

Osteoporosis: public awareness, commitment, and perspectives

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- Objective** To explore public awareness of osteoporosis and willingness to manage the problem, with reference to a variety of socio-economic factors.
- Design** Cross-sectional questionnaire study.
- Setting** A public hospital and a private health care clinic in Hong Kong.
- Patients** Two hundred and fifty postmenopausal women consisting of five equal cohorts recruited at random. The cohorts consisted of: patients with fragile fracture, their next-of-kin, patients (without fragile fractures) from a government primary health care clinic, patients from a government orthopaedic clinic, and patients from a private primary health care clinic.
- Results** Only 81% of those interviewed had heard of the disease. Among these, 92% believed that the government was responsible for managing osteoporosis. Most (83%) were willing to self-finance treatment; a higher percentage were willing to do so among those with relatives having osteoporotic fractures. Most (87%) of the subjects underestimated the cost. Less than 40% expected to pay more than HK\$1200 annually. Given the current market price, only 66% would still consider undertaking the treatment. Notably, 99% of interviewees would commence treatment provided the cost was lower.
- Conclusion** Direct costs of managing osteoporosis deter the public from commencing treatment. If the cost of treatment could be lowered and publicised, a dramatic increase in self-financed treatment can be anticipated.

Introduction

As defined by the World Health Organization, osteoporosis is a systemic skeletal disease characterised by low bone mass and bone matrix deterioration, leading to bone fragility and an increased risk of fracture.¹ As the general population is ageing, osteoporosis is becoming more prevalent, not just in Hong Kong, but worldwide.²⁻⁴ In the western world, the prevalence of osteoporosis and osteopenia in those aged 55 to 64 years is 20% and 37% respectively.^{2,3} After the age of 80 years, the prevalence of osteoporosis reaches almost 70%.⁵ Up to 37% of climacteric Hong Kong females suffer from osteoporosis,⁶ and related complications increase in parallel with its prevalence. By 2050 therefore, the projected incidence of hip fractures is expected to increase to three-fold the current value.⁵

Osteoporosis is a silent disease and can go unnoticed for many years until a fracture occurs.⁷ Dual energy X-ray absorptiometry (DEXA) is not only the gold standard for confirming the diagnosis, it is also the best indicator of fracture risk. In that sense, DEXA can be used to stratify the patients according to risk, so that high-risk patients can receive more aggressive intervention.⁸ Without a proper screening programme of utilising DEXA, many patients are underdiagnosed and hence undertreated.^{9,10} The general population, even the high-risk group, may not be aware that they are at risk.¹¹

For patients with established osteoporosis, the most effective proven treatment has been pharmacological.^{5,11-16} However, the cost-effectiveness of establishing a screening programme and subsidising population-based treatment is still lacking.^{9,11,17,18} In the absence of financial justification, the Government of Hong Kong SAR is currently taking only a passive role in the treatment of osteoporosis; it limits its service to managing complications, namely osteoporotic fractures, without paying much attention to their

Key words

Bone density; Diphosphonates;
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骨質疏鬆症：公眾警覺性、承擔和前瞻

- 目的** 參考多項社會經濟因素，探討大眾對骨質疏鬆症的警覺性和願意接受治療的程度。
- 設計** 橫斷面問卷調查。
- 安排** 香港一所公共醫院及私家診所。
- 患者** 250名隨機抽樣的已停經女性。她們分為五類：患有脆骨骨折的病人、脆骨骨折病人的近親、由政府基層醫療診所轉介沒有脆骨骨折的女性、由政府骨科診所轉介的女性，和由私家基層醫療診所轉介的女性。五類參與者的人數相同。
- 結果** 只有81%參與者聽過骨質疏鬆症，聽過的人之中有92%受訪者認為政府有責任治理骨質疏鬆症。大部分(83%)受訪者願意自費治療，以有親人患骨質疏鬆症骨折的受訪者尤甚。然而大部分(87%)都低估了醫療的成本，每年認為須負擔超過1200港元的病人不足40%。在了解現時的醫療成本後，仍然願意接受自費治療的受訪者減至66%。值得注意的是，如果治療成本下降，願意接受這些治療的受訪者達到99%。
- 結論** 治療骨質疏鬆症的直接成本會阻礙市民接受治療。如果治療成本下降和增加對治療費用的宣傳，估計接受自費治療的人數會驟增。

prevention. As a result, both the investigation and treatment of osteoporosis are not being addressed by the public health care system. Even for subsidised organisations, such as the Family Planning Association of Hong Kong,¹⁹ the charges for DEXA range from HK\$600 to HK\$1000 (according to a linked exchange rate system settled US\$1 against HK\$7.8). A monthly supply of Alendronate (Fosamax, Merck & Co, Inc, Alcalá de Henares, Madrid, Spain) and Risedronate (Actonel, OSG Norwich Pharmaceuticals, Inc, North Norwich, New York, US) are sold at around HK\$300 in local pharmacies. Despite Hong Kong being ranked the sixth highest in the world in terms of Gross Domestic Product per capita, reaching US\$38 127 (per capita),²⁰ it is also the fourth most expensive place on earth to live.²¹ Given that the average monthly salary of a general worker in Hong Kong is HK\$7375 (according to the 2006 census report²²), the financial implications of managing osteoporosis are undoubtedly a heavy burden for the general public.

This cross-sectional study aimed to explore current public perspectives on the subject of osteoporosis. As a secondary objective, it tried to assess the possible socio-economic factors influencing such perspectives and decisions pertinent to the management of osteoporosis. This aspect has seldom, if ever, been explored.

Methods

We selected postmenopausal females as our study

subjects, who constitute a well-established high-risk group for osteoporosis,^{2,3} and contribute the largest patient load. The subjects were taken from five different backgrounds. The resulting cohorts comprised: (1) patients with fragile fractures attending an orthopaedic specialty out-patient clinic, (2) their next-of-kin, (3) patients (without fragile fractures) from a government orthopaedic clinic, (4) patients attending a government general out-patient clinic, and lastly (5) patients attending a private family medicine clinic. We hypothesised that patients with fragile fractures, and to a lesser degree, their next-of-kin would be most prepared and committed to undertake osteoporosis treatment. Accordingly, patients suffering from other orthopaedic diseases, who attended the orthopaedic clinic, were expected to be less eager to avail of osteoporosis management. The general public, represented by those attending the public and private family medicine clinics, was expected to be the least keen for such treatment. People attending the private sector clinic were expected to come from an economically more advantaged background and were therefore more willing to pay for their own health care expenses.

Two hundred and fifty postmenopausal women were recruited at random to the five equal cohorts. We constructed a questionnaire, written in Chinese (Appendix 1), to explore each subject's socio-economic background as well as their understanding on the cost implications of osteoporosis treatment. Given the cost of DEXA varied from HK\$600 to HK\$1000, and that a monthly supply of an anti-resorptive agent amounted to HK\$300, we stratified the interviewees' expected costs into four levels. For monthly income, we specified 'family income' as the average monthly revenue generated by all family members living in the same household. We divided their monthly income levels into three categories, namely: less than HK\$15 000, HK\$15 000 but less than HK\$30 000, and more than HK\$30 000. Thus, the monthly expenses for the medication would be approximately 1 to 2% of the family's respective income levels. An additional question was included to explore factors contributing to refusal of treatment, apart from the cost implications (Appendices 1 and 2).

The questionnaire contained only nine closed-end questions (requiring multiple choice responses). Completion of this simplified questionnaire was expected to take less than 3 minutes, rendering a low dropout rate.

With their informed consent, each subject was individually interviewed in Cantonese to ascertain their responses to the questionnaire (Appendix 1). For anyone not able to communicate adequately or who refused to participate, another subject belonging to the same group was recruited. Interviewees who were unaware of osteoporosis were discharged from the interview without any replacement (to avoid

TABLE. Summary of responses to questionnaire survey

		Participating cohorts*					Overall	P value
		Patients	Relative	SOPD	GOPD	GP		
Mean (\pm SD) age (years)		81 \pm 5	53 \pm 7	65 \pm 12	60 \pm 11	68 \pm 13	67 \pm 14	<0.001
No. (%) who had heard of the disease		28 (56)	48 (96)	40 (80)	47 (94)	40 (80)	203 (81)	<0.001
No. (%) of subjects who had heard of osteoporosis (n=203)								
Consider the government has the responsibility		28 (100)	48 (100)	35 (88)	42 (89)	33 (83)	186 (92)	0.014
Readiness to self-finance treatment (without knowledge of costs)		23 (82)	45 (94)	32 (80)	39 (83)	29 (73)	168 (83)	0.180
Cost range (HK\$) of dual energy X-ray absorptiometry (estimated by subjects)	<300	16 (57)	42 (88)	34 (85)	36 (77)	29 (73)	157 (77)	<0.001
	300-600	6 (21)	6 (13)	6 (15)	6 (13)	11 (28)	35 (17)	
	600-1000	6 (21)	0	0	5 (11)	0	11 (5)	
	>1000	0	0	0	0	0	0	
	Willing to self-finance after knowing the current cost (HK\$700)	17 (61)	33 (69)	21 (53)	25 (53)	33 (83)	129 (64)	0.434
Price range (HK\$) of medication per month (estimated by subjects)	<100	5 (18)	30 (63)	29 (73)	32 (68)	25 (63)	121 (60)	<0.001
	100-250	11 (39)	14 (29)	9 (23)	11 (23)	12 (30)	57 (28)	
	250-350	12 (43)	4 (8)	2 (5)	4 (9)	3 (8)	25 (12)	
	>350	0	0	0	0	0	0	
	Willing to self-finance after knowing the current price (HK\$300/month)	28 (100)	34 (71)	22 (55)	27 (57)	22 (55)	133 (66)	<0.001
Family monthly income (HK\$)	<15 000	5 (18)	42 (88)	34 (85)	28 (60)	27 (68)	136 (67)	<0.001
	15 000-30 000	11 (39)	5 (10)	3 (8)	16 (34)	10 (25)	45 (22)	
	>30 000	12 (43)	1 (2)	3 (8)	3 (6)	3 (8)	22 (11)	

* 'Patients' refers to patients with fragile fractures; 'Relative' refers to the next-of-kin of patients with fragile fractures; 'SOPD' refers to subjects (without fragile fractures) attending public orthopaedic specialist clinic; 'GOPD' refers to subjects attending public general out-patient clinic; 'GP' refers to subjects attending private general practitioner; and 'Overall' refers to all the interviewees

selection bias).

Statistical analysis was performed using the Statistical Package for the Social Sciences (Mac OS X 11.0; SPSS Inc, Chicago [IL], US). One-way analysis of variance and *t* tests were used whenever appropriate. The two-tailed significance level was set at 0.05. A forward likelihood regression model was adopted to investigate possible factors affecting the patients' alleged commitments to osteoporosis investigation and treatment.

Results

The age distributions of the subjects in the five pre-selected groups are summarised in the Table. Among the interviewed subjects, 203 (81%) had heard about osteoporosis. Nearly all the subjects (96%) in the next-of-kin group and patients attending government general out-patient clinic (94%) were aware of osteoporosis. In contrast, only 56% of the subjects in the fragile-fracture group had heard about osteoporosis. This proportion was significantly lower than in the other groups ($P<0.001$).

All other figures refer to the 203 subjects who had heard about osteoporosis. Among these, 92% believed that it should be the government's responsibility to

provide treatment for osteoporosis. The same belief was shared by all fragile-fracture patients and their next-of-kin. Before being confronted with actual monetary issues, 83% of the interviewees claimed that they would pursue treatment even it had to be self-financed. The proportions were no different between the five groups of subjects ($P=0.180$).

The actual costs of the investigation, densitometry, and the medication for the osteoporosis treatment were not well known. Overall, 94% expected the cost of densitometry to be under HK\$600. In fact, 77% of them believed that it should be less than HK\$300. Without significant difference between groups ($P=0.434$), only 64% of subjects were prepared to pay for the densitometry if it costed HK\$700.

Costs of medication were also poorly appreciated by the subjects, except by those with fragile fracture. Overall, 43% of the latter could rightly select the price range of the drug in contrast to 7% for the remainder. Once the cost of medication was revealed to be around HK\$300 per month, all patients with fragile fracture and 71% of their next-of-kin continued to be willing to pay for treatment, whereas less than 60% in the other groups were prepared to do so, the difference between these groups being

statistically significant ($P < 0.001$).

Most of these interviewees had a relatively low monthly family income—in 67% it was less than HK\$15 000 per month for the entire family. Fragile-fracture patients who were aware of osteoporosis had a relatively higher monthly family income ($P < 0.001$); 82% of them had family incomes exceeding HK\$15 000 per month.

The forward regression model showed that a higher likelihood of patients being prepared to self-finance DEXA scans among subjects who: (i) were willing to purchase drugs for osteoporosis ($-2 \log \text{likelihood} = 43.95$), (ii) had higher family incomes ($-2 \log \text{likelihood} = 26.93$), (iii) had suffered from fragile fractures ($-2 \log \text{likelihood} = 20.07$), and (iv) were able to point out the cost of DEXA scans accurately ($-2 \log \text{likelihood} = 14.60$).

Similarly, a higher likelihood of patients prepared to self-finance osteoporotic medication was noted among those who: (i) were willing to pay for the DEXA scan ($-2 \log \text{likelihood} = 63.27$), (ii) had suffered from fragile fracture ($-2 \log \text{likelihood} = 23.60$), and (iii) were able to point out the cost of medication ($-2 \log \text{likelihood} = 9.98$) accurately.

Excepting one person, all the interviewees were willing to obtain self-financed treatment if the cost was expedient to them, which implies that financial consideration was a major determinant.

Discussion

This study revealed that most subjects were aware of the disease, osteoporosis, though this only amounted to 81%, a much lower level than expected after a decade of extensive publicity on the topic. Ironically, patients with fragile fractures that one might have expected to know most about osteoporosis, had the lowest proportion (56%) who knew about it, possibly because they were relatively older, and least exposed to the public media. In addition, elderly people, in general, may have difficulty in understanding a new concept. The fact that traditional publicity strategies, especially those utilised by market-driven pharmaceutical companies, were not effective in disseminating relevant health information to this targeted patient group, should be recognised. As up to 40% of these patients claimed never to have heard of osteoporosis, we expect that a significant proportion of them would have also been confused and have misconceptions about this disease entity. More efforts should therefore be channelled into alerting the elderly population, with suitable tactics (TV campaigns, seminars in old-age charitable centres) to reach this target group.

Regarding their financial backgrounds, surprisingly, patients with fragile fractures had significantly higher monthly family incomes than

others, possibly due to subject selection bias, as only those who are aware of osteoporosis may have agreed to be interviewed. Although not shown in the study, awareness of osteoporosis might by itself reflect a higher level of education, better family support, and a higher monthly family income.

Regarding the expected cost of managing osteoporosis, patients with fragile fractures were more aware of the actual costs of investigations and medication, which was probably related to the fact that they have already undergone a DEXA scan and have been prescribed anti-resorptive agents. In contrast, the remaining groups drastically underestimated the actual expenses. As the actual cost of DEXA and medications was 2 to 3 times their expected budget, not surprisingly more than one third of the subjects would not undertake self-financing, after the actual costs were revealed. Even in the remaining two thirds, the proportion that would eventually proceed to undertake such treatment might be much lower.

Patients with fragile fractures were expected and confirmed to have the strongest motivation for undergoing osteoporotic treatment. However, their relatives did not appear to have a strong commitment towards self-financing investigations and medication, despite witnessing the suffering incurred due to osteoporotic fractures. Socio-economic issues (such as family income) might play a significant role in such decisions. Exploring the underlying factors that determine individual decisions about treatment would be of interest. Better understanding of these aspects might help heighten patient adherence and compliance.

Subjects attending private primary health care services did not appear to be more financially capable, although they seemed more willing to spend on health-related issues, such as having a DEXA scan. Despite their claimed willingness in paying for 'one-off' investigations was high, their commitment to take long-term medication was evidently no different to the others, which might reflect genuine financial constraints.

Patients attending either the public sector orthopaedic clinic or the primary health care service did not vary significantly in their alleged eagerness to undertake self-financing of osteoporosis treatment. Based on this, we found no evidence to suggest that the primary health care was a less favourable setting for promoting osteoporosis management.

Currently, treatment for osteoporosis continues to be limited to a small group of patients who are willing and able to afford the treatment. In a simplified business model based on this study, if the cost of treating osteoporosis could be made known to the public and reduced to an acceptable level (perhaps one third of current costs), an exponential increase in uptake might offset the decreased profitability,

resulting in a win-win situation. The Hospital Authority statistical report for 2006²³ indicates that nearly 8500 patients were admitted to either public or private hospitals for management of fractured femur. Assuming that more than two thirds of these patients suffered fragility fractures and that on average they needed a 5-week hospital stay for treatment and rehabilitation, the total cost would amount to HK\$892 500 000 (\$3000/day/person x 35 days x 8500 patients). This sum poses a significant burden on the Hospital Authority, and in turn on the Hong Kong SAR Government. Subsidising patients to undergo osteoporotic treatment to minimise fragility fractures might therefore be a cost-effective strategy in the long term. Another means of broadening the uptake of osteoporosis treatment might be to provide free DEXA scans, as patients agreeing to undertake such scans were also shown to have a higher commitment to taking medications.

Business decisions based solely on the findings of this study should be taken with caution, because of several significant limitations. First and most importantly, the results were based on self-reported financial situations and alleged commitments. Significant differences may exist between alleged and actual commitments. In regions where financial implications were not an issue, compliance to daily medication was still largely suboptimal (down to 25% after 1 year).²⁴⁻²⁶ Compliance might increase by around 10% following the introduction of a more user-friendly weekly regimens, but even these were far from satisfactory.²⁷ In the presence of financial constraints, the compliance and adherence are likely to be even lower. Second, initiation of appropriate investigations and pharmacological treatment requires a high level of awareness among attending clinicians.¹⁸ Even with the introduction of a guideline on managing osteoporosis, a survey found that 51% of women and 95% of men were not managed in accordance with recommendations.⁶ Without a system to ensure that all the eligible patients received the right treatment, there was no

certainty that an increased volume of patients would be sufficient to recover losses related to adjustment in costs.

Limitations of the study largely stemmed from self-reporting of possibly invalid information and the small sample size. A larger scale study based on validated data might be able to draw a reliable inference. Nonetheless, resource requirements and the possibility of breaching privacy on the usage of validated data should be seriously considered.

Conclusion

Our study revealed that the people at risk of osteoporosis were, in general, aware of this disease entity and willing to pay for the cost of treatment. However, their enthusiasm was deterred by the direct costs involved. The resulting lack of motivation might be partly solved by publicising a reduction in costs, either via a government subsidy, or the introduction of generic or discounted medications. This study also suggests that offering free DEXA scans to the at-risk population might heighten their commitment to self-financed continued osteoporosis treatment.

Appendices

Additional material related to this article can be found on the HKMJ website. Please go to <<http://www.hkmj.org>>, search for the appropriate article, and click on Full Article in PDF following the title.

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Appendix 1. Questionnaire

- 年齡 _____ 女 組別 GOPD / SOPD / patient / relative / GP
- 請問你有冇聽過骨質疏鬆這個病？
A. 有 (到 2.) B. 冇 (多謝, 拜拜)
 - 你覺得政府有冇責任診斷及醫治骨質疏鬆這個病？
A. 有 B. 冇
 - 其實現在是要病人自己負責出錢診斷檢查，你會唔會自己俾錢去診斷骨質疏鬆這個病？
A. 會 B. 唔會
 - 你覺得正統的骨質密度檢查應該多少錢才算合理？
A. 少過300蚊 B. 300至600蚊 C. 600至1000蚊 D. >1000蚊
 - 現時正統的骨質密度檢查其實是需要約700蚊，你會選擇購去檢查定係由得佢？
A. 去檢查 B. 由得佢
 - 同時，其實現在是要病人自己負責出錢買藥，你覺得藥費每個月應該多少錢才算合理？
A. 少過100蚊 B. 100至250蚊 C. 250至350蚊 D. >350蚊
 - 現時藥費每年其實是需要3600蚊，你會選擇購買藥物去治療定係由得佢？
A. 購買藥物去治療 B. 由得佢
 - 請問你家庭月入介乎下列那範圍？
A. <15000蚊 B. 15000至30000蚊 C. >30000蚊
 - 最後，若果診斷同藥費都係你心水的範圍，你會選擇購檢查同治療定係由得佢？
A. 檢查同治療 B. 由得佢，因為 _____

我謹代表港大醫學院骨科部多謝你的幫忙，拜拜。

Appendix 2: English version of the questionnaire

- Age _____ Female Group: GOPD / SOPD / patient / relative / GP
- Have you ever heard of "osteoporosis"?
A. Yes (proceed to question 2.) B. No (Thank you and goodbye)
 - Do you believe that the government has the responsibility in diagnosing and treating osteoporosis?
A. Yes B. No
 - Currently, patients need to self-finance the standard DEXA scan for diagnosing osteoporosis. Are you willing to pay for the investigation?
A. Yes B. No
 - What is the price range that you feel a standard DEXA scan would cost?
A. less than \$300 B. \$300 to \$600 C. \$600 to \$1000 D. >\$1000
 - Currently a standard DEXA scan costs about \$700. Are you willing to pay for the investigation or simply leave it alone?
A. Proceed to the investigation B. I shall leave it
 - Currently patients also need to self-finance the medication. What is the price range that you feel a month supply of drug would cost?
A. less than \$100 B. \$100 to \$250 C. \$250 to \$350 D. >\$350
 - The annual expenditure for the medication is about \$3600. Are you willing to pay for the medication or simply leave it alone?
A. I shall pay for the medication B. I shall not get the medication
 - What is the range of your family monthly income belongs to?
A. less than \$15000 B. \$15000 to \$30000 C. more than \$30000
 - Lastly, if the cost of investigation and medication falls within your proposed range mentioned above; are you willing to self-finance the investigation and drug or simply leave it alone?
A. I shall pay for the investigation and proceed with the treatment
B. I shall leave it alone because _____

On behalf of the Department of Orthopaedics and Traumatology, the University of Hong Kong, I would like to express my sincere appreciation for your help. Goodbye.