Original Article

The Demographic Changes of Menopausal and Geripausal Women in Korea

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Background: Osteoporosis and resultant fracture seems to be the most common skeletal disease, affecting female exclusively. Osteoporosis increases exponentially with menopause and age. Therefore the demographic data seems to be the most important & fundamental for the study of osteoporosis epidemiology. **Methods:** This study was to analyzed population projection from 1960 to 2060. We evaluated the demographic change of female, postmenopausal and elderly geripausal population in South Korea using Korean statistical information service database as basic fundamental data for osteoporosis epidemiology. **Results:** According to population projection, the total female population will be exceeds the total male population since 2015 and maximize up to 2030. In 2030, nearly half of female will become postmenopausal and one fourth of women elderly will be geripausal. Of total female population in 2060, the proportion of postmenopausal women will be increased up to 59.8%. **Conclusions:** According to population projection in South Korea, six of ten women in 2060 will be postmenopausal and seven of ten postmenopausal women geripausal. As expected to increase proportion of elderly women, dramatic rise of osteoporosis and osteoporotic fracture also expected. Health providers pay more attention to postmenopausal and geripausal women health care.

Key Words: Demography, Forecasting, Korea, Menopause

INTRODUCTION

Osteoporosis, the most common metabolic bone disease, is a major health problem throughout the world. Osteoporosis is exclusively women's disease and its prevalence increases as population ages. Primary osteoporosis, one of 2 broad categories of osteoporosis, has been divided traditionally as type I postmenopausal and type II senile osteoporosis according to menopausal states and ageing process. Therefore demographic survey on certain society or nation seems to be the fundamental for the epidemiological study of osteoporosis.

The elderly population of Korea has been rapidly growing. The elderly comprised 3.1% of total population in 1970. Now in 2015, it is increased up to 13.1%. The female life expectancy in Korea is 84.6 years, 6.8 years longer than male in 2015. [1] As growing elderly population, the population of old women will be also increasing.

In this year of 2015, the Korean total population is 50.62 million with 25.31 million female population. From this year, female population exceeds the male popu-

lation. The number of aged 65 and over is 6.62 million, composed of 13.1%. The population of women aged 50 and over, that seems to be menopausal, is 9.31 million, comprising 36.8% of total female. The proportion of women aged 50 to 64 years is 21.5% and 65 years and over is 15.2%.

As growing of old women population, menopausal women will also increase. Estimation of postmenopausal population is essential information for health care providers, especially gynecologists, endocrinologist and geriatricians.

But there has been no clear demographic information about postmenopausal and elderly geripausal population. The aim of this study was to survey the demographic changes of 1) Korean women, 2) postmenopausal women, and 3) elderly geripausal women using Population projection 1960-2060 from Korean Statistical Information Service (KOSIS).

METHODS

We use population projection 2010-2060 from KOSIS published in 2011. Population projection is made basis of population and housing census 2010. Average annual increase rates and cumulative increase are used for change of population. The average annual increase rates are calculated on the assumption that growth is continuous. The cumulative increase is calculated rate of increase and decrease basis of population of 2000.

1. Definition of terminology
1) Elderly
Elderly person is defined as 65 years and over in our study.
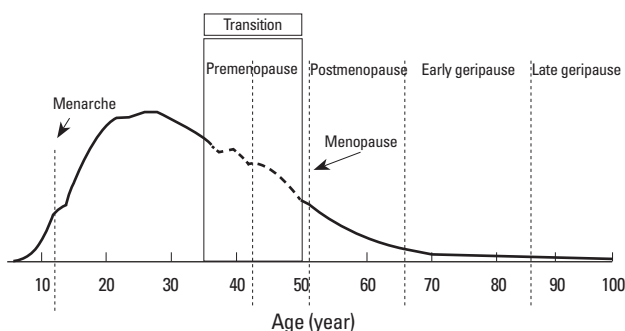
Fig. 1. Definition of menopause and geripause. During reproductive cycle estrogen fluctuates up to 300 pg/mL. In period of transition to menopause, estrogen begins to gradually decrease. Eventually over age 65, early geripause, have less than 10 pg/mL.

The status of society is divided into three categories based on proportion of population of 65 years and over: Ageing society (from 7% to 14% elderly population) , aged society (from 14% to 20%), super-aged society (exceed 20%).[2,3]

2) Postmenopause
According to Gallup survey 2001, Korean women undergo menopause at 49.7 years on average. So women older than 50 years is potentially regarded as postmenopausal in this study.

3) Geripause
Geripausal women is defined if she is 65 years or over. Early geripausal women is 65 to 85 years and late geripausal women is aged 85 years and over (Fig. 1).

RESULTS

1. The total population and elderly population in Korea

The total population was 47.01 million in 2000 and 49.41 million in 2010 (Fig. 2). Population will grow by 0.3% annually and reach the top in 2030, 52.16 million. After 2031, total population will be decreased by 0.3% annually and reach to 43.96 million in 2060.

In 2000, the Korean elderly population was 3.39 million, take 7.2% of total population. So Korea is already in the phase of the ageing society. Now in 2015, elderly popula-
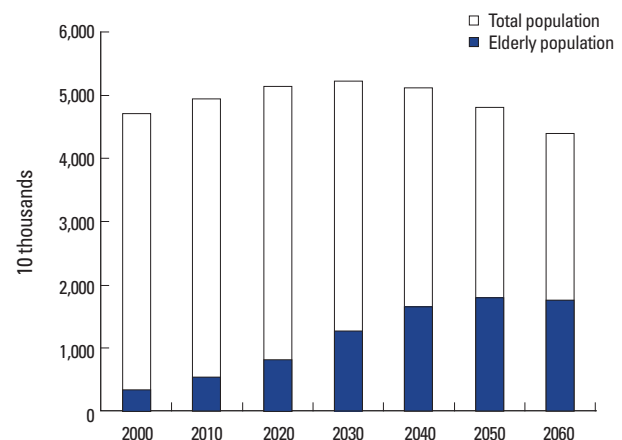
Fig. 2. The change of total and elderly population in Korea. Total population will be maximum in 2030, 52.16 million. After 2031, it will be decrease to 43.96 million, in 2060. Elderly population will be increase continuously. In 2030, 24.3% of total population will be elderly and increase to 40% in 2060.

Table 1. The demographic change of female population in Korea

Year	Total female population (Ten thousand persons)	Cumulative increase (%)
2000	2,334	100.0
2010	2,465	105.6
2020	2,579	110.5
2030	2,626	112.5
2040	2,583	110.6
2050	2,438	104.5
2060	2,219	95.1

Table 2. The number and proportion of menopausal and geripausal population

Year	Menopausal population		Geripausal population	
	Number (Ten thousand persons)	%	Number (Ten thousand persons)	%
2000	526	22.5	210	9.0
2010	770	31.2	323	13.1
2015	931	36.8	386	15.2
2020	1,079	41.8	463	18.0
2030	1,315	50.1	701	26.7
2040	1,436	55.6	904	35.0
2050	1,460	59.9	984	40.4
2060	1,328	59.8	942	42.5

tion is 6.62 million which is doubled from 2010, comprising 13.1% of total population. Elderly population will grow by 2.8% annually until 2060. In 2018, the proportion of elderly population will exceed 14% so Korea will become the aged society. Eight years later, in 2026, Korea will enter a super-aged society. The elderly population will be 12.69 million in 2030, 17.62 million in 2060. Forty percent of total Korean population will be elderly person in 2060.

2. The female population in Korea

1) Total female population

Female population was 23.34 million in 2000 which was less than male population. However, from 2015, female population will be 25.31 million, which exceed male population number. Female population will increase 0.4% annually until 2031 and reach to 26.26 million. From 2032, female population will decrease by 0.6% annually and become 22.19 million in 2060, which still exceed male population. Comparing with female population in 2000, female population in 2030 will increase by 12.5% from 2000. However, the female population in 2060 will be decreased 4.9% from 2000 (Table 1).

Population of females who are younger than 50 years will decrease by 1.2% annually. On the contrary, the number of females aged over 50 years will increase 1.6% annually. Population of the females age under 14 years will steadily decrease (4.67 million in 2000, 3.83 million in 2010, 3.40 million in 2015, 3.19 million in 2030, 2.17 million in 2060). Number of the females from 15 to 49 years old will also decline (13.42 million in 2000, 12.60 million in 2015, 99.0 million in 2030 and 6.73 million in 2060).

2) Menopause

The postmenopausal population was 5.26 million in 2000 which comprised 22.5% of total female population. The

population of menopausal will be increased by 1.6% annually until 2060. In 2030, the menopausal population will be 13.15 million, comprising nearly half of entire female population. In 2060, six out of ten female will be postmenopausal, which will be 13.28 million (Table 2).

3) Geripause

The geripausal population was 2.10 million in 2000, which comprised 9.0% of total female population. In 2020, geripausal population will be doubled from 2000; 4.63 million which will comprise 18% of total female population.

Geripausal population will be increased by 2.5% annually and become 7.01 million & 9.42 million in 2030 & 2060 respectively. The proportion of geripausal population among entire female population will be 42.5% in 2060 (Table 2).

The geripausal proportion of menopausal population is 41.4% in 2015. In 2027, the population of geripausal will be 6.31 million, which will make up nearly half of the menopausal women. Seven out of ten menopausal women will be geripausal women in 2060.

(1) Early geripause

Early geripausal population was 1.96 million in 2000 and is 3.45 million in 2015. Early geripausal population will be grown by 2.1% every year until 2060 and it will become 6.10 million & 6.67 million in 2030 & 2060 respectively. Until 2015, three out of ten postmenopausal females are early geripausal and nearly half of postmenopausal females will be early geripausal in 2060.

(2) Late geripause

The late geripausal population was 0.13 million in 2000

and numbered 0.27 million in 2010. Annual mean increase rate of late geripausal population is 5.2%, from 2000 to 2060. The number of late geripausal population in 2015 is 0.41 million and this number will be doubled as 0.91 million in 2030 and will be increased sevenfold in 2060 and become 2.76 million.

The proportion of late geripausal among menopausal women was only 2.5% in 2000. However, the proportion increased gradually to 3.6% and 4.4% in 2010 & 2015 respectively. In 2060, 20% of postmenopausal females' age will be over 85 years.

DISCUSSION

According to our survey on demographic changes in Korea, total population, will be peak in 2030, reaching 52.16 million in number. By 2030, one out of 2 women will be postmenopausal & nearly 1 out of 4 women will be geripausal. The postmenopausal population will reach about 22.19 million in number by 2060, comprising nearly 60% of all female and the elderly, geripausal population will be 9.42 million in number, comprising 43% of all female.

The greying of Korea is accelerating due to low birth rate and increased life expectancy. The ageing rate of Korea is faster than that of developed country. Korea has already been an aging society since 2000. After only 26 years, Korea will become a super-aged society through aged society in 2018.[4]

According to reports from 2013 United Nations,[5] ageing is worldwide phenomenon. The cause of ageing is decreasing mortality and decreasing birth rate. The relative decrease in the youth population due to reduced fertility is most important cause. World population over 60 years increased 9.2% in 1990 to 11.7% in 2013. And it will increase 21.1% in 2050. The old women are living longer than the old men and it is universal feature.[6] The world is going to small, old and female society.

Some developed countries, such as Germany, Italy, and Japan had already over 20% of elderly, in 2012. Until 2030, elderly proportion is projected to increase in all developed countries. In 2030, one third of Japanese will be elderly (32.2%). In USA, elderly population was 43.1 million in 2012, and it will expected almost double in 2050, as 83.7 million.[5]

As getting older, there are many changes in body composition and hormonal regulation system to maintain homeostasis. The declined hormonal function influences end organs. The elderly people are susceptible to disease because of poor adaptation.[7] According to the report from Korea National Health and Nutrition Examination Survey, one in four old people have restriction on daily life due to Health problem or disability.[8]

Mean age of menopause In Korean women is 49.7 years. Menopausal age is similar to other countries. For instance, 50 years is mean menopausal age in the USA, 48.6 years in Australia and 49.0 years in Singapore.[9] As life expectancy of women is longer, women live about 30 years after menopausal state. By 2030, postmenopausal women will be half of the entire Korean women. Even more in 2060, the number of postmenopausal women will outnumber. Therefore Health care for postmenopausal women will be most important issue for health care providers.

Low estrogenic state cause many health problems. Vasomotor and psychological symtoms are early menopausal symptoms. Followed symptoms are urogenital atrophy, skin ageing from collagen loss, myalgia and arthralgia. Chronic sequelae are osteoporosis, cardiovascular disease (CVD) and senile dementia.[10]

Estrogen plays an important role in bone formation and maintaining bone. So bone loss is accelerated after menopause. The rate of bone loss is maximal during the first 5 years and may be 3-5% annually. The rate begins to decrease 10 years after menopause but continues throughout the postmenopausal years. There are two aspects of osteoporotic fracture, one is crush fracture syndrome occurs 55 to 65 years, called postmenopausal osteoporosis. The other is hip fracture occurred in elderly person, called senile osteoporosis. Osteoporosis and osteoporotic fracture are associated with morbidity, mortality and high socio-economic costs. Osteoporosis is rising health problem in ageing society.[11]

In USA, 30% of postmenopausal women have osteoporosis and about 50% have osteopenia. As getting older, prevalence of osteoporosis is increasing. At the age of 80, 27% have osteopenia and 70% have osteoporosis. Life time risk of osteoporotic fracture is 39.7% in women and 13.1% in men.[12] About 38% of Chinese women and 31% Japanese women aged 50-79 years have osteoporosis.[13] According to Korea National Health and Nutrition Examination Survey, reported prevalence of osteoporosis of Korean men and women older than 50 years is 7.5% and 37.5%, similar

to the western. Classifying by age group, prevalence of osteoporosis in women is 15.5%, 36.6%, and 68.7% in 50's, 60's and over the 70's respectively, compared with 3.5%, 7.5% and 18.0% in men.

Osteoporosis increases the risk of fracture especially in vertebra, hip and wrist. Hip fracture is associated with high mortality and morbidity.[14,15] Osteoporotic fracture in the US is about 2 million cases. Seventy-two percent of Medicare budget for fracture was associated with osteoporotic hip fracture. This cost will be rising to 253 billion in 2025.[15] In Korea, 3 of 4 osteoporotic patients did not know morbid state and only one in ten patients was on medication for osteoporosis.[16] Health providers for elderly people needs more concern for prevention, education and treatment of osteoporosis.

CVD is leading cause of death in western society.[10] In Korean women, CVD is third cause of death.[17] Because women's CVD is increased after menopause, increased incidence of CVD is seen women after 50's compared with increase in men in 40's.[18]

Dementia is most common cause of disability in elderly person. Women are higher risk for developing dementia than men. The prevalence and incidence of dementia is tend to higher in postmenopausal women because of longer life expectancy of women and long term effect of estrogen deficiency.[18] The prevalence of dementia among Korean elderly people is reported as 9.18% in 2008 and it will increase 9.61% in 2030, followed by 13.17% in 2060. [19,20]

Women over 65 years encounter not only postmenopausal changes but also changes from ageing. Eskin and Troen [21] first proposed the term 'geripause' for postmenopausal women over 65. He insisted that geripause can be divided into early, 65 to 85, and late, 85 and over. Geripausal women go through a lot of changes from ageing rather than menopausal changes. After 65 years, gonadotropin begins to decrease and estrogen level is lower than early menopausal level. Clinically, menopausal symptom such as hot flush, urogenital atrophy, mood change improved slightly. Instead, other endocrinologic changes are occured such as thyroid function abnormality, impaired glucose tolerance and adrenal impairment. Therefore geripausal women need new environmental and medical settings, such as diet adjustment, regulation of medication dosage, multidrug use, and new laboratory standards.[21,22]

In contrast of decreasing of total women, geripausal women will increase continuously during the next 45 years in Korea and, the number will be more than double. Average annual increase rates of late geripausal women are 5.2%, suggestive of the fastest growing population. In 2060, four of Korean women will be geripausal and one of menopausal women will be late geripausal. Therefore we needs more concern about geripausal change and manage for geripausal women.

In conclusion, in the year of 2060, six of ten women will be postmenopausal and seven of ten postmenopausal women will be geripausal. As expected to increase proportion of elderly women, dramatic rise of osteoporosis and osteoporotic fracture also expected. Health providers pay more attention to postmenopausal and geripausal women health care. For adequate care of osteoporosis, collaboration of primary physician and specialist in bone metabolism will be essential. We urgently needed the adequate strategies against rapid aging of our Korean society at moment.

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