Funding: Health and Medical Research Fund ref:19201571

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Comparative performance of the Osteoporosis Self-Assessment Tool for Asians (OSTA), Chinese Osteoporosis Screening Algorithms (COSA), and Fracture Risk Assessment Tool (FRAX®) for stratifying osteoporosis risk among free-living older adults in Hong Kong

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1 Introduction

- The Osteoporosis Society of Hong Kong ***recommends universal dual-energy X-ray absorptiometry (DXA) screening*** for all men aged ≥ 70 years and women aged ≥ 65 years
- Access to DXA in Hong Kong is limited by high cost, long wait times, and is reimbursed only for those with prior fractures
- ***Risk prediction tools*** enable stratified screening by ***prioritizing limited resources*** for individuals at highest risk

Objective: This study compares the performances of the OSTA, COSA and FRAX calculated without BMD in stratifying osteoporosis risk among older adults in Hong Kong

2 Methods

- **Design:** Cross-sectional study of 376 healthy community-dwelling men ≥ 70 years and post-menopausal women ≥ 65 years in Hong Kong
- Bone mineral density (BMD) measured with dual-energy X-ray absorptiometry (DXA) at non-dominant hip and lumbar vertebrae (L1-L4)
- **Primary exposure:** OSTA, COSA and FRAX scores calculated without BMD for major osteoporotic fracture (MOF) and hip fracture (HF)
- Predictive abilities of OSTA, COSA and FRAX evaluated using the area under the receiver operating characteristic curves (AUC)

Main outcomes:

1 **Osteoporosis**
BMD T-score ≤ -2.5 at the femoral neck or L1-L4

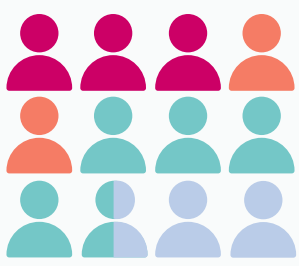
2 **Treatment-eligible**
OSHK 2024 recommendation: Osteoporosis or osteopenia with high fracture risk (FRAX-MOF≥20% or FRAX-HF≥3%)

Table 1. Risk factors included in the OSTA, COSA and FRAX

	Age	Weight	Prior fracture	Parent HF	2º OP	GCs	Smoking/ Alcohol	BMD
OSTA	•	•						
COSA	•	•	•					
FRAX	•	•	•	•	•	•	•	(•)

2º OP, secondary osteoporosis; BMD, bone mineral density; COSA, Chinese Osteoporosis Screening Algorithm; FRAX, Fracture Risk Assessment Tool; GC, glucocorticoids; HF, hip fracture; OSTA, Osteoporosis Self-Assessment Tool for Asians

3 Results



- **24.7%** Osteoporosis (T-score <-2.5)
- **17.0%** Osteopenia, high-risk (FRAX-MOF ≥ 20% or HF ≥ 3%)
- **37.8%** Osteopenia, low-risk (FRAX-MOF <20% and HF <3%)
- **20.5%** Normal BMD

Table 2. Participant characteristics

	Normal BMD (n=77)	Osteopenia		Osteoporosis (n=93)
		Low risk (n=142)	High risk (n=64)	
Sex, females	42 (54.5%)	110 (77.5%)	47 (73.4%)	87 (84.8%)
Age, years	72.3 (4.6)	70.4 (4.0)	74.7 (4.4)	70.8 (4.3)
Weight, kg	63.3 (9.9)	56.3 (8.6)	57.8 (8.7)	51.3 (5.6)
Parent hip fracture	8 (10.4%)	9 (6.3%)	15 (23.4%)	13 (14.0%)
Prior major fracture	3 (3.9%)	2 (1.4%)	1 (1.6%)	2 (2.2%)
T2DM	18 (23.4%)	25 (17.6%)	10 (15.6%)	6 (6.5%)
Hypertension	35 (45.5%)	49 (34.5%)	30 (46.9%)	32 (34.4%)
FRAX–MOF*	11.57 (7.11)	10.12 (5.00)	13.33 (5.95)	13.15 (7.92)
FRAX-HF*	5.85 (5.67)	4.40 (3.49)	6.85 (4.21)	6.70 (7.22)
OSTA	-1.82 (2.14)	-2.82 (1.67)	-3.39 (1.72)	-3.89 (1.41)
COSA	-27.3 (19.9)	-21.1 (17.1)	-15.9 (17.1)	-11.6 (14.8)

n(%) or mean (SD). COSA, Chinese Osteoporosis Screening Algorithm; FRAX, Fracture Risk Assessment Tool; HF, hip fracture; MOF, major osteoporotic fracture; OSTA, Osteoporosis Self-Assessment Tool for Asians; T2DM, type 2 diabetes mellitus. * FRAX scores are calculated without bone mineral density input

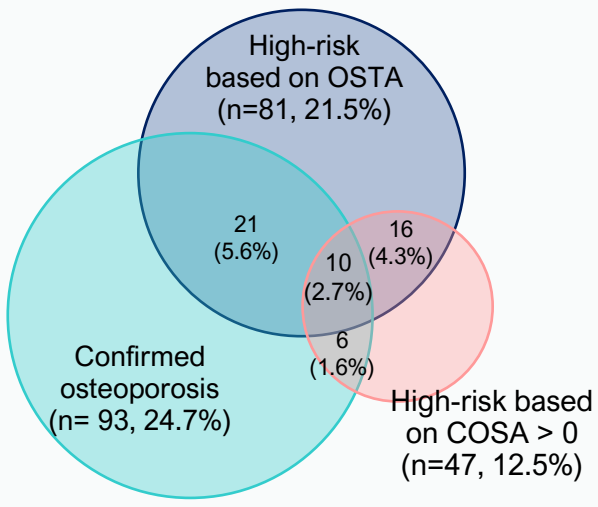
- Approximately **1 in 2.5** older adults have osteoporosis or osteopenia with high fracture risks
- **Parent hip fracture** was the most common risk factor among this cohort, reported by 12.0% of participants

Table 3. AUC for predicting osteoporosis and treatment eligibility by FRAX, OSTA and COSA

	AUC (95% CI)	
	Osteoporosis (n=93)	Treatment-eligible (n=157)
FRAX-MOF without BMD	0.592 (0.527, 0.656)	0.642 (0.568, 0.715)
FRAX-HF without BMD	0.556 (0.489, 0.624)	0.638 (0.581, 0.695)
OSTA	0.698 (0.644, 0.753)	0.692 (0.635, 0.742)
COSA	0.675 (0.527, 0.656)	0.666 (0.614, 0.723)

BMD, bone mineral density; COSA, Chinese Osteoporosis Screening Algorithm; FRAX, Fracture Risk Assessment Tool; HF, hip fracture; MOF, major osteoporotic fracture; OSTA, Osteoporosis Self-Assessment Tool for Asians

Figure 1. Venn diagram showing agreement between high-risk determined by OSTA, COSA and confirmed osteoporosis



- All tools showed **limited predictability** for osteoporosis or treatment eligibility
- **OSTA** showed the best performance among the three tools
- Using high-risk thresholds for OSTA or COSA to inform DXA screening will **miss 60%** of individuals with confirmed osteoporosis

4 Conclusions

- About 40% of older adults in Hong Kong meet the criteria for osteoporosis treatment
- Existing risk prediction tools are limited in accurately identifying high-risk individuals for DXA screening
- Optimal thresholds to guide DXA screening may need to be re-evaluated to better suit the HK population