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Osteoporosis in Sri Lanka

Sisira Siribaddana * Sarath Lekamwasam *

スリランカでは年齢の中央値は1991年25歳であったが、2041年までに45歳に延長すると期待されている。筆者らはスリランカにおける2つの疫学研究について述べる。第一に Galle Prospective Osteoporosis Surveyにおいて現在の選挙登録者の中から350名の女性を選んだ。全体の42.4%、50歳以上の61.5%に骨粗鬆症が見出された。第二の研究ではコロンボの近くの都市部において踵骨の超音波検査から stiffness index とカルシウム摂取を調査した。筆者らは1,250名を選挙者名簿から選び986名が調査に同意した。Stiffness index は平均閉経年齢の50歳から減少し始め、男性では70歳で減少し始めた。

In Sri Lanka the median age, which was 25 in year 1991, is expected to rise to 45 by the year 2041 and half of the population will be over 45 years and vulnerable to osteoporosis. We describe 2 large epidemiological studies done in Sri Lanka. The first one, Galle Prospective Osteoporosis Survey, in its initial phase recruited 350 women randomly from the current voters registers. 42.4% of women in the entire sample and 61.5% in women over 50 years were found to have osteoporosis. The second study was to assess the prevalence of stiffness index with heel ultrasound and calcium intake in a suburban population close to Colombo. We randomised 1250 from electoral register numbers and 986 people consented to participate. Stiffness index start decreasing after the age of 50, which is the average age of age of menopause. In men stiffness decreases after age of 70.

Prevalence of Osteoporosis

Sri Lanka is an island with a land area of 65,654 square kilometers. The mid year estimated population for 1999 is 19 million with a growth rate of 1.4 percent¹⁾. Life expectancy in

Sri Lanka in the year of 1991 was 71 for males and 75 for females. This is projected to rise in year 2036-2041 to 77 years for males and 82 years for females. The median age, which was 25 in year 1991, is expected to rise to 45 by the

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Table 1 Increase in elderly population in Sri Lanka

Year	Projected population ('000)	Percent of population over 60 years	Projected population over 60 years ('000)	Old age dependency
1991	17 015	8.2	1,395	13.5
2041	22 693	27.8	6,308	47.9

Galle Prospective Osteoporosis Survey

Table 2 Prevalence of osteoporosis and age related trends in the bone density

Age Group (years)	39 below	40 ~ 49	50 ~ 59	60 ~ 69	70 above
Number	20	53	52	40	38
Spinal BMD (gm/cm ²)	0.977	0.934	0.810	0.698	0.622
Femoral neck BMD (gm/cm ²)	0.797	0.827	0.738	0.639	0.572
% of women with osteoporosis	0%	11.3%	42.3%	67.5%	81.6%

year 2041(half of the population will be over 45 years)²(Table1).

About 40% of women of northern European ancestry will suffer at least one osteoporosis fracture after the age of 50 years³. As there is no comparative data in Sri Lanka (Indo-Asians) if we extrapolate European data the burden of fragility fractures are expected to be enormous in future, as most women tend to live a major part of their life post-menopausal.

Galle (100 km south of Colombo and the capital of southern province) Prospective Osteoporosis Survey

We describe 2 large epidemiological studies done in Sri Lanka. The first one, Galle Prospective Osteoporosis Survey, in its initial phase recruited 350 women randomly from the current voters registers. Consented women who were free of bone active diseases and had not taken bone active medications underwent DEXA.

When the subjects were stratified according to the WHO criteria based on t scores, calcu-

lated using the Asian reference data provided by the manufacturer, 42.4% of women in the entire sample and 61.5% in women over 50 years were found to have osteoporosis.

1. Risk Factors

Osteoporosis was diagnosed in first 199 post-menopausal women using the WHO criteria based on BMDs of lumbar spine and femoral neck. Demographic data and data related to reproductive function were compared between women with and without osteoporosis. When compared with women without osteoporosis (n = 60), women with osteoporosis(n = 139) were older(66.3 verses 60 years p = < 0.001), shorter (1.45 verses 1.48 m, p = 0.007) and lighter (43.6 verses 51.1 kg, p = < 0.001). Osteoporotic women had more pregnancies (4.3 verses 3.4, p = 0.02), breast fed for a longer period (70 verses 44 months, p = 0.001) and had a longer duration since menopause (18.3 verses 12 ys, p = < 0.001)(Table2).

Table 3 Sri Jayewardenepura Osteoporosis Survey :
Heel ultrasound and anthropometrical data of 714 female participants

Age	No	Weight (kg)	Height (m)	BMI (kg/m ²)	BUA (dB/MHz)	SOS (m/sec)	Stiffness
20 ~ 30	146	50.04	155.68	20.61	114.19	1516.68	80.97
31 ~ 40	143	56.43	153.73	23.82	124.38	1502.15	79.84
41 ~ 50	160	57.64	153.14	24.50	115.36	1513.63	81.15
51 ~ 60	162	56.28	151.34	25.45	109.28	1498.34	72.18
61 ~ 70	74	52.99	149.18	23.77	100.22	1482.62	62.11
71 ~ 80	25	48.84	146.72	22.65	94.2	1474.6	55.68
81 ~ 90	4	38	142.25	18.86	89.25	1457	47.5

BUA = broadband ultrasound attenuation SOS = speed of sound

Table 4 Sri Jayewardenepura Osteoporosis Survey :
Heel ultrasound and anthropometrical data of 274 male participants

Age	No	Weight (kg)	Height (m)	BMI (kg/m ²)	BUA (dB/MHz)	SOS (m/sec)	Stiffness
20 ~ 30	74	59.09	169.64	20.42	121.20	1536.72	91.62
31 ~ 40	57	63.11	167.39	22.50	119.05	1530.40	88.14
41 ~ 50	50	63.48	165.5	23.16	116.16	1524.86	84.36
51 ~ 60	44	62.16	162.86	23.68	113.32	1511.82	79.41
61 ~ 70	32	60.41	162.28	22.98	115.16	1510.78	80.13
71 ~ 80	12	50.17	161.67	19.27	110.42	1519.00	76.92
81 ~ 90	5	54	165.8	19.66	90.8	1460.4	49.6

2. Specificity and sensitivity of different skeletal sites in diagnosing osteoporosis and the degree of misclassification at each site

Due to the different rates of bone loss at different skeletal sites, the site-specific prevalence of osteoporosis is not uniform and a discrepancy in the prevalence of osteoporosis between the spine and proximal femur can be seen. Analysis of initial 350 women who underwent DXA assessment in our institution showed that this discrepancy is much wider than that

was reported from the USA populations. A high degree of T score discordance was seen across skeletal sites. Prevalence of osteoporosis varied from 6.6% at trochanter to 49.5% at lumbar spine and proximal radius. Even within the two hip regions the prevalence varied from 6.6% to 15%. Patients were considered to have "definite osteoporosis" when T score was equal or below -2.5 either at spine or femoral neck (n = 174). By definition spine and femoral neck had 100% specificity. Trochanter and distal forearm bones had specific-

Table 5 Sri Jayewardenepura Osteoporosis Survey :
Classifications of participants according to T score derived for the stiffness index.

	Female			Male		
	T score < - 2.5	T score between - 2.5 to -1	T score ≥ - 1	T score < - 2.5%	T score between - 2.5 to -1	T score ≥ - 1
21 ~ 30	0	14	86	0	19	81
31 ~ 40	1	19	80	0	21	79
41 ~ 50	0	13	87	6	26	68
51 ~ 60	6	30	64	5	27	68
61 ~ 70	7	54	39	0	34	66
71 ~ 80	8	68	24	17	33	50
81 ~ 90	100	0	0	60	40	0
Total	2.9	24.6	72.5	3.6	24.8	71.5

(Only percentages are shown here.)

ity above 90% and proximal radius showed the lowest but acceptable specificity. Lumbar spine had the highest sensitivity (94%) followed by proximal radius with 84% and distal forearm bones with 55%. Both regions in the hip were found to have a low sensitivity.

Sri Jayewardenepura (suburb of Colombo, administrative capital of Sri Lanka) Osteoporosis Survey

The second study was to assess calcium intake and the prevalence of stiffness index with heel ultrasound in a suburban population. Three Family Health Worker (FWH-the smallest preventive unit in the island) areas adjacent to the University Family Medicine unit were selected. There were 20,489 people living in these 3 FHW areas and 8,383 of them were over 20 years. All people over 18 years are entered in the electoral registers. We randomized 1,250 from electoral register numbers and 986 people consented to participate (79%).

Although height decreases progressively with advancing age weight decreases after 60 years. BMI also starts to decline after age of 60 after progressive increase from years 20. BUA, SOS and stiffness start decreasing after the age of 50, which is the average age of age of menopause (Table3).

In men weight and BMI decrease after age of 60. Height decreases progressively with advancing age. BUA and stiffness decreases after age of 70 and SOS decreases only after age of 80. This quite contrasts to women whose BUA and stiffness decrease after the age of 50. The stiffness is the most robust measurement of the QUS parameters and we used this as means of classifying our patients¹⁴. Although the manufacturers give a T score for the stiffness with each measurement, these T scores are based on the reference data from the white Caucasian population. We derived the Sri Lankan T score values for each gender by using the following formula (Table4) .

Table 6 Calcium Intake in both males and females

Age	Females				Males			
	Mean (mg)	Milk%	Fish and meat%	Vegetables, pulses and other %	Mean (mg)	Milk%	Fish and meat%	Vegetables pulses and other %
21 ~ 30	1446	18	32	50	1386	17	33	50
31 ~ 40	1482	16	32	52	1343	16	32	52
41 ~ 50	1448	15	33	52	1576	12	34	54
51 ~ 60	1354	17	31	52	1311	16	32	51
61 ~ 70	1354	17	31	52	1325	18	36	45
71 ~ 80	1252	16	31	53	1215	20	32	48
81 ~ 90	1277	12	53	35	752	20	33	47

Table 7 Percentage of Refuse in Foods as purchased and the Composition of Foods per 100 g (or 100 mL) edible portion

	Calcium in mg
Millet, Kurakkan	350
Cashew nuts	1,200
Sesame seeds	1,200
Alternanthera-Mukunuwenna	510
Sesbania (Kathurumurunga)	1,130
Cummin	1,080
Mustard	490
Pepper, black, dry	460
Coconut jaggery	1,638
Tea, dried leaves	527
Tea infusion	3

T score = (Participants stiffness value - Mean stiffness value of the age group between 20 ~ 30years) / SD of the stiffness value of age group between 20 ~ 30years] (Table5) .

Calcium intake was obtained from a semi-quantitative food frequency questionnaire. Calcium intake decreases around 100mg after the age of 50 and another 100 mg after the age of

70 in the females. In the men also there is decrease in calcium intake at old age (Table6) .

Clinical facilities for Osteoporosis

Osteoporosis Society of Sri Lanka has produced guidelines on treatment of postmenopausal osteoporosis and calcium intake. Ground water in some areas contain excessive

amount of calcium and fluoride. Dental fluorosis and skeletal fluorosis have been reported from dry zone and this may be a confounding factor when interpreting BMD values^{5, 6)}. Calcium content of some indigenous food items is high and can be used to supplement calcium in the diet⁷ (Table7).

D6XA scan or heel ultrasound are not available in the state health sector and only 2 D6XA scans are available in Sri Lanka, one in Galle (costs \$4.5) and one in private sector in Colombo (costs \$30). None of the drugs currently recommended for the illness are available in the government sector. A generic bisphosphonate costs \$4.5 and branded product is \$45 per month. The average monthly income is \$14.4 per person in Sri Lanka. If the World Trade Organisation's (WTO) agreement on Trade Related aspects of Intellectual Property (TRIPS) becomes the law, average Sri lankan patient will not be able to afford effective drugs for osteoporosis⁸⁾.

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