' and '19', in which high values of the score reflected better knowledge. Simple and multiple linear regression analysis was used to investigate the correlation of sociodemographic factors with knowledge. All results were considered statistically significant when the p-value <0.05 with confidence interval of 95%.

3. RESULTS

One hundred sixty pharmacists participated in this study. The majority of the participants were aged 40 years and below (67.5%), female respondents (61.2%) and employees (69.4%) at the community pharmacy. As for the highest educational level attained, half were holders of a Bachelor's degree (50%), while the other half had achieved higher degrees: 23.1% a Pharm D degree, 23.8% a Masters' degree and 3.1% a PhD degree. Eighty-three percent achieved their university education in Lebanon with 80.6% reported receiving enough information on osteoporosis during their university years and 33.8% reported receiving post-graduate training on osteoporosis. Forty-eight percent of the pharmacists had 1-7 years of work experience and majority worked in a pharmacy that has been open for more than ten years (68.1%) (Refer to table 1).

Table 1: Demographic profile of the participants. (n=160)

Characteristic	Frequency (n)	Percentage (%)
Age range:		
< 30 years	66	41.3
31 – 40 years	42	26.2
≥ 41 years	52	32.5
Gender:		
Male	62	38.8
Female	98	61.2
Employment status:		
Employee	111	69.4
Pharmacy owner	49	30.6
Highest educational qualification attained:		
Bachelors	80	50
Masters	38	23.8
Pharm D	37	23.1
Ph.D.	5	3.1
University graduated from:		
In Lebanon	133	83.1
Outside Lebanon	27	16.9
In your university years, did you have enough information about osteoporosis?		
Yes	129	80.6
No	31	19.4
Did you receive any postgraduate training on osteoporosis?		
Yes	54	33.8
No	106	66.2
Years of work experience:		
1 – 7 years	77	48.1
8 – 10 years	26	16.3
Above 10 years	57	35.6
How long has this pharmacy been opened for?		
1 –7 years	33	20.6
8 – 10 years	18	11.3
Above 10 years	109	68.1

From the current practices, the majority of the pharmacists reported that they rarely/never obtain patient information to identify risk factors related to osteoporosis (63.1%), counsel patients on osteoporosis risk factors (57.5%), lifestyle modifications to optimize bone health (62.5%), advice on adequate daily calcium (58.2%) and vitamin D intake (66.3%-sometimes), review medication profile to identify increased risk of fall patients (59.4%) and counsel on fall prevention techniques(55.1%). Additionally, 55.6% of the pharmacists reported that they sometimes refer high-risk patients to a doctor for BMD testing. On the other hand, the majority of the pharmacists reported that they always/often counsel patients on proper way to take medication (84.4%), ensure patient adherence (62.5%), check for drug or food interactions (64.4%) and take feedback for any side effect experienced after taking osteoporotic medication (53.8%) (Refer to Fig. 1).

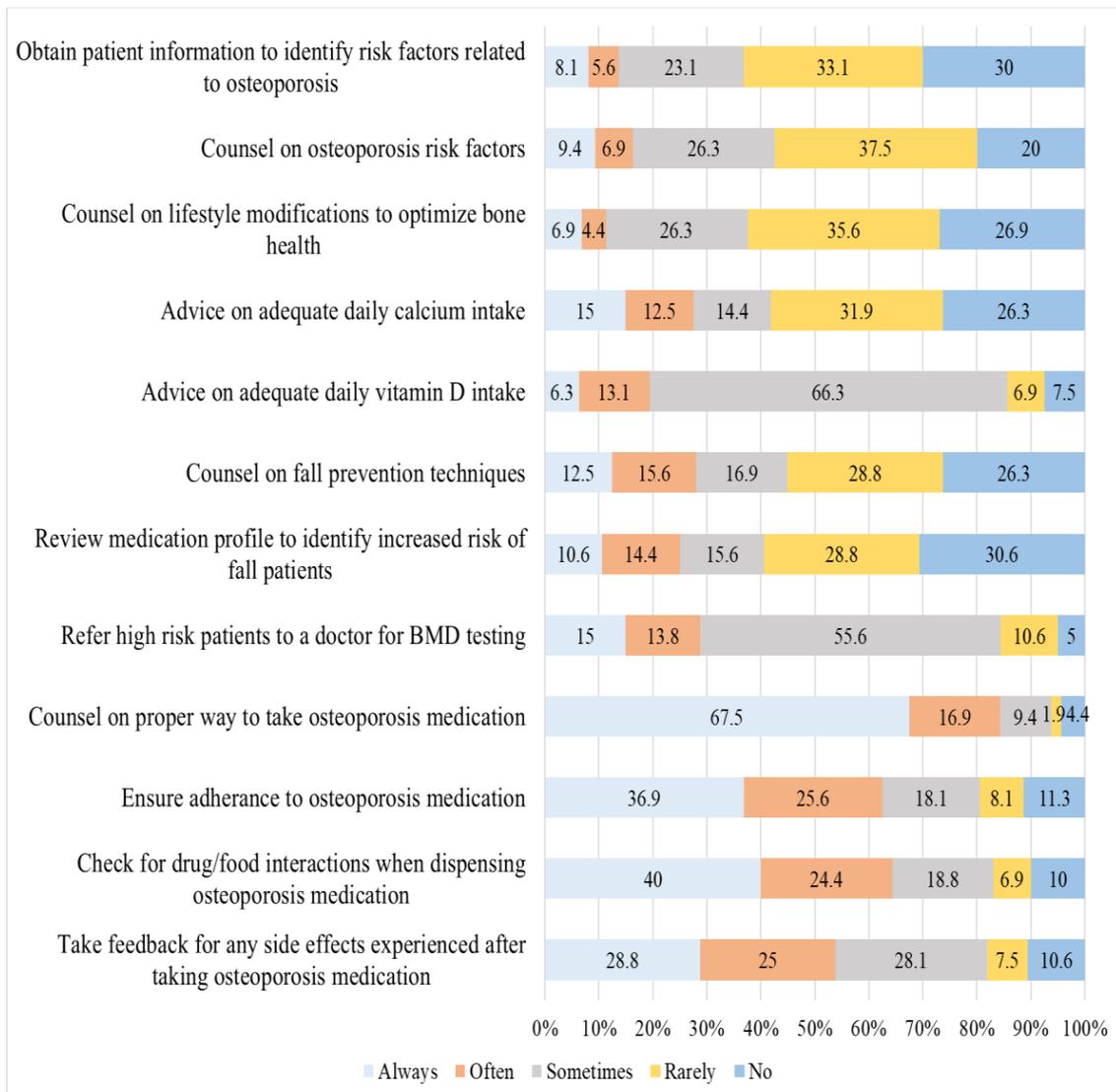


Fig.1: Current practice towards providing osteoporosis services among community pharmacists in Beirut.

As shown in Fig. 2, 80% of the pharmacists have not heard of Fracture Risk Assessment Tool(FRAX) and 20% who have heard of the tool do not use it to assess patients who are at risk in their practice.

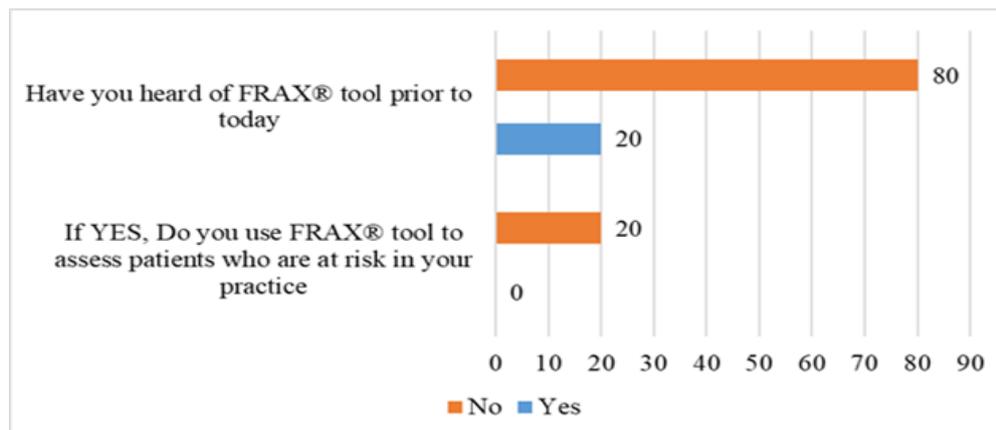


Fig.2: Current practice towards the use of Fracture Risk Assessment Tool (FRAX).

As shown in Fig. 3, barriers that were reported by a considerable proportion of the pharmacists in this study were lack of time (24.4%), lack of staff (29.4%), lack of space (26.9%), lack of patients’ interest in osteoporosis prevention activities (25%) and limited collaboration with other healthcare providers (17.5%), whereas lack of knowledge (81.9%) and need for extra charge (76.3%) were not reported as main barriers by the majority of pharmacists. Additionally, 90% of the pharmacists believed that osteoporosis is a serious medical condition.

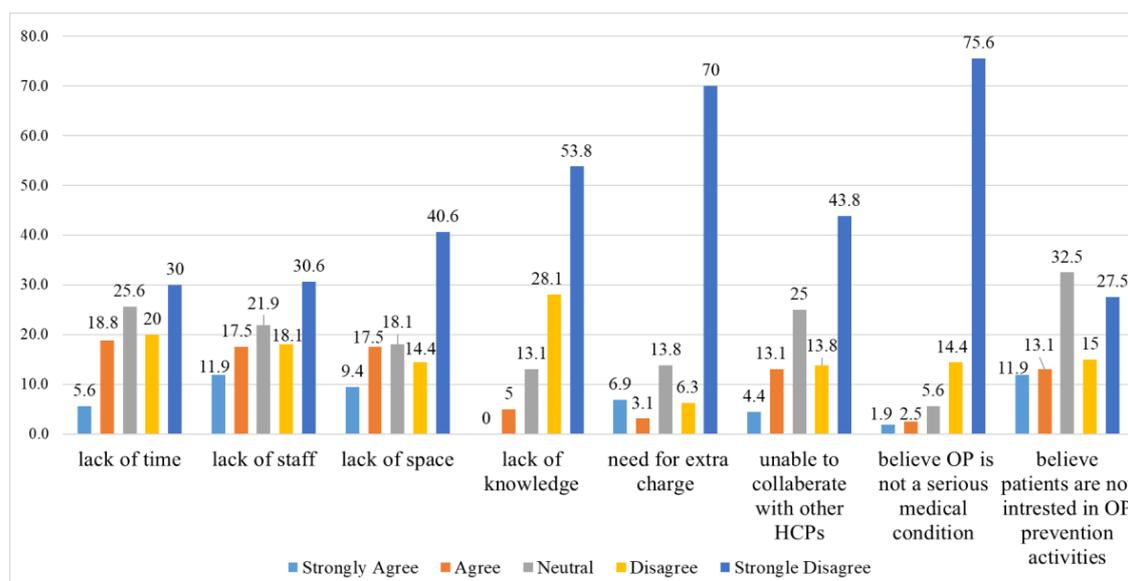


Fig.3: Barriers in providing osteoporosis services among community pharmacists in Beirut.

With regard to knowledge, the majority of surveyed pharmacists were aware that smoking (86.3%), alcoholism (73.1%), low body mass index (51.3%), carbonated drinks (85%) and high caffeine consumption (85%) increase osteoporotic risk. Likewise, many pharmacists were knowledgeable about the appropriate lifestyle modifications that optimize bone health, such as weight bearing exercises (74.4%), adequate daily calcium intake of 1200mg in women above 50 years (60.6%) and vitamin D of 1000-2000IU in adults above 50 years (80%). Sixty-five percent were familiar with the possibility of fragility fracture occurrence on long-term proton pump inhibitor use. Additionally, 60%, 36.9% and 42.5% knew that rheumatoid arthritis, diabetes mellitus and hyperparathyroidism increase the risk of osteoporosis, while hypothyroidism (41.9%) is not a risk factor. In relation to preventative therapy, 75.6% were aware that estrogen therapy prevents bone loss after menopause. The majority (91.9%) knew that long term corticosteroid use is an indication for bone mineral density testing and 31.9% knew that low calcium intake is not indicative to testing. Finally, the effect of benzodiazepine, antidepressants and antipsychotics on increasing the risk of falls was known by 63.8%, 33.1% and 43.8% of pharmacists, respectively (Refer to table 2).

Table 2: Evaluation of knowledge towards osteoporosis prevention and high-risk identification among community pharmacists in Beirut.

Statement	% answered correctly	% answered incorrectly	% answered I don't know
Weight-bearing exercise (like walking briskly, jogging/running, stair climbing) improves bone health	119(74.4)	31(19.4)	10(6.3)
The recommended daily intake for Calcium in women above 50 years is 1200mg	97(60.6)	39(24.4)	24(15)
The recommended daily allowance for Vitamin D in adults above 50 years is 1000-2000IU	128(80)	21(13.1)	11(6.9)
Smoking is a risk factor for osteoporosis	138(86.3)	9(5.6)	13(8.1)
Alcoholism is linked to occurrence of osteoporosis	117(73.1)	16(10)	27(16.9)
Drinking carbonated drinks (like Coca Cola, Pepsi, energy drinks) regularly increases risk of osteoporosis	136(85)	13(8.1)	11(6.9)
High caffeine intake along with low calcium intake increases the risk of osteoporosis	136(85)	13(8.1)	11(6.9)
Low BMI is a risk factor for osteoporosis	82(51.3)	54(33.8)	24(15)
Long-term use of proton-pump inhibitors may increase the risk for fracture	105(65.6)	20(12.5)	35(21.9)
Hormone therapy (estrogen) prevents bone loss after menopause	121(75.6)	19(11.9)	20(12.5)
Low Calcium intake is an indication for Bone Mineral Density testing	51(31.9)	94(58.8)	15(9.4)
Patient on corticosteroid use for a long time is an indication for Bone Mineral Density testing	147(91.9)	3(1.9)	10(6.3)
The disease(s) that might increase risk for osteoporosis:			
Diabetes Mellitus	59(36.9)	92(57.5)	9(5.6)
Rheumatoid Arthritis	96(60)	55(34.4)	9(5.6)
Hypothyroidism	67(41.9)	84(52.5)	9(5.6)
Hyperparathyroidism	68(42.5)	83(51.9)	9(5.6)
The drug(s) that might increase risk of fracture from fall in osteoporotic patients:			
Antidepressants	53(33.1)	74(46.3)	33(20.6)
Antipsychotics	70(43.8)	57(35.6)	33(20.6)
Benzodiazepines	102(63.8)	25(15.6)	33(20.6)
Mean Knowledge Score (\pm SD)	11.83 (\pm 2.61)		

The mean knowledge score was 11.83 (\pm 2.61) out of 19. Results of the multiple linear regression showed that two factors corresponded to a higher knowledge score, indicated by a significantly positive value for β . These factors included: graduating with a pharmacy degree from a university in Lebanon ($\beta = 1.46$, 95%CI: 0.4–2.53) and receiving postgraduate training on osteoporosis ($\beta = 1.18$, 95%CI: 0.34–2.02) (Refer to table 3).

Table 3: Predictors knowledge score (related to osteoporosis prevention and high-risk identification) among community pharmacists in Beirut.

Characteristic	β , 95% CI	Adjusted β , 95% CI
Age range:		
< 30 years	ref	-
31 – 40 years	0.29(-0.73,1.31)	-
\geq 41 years	-0.17(-1.13,0.79)	-
Gender:		
Male	ref	-
Female	0.74(-0.09,1.57)	-
Employment status:		
Employee	ref	-
Pharmacy owner	-0.63(-1.51,0.25)	-
Highest educational qualification attained:		
Bachelors	ref	-
Masters	0.30(-0.72,1.32)	-
Pharm D	0.30(-0.73,1.33)	-
Ph.D.	-0.50(-2.89,1.89)	-
University graduated from:		
Outside Lebanon	ref	ref
In Lebanon	1.26(0.19,2.33)*	1.46(0.4,2.53)**
In your university years, did you have enough information about osteoporosis?		
No	ref	-
Yes	0.90 (-0.12,1.93)	-
Did you receive any postgraduate training on osteoporosis?		
No	ref	ref
Yes	1.02(0.17,1.87)*	1.18(0.34,2.02)**
Years of work experience:		
1 – 7 years	ref	-
8 – 10 years	-0.79(-1.97,0.37)	-
Above 10 years	-0.31(-1.21,0.59)	-
How long has this pharmacy been opened for?		
1 –7 years	ref	-
8 – 10 years	0.27(-1.24,1.79)	-
Above 10 years	0.59(-0.44,1.61)	-

*p value <0.05, **p value<0.01

4. DISCUSSION

Evidence suggests that community pharmacists are well-positioned for providing preventative services due to their convenient location, frequent contact with the public and extended opening hours (Nik et al., 2016). However, alarmingly in this study, the practices of pharmacists related to providing osteoporosis prevention services jeopardized the efficacy of their role in health promotion and disease prevention. For instance, the majority of pharmacists were rarely/never involved in counseling patients on osteoporosis risk factors (57.5%), lifestyle modifications to optimize bone health (62.5%) including advice on adequate daily calcium (58.2%) and vitamin D intake (66.3%-sometimes). The findings were similar to studies done by Laliberté et al. (2013) and Nik et al. (2016), however were in contrast to the Schmiedel et al. (2013) study that identified that 48.2% of community pharmacists were actively involved in counseling patients on osteoporosis prevention.

Another disconcerting study finding is the practices of pharmacists related to risk-assessment/screening and physician referrals. Sixty three percent of pharmacists were rarely/never involved in obtaining patient information to identify whether patients have risk factors related to osteoporosis. In addition, 55.6% sometimes referred high-risk patients to a doctor for BMD testing. Community pharmacists should be able to categorize patients into risk groups and play a significant role in identifying high-risk patients, such as in corticosteroid users. FRAX is used in risk stratification, to select most suitable patients for BMD testing (Khan et al., 2013). However, based on the study findings, none of the surveyed pharmacists that were aware of FRAX (20%), used the tool to assess patients who are at risk in their practice. In comparison to study done by Khan et al. (2013), 46% of pharmacists were aware of FRAX and 16% utilized such tool in their practices. Studies by Alexander & Mager (2019) and Yousuf et al. (2019) also identified a lack of

involvement of community pharmacists in osteoporosis screening. In this case, many patients at risk or with osteoporosis are not educated on the steps they can take to prevent or minimize its impact on health increasing the risk of morbidity, mortality and health-care costs associated with osteoporosis. According to the American Pharmacists Association, pharmacists should engage in public health education and provide services aimed at promoting health and preventing disease as it is linked directly to improving patient outcomes and health system efficiency. Pharmacists should also contribute in reducing the risk of falls, however in this study, the majority were scarcely involved in providing such services (55.1-59.4%).

With regard to knowledge, the majority of pharmacists answered correctly the questions related to osteoporosis risk factors, healthy lifestyle habits along with the therapies used for prevention. However, a sizable proportion had significant knowledge gaps in the diseases associated with osteoporosis. For instance, 60% of pharmacists were aware that rheumatoid arthritis increases osteoporosis risk, whereas only 36.9% and 42.5% knew that diabetes mellitus and hyperparathyroidism also intensify such possibility while hypothyroidism (41.9%) does not. A study done by Fogelman et al. (2016) also revealed that only 8% of surveyed participants gave correct responses to all of these diseases. Additionally, pharmacists in this study had knowledge gaps regarding the indications for BMD testing. The minority of pharmacists (31.9%) knew that low calcium intake is not indicative for testing as opposed to long-term corticosteroid use (91.9%). In comparison to a study by Al-Musa et al. (2013), 87.9% of health-care professionals had good to excellent knowledge regarding BMD indications. Finally, pharmacists in this study showed varying degrees of knowledge on the medications associated with increased risk of falls (benzodiazepines, antidepressants and antipsychotics as 63.8% 33.1% and 43.8% respectively). The results were similar to another study by Akande-Sholabi et al. (2020) where 89.3% of pharmacists had unsatisfactory knowledge on classes of medications associated with falls.

According to the study findings, receiving postgraduate training on osteoporosis and obtaining the pharmacy degree from a university in Lebanon were significantly associated with better knowledge. Therefore, continuous educational programs on osteoporosis prevention and high-risk patient identification are strategies that the MoPH by working collaboratively with the OPL can provide, in order to increase the knowledge, awareness and improve the health-care services provided by community pharmacists. Moreover, foreign trained pharmacists should have additional training to be more familiar with the community services provided regarding osteoporosis and the health-care system in Lebanon.

The results of this study showed that a considerable proportion of pharmacists agreed that the lack of time, staff, space, patients' interest in prevention activities along with limited inter-professional collaboration were common barriers to providing osteoporosis services. A study by Alameddine et al. (2020) identified that Lebanese pharmacists are facing multiple challenges when practicing the pharmacy profession. Recommendations proposed to overcome the staff barrier included workforce optimization and improving the working conditions by concerned stakeholders in order to give more time for pharmacists to practice their professional roles and engage in patient counseling. Additionally, in this study, the lack of patients' interest in prevention activities points at the urging need for pharmacists to increase public awareness on osteoporosis and the consequences for lack of prevention. On the other hand, pharmacists themselves can be barriers to their expanding roles and implementation of disease prevention services (Nik et al., 2016). A study by El Bizri & Dimassi (2019) identified that the majority of Lebanese pharmacists perceived themselves as medicine experts but only 18.4% and 9.7% perceived themselves as patient counselors and health promoters addressing the need that pharmacists should have a better understanding of their roles in the healthcare system.

The current study has limitations such as lack of generalizability since it was conducted in Beirut and may hide the practices, barriers and knowledge of community pharmacists in other Lebanese regions. Additionally, a study to assess pharmacists' perception of their role in osteoporosis prevention and high-risk identification would have to be conducted, the misconception of the pharmacists in this regard has implicated effect on the results of the current study and may reflect on the role of pharmacists in this regard.

5. CONCLUSION

The study findings provided important insights on the practices, barriers and knowledge of community pharmacists regarding osteoporosis prevention and high-risk identification. The majority of pharmacists were rarely/never involved in counseling patients on osteoporosis risk factors, healthy lifestyle habits as well as engaging in risk-assessment, screening and physician referrals (sometimes). Pharmacists were knowledgeable about osteoporosis prevention however had important gaps in the diseases that increase osteoporosis risk as well as in FRAX tool, indications that require BMD testing and increased risk of fall medications. Significant predictors of better knowledge were receiving postgraduate training on osteoporosis and earning the pharmacy degree from a university in Lebanon. Barriers to providing osteoporosis services included lack of time, staff, space, patients' interest in prevention activities and limited inter-professional collaboration.

Therefore, continuous educational programs on osteoporosis prevention and high-risk patient identification are strategies that the MoPH by working collaboratively with the OPL can provide, in order to increase the knowledge, awareness and improve the health-care services provided by community pharmacists. Moreover, pharmacy schools in Lebanon should revise their curricula to ensure proper education and training of pharmacy students on the topic involving osteoporosis. This is necessary to enhance the public health aspect of the profession.

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