PRELIMINARY STUDY OF OSTEOPOROSIS AND OSTEOPENIA AMONG POSTMENOPAUSAL WOMEN IN MUKIM TASEK, DAERAH BADANG FROM NOVEMBER 2006 TO NOVEMBER 2007

BY

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Dedicated to

Puan Esharmanizawati

Without you this would not happen

Rabiatul Adawiyah

Luqmanul Hakim

Qurratul Ain Batrisyia

You are the light of my life!!!!

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Abstract

Abstrak

Kajian prospektif ini bertujuan ini bertujuan untuk mengenal pasti prevalen osteoporosis dan osteopenia dikalangan wanita pasca-menopos luar bandar di Mukim Tasek, Daerah Badang Kota Bharu. Subjek direkrut secara systematik dari bulan November 2007 hingga November 2007. Sejumlah 54 wanita pasca-menopos berumur diantara 45 hingga 65 tahun yang tiada penyakit dan tidak pernah menjalani pembedahan pembuangan ovari direkrut. Purata umur menopos ialah 50.56 $\pm$ 2.93 tahun. Prevalen osteoporosis ialah 5% pada pinggul dan 14% pada tulang belakang.Prevalen osteopenia ialah 13% pada pinggul dan 30% pada tulang belakang. Berat, tinggi dan kumpulan yang menduduki pendidikan peringkat rendah mempunyai perkaitan yang siknifikan dengan Ketumpatan Jisim Tulang (Bone Mineral Density 'BMD') dimana, berat badan rendah($p=0.0001$), ketinggian rendah($p=0.01$) dan kumpulan dengan hanya menduduki persekolahan peringkat rendah($p=0.009$) mempunyai risiko tinggi osteoporosis atau osteopenia. Tiada perkaitan antara umur, umur semasa menopos, jangkamasa haid dan bilangan anak dengan BMD. Merokok dan menjalankan aktiviti riadah tiada perkaitan dengan BMD. Keputusan kajian ini adalah setara dengan keputusan dikalangan wanita pertengahan umur di bandar. Prevalen osteopenia yang tinggi dalam populasi akan menjadikan kepatahan tulang ini satu masalah besar untuk masyarakat dan negara.

Kata kunci : Malaysia; Osteoporosis: Osteopenia; Prevalen; Menopos

Abstract

This is a prospective cross sectional descriptive study with aims to identify the prevalence of Osteoporosis and Osteopenia in early postmenopausal women in Mukim Tasek, Daerah Badang. Systematic sampling of the population in Mukim Tasek, Kota Bharu was conducted from June 2007 to November 2007. A total of 54 women post menopause age 45-65 years old, who are disease free and with intact uterus were recruited. Mean menopausal age at 50.56 $\pm$ 2.93 years. Prevalence of osteoporosis is 14% and osteopenia 30%. The weight, height and primary education have positive correlation with bone mineral density (BMD) where low body weight, shorter height and primary education have increase risk of osteopenia and. No correlation noted between age, age at menopause, duration of menses or parity with BMD. Smoking and exercise has no association with BMD. The result of the study comparable to urban midlife population of Malaysia. With high prevalence of osteopenia and osteoporosis in the population, the problem of fracture will be major health issues to the society and nation.

KEYWORDS : Malaysia; Osteoporosis; Osteopenia; Prevalence; Menopause

Chapter 1
Introduction

1 Introduction

It has been 50 years since our nation gained independence, since then our nation has developed into an established developing country and so has our social and economic structure. As a result our health support have also improved to a standard where more than 90% of the populations are within reach of any medical facilities whether it is government sponsored or privately owned.

With our advances in medical care, the infant mortality rate has reduced from 9.5/1000 (1990) to 6.7/1000 (2006) comparable to other developed country and the life expectancy has also increased in 2006 male to female life expectancy are 71.9 and 76.4 respectively based on National Statistic Data from National Statistic Department report in 2007. These advances brings new problem to our population. As the life expectancy in our population is increasing, we will expect a multitude of medical problems that we must face. One of the silent problems that we will be facing is *osteoporosis.*

World health Organization (WHO) working group on osteoporosis defined osteoporosis based on the bone mineral density in comparison with age group. They defined osteoporosis as T score below -2.5 SD (standard deviation) for bone mineral density measurement comparing with young age group mean of bone mineral density. This value would identify 95% of women at highest risk of fracture. The risk of fracture increased 2 fold for every SD reduction in BMD (Marshall et. al. 1996).

It is a silent disease affecting geriatric population. Osteoporosis prevalence in elderly is high and the consequences of osteoporosis are fractures especially at hip region, spine and wrist. It carries high morbidity and even mortality to the involved party.

Therefore measures should be taken to prevent it from creeping into our society. An approach towards "prevention is better than cure" should be taken to address this matter.

Problem that we face in Malaysia is there are scattered data regarding the prevalence of osteoporosis and osteopenia. Lee et al. studied peri and postmenopausal urban midwifes population in urban setting and found out that the prevalence of osteoporosis is 24.1%. This study includes women in perimenopausal, postmenopausal and elderly more than 70 years olds. It includes women with possibility of senile osteoporosis as well. The main concern in women in early postmenopausal period is the high turnover phase of bone mineral density that that increases rate of reduction in bone mineral density thus increasing the risk of fracture fragility (Hadji et. al. 2002). Currently, there is no data regarding suburban population or the prevalence in postmenopausal women as the other study representing peri, postmenopausal and women in senile osteoporosis group. Therefore in this study we would like to find out the prevalence of osteoporosis and osteopenia in suburban early postmenopausal women in Mukim Tasek , Daerah Badang as a preliminary data for larger scale study design. This is a preliminary study design to estimates the number of patients need to be recruited for the 2^{nd} phase interventional study for osteoporosis.

District of Badang is located in Jajahan Kota Bharu. It consist of 14 Mukim with total population of 47,000 people with estimated area of 29.55 km^2 fisheries, home industries and craft making are the main source of income for the society. Mukim tasek have estimated population of 1175 people with an estimated of 309 household. Most of the houses are located near the main road to Paintai Cahaya Bulan. This locality is chosen as the location provides easy access and for logistic purposes and lies in suburban area.

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1.1 Rationale of study

1. In our local population in Malaysia and in Kelantan, there was no baseline data of DEXA (Dual Energy Xray Absorptiometry) measurement osteoporosis and osteopenia in healthy postmenopausal women group for comparison.

2. Previous data on osteoporosis does not represent the actual incidence and potential risk of fractures for local healthy population as no study done previously targeting healthy women to look for prevalence in the society. Most data are based on interventional study and patient subjected to BMD (Bone Mineral Density) measurement only when suspected Osteoporosis or for Monitoring treatment on HRT (Hormone Replacement Therapy).

3. Diagnosis of osteoporosis were made without any conclusive evidence in our local practice. Most patients were treated with biphosphonates and SERMS (Selective Estrogen ReceptorModulators) without having conclusive evidence of osteoporosis eventhough DEXA is a safe and reliable tool for quantitative measurement of bone mineral density, thus provide conclusive evidence for treatment of osteoporosis.

4. To assess risk of osteoporosis in healthy post menopausal suburban Kelantan population for prevention of osteoporotic fracture. This data will be used as a sample

database for comparison of DEXA measurement for a larger 2nd phase intervensional study planned later.

5. This study design as a preliminary study to determined the total number of subject need to be recruited for second phase intervensional study on oateoporosis.

1.2 Research question

1. Is there high prevalence of osteoporosis among healthy post menopausal women in suburban setting?

2. What is the severity of the problem?

3. What are the associated risk factors in correlation with Osteopenia and Osteoporosis?

Chapter 2

Literature Review

2. LITERATURE REVIEW

2.1 Osteoporosis

Osteoporosis is a silent progressive systemic disease characterized by low bone mass and micro-architectural deterioration of bone tissue leading to bone fragility and fracture. It posed 40% lifetime risk of fracture especially for women. World wide this problem is likely to increase with aging of the population and better health provision. Advanced age is the best predictor of osteoporosis, but early menopause, a maternal history of hip fracture, a fracture after 40 years of age, low body weight, or specific diseases and treatments increase susceptibility to fractures related to osteoporosis.

Of all fractures due to osteoporosis, hip fractures are the ones that are most disabling. Expected hip fracture due to osteoporosis will rise threefold from 1.7 million in 1990 to 6.3 million by 2050 worldwide. Developing countries are expected to contribute 75% of the total predicted numbers by 2050 due to the graying population (WHO 1999). 50% of all hip fractures are estimated to occur in Asia (Cooper C et al. 1992). However recent studies have demonstrated that there is a variation in the incidence of hip fractures in different regions of the world (Maggi S et. al. 1991) (Schwartz AV et. al. 1999)

Few studies regarding the incidence of hip fracture have been reported in Asia. Incidence in Hong Kong has risen by more than twofold in the last 30 years (Lau EM 1999). Within the same period in Singapore, a similar incidence was observed (Lee ST 1992). In mainland China reported hip fracture was lower than in Hong Kong and

Singapore. Age adjusted incidence were 50% in men and 25% of women respectively of Hong Kong rates (Xu L et. al. 1996).

In Caucasian population, the incidence is much higher; lifetime risk of fracture in Sweden is 28.5% (John AK 2002). In a study based in the United Kingdom, derived from General Practice Research Database the incidence of hip fracture were 17/10000 for women and 5.3/10000 for men (Van Staa et. al. 2001). Hip fracture rates also increase exponentially with age, so does osteoporosis with rates of 2/100000 for age below 35 years old to 3032/100000 in women age 85 or more (Melton LJ et. al. 2001).

Osteoporotic fragility fractures impose a considerable financial burden on health services due to reduced patients mobility and hospitalization. In the European Union, in 1998, osteoporosis patients occupied 500,000 hospital bed-nights per year, and this was expected to double by 2050 (Clayer MT et. al. 1989) . Hip fracture associated with high morbidity and mortality of up to 20% in the first year post injury. Majorities are disabled and only 25% will resume premorbid activities (Jensen JS, Bagger J 1982).

In Malaysia the incidence in 1997 for individuals above 50 years olds was 90 per 100000. There are marked increased in incidence among elder age group and among women (Lau EM et. al. 2001).

	Incidence by Age Group (per 100,000)		
Age Group	Male	Female	Overall
50-54	10	10	10
55-59	20	30	20
60-64	40	50	40
65-69	60	100	80
70-74	100	230	170
≥ 75	320	640	510

Table 1: Incidence of hip fracture in Malaysia (1997). (E. M. C. Lau, J. K. Lee et al (2001))

There was a marked increase in incidence of hip fracture among the-older age group. The direct hospitalization cost for hip fractures in 1997 is estimated *at* RM 22 million and rising each year as medical treatment progress and the aging population increase (Lee JK et al 2006). The age selection criteria for this study is planned to identify the earliest occurrence of osteoporosis for prevention of fracture this major disability.

In Kelantan the total population is 1,373,173 with population of Kota Bharu district of 425,294. Number of people in group 45 years old and above are estimated around 30% of the population based on national data. This poses a high potential for devastating osteoporosis impact if the problem not tackled seriously. Race distribution in Kelantan as in Figure 1.

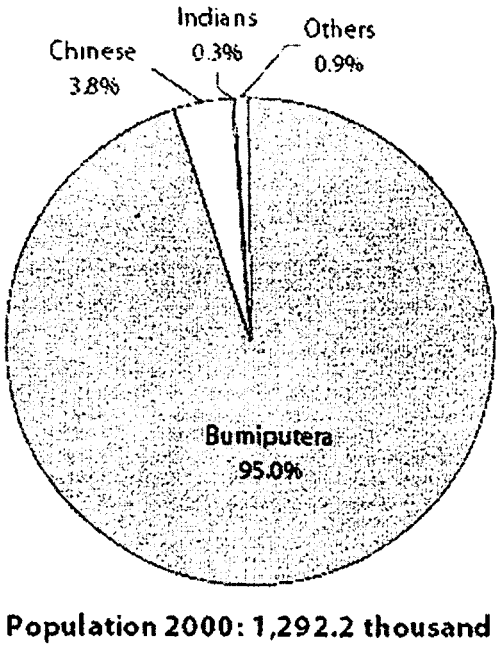

Fig 1: Kelantan population distribution
Source of data: *Department of Statistics, Population Distribution and Basic Demographic Characteristics, Census 2000;*

The mean menopausal age in population based studies in Malaysia is 50.7 years old done by Ismael in 1994 and 49.4 years old by Dhillon in 2007. Caucasian data indicates menopause age at 53 years old. This value indicated that our women population in Malaysia having menopause 3 years earlier and having higher potential of disability with osteoporosis.

Osteoporosis can be divided into primary and secondary osteoporosis. Primary osteoporosis consists of post menopausal and senile osteoporosis. Post menopausal osteoporosis affects the women in between 45 to 65 years old where high bone mineral turnover phase is the cause for concern, where else the senile osteoporosis affects elderly more than 65 years old equally between genders. Another cause for primary osteoporosis is idiopathic osteoporosis but the incidence is rare.

Secondary Osteoporosis can be divided into categories:-

1 Endocrine

- Cushing's syndrome
- Hypogonadism
- Thyrotoxycosis
- Hyperparathyroidism

2 Drugs

- Glucocorticoids
- Heparin
- Phenytoin
- Immunosuppressants

3 Chronic diseases

- Renal impairment
- Liver cirrhosis
- Malabsorption/ post-gastrectomy
- Chronic inflammatory polyarthropathies (e.g. Rheumatoid Arthritis)

4 Others

- Nutritional
- Malignancy/ multiple myeloma
- Osteogenesis Imperfecta

Osteoporosis leads to decrease in bone strength which leads to fracture. Bone strength is determined by the bone density and the quality. Bone density is determined by

peak bone mass and the amount of the progressive bone loss especially post menopause. Bone mineral density (BMD) defines as bone density per area with this formulation.

$$BMD = \frac{\text{Bone density}}{\text{Area}} = \frac{\text{grams}}{cm^2}$$

Bone mineral density peaks during third decades of life and deteriorates with advancing age especially in the period immediate after post menopause.

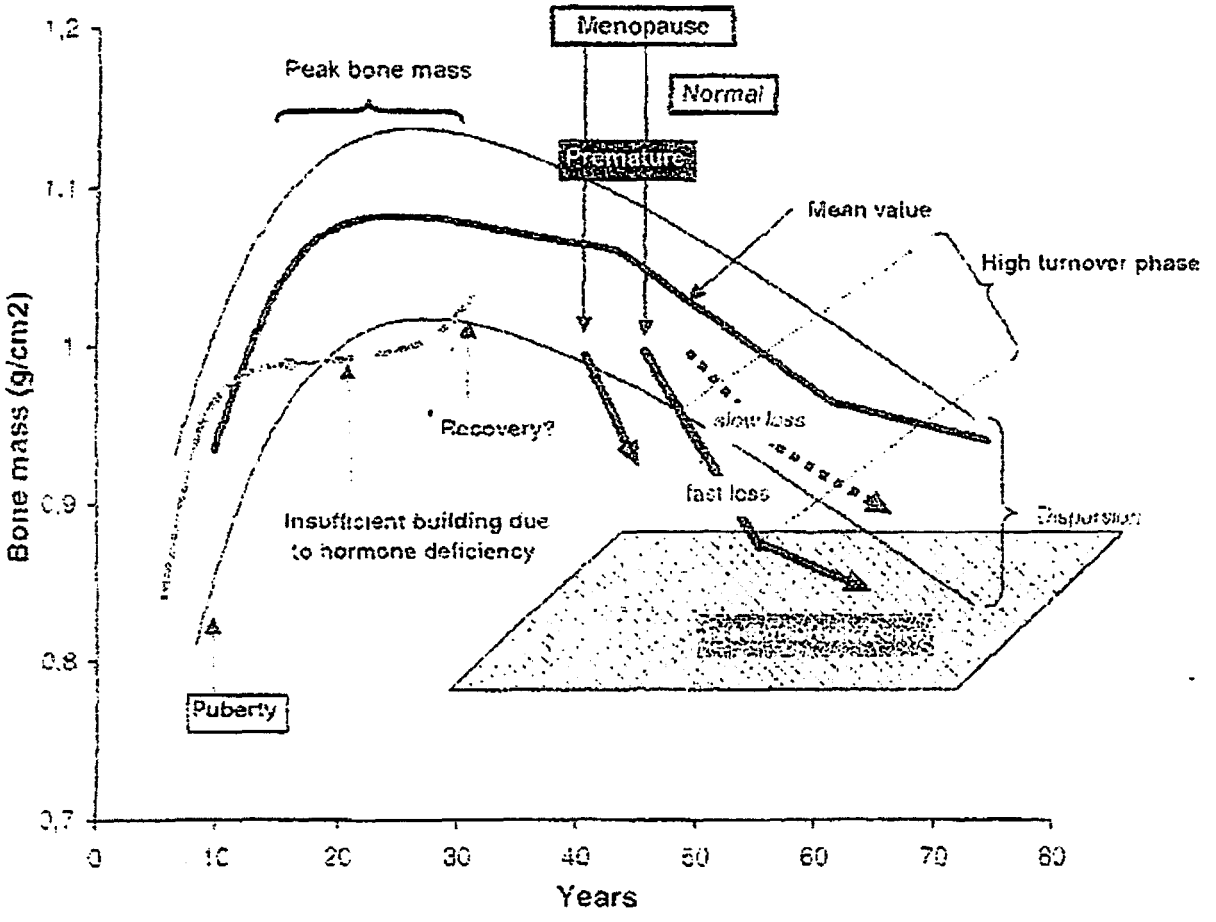

Fig 2 : Changes of BMD over Time (adapted from Hadji et.al 2002, 'The possibility of estrogens and progesterone in prevention of osteoporosis'. *Geburtsh Frauenheilk* 62:436-45)

World health Organization (WHO) working group on osteoporosis defined osteoporosis based on the bone mineral density in comparison with age group.

They defined osteoporosis as T score below -2.5 SD (standard deviation). This value would identify 95% of women at highest risk of fracture.

Table 2 : The World Health Organization (WHO) working group classification of osteoporosis

Normal	Bone mineral density (BMD) within 1 SD of young adult reference range (T score > –1)
Osteopenia	BMD more than 1 SD but less than 2.5 SD below the young adult mean (T score between –1 and –2.5)
Osteoporosis	BMD value of 2.5 SD or more below the young adult mean (T score $\leq$ –2.5)
Severe/ Established Osteoporosis	BMD value of 2.5 SD or more below the young adult mean with the presence of 1 or more fragility fractures

* T score: comparison with young adult mean

The T-score is the number of standard deviations below the average for a young adult at peak bone density.

$$\text{T score} = \frac{\text{Measured BMD} - \text{Young Adult mean BMD}}{\text{Young adult population standard deviation}}$$

The Z-score is the number of standard deviations below an average person of the same age, race and gender

$$\text{Z score} = \frac{\text{Measured BMD} - \text{Group age specific mean BMD}}{\text{Group age specific population standard deviation}}$$