Original Research Article

Prevalence of osteoporosis in spinal cord injury

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Abstract

Background: Osteoporosis is a chronic metabolic bone disease-related to various factors including menopause, old age, less physical activities, prolonged bedridden patients, spinal cord injuries etc. About 200 million people had been affected worldwide due to osteoporosis. Osteoporosis has affected nearly 50 million Indians. Numerous clinical series have reported a high incidence ranging from 1 to 34%of lower extremities fractures in spinal cord injuries. The pathogenesis of osteoporosis after SCI remains complex and perplexing. Disuse may play an important role in the pathogenesis of osteoporosis, but neural factors also appear to be important. Our aim of study to measure the prevalence of osteoporosis in SCI patients who attended outpatient clinic in government institute of rehabilitation medicine during June 2019.

Key Word: osteoporosis, spinal cord injury.

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INTRODUCTION

Bone loss is a common complication in spinal cord injury patients.[1] Reduced muscular activity and mechanical loading causing reduction in bone mineral density after a spinal cord injury. The rate of bone loss is rapid and linear in acute stages which stabilize in one to two years post injury.[2] The loss of bone mineral density is found to be more in the lower limbs than the upper limbs. The fracture risk is closely related to bone mineral density.[3]

MATERIALS AND METHODS

Participants and study design

Cross sectional study conducted with 30 participants with traumatic spinal cord injury who attended OPD between June 2019 at Government Institute of Rehabilitation Medicine, Chennai were included in the study. Inclusion criteria: Age 18 to 60 years, both sexes, duration of injury >5 years, ASIA A or B as per American Spinal Injury Association Impairment Scale. Exclusion criteria: duration of injury <5 years, not willing to participate in the study, heterotopic ossification.

METHODOLOGY

Demographic details collected: age, sex, duration of injury, level of injury, medication history, history of fracture after the spinal cord injury, rehabilitation details. Informed consent was obtained. All participants were made to undergo Dual Energy X-ray absorptiometry of femoral neck and hip on the non- dominant side. The procedure of the scan was done as per The international society of Clinical Densitometry guidelines. The bone mineral density was measured in g/cm.^{2}

RESULTS

A total of 30 spinal cord injury patients participated in the study which includes 22 males(73.33%) and 8 females(26.67%). The mean age of the males was 43.6 years and that of females was 47.8 years. The level of injury was cervical- 9 (30%), thoracic- 16 (55.33%) and lumbar- 5 (16.67%) with 8(26.67%) participants on ASIA A level and 22(73.33%) on ASIA B level. The duration of injury was 5-10 years for 23(76.67%) participants and >10years for 7 (23.33%) participants. 26(86.66%) of the population was taking calcium supplements, 5(16.66%) were taking Vitamin D supplements and 2(6.67%) were

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taking bisphosphonates. 1 participant reported history of fracture of tibia and 2 reported fracture neck of femur.

Table 1

Sex	Male	22
	female	8
Mean age	Male	43.6
	Female	47.8
Level of injury	Cervical	9
	Thoracic	16
	Lumbar	5
ASIA	ASIA A	8
	ASIA B	22
Duration of injury	5-10 years	23
	>10 years	7
Medication history	Calcium	26
	Vitamin D	5
	Bisphosphonates	2
Fracture history	Tibia	1
	Femur	2

The mean bone mineral density in hip was 0.560 in males and 0.495 in females. The mean BMD in neck of femur was 0.515 in males and 0.469 in females. Mean Z score in hip was -2.51 in males and -2.78 in females. The mean Z score in neck of femur was -2.05 in males and -2.02 in females

Table 2

	Male	Female
Mean BMD g/cm²- Hip	0.560	0.495
Mean BMD g/cm²- Neck of Femur	0.515	0.469
Mean Z score- hip	-2.51	-2.78
Mean Z score- Neck of Femur	-2.05	-2.02

DISCUSSION

Pathogenesis of loss of bone mineral density is due to hormonal causes, aging and reduced physical activity. Coupaud *et al.* have found a more reduction in BMD in women after spinal cord injury.[4] A study by Slade *et al.* concluded that the effect of spinal cord injury on bone mineral density was higher than that of estrogen loss due to menopause.[5] Absence of weight bearing activities is found to play a major role in loss of bone mineral density in motor complete paraplegics below the level of spinal cord injury.[6] Disturbances in autonomic nervous system with altered sympathetic activity also lead to accentuated bone loss.[7] As the bone mineral density decreases the capacity to preserve the bone integrity during mechanical loading reduces.[8] The bone mineral density loss is more prominent in femur and tibia, the fracture risks are higher at these sites.[9,10,11] The most common circumstances when fractures occur were falls from wheelchair during transfers.[10,11] Previous studies have shown incidence of fractures in spinal cord injuries is 10-34%.[11,12] The fracture risk was higher in women in non spinal cord injury individuals.[13,14] Carbone *et al.* showed a significant association between lower limb fractures in spinal cord injury more than 2 years duration[15] The fracture incidence did not show significant difference between the sexes in spinal cord injury patients. The bone loss was more in the female participants when compared with the male. Osteoporosis and fractures increase the morbidity and mortality in spinal cord injury patients. Fracture management is challenging in this population and increase occurrence the complications like deep vein thrombosis, pressure ulcers and increased risk of surgery related complications. Addressing the bone health with medical management, physical therapy and reducing fall incidence is of paramount importance in preventing osteoporosis and bone related complications

The Z score

LIMITATIONS

Small sample size. Further study with larger sample size including bone mineral density evaluation at tibia should be done. There was no control group of the same age group.

CONCLUSION

The bone mineral density was found to be lower in spinal cord injury patients. Addressing the bone health with medical management, physical therapy and reducing fall incidence is of paramount importance in preventing osteoporosis and bone related complications. The need of patient education and development of protocols to treat and prevent osteoporosis in spinal cord injury as a part of rehabilitation program is reemphasized by the study.

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