Perception, Guideline Utilization and Barriers Against Screening and ManagementofOsteoporosisamongPrimaryHealthCarePhysicians,in Eastern Province of Saudi Arabia 2023-2024

ABSTRACT

Introduction

Osteoporosis is a preventable and progressive metabolic bone disease that is commonly encountered in primary care settings. It is characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and increased fracture risk. Family physicians play a major role in the early detection and treatment of osteoporosis.

Aim

This study aimed to evaluate perception, guideline utilization, and barriers against screening and management of osteoporosis among primary healthcare physicians in the Eastern province of Saudi Arabia (Qatif, Dammam, and Khobar).

Subject and methods

An analytic cross-sectional study was conducted among PHCPs in the Eastern province of Saudi Arabia. A self-administered questionnaire was distributed. The questionnaire comprised socio-demographic data (e.g., age, gender, qualifications, etc.), 12-items to assess perception about osteoporosis screening and management, 4-items to assess guidelines utilization of osteoporosis screening, and 15-items to evaluate the barriers of osteoporosis screening and management.

Results

Among the 261 PHCPs involved, 67.4% were females, and 56.3% were between 25 and 35 years old. 73.2% were considered to have a good perception. 75.1% of PHCPs implemented the Saudi guidelines for osteoporosis screening in standard practice. The commenest encountered barrier against both osteoporosis screening and management was limited consultation time 68.6% and 67.4% respectively. Additionaly, limited anti-osteoporosis medications in PHCs was precieved barrier against osteoporosis management67.4%.

Conclusion

The primary healthcare physicians in the Eastern province of Saudi Arabia demonstrated good perception and average guidline utilization. Up to our knowledge, this is the first study is Saudi Arabia that managed to stratify the total barriers score into 3 levels. Hence, studies following similar methodology are werented to verify these results.

Introduction&Literaturereview:

Osteoporosisisadiseasecharacterizedbylowbonemassand microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and increased fracture risk. (1)

Theprevalenceofosteoporosisisincreasingatanalarmingrate,a recentsystematicreviewandmeta-analysisof86studies(2021)showed that the global prevalence of osteoporosis was 18.3%. (2) Anothermeta-analysisconductedin(2021)foundthatamongtheMiddle East countries, Saudi Arabia has the highest prevalence of osteoporosis at 32.7%, while the lowest prevalence was accounted for Kuwait at 15.1%. (3)

Osteoporosis is a preventable and progressive metabolic bone disease that rarely causes symptoms and may go undiagnosed until a complicated fracture occurs. These fractures can lead to infirmity, dependency, premature mortality, and negatively affect quality of life. Physicians usually depend on age and risk factors for screening and diagnosis. (4)

In 2019, the total number of fractures related to osteoporosis in KSA were 174,225,puttingafinancialburdenonthehealthcaresystemofmore than 2.3 billion Saudi Riyals (SAR). Over the next few years, there will be an increase in the Saudi populationalongwithlifeexpectancy, therefore, by2025thefragilityfracturescost in KSA is expected to reach 35 billion SAR. (5)

Osteoporosis is commonly encountered in primary care setting, as primary health care centers (PHCCs) serve as an entry point for all populationtoaccesshealthcareservices.Therefore,primaryhealthcare physicians (PHCP) play a major role in the early detection and treatment of osteoporosis. (6)

The Ministry of Health and Saudi Osteoporosis Society established guidelines and evidence-based tools to evaluate patients who are suspected to have osteoporosis. The PHCPs are advised to initiate pharmacological therapy once osteoporosis is diagnosed. (4)

Accordingtothenationalguideline,itisrecommendedtoscreenall asymptomatic women and men with dual x-ray absorptiometry (DEXA) scan starting from the age of 60. However, it should be done earlier in patients with some clinical conditions like early menopause < 45 years, long-standing secondary amenorrhea, women ≥ 40 years with a trauma fragility fracture, primary hyperparathyroidism, prolonged glucocorticoid use, current smoking, high alcohol

intake, and evidence of kyphosis or height loss. (7)

Web-based risk assessment tools, such as the Fracture Risk Assessment (FRAX), can be used to predict the 10-year probability of fracturerisk.Itisacountry-based toolthatwasrecentlyissuedforKSA in 2021. FRAX depends on the patient's demographics, and clinical characteristics, with or without femoral neck bone mineral density (BMD).Itoffersaninterventionthresholdtohelpphysiciansindecision making. (8)

Effective prevention and management of osteoporosis with pharmacologic and nonpharmacologic treatments have the greatest impact on patient’s health. Adequate Calcium and vitamin D supplementation should be offered to all patients if needed. In most cases,Boneresorptioninhibitorswithoralorparenteral Bisphosphonatesarethe first line of treatment. Other medications including parathyroid hormone (PTH) analogs and selective estrogen receptor modulators can be offered in some cases. (9)

To ensure successful treatment, appropriate follow-up must be establishedandmaintained.ThiscanbeachievedbyrepeatingtheBMD testing every one to two years after starting treatment with bone resorptive inhibitors. Follow-up should also include addressing any change in clinical condition or risk factors as well as patient adherence to treatment.

Patients with specific needs can be referred to other specialized clinics along with follow-up in PHCC.(10)

Aretrospectivecohortstudywasdonetodeterminegapsinpracticeand currentpatternsofosteoporosistreatmentinAustraliangeneralpractice. The study found

that osteoporosis is underdiagnosed and undertreated. Up to 25% of patients with a documented osteoporosis diagnosis did not receive prescriptions for osteoporosis medications from their regular general practitioner. (11)

A cross-sectional study evaluated the perception and guideline utilizationofosteoporosisamongIranianfamilyphysicians and foundthatthe average level of knowledge among Iranian family physicianspracticing in urban areas about osteoporosis was moderate, and about two-thirds of them had a positive perspective on the availability of various tools for osteoporosis prevention, education and follow up. Despitethat,themajorityoffamilyphysiciansreportednotbeingaware of the national clinical guidelines for osteoporosis.(12)

An Egyptian cross-sectional study among secondary care physicians aimed to assess the knowledge and standard of care provided by professionals to elderly patients with fragility fractures. The study found that more than half of the physicians were aware, adequately trained, and adherent to the osteoporosis guidelines. On the other hand, less than half of the physicians were aware of how important the FRAX tool is in managing osteoporosis.(13)

Astudy was conductedinMalaysia, in 2021on350PHCPstoassess knowledge, practice gap, and barriers to osteoporosis screening and management. The most common listed barriers against screening were unavailabilityofBMDtestingfollowedbyinadequateknowledgethen patientco-morbidities.Thephysiciansbelievedthatputtingtheeffortinto treating patients' comorbidities distracts them from screening for other medical conditions including osteoporosis. Other barriers like limited

accesstopharmacologicaltreatmentinPHCCsandlimitedconsultation time were also reported. (14)

The majorityofPHCPsinSingaporereportedproperutilizationofthe latest guidelines. However, barriers were encountered mostly due to focusing on screening and treating other medical conditions, lack of knowledge about osteoporosis, high medication cost, and short consultation time. (1)

Similarly, barriers to osteoporosis screening were studied among American physicians in a cross-sectional study done in 2023. The frequently reported barriers were non-adherence by the patients, low prioritizationofosteoporosis,consultationtimerestraints,cost,andfear of radiation exposure. (15)

A survey was conducted in the Middle East and North Africa “MENA” (2019) to assess physicians' perceptions and barriers against diagnosis and management of osteoporosis. The study found that most physicians were using DEXA scan for diagnosis. A significant number of physicians performed vitamin D levels and other standard tests to rule out secondary causes before starting medications. (16)

Although two-thirds of participantshadsignificantawarenessaboutFRAX,lessthanhalf of them were using it in practice. The reported barriers were lack of knowledge, lack of country-specific FRAX, and physicians' concern regarding medication cost and safety.(16)

Al-Anazi et al., in 2022 conducted a study aimed to investigate the practice of family physicians regarding the management of osteoporosis in older female patients in Riyadh. The results were, that out of 250 patients, 42 were missed to be

diagnosed. Almost half of the patientsdidnothavethebasiclaboratoryinvestigationsforosteoporosis. (17)

A key management of osteoporosis is enhancing the levels of vitamin D and calcium; however, vitamin D and calcium were not prescribed for nearly half of the patients. 33% of patients didn't receive any osteoporotic medications. Regarding follow-up, 36.1% of patients had no follow-up visits. (17)

A cross-sectional study was conducted in 2020 involving 43 physicians in Al Majmaah Province, KSA. The study aimed to assess their knowledge, attitude, and practice towards osteoporosis. Although there's a recognizable level of knowledge and favorable attitudes toward osteoporosis, further improvements in prevention measures are needed. (18)

Researchquestion:

Whatistheperception,guidelineutilization,andbarriersagainst screening and management of osteoporosis among primary health care physicians in the Eastern province, of Saudi Arabia?

Research aim:

To evaluate perception, guideline utilization, and barriers against screening andmanagementofosteoporosisamongprimaryhealthcarephysicians, in the Eastern province of Saudi Arabia

Research objectives:

- To assess the perception of osteoporosis screening and management among primaryhealthcarephysicians,in the EasternprovinceofSaudi Arabia
- Toassessutilizationofosteoporosisscreeningguideline among primary

health care physicians, in the Eastern province of Saudi Arabia

- To identify barriers against screening and management of osteoporosisamongprimaryhealthcarephysicians,in the Eastern province of Saudi Arabia
- To measure the association between physician-related factorsandperception,guidelineutilization, and barriers against screening and management of osteoporosis.

Methodology:

1. Study design:

An analytic cross-sectional study was conducted.

2. Study setting and time:

The study conducted at the PHCCs of the Ministry of Health; E1 cluster at three different sectors including Qatif, Dammam, and Khobar. The study involved 26 centers in Qatif, 22 centers in Dammam, and 11 centers in Khobar during the period from November 2023 to December 2024.

3. Study population:

All practicing physicians in Qatif, Dammam, and Khobar PHCCs were included in the study.

Inclusion criteria

- Practicing General practitioners and Certified family physicians in Qatif, Dammam, and Khobar during the period of study

Exclusion criteria

- General practitioners and Certified family physicians who are non-English speakers.

4. Sample size:

PHCPs who are practicing as general practitioners and certified family physicians were included in the study. The total number is 512 (220 in Dammam, 112 in Khobar, and 180 in Qatif).

The Minimum recommended sample size was 220 calculated by using the Raosoft formula with a 5% margin of error, 95% confidence level, 512 estimated population size, and 50% response distribution. Adding 10% non-response the sample size was 242.

5. Sample technique:

The sample was collected from 3 sectors: Khobar, Dammam and Qatif.

Proportional to the numbers of physicians in each sector:

- Khobar 21.9%
- Dammam 43%
- Qatif 35.2%

Sample size from Khobar was 53 physicians, 105 from Dammam and 85 from Qatif.

Physicians were selected using Simple random sampling.

6. Data collection tool and method:

A self-administered questionnaire was used. The questionnaire was developed based on previous studies after an in-depth literature review and was modified to address the research question of the study. Data was collected from physicians by meeting them during working hours without disrupting the clinic. The questionnaire was written in English and included a total of 41 questions, consisting of open- and closed-ended questions, including multiple-choice questions, yes/no questions, and Likert scale items. (Appendix 1). It consists of 6 main parts:

Part 1 is Demographic and professional practice data which contains 10 questions (Age, gender, nationality, qualification, sector, years of experience, number of osteoporotic patients seen per month, number of elderly patients seen per week, involvement in clinical teaching, and attendance of osteoporotic related activity)

Part 2 contains 6 questions to assess physicians' overall perception of osteoporosis screening

Part 3 contains 6 questions to assess physicians' overall perception of osteoporosis management

Part 4 had 4 questions to assess guideline utilization

Part 5 had 6 questions to identify barriers facing physicians against osteoporosis screening

Part 6 which was the last part, had 8 questions to identify barriers facing physicians against osteoporosis management

7. Study variables:

Independent variables

PHCPs demographic factors: age, gender, nationality, qualification, sector, years of experience, number of osteoporotic patients seen per month, number of elderly patients seen per week, involvement in clinical teaching, and attendance of osteoporotic-related activity.

Dependent variables

Perception, guideline utilization, and barriers against screening and management of osteoporosis among Primary health care physicians

8. Validity and reliability:

Construct validity

The researchers used three validated questionnaires (1) (14) (16). The three questionnaires were merged and modified to answer the current research questions. The modification was done after an extensive literature review as part of the construct validity.

Content validity

The reliability, validity, understandability, and suitability of the language used in the questionnairewere tested. The questionnaire items were reviewed by seven family physicians who are experts on osteoporosis to ensure the importance of each question as part of content validity.

Pilot study

A pilot study was conducted on 30 PHCPs to ensure the clarity, understandability of the questions, and suitability of the language used in the questionnaire. The results of the pilot were excluded from the final research results. The reliability was checked by calculating Alpha-Cronbach which was 0.9.

9. statistical analysis:

The data were presented by numbers and percentages for all categorical variables, while means and standard deviations were given to all continuous variables. The perception and barrier scores were compared with the socio-demographic characteristics and the guidelines utilization by using the Mann-Whitney Z-test and Kruskal Wallis H-test. Normality test has been performed using the Kolmogorov-Smirnov test. Based on the plot, both perception and barrier scores follow the non-normal distribution. Thus, the non-parametric tests were applied. Also, the relationship between guidelines utilization and the socio-demographic characteristics of the physicians was examined using the Chi-square test. Further, the Spearman correlation coefficient has been conducted to determine the correlation between the perception and barrier scores. Statistical significance was set to $p<0.05$ level. All data analyses were performed using the Statistical Packages for Software Sciences (SPSS) version 26 Armonk, New York, IBM Corporation.

10. Ethical consideration:

The following ethical considerations will be adopted in this research:

- IRB and administrative approval were obtained from each sector.

- Consent was taken from the authors of the previous questionnaires.
- Informed consent was obtained from all participants.
- All data was kept confidential.
- Conflict of interest was avoided.

11. Study reporting and implementation:

A scientific paper will be written for publication in national and international journals.

12. Budget:

Self-funded by the research team members.

Questionnaire criteria

The perception against screening and management of osteoporosis has been assessed using a 12-item questionnaire with "yes" coded with 1 and "no/not sure" coded with 0 as the answer options. The total perception has been calculated by adding all 12 items. A possible score ranging from 0 to 12 points has been generated. The higher the score, the higher the perceptionofscreening and management of osteoporosis. By using 50% and 75% as cutoff points to determine the level of perception, physicians were considered to have poor perception if the total score was less than 50%, 50% to 75% were moderate, and above 75% were considered as having good perception levels. (19)

Likewise, the barrier toward screening and management of osteoporosis has been assessed using a 15-item questionnaire with "yes" coded with 1 and "no" coded with 0 as the answer options. By summing up 15 items, we got scores ranging from 0 to

15 points. Similar criteria were applied following the perception representing the level of barrier: low barrier (<50% points), Average (50% to 75% points), and high (>75% points). (19)

Results

Table 1: Socio-demographic characteristics of the primary healthcare physicians (n=261)

Study variables	N (%)
Age group	
• 25 – 35 years	147 (56.3%)
• 36 – 45 years	100 (38.3%)
• >45 years	14 (05.4%)
Gender	
• Male	85 (32.6%)
• Female	176 (67.4%)
Nationality	
• Saudi	258 (98.9%)
• Non-Saudi	03 (01.1%)
Qualification	
• General Practioner	94 (36.0%)
• Family Medicine Specialist	89 (34.1%)

- Family Medicine Consultant 78 (29.9%)

Sector

- Qatif 96 (36.8%)
- Dammam 111 (42.5%)
- Khobar 54 (20.7%)

Years of experience in primary health care

- 1 – 2 years 63 (24.1%)
- 3 – 6 years 47 (18.0%)
- 7 – 9 years 41 (15.7%)
- >9 years 110 (42.1%)

Number of Osteoporotic patients seen/month

- <10 patients 187 (71.6%)
- 10 – 20 patiehts 58 (22.2%)
- >20 patients 16 (06.1%)

Number of elderly patients seen/week (older than 65)

- <10 patients 46 (17.6%)
- 10 – 20 patiehts 111 (42.5%)
- >20 patients 104 (39.8%)

I'm involved in clinical teaching

- Yes 124 (47.5%)
- No 137 (52.5%)

I attended an Osteoporotic related activity (lecture,

courses, workshops, conferences, webinars, CME)

• Yes	133 (51.0%)
• No	97 (37.2%)
• There are no available courses	31 (11.9%)
If you answered the previous statement yes, when was the last osteoporosis-related activity you attended? (n=133)	
• 1 – 2 years	99 (74.4%)
• 3 – 6 years	30 (22.6%)
• 7 – 9 years	03 (02.3%)
• >9 years	01 (0.80%)

A total of two hundred sixty-one primary healthcare physicians responded to our survey. Table 1 presents the socio-demographic characteristics of the PHCPs. Approximately 56.3% were between 25 and 35 years old. Female physicians (67.4%) were predominantly higher than male physicians (32.6%). Saudi nationality constitute most of our respondents (98.9%). The most common qualification was a general practitioner (36%), while the most common healthcare sector was the Dammam sector (42.5%). Approximately 42.1% had more than 9 years in practice in PHC. 71.6% saw less than 10 osteoporotic patients per month, while 39.8% saw more than 20 elderly patients per week. The proportion of physicians who were involved in clinical teaching was 47.5%. Half of the Physicians attended an osteoporotic-related activity (51%). Of them, 74.4% had attended inthe past 1 to 2 years.

Table 2: Assessment of the Perception and Guidelines Utilization of Primary Healthcare Physicians about Screening and Management of Osteoporosis(n=261)

Perception items	Yes (%)
1. I think it's important to assess risk factors for fragility fracture	256 (98.1%)
2. I think PHC physicians are responsible for osteoporosis screening	255 (97.7%)
3. I think DEXA is a valuable tool for osteoporosis screening	254 (97.3%)
4. I think that patients with osteopenia and osteoporosis should be started on calcium and vitamin D supplements	251 (96.2%)
5. I think non-pharmacological measures have an important role in managing osteoporosis (such as exercise, sun exposure, smoking cessation, and limiting alcohol consumption)	244 (93.5%)
6. I think I'm confident in interpreting DEXA scan result	230 (88.1%)
7. I think PHC physicians are responsible for initiating anti-osteoporotic medications	224 (85.8%)
8. I think FRAX is a valuable tool for fracture risk assessment	221 (84.7%)
9. I think I'm confident to initiate anti-osteoporotic medications	214 (82.0%)
10. I think that I know when I should refer patients with osteoporosis	205 (78.5%)
11. I think that I know when I should re-evaluate patients with osteoporosis	200 (76.6%)
12. I think I'm confident in interpreting FRAX result	171 (65.5%)
Total Perception score (mean ± SD)	**10.4 ± 1.89**

Level of perception	
• Poor	11 (04.2%)
• Moderate	59 (22.6%)
• Good	191 (73.2%)
Guidelines utilization items	
I use the following for osteoporosis screening and management	
• Saudi Guideline	137 (52.5%)
• Other Guidelines (American collage Physician, Endocrine Society, USPTSF and others)	56 (21.5%)
• Online references (UpToDate, Medscape, and others)	49 (18.8%)
• Clinical experience	19 (07.3%)
I read the latest Saudi guidelines for screening osteoporosis	
• Yes	150 (57.5%)
• No	111 (42.5%)
I implement the Saudi guidelines for screening osteoporosis in my standard practice	
• Yes	196 (75.1%)
• No	65 (24.9%)
I would rate my adherence to clinical practice guidelines on screening as	
• High	97 (37.2%)
• Average	151 (57.9%)
• Low	13 (05.0%)

With regards to the assessment of the perception of screening and management of osteoporosis (Table 2), all items related to perception yielded good results. Most notably, higher perceptions were seen in the items, "I think it's important to assess risk factors for fragility fracture" (98.1%), "I think PHC physicians are responsible for osteoporosis screening" (97.7%), and "I think DEXA is a valuable tool for osteoporosis screening" (97.3%). The lowest rating was seen in the item, "I think I'm confident in interpreting FRAX result" (65.5%). The overall mean perception score was 10.4 (SD 1.89), with poor, moderate, and good perception detected in 4.2%, 22.6%, and 73.2%, respectively. Regarding guidelines utilization, we noted that Saudi Guidelines were the most commonly usedfor osteoporosis screening and management (52.5%). Approximately 57.5% of the physicians were reading the latest Saudi guidelines for screening osteoporosis. About three-quarters (75.1%) were implementing the Saudi guidelines for screening osteoporosis in their standard practice. Additionally, only37.2% rated their adherence to clinical practice guidelines on screening as high.

Table 3: Assessment of the barriers to Screening and Management of Osteoporosis (n=261)

Barrier against osteoporosis screening	Yes (%)
1. I have Limited consultation time	179 (68.6%)
2. Patient is not willing to undergo screening	79 (30.3%)
3. I am not familiar with FRAX interpretation	72 (27.6%)

4. Osteoporosis ranks lower on my list of priorities of diseases to screen	53 (20.3%)
5. I am not familiar with screening indications	34 (13.0%)
6. I am not familiar with DEXA scan interpretation	26 (10.0%)
Barrier against osteoporosis management	
7. There are limited anti-osteoporosis medications in PHCs	176 (67.4%)
8. I have Limited consultation time	176 (67.4%)
9. I have concerns regarding medication side effects	111 (42.5%)
10. Patient is not willing to undergo management	77 (29.5%)
11. I have concerns regarding medication effectiveness	66 (25.3%)
12. Osteoporosis ranks lower on my list of priorities of diseases to manage	49 (18.8%)
13. I am not familiar with the prescription of pharmacological treatment	34 (13.0%)
14. I am not familiar with DEXA referral pathway	33 (12.6%)
15. I am not familiar with management indications	28 (10.7%)
Total barrier score (mean ± SD)	**4.57 ± 3.26**
Level of barrier	
• Low	218 (83.5%)
• Average	30 (11.5%)
• High	13 (05.0%)

Regarding the assessment of barriers to osteoporosis screening (Table 3), nearly all items showed low ratings, except for the limited consultation time (68.6%). Other items had low ratings, including unfamiliarity with DEXA scan interpretation (10%), unfamiliarity with screening indications (13%), and osteoporosis ranks lower on the list of priorities of disease to screen (20.3%). Regarding the barrier against osteoporosis management, only two items showed high ratings: limited consultation time (67.4%) and limited anti-osteoporosis medications in PHCs (67.4%). Other items were rated below 50%, most notably unfamiliar with management indications (10.7%), unfamiliar with the DEXA referral pathway (12.6%), and unfamiliar with the prescription of pharmacological treatment (13%). The total mean barrier score was 4.57 (SD 3.26). Accordingly, low, average, and high barrier levels were found in 83.5%, 11.5%, and 5%, respectively.

Figure 1: Correlation between perception and barrier scores

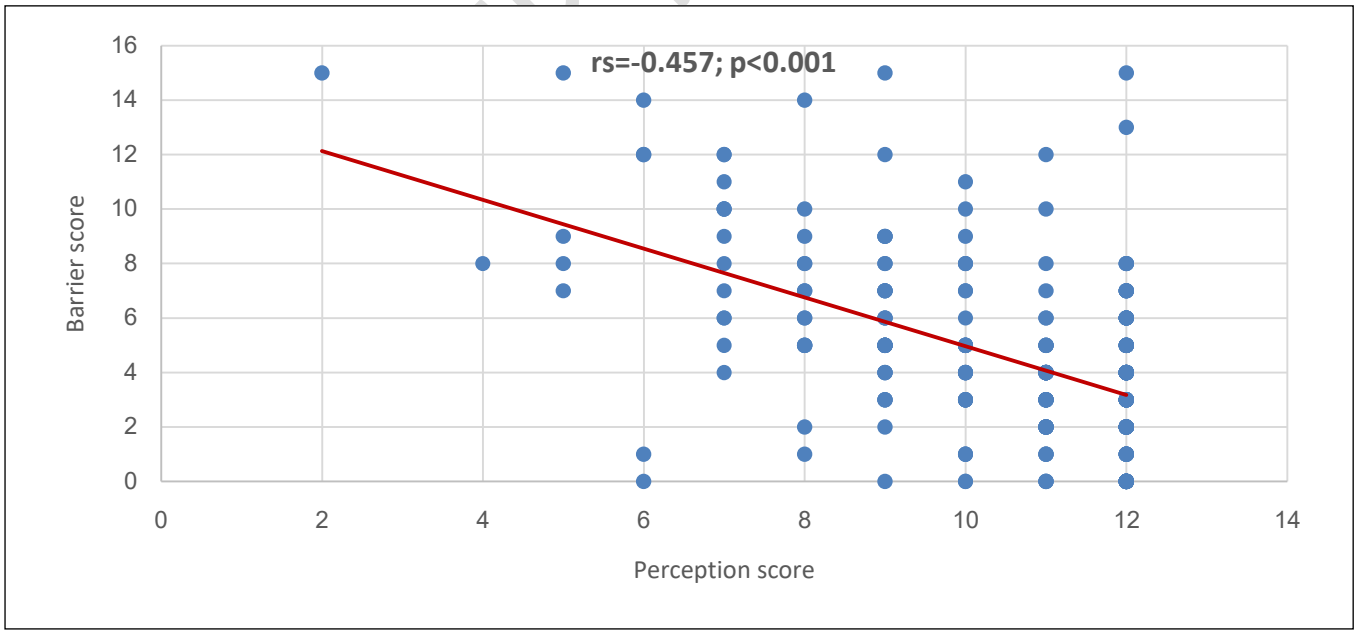

Figure 1 depicts an inverse significant correlation between perception and barrier scores (rs=-0.457l p<0.001), suggesting that the increase in perception score correlates with the decrease in barrier score.

Table 4: Differences in perception and barrier scores in relation to the socio-demographic characteristics and osteoporosis guidelines utilization of the primary healthcare physicians (n=261)

Factor	Perception Score (12) Mean ± SD	Barrier Score (15) Mean ± SD
Age group[a]		
• ≤35 years	10.2 ± 2.00	5.24 ± 3.67
• >35 years	10.7 ± 1.71	3.71 ± 2.39
Z-test; p-value	***1.999; 0.046 ** ***	***3.147; 0.002 ** ***
Gender[a]		
• Male	10.5 ± 1.69	4.31 ± 3.18
• Female	10.4 ± 1.99	4.69 ± 3.29
Z-test; p-value	***0.231; 0.817***	***0.979; 0.328***
Qualification [b]		
• General Practioner	9.24 ± 2.15	6.02 ± 3.71
• Family Medicine Specialist	10.9 ± 1.54	4.07 ± 3.01
• Family Medicine Consultant	11.3 ± 1.03	3.39 ± 2.13
H-test; p-value	***58.660; <0.001 ** ***	***27.037; <0.001 ** ***
Sector [b]		
• Qatif	10.8 ± 1.59	4.49 ± 2.89
• Dammam	9.86 ± 2.19	4.84 ± 3.70
• Khobar	10.9 ± 1.39	4.17 ± 2.87

H-test; p-value	***15.682; <0.001 *****	***0.765; 0.682***
Years of experience in primary health care [a]		
• ≤6 years	9.98 ± 2.06	5.41 ± 3.79
• >6 years	10.8 ± 1.69	3.96 ± 2.65
Z-test; p-value	***3.312; 0.001 *****	***2.834; 0.005 *****
Number of Osteoporotic patients seen/month [a]		
• <10 patients	10.5 ± 1.82	4.51 ± 3.09
• ≥10 patients	10.3 ± 2.08	4.73 ± 3.64
Z-test; p-value	***0.303; 0.762***	***0.077; 0.939***
Number of elderly patients seen/week (>65 years) [b]		
• <10 patients	9.78 ± 2.21	6.09 ± 4.02
• 10 – 20 patiehts	10.7 ± 1.72	3.94 ± 3.02
• >20 patients	10.4 ± 1.87	4.58 ± 2.92
H-test; p-value	***7.717; 0.021 *****	***10.269; 0.006 *****
I'm involved in clinical teaching [a]		
• Yes	11.1 ± 1.50	3.95 ± 3.16
• No	9.79 ± 2.05	5.22 ± 3.24
Z-test; p-value	***5.701; <0.001 *****	***3.623; <0.001 *****
I attended an Osteoporotic activity (lecture, courses, workshops, conference,		

webinars, CME) [a]		
• Yes	11.1 ± 1.50	3.95 ± 3.16
• No	9.76 ± 1.94	5.07 ± 3.14
Z-test; p-value	***5.665; <0.001 ** ***	***3.072; 0.002 ** ***
Implementation of Saudi guidelines for screening of osteoporosis in the current practice [a]		
• Yes	10.8 ± 1.65	4.29 ± 3.12
• No	9.43 ± 2.22	5.43 ± 3.51
Z-test; p-value	***4.643; <0.001 ** ***	***2.351; 0.019 ** ***

[a] P-value has been calculated using Mann-Whitney Z-test.

[b] P-value has been calculated using Kruskal Wallis H-test.

** Significant at p<0.05 level.

Exploring the differences in perception and barriers scores according to the socio-demographic and osteoporosis guidelines utilization of PHCPs found that higher perception scores were more associated with increasing age (Z=1.999; p=0.046), being a family medicine consultant (H=58.660; p<0.001), practicing at Khobar sector (H=15.682; p<0.001), increasing years of practice in PHC (Z=3.312; p=0.001), seeing 10 to 20 osteoporotic patients per month (H=7.717; p=0.021), involvement in clinical teaching (Z=5.701; p<0.001), participation in osteoporotic-related activities (Z=5.665; p<0.001) and implementation of Saudi guidelines for screening of osteoporosis in the current practice (Z=4.643; p<0.001). On the other hand, higher

barrier scores were more associated with being younger (Z=3.147; p=0.002), being a general practitioner (H=27.037; p<0.001), having a shorter duration of experience in PHC (Z=2.834; p=0.005), seeing fewer elderly patients per week (H=10.269; p=0.006), being not involved in clinical teaching (Z=3.623; p<0.001), not participating in any osteoporotic-related activities (Z=3.072; p=0.002) and not implementing Saudi guidelines for screening of osteoporosis in the current practice (Z=2.351; p=0.019) (Table 4).

Table 5: Relationship between osteoporosis guidelines utilizationand the socio-demographic characteristics of the primary healthcare physicians (n=261)

Factor	Guidelines Utilization		X2	P-value §
	Yes N (%) (n=196)	No N (%) (n=65)		
Age group				
• ≤35 years	116 (59.2%)	31 (47.7%)	2.620	0.106
• >35 years	80 (40.8%)	34 (52.3%)		
Gender				
• Male	59 (30.1%)	26 (40.0%)	2.178	0.140
• Female	137 (69.9%)	39 (60.0%)		
Qualification				
• General Practioner	60 (30.6%)	34 (52.3%)	10.788	**0.005 ** **
• Family Medicine	75 (38.3%)	14 (21.5%)		

Specialist				
• Family Medicine Consultant	61 (31.1%)	17 (26.2%)		
Sector				
• Qatif	80 (40.8%)	16 (24.6%)		
• Dammam	75 (38.3%)	36 (55.4%)	6.867	**0.032 ** **
• Khobar	41 (20.9%)	13 (20.0%)		
Years of experience in primary health care				
• ≤6 years	84 (42.9%)	26 (40.0%)	0.163	0.686
• >6 years	112 (57.1%)	39 (60.0%)		
Number of Osteoporotic patients seen/month				
• <10 patients	137 (69.9%)	50 (76.9%)	1.186	0.276
• ≥10 patients	59 (30.1%)	15 (23.1%)		
Number of elderly patients seen/week (>65 years)				
• <10 patients	34 (17.3%)	12 (18.5%)		
• 10 – 20 patiehts	88 (44.9%)	23 (35.4%)	1.937	0.380
• >20 patients	74 (37.8%)	30 (46.2%)		
I'm involved in clinical teaching				
• Yes	97 (49.5%)	27 (41.5%)	1.238	0.266

• No	99 (50.5%)	38 (58.5%)		
I attended an Osteoporotic related activity (lecture, courses, workshops, conferences, webinars, CME)				
• Yes	110 (56.1%)	23 (35.4%)	8.400	**0.004 ****
• No	86 (43.9%)	42 (64.6%)		

§ P-value has been calculated using Chi-square test.

** Significant at p<0.05 level.

Measuring the relationship between osteoporosis guidelines utilization and the socio-demographic characteristics of PHCPs found that the family medicine specialists were significantly more likely to use these guidelines for osteoporosis screening (X2=10.788; p=0.005) among those practicing in the Qatif sector (X2=6.867; p=0.032) and those who attended osteoporotic-related activities (X2=8.400; p=0.004). No significant relationships were observed between the utilization of osteoporotic guidelines in terms of age, gender, years of experience in PHC, number of osteoporotic patients seen per month, number of elderly patients seen per week, and involvement in clinical teaching (all p>0.05) (Table 5).

Discussion

This study explores the PHCPs' perception, guidelines utilization, and barriers against osteoporosis screening and management at PHCCs in the Eastern Province

of Saudi Arabia. The findings of this study will be a significant contribution to the literature, given the importance of physician's confidence in diagnosing and managing osteoprosis cases, particularly in the elderly population.

Perception about osteoporosis screening and management

The overall perception of PHCPs regarding osteoporosis screening and management was sufficient. Based on the given criteria, 73.2% of the physicians were regarded as having good perception levels, and only fewer than 5% were poor (mean score: 10.4 out of 12 points). This result is comparable with that of Jamil & Salman (2022), indicating that almost 98% of the physicians had good knowledge about osteoporosis. (6) Corroborating these reports, Ahmed et al. (2020) found that the majority of general practitioners (74.4%) had good knowledge of osteoprosis. (18) In contrast, Malaysian primary care physicians showed a lower prevalence of satisfactory knowledge, as only 31.4% achieved good ratings. (14) These differences could be due to study design, regional settings, and sample size.

Regarding the details of osteoprosis perception, most perception items were seen to have high ratings. In particular, five perception items had ratings of more than ninety percent. These perception items include "the importance of assessing risk factors for fragility fracture" (98.1%), "PHCPs are responsible for osteoporosis screening" (97.7%), "DEXA is a valuable tool for osteoporosis screening" (97.3%) and "Calcium and vitamin D supplements should be started among osteopenia and osteoporosis patients" (96.2%), and "Non-pharmacological measures have an important role in managing osteoprosis" (93.5%). The lowest rating for the perception domain was about "confidence in interpreting DEXA scan results," with 65.5%. This is in

agreement with the study done in Iraq. Approximately 97% of PHCPs were considered to have excellent knowledge of osteoprosis risk factors and their general knowledge of osteoprosis as well (95%). The least knowledge was related to the treatment options (76.7%). (6) Contradicting these reports, a study in Riyadh documented that family physicians in Riyadh did not seem to manage older females with osteoporosis effectively .This is maybe attributed to that Nearly one-third of the patients did not receive any osteoprosis prescriptions, and laboratory tests were performed on only half of the patients. (17) Physicians' confidence in managing osteoporotic cases is critical for effective prevention, detection, and management. Hence, continuous education is needed among PHCPs to update their information on the latest osteoporosis screening and management guidelines.

Significant factor of perception

Increased perception about osteoprosis screening and management were associated with increasing age, family medicine consultant, practicing in the Khobar sector, increasing years in practice, and seeing 10 to 20 elderly patients per week. This is comparable with that of Tay et al. (2022). PHCPs' satisfactory knowledge of osteoprosis was associated with family medicine specialists, attending osteoprosis management courses, and screening elderly patients. (14) This result can be justified by the fact that courses offer focused and up-to-date information, which enhances knowledge. Additionally, clinical experience and frequent interactions with osteoporosis-related cases further reinforce understanding and practical expertise. A conflicting report by Elwakil et al. (2023) showed that the total knowledge score of healthcare professionals practicing in university hospitals was significantly higher

than those working in government hospitals. However, they found no relevant associations between the total knowledge score in terms of years of experience and the physician's residence location ($p>0.05$). (13) Further investigations are warranted to determine the most relevant factors associated with knowledge and perception of osteoprosis.

Barriers to osteoporosis screening and management

Consistent with perception, the barriers toward osteoprosis screening and management also achieved good results. Only 5% of PHCPs were deemed to have high barriers, and most physicians were considered to have low levels (83.5%). The overall mean barriers score was 4.57 out of 15 points. To our knowledge, this is the first study in Saudi Arabia that managed to stratify the barrier score into three levels. Hence, studies following similar methodologies are warranted to verify these results.

In terms of specific barriers related to osteoprosis, limited consultation time was the only detrimental factor to osteoprosis screening and management (68.6%) and (67.4%) respectively, while limited anti-osteoporosis medication in PHCs was another factor that negatively affected osteoprosis management (67.4%). Other barriers to osteoprosis screening and management ratings were below 50%. Some minor barriers to look up were the concerns about medication effectiveness (25.3%) and its side effects (42.5%), along with patient's unwillingness to undergo screening (30.3%) and management (29.5%). FRAX interpretation rating as a barrier was slightly higher (27.6%) than that of DEXA tool (10%). Consistent with our findings, Choksi et al. (2023) reported that patients' nonadherence, patient concern about the cost, duration of clinic visiting time, and priority list issues were the most frequently

reported barriers by the physicians (15), while Beshyah et al. (2019) indicated that physician and patient lack of knowledge about osteoprosis was the most prominent barrier, followed by treatment cost. (16) The variations in barriers across literature could be mainly due to geographic location, healthcare systems, specialties, and study population diversity.

Significant factors of barrier

Significant predictors of barriers to osteoprosis screening and management include age, qualification, years of experience in PHC, number of elderly patients seen per week, involvement in clinical teaching, and attendance in osteoporosis related activities. In particular, younger age groups (≤35 years), general practitioners, PHCPs with fewer years in practice, seeing less than 10 elderly patients per week, not involved in clinical teaching, and not participating in any osteoprosis related activities were associated with higher barriers to osteoprosis screening and management. However, our results yielded no significant differences between the barrier score in relation to gender and the number of osteoporotic patients seen per month ($p>0.05$). Further, we noted an inverse significant correlation between perception and barrier scores, suggesting that the increase in PHCPs' perception correlates with decreased perceived barriers by the PHCPs toward osteoprosis screening and management. Not opposing these reports, Mahdaviazad et al. (2018) found positive significant correlations between knowledge versus attitude, between knowledge and practices, and between attitude and practices toward osteoprosis. (12) However, in a study conducted by Taytayon et al. (2024), based on comparative analyses, most barriers revealed no significant differences in relation to

physician designation. However, they found a significant correlation between low knowledge and negative attitudes toward osteoprosis screening and management (20). These disparities could be attributed mainly to the number of populations and the study methodology used in the studies.

Saudi guidelines utilization for osteoporosis screening

Most PHCPs utilized and read Saudi guidelines for osteoprosis screening and management. Implementation of Saudi guidelines as the standard practice was seen in more than three-quarters of PHCPs, and the perceived rate of adherence to clinical practice guidelines was seen as average to high (95%). This mirrored the results of a study done by Choong et al. (2023). Approximately three-quarters of the PHCPs have read, self-reported good knowledge, and used standard guidelines for osteoprosisscreening (1), which was consistent with the reports of Beshyah et al. (2019). (16) Contradicting these reports, several studies documented poor practices on clinical osteoprosis guidelines which lead to underdiagnose and undertreated disease. (12)(13)(14) The contradictions in these studies may stem from the difficulty in accessing national guidelines and the complexity of the language used, which makes them difficult to understand. The use of national guidelines for osteoprosis screening and management in standard practice is critical for ensuring effectiveness and high-quality care. For PHCPs, adherence to these guidelines encompasses a dedication to evidence-based medicine and better long-term patient outcomes.

Influential factor of using Saudi Guidelines

Our univariate analyses suggest that being family medicine specialists, practicing in the Qatif sector, and attending any osteoporotic-related activities were associated with utilizing Saudi guidelines for osteoprosis screening. Further, we noted that using Saudi guidelines positively influences PHCPs' perception and negatively impacts the barriers toward osteoprosis screening and management. In this scenario, Saudi guidelines utilization could boost PCHPs' overall confidence in screening and managing osteoprosis cases. This observation is strikingly similar to Choong et al.'s (2023) reports, stating that PHCPs who self-reported good guideline understanding and application tended to exhibit confidence in osteoporosis management. (1)

Study limitations

The results of this study account for several limitations. First, the convenience sampling method could result in sampling bias and may not represent a true population. Second, a cross-sectional survey could be prone to bias, unable to determine cause and effect, and cannot be used to measure behavior over time.

Conclusion

Primary healthcare physicians in the Eastern Province of Saudi Arabia demonstrated high perception and minimal perceived barriers toward osteoporosis screening and management. Further, their standard practice utilizing the Saudi guidelines yielded better perception and reduced the barriers toward osteoporosis screening and management. In addition, more osteoporosis-related activities are needed to an improved perspective across all domains of osteoporosis assessment. Continuous education and policy updates to promote awareness about the

existence of guidelines for osteoporosis screening can reduce the barriers leading to enhanced osteoporosis outcomes, prevent fractures, and improve overall patient quality of life.

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