Comparison of Bone Mineral Density in Patients with Celiac Disease and Healthy Individuals

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Abstract

Objectives: To study the effects of celiac disease on bone mineral density.

Design: Case-control study.

Setting: The study was conducted in Department of Anatomy, Sardar Patel Medical College, Bikaner, Rajasthan.

Participants: A total of 90 patients, 60 control group healthy normal and 30 celiac disease patients case group were incorporated in study with informed consent.

Material and Methods: The bone mineral density was measured in case and control group at calcaneum by peripheral dual X-ray absorptiometry along with body mass index and age.

Results: The significant difference was found between the bone mineral density of case and control group (0.87±0.49 & 0.61±0.44: p=0.0001) and 43.33% subjects had osteopenia in case group while only 5% subjects had osteopenia in healthy group. The significant difference of bone mineral density in both groups below the age of 15 years was non existing but between the age group of 16-30 years it was significant(-1.17±0.68 & 0.68±0.21: p=0.001)

Conclusion: Celiac disease patients are at higher risk of osteopenia so it is suggested that they should be investigated in early time of diagnosis mainly in the growing years because it affects most at this time.

Key Words: *osteopenia, celiac disease, Bone mineral density, Body mass index*

Introduction

Celiac disease is an autoimmune disorder resulting from genetic as well as environmental factors[1]. Approximately 1% of the world's population is affected by it[2]. The gluten protein stimulates celiac disease which mainly found in wheat, rye and barley and common symptoms which can be experienced are abdominal pain, weight loss, vomiting, dermatitis herpetiformis, hypocalcemia and constipation, although clinical indications of celiac disease differ considerably according to age group[3]. Celiac disease causes malabsorption which leads to low bone mineral density, osteoporosis, rickets[4] and out of these the more common complication of celiac disease is low bone mineral density[5]. As Celiac disease causes bone diseases the prevalence of affecting by these are much more extensive for late diagnosed patients and relatively lower in early diagnosed patients[6].

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To measure the bone mineral density dual energy x-ray absorptiometry method is greatly opted[7] because of its high accuracy and great precision as well as low radiation exposure[8]. Even though there is a common agreement that gluten free diet improves the calcium metabolism and reverse the effects of low bone mineral density[9].

In the view of this consideration, the aim of the study was to evaluate the difference between the bone mineral density of case group and control group so that the risk of osteopenia can be observed.

Materials & Methods

This cross sectional study was conducted in Sardar Patel Medical College and associated group of hospital, Bikaner, Rajasthan. This study included total 90 subjects, 60 control group and 30 case group, in which control group included the healthy subjects and in case group celiac disease patients were included. The subjects which had any surgery and other disease except celiac disease were excluded from this study. All subjects gave informed voluntary consent to participate in the study. This study was approved by ethical committee of Sardar Patel Medical College. Bone mineral density was measured at the calcaneum bone by peripheral dual energy x-ray absorptiometry.

An appropriate lifestyle questionnaire was provided to the all subjects to determine date of birth, sex, weight and height. Some questions were asked to the older subjects and few parents of young subjects. The height was measured manually by non stretchable measuring tape or measuring stick for accuracy of the data. Weight is measured by portable weighing machine. Bone mineral density was measured with a dual-energy x-ray absorptiometer. Any metal object was removed from the area to be scanned. During the measurement the subjects were made to place the heel in the foot support and the lower leg rests back against the leg support. Readings in the digital screen were recorded. Although scan time was short (15 seconds) again care must be taken to ensure that the patient keeps still and does not move as there are no immobilization devices supplied. For accessing the bone mineral density WHO osteoporosis definition, based on T-score results was considered. According to that T-score greater than -1 is normal, T-score between -1 and -2.5 is osteopenia and T-score less than -2.5 is referred as osteoporosis. To compare the bone mineral density values of control group and case group multiple regression analysis were used.

Result

In this study, bone mineral density of case group was significantly low than the control group and the mean±sd value was 0.87±0.49 of case group while mean±sd value of control group was 0.61±0.44. p value was (p=0.0001) which was highly significant. Table no. 1 showing the details mentioned above.

Table 1- Distribution of study population according to their BMD

(n=90)

	Case (n =30)	**Control (n=60)**	**P VALUE**
BMD	**MEAN ±SD**	**MEAN ±SD**	
	0.8763±0.491	0.618 ± 0.445	0.0001*

The case group showed comparatively more percentage of osteopenia than in the control group. 13 out of 30 subjects were osteopenic in case group almost 43.33% and 17 subjects out of 30 were normal but in the control group only 5% subjects showed the osteopenia which means 57 out of 60 subjects were absolutely normal. Table no. 1 showing above metioned details.

Table 2 -Distribution of study population according to presence of osteopenia (n=90)

Osteopenia	Case (n =30)		Control (n =60)	
	Frequency(n)	Percent	Frequency(n)	Percent
Present	13	43.33%	3	5.00%
Absent	17	56.67%	57	95.00%
TOTAL	30	100.00%	60	100.00%

In the age group of below 15 years mean±sd value of bone mineral density for case group was -0.54±0.41 and for the control group it was -0.57±0.51 that leads the p value to 0.84 (p=0.84) which was not significant but in the age group of 16-30 years the mean±sd value for case and control group was -1.17±0.27 & 0.68±0.21 and p value was 0.001 (p=0.001) which was significant.

The results and findings of our study correlates compared to published data (Burrows R[10] et al 1999) and which shows the difference of bone mineral density values between the celiac disease patients and the healthy controls. They included 39 celiac disease patients in case group and 39 healthy subjects in control group. The mean±sd value for case group was (-0.98±1.0) and for control group was (0.19±0.93) and the p value was lower than 0.000 which was highly significant. Another similar study by Stefano Pantaleoni[11] et al 2014 also compared with our study which reported that in 169 patients, 71 patients (42%) were normal, 62 patients (37%) were osteopenic meanwhile 36 patients (21%) were osteoporotic.

Conclusion

In our study we found that the bone mineral density levels low in the case group than the control group and comparatively more subjects were suffering from the osteopenia in case group than the control subjects. So celiac disease patients are suggested to access the bone mineral density in early time of diagnosis to escape from the risk of developing osteopenia. Although some authors suggested that bone mineral density values can be reversed by the gluten free diet. According to our study, the patients of 16-30 years of age group are at higher risk of lower bone mineral density and these years are very crucial for development of skeletal growth of an individual as bone formation and resorption activities are high during skeletal growth and because peak bone mass is gained in childhood and adolescence, the precautions must be taken. The bone mineral density test must be done and strict gluten free diet should also be followed for good bone health and to minimize the risk of osteopenia. In our study, the age group of below 15 years did not show any significant difference in bone mineral density between the case group and healthy group. Therefore the patients under the age of 15 years should also take care of their diet and should also be taking the bone mineral density test so that the risk of developing osteopenia in growing age is least.

As our study was a cross sectional study, a longitudinal and large population study is also required to get a detailed examination of calcium metabolism of celiac disease patients to get more detailed data for reference and to evaluate whether or not life style and dietary precautions help to make up for the decreased BMD in CD patients over time and avoid skeletal complications.

Ethical Clearance - taken from ethical committee of Sardar Patel Medical college, Bikaner, Rajasthan.

Source of Funding - Self

Conflict of Interest - Nil

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Indian J Pediatr 2016

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