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Literature Review on Non Pharmacological Method of Prevention & Management of Osteoporosis in Cerebral Palsy Children

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Abstract – Cerebral palsy is a non-progressive disorder of posture and movement due to insult to the developing brain. Its prevalence on the basis of population according to the reports is 1.2- 3.6 per live births. Cerebral palsy is one of the most prevalent condition which has been associated with osteoporosis due to decreased mobility. In terms of Cerebral palsy evaluation, prevention and management of osteoporosis is most important aspect. The purpose of this study is to justify that increased weight bearing activities in cerebral palsy children shows considerable improvement in BMD and the muscle strength and also improved their mobility status.

Intervention: A randomized literature review was conducted to find out the most suitable conventional method in prevention of Osteoporosis in Cerebral palsy children other than pharmacological intervention.

Results: Studies have revealed that weight bearing exercises and mobility training in cerebral palsy children has shown considerable improvement in prevention of osteoporosis and increase in BMD.

Conclusion: The present literature review reveals that weight bearing exercise with mobility training prevents osteoporosis which was one of the causative factor for secondary fracture in Cerebral palsy children.

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INTRODUCTION

"Cerebral palsy is non-progressive disorder of posture and movement due to insult to developing brain"[1]. Its prevalence on the basis of population according to study reports reveals that 1.2 – 3.6 per live births[2].Cerebral palsy is one of the most prevalent childhood condition which has an association with Osteoporosis[3].Increase in bone mass occurs throughout the childhood and during early adulthood .Presence of a peak bone mass is one of the key determinant of life time risk of Osteoporosis[4,5].According to WHO Osteoporosis is defined as a "Low bone mass and micro architectural detoriation of bone tissue leading to enhanced bone fragility and consequent increase in fracture risk"[6].Osteoporosis definition with respect to children composites of a BMD Z score less than or equal to-2 adjusted for age, gender and their body size along with significant history of fracture,(1) 2 upper extremity fractures or (2) vertebral compression fracture or (3) a single lower extremity fracture [3]. Research findings has proved that osteoporosis has its roots originated from childhood.Childrern with cerebral palsy usually presents significantly decreased bone density , which makes them prone to painful fractures resulting from minimal trauma, which leads to impairment in their normal function[3].

Risk factors for Osteoporosis in Cerebral palsy[7]

Poor growth and nutritional status ---------- Low calcium intake

Poor sunlight ---------- Immobility

Low Vitamin D ---------- Medications that interpret with Vitamin metabolism

Lack of weight bearing ---------- Growth hormone insufficiency

ChenCL et al in a research study has mentioned that children and adolescents with Cerebral palsy are at high risk of secondary osteoporosis because of reduced mobility[8, 9].For diagnosis of Osteoporosis on children the clinical report should reveal a significant fracture history and low mineral

content or bone mineral density(ISCD Pediatric position statement, 2008)[3]

Studies justifying occurrence of fractures in cerebral palsy:

'W' King et al (2003) in their study on Cerebral palsy has revealed that 39% of children with quadriplegic cerebral palsy presented with history of fracture[10].Presedo et al (2007) conducted a study on 1637 patients with cerebral palsy and found that 6% of the total had prevalence of fracture[11].A.I.Litt.A.Merfin et al (2006).E.Bischof et al (2002) in their study on cp has reported that 23% of 88 children of quadriplegic cerebral palsy had prevalence of fracture [14].

R.D. Stevenson et al (2006) conducted a study on occurrence of fracture on 261 children and reports have shown that 4.8 per 100 person developed fractures[14.].

It is found that number of chronic childhood disorder are associated with reduced mobility e.g.cerebral palsy, spinal cord injury, head injury, muscular dystrophy, spinal muscular atrophy, neuromuscular conditions with unknown etiology.

The main component for bone development is muscle tone and its function with mechanical loading which is more essential for development of bone growth. This particular term is called functional muscle bone unit. It was found that during childhood bone growth takes place both in length as well as width wise due to periosteal expansion, which is aided by mechanical loading created by the muscle tone[15].In cerebral palsy during bone growth the mechanical stimulus gets removed and occurrence of long narrow bones with weaker strength takes place which leads to vulnerable fractures[15].

Studies supporting weight bearing activities in cerebral palsy children in improving Bone mineral density (BMD) and bone growth.

In cerebral palsy standing frames are usually encouraged as a postural management approach in cerebral palsy children[17].In the standing programmes usually adaptive equipment e.g. standing frame with extended and adjustable support is provided for the patients to facilitate upright position.Literaure reveals that encouraging standing in developmentally appropriate position stimulates antigravity muscles, improves the muscle strength and endurance which facilitates independent standing in cerebral palsy children[18,19,20].

Han EY et al (2017) conducted a study to find out the effect of weight bearing on bone mineral density and bone growth on spastic cerebral palsy children.The study participants were screened by a dual-energy X-ray absorptiometry scan to measure the BMD of the femur and full-length anteroposterior radiography to measure the bone length of the femur and tibia, pre and post study findings were recorded and evaluated after 6 months. The results have shown that programmed weight bearing exercise for at least 2hours a day for more than 5 days a week could be used as an effective treatment to increase BMD and to achieve normal bone growth in children with cerebral palsy[16].C.L Chen e.t al (2011) has conducted a study on ambulatory children with cerebral palsy to find out the efficacy of home based virtual cycling training to improve bone mineral density. Thestudy results have revealed that there was an increase in lower limb strength and increase in femur BMD[17].Caulton JM et al conducted a clinical trial on 26 prepubertal children with cerebral palsy to evaluate the impact of standing /weight bearing on BMD.The study was conducted for a period of 9 months with comparison of study group and control group .The period of study was 180-675 minutes for a week. Standing training was given with assisted standing frames .The results had proved that there was considerable improvement in lumber spine BMD by 6%in the standing group compared to that of control group. This shows that increased standing can lead to decrease risk of vertebral fractures [1].

CONCLUSION:

With the review of literature it was found that various studies have reported increased weight bearing activities along with provision of good nutrition and with considerable intake of calcium and vitamin D, together with physical activity, should be enforced when provided to cerebral palsy children as part of treatment, can reduce the occurrence of fractures .It helps them to improve their BMD and also assist them in their mobility.

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