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# OSTEOPOROSIS INTERNATIONAL

with other metabolic bone diseases

EDITORS-IN-CHIEF JOHN A. KANIS AND ROBERT LINDSAY

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P393

Microstructure and Hydroxyapatite Crystal on Indonesian Osteoporosis  
Phenomenon

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**Objectives:** Osteoporosis is widespread problem, dangerous because of low traumatic fractures. Besides it is part of status of the patients with prevalent internal diseases. Researches of the last years show more severe course of some internal diseases in the patients with BMD loss. Objective: To study prevalence of osteopenia and osteoporosis in the patients with internal diseases.

**Materials/Methods:** We created an osteoporosis prophylaxis and treatment city center. 8,600 patients, average age  $57.3 \pm 6.4$  were examined in 2003–2008. There were 6,255 (72.7%) females and 2,345 (27.3%) males (Group 1). The number of patients with cardiovascular disease (CVD) was 69%; CVD and diabetes mellitus 2 type (DM2T)—19.8%; DM2T—2.2%; chronic obstructive pulmonary disease (COPD) (including combination with CVD)—4.2%; alcohol polyvisceropathy—1.5%; other disease (including rheumatic arthritis) —3.2%. Risk factors were assessed. Bone densitometry was performed on Lunar DPX Bravo. Control group (Group 2)—1,600 relatively healthy people of both sexes which underwent the same examination.

**Results:** Risk factors for osteoporosis were found in 7,348 (85.4%) cases in both group. Low traumatic fractures were diagnosed in 1,943 (22.6%) cases, and the loss in height more than 3 cm in 3,347 (38.9%) cases. Osteoporosis was diagnosed in 34.3% in Group 1, in 18.6% in Group 2 ( $p < 0.05$ ); osteopenia—in 43.2% and 39.2, respectively ( $p = 0.07$ ). The average total T-score at the femoral neck in Group 1 was  $(-1.7) \pm 0.9$  SD and in Group 2— $(-1.2) \pm 1.4$  SD ( $p < 0.05$ ). The average value of BMD in femoral neck was  $-0.39 \pm 0.9$  and  $0.432 \pm 0.08$ , respectively ( $p < 0.05$ ).

**Conclusions:** Prevalence of BMD loss in the patients after 40 years with internal disease higher than in the healthy group of the same age.

**Disclosure of Interest:** None declared.

### P393 MICROSTRUCTURE AND HYDROXYAPATITE CRYSTAL ON INDONESIAN OSTEOPOROSIS PHENOMENON

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**Objectives:** Aim of this study was to know an association between hydroxyapatite crystallization and microstructure on osteoporosis and normal bone.

**Materials/Methods:** 25 osteoporosis patients and 18 normal patients were involved in this study obtained in Ulin General Hospital of Banjarmasin and another hospital. Hydroxyapatite crystallization was analyzed by X-Ray Diffraction (XRD) and microstructure was analyzed by Scanning Electron Microscope (SEM) in State University of Malang.

**Results:** XRD results show hydroxyapatite peak and no other peak. Broadening of XRD peak in osteoporosis indicate lower crystallization. Crystal size is smaller in osteoporosis than normal. SEM result show degeneration of micro architecture (resorption cavity, holes, and high granule) in osteoporosis than normal.

**Conclusions:** There is an association between size of hydroxyapatite crystal and bone microstructure in osteoporosis.

**Disclosure of Interest:** None declared.

### P394 RISK FACTORS OF LOW PEAK BONE MASS IN COMMUNITY DWELLING YOUNG CHINESE MEN AND WOMEN: IMPORTANCE OF PHYSICAL ACTIVITY AND REPRODUCTIVE HEALTH

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**Objectives:** To identify the risk factors for low peak bone mass, defined as BMD z-score  $< -1$ , in Southern Chinese.

**Materials/Methods:** BMD of 390 and 1,526 southern Chinese men and women, aged 20–39 years, were measured at both spine and total hip. The impact of age, height, weight, duration of exercise/day (categorized as  $< 30$ , 30–60 and  $> 60$  min), smoking, drinking, daily calcium and phytoestrogen intake, age of menarche as well as pregnancy on BMD was evaluated.

**Results:** Mean age for males and females were 31.5 and 31.3 years, respectively. 17.7% and 17.4% of males as well as 21.6% and 28.7% of females had z-score  $< -1$  at spine and hip, respectively. Regression model analysis revealed that low body weight (1 S.D. below the mean, i.e., 67.6 kg for men and 52 kg for women) was associated with increased risk of having z-score  $< -1$  at either spine or hip in both men and women with an OR of 2.20 (95% CI: 1.13–4.28;  $p = 0.02$ ) and OR of 3 (95% CI: 1.99–4.52;  $p = 0.001$ ), respectively. Men with daily exercise  $< 30$  min/day had an increased risk of low peak bone mass (OR = 2.94, 95% CI: 1.20–6.72;  $p = 0.018$ ) when compared with those exercised  $> 60$  min/day. In women, early menarche (menstruation before 14 years old) and pregnancy were protective factors.



# ECCEO11-IOF

## European Congress on Osteoporosis and Osteoarthritis

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### CERTIFICATE OF ATTENDANCE

We, Professors John A. Kanis & Jean-Yves Reginster,  
Co-Presidents, certify that:

**Zairin NOOR**

attended the  
**European Congress on Osteoporosis and Osteoarthritis**

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*Prof. J.A. Kanis*

&

*Prof. J.-Y. Reginster*

A handwritten signature in black ink, appearing to read 'John A. Kanis', written over a faint background image of the Valencia Congress Palace.

A handwritten signature in black ink, appearing to read 'J.-Y. Reginster', written over a faint background image of the Valencia Congress Palace.

Courtesy of

The AMGEN logo, featuring the word 'AMGEN' in a bold, blue, sans-serif font with a registered trademark symbol.

The gsk logo, featuring the lowercase letters 'gsk' in white inside a red circle, with the text 'GlaxoSmithKline' in a smaller, black, sans-serif font to the right.

# MICROSTRUCTURE AND HYDROXYAPATITE CRYSTAL ON INDONESIAN OSTEOPOROSIS PHENOMENON

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## Background



- White paper from Osteoporosis Indonesian Association show prevalence osteoporosis at 2009 was 28.85% for men and 32.3% for women (PEROSI, 2009).
- Transmission electron microscope study to measure bone crystal size yield average crystal size from normal bone was 50 x 25 x 10 nm (Robinson, 1952).
- Next study by Atomic Force Microscope obtain smaller size, 12 x 10 x 1 nm (Eppel et al, 2001).
- Rubin et al (2003) show that no significant difference in nanostructure of osteoporosis and normal bone by Transmission Electron Microscope
- There is no information relating hydroxyapatite crystallization and microstructure of osteoporosis and normal bone in Indonesia.

## Aims

Aim of this study was to seek any information relating with hydroxyapatite crystallization and microstructure on osteoporosis and normal bone.

## Methods

- Multicenter study
- Inclusion criteria:
  - postmenopausal woman,
  - trabecular bone fracture,
  - normal and osteoporosis BMD value, and
  - no history of previous disease.
- Bone was obtained in surgery room then analysed for:
  - microstructure by Scanning Electron Microscope,
  - Hydroxyapatite crystal by X-Ray Diffraction

## Discussion

- Microstructure osteoporosis trabecular bone is different than normal bone.
- Changes such as thinning, hole, and perforation made the arch structure lose its integrity.
- These changes contributed to an obviously porosity of inter-trabeculae.
- Step ladder appearance (imbalance between resorption and formation activity), granule also found in osteoporosis.

Shen et al, 2009

## Results

### MICROSTRUCTURE (Magnitude 200)



OSTEOPOROSIS

NORMAL

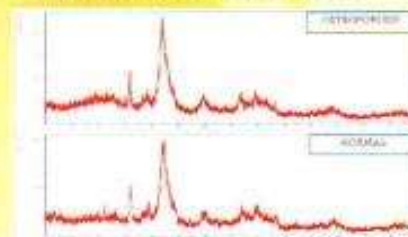
### MICROSTRUCTURE (Magnitude 3000)



OSTEOPOROSIS

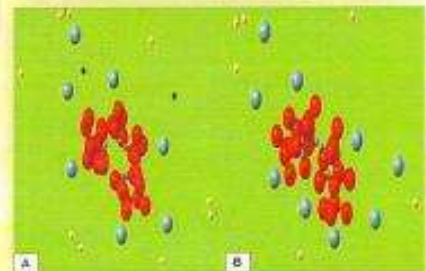
NORMAL

### HYDROXYAPATITE CRYSTAL



Osteoporosis: calcium hydroxyapatite /  $\text{Ca}_{10}(\text{OH})(\text{PO}_4)_6$   
 Normal: sodium-calcium hydrogen carbonate phosphate hydrate /  $\text{Ca}_{10}(\text{H}_2\text{PO}_4)_6\text{H}_2\text{O} \cdot \text{NaHCO}_3 \cdot \text{H}_2\text{O}$

### Crystal of osteoporosis (A) and normal bone (B)



- Atomic density of osteoporosis bone is lower than normal bone
- Crystal size of osteoporosis bone is smaller than normal bone
- Smaller crystal indicate lower crystallinity or tend to amorphous state
- This result is similar with Sastry et al (2007).

## Conclusion

There is an association between size of hydroxyapatite crystal and bone microstructure in osteoporosis.

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