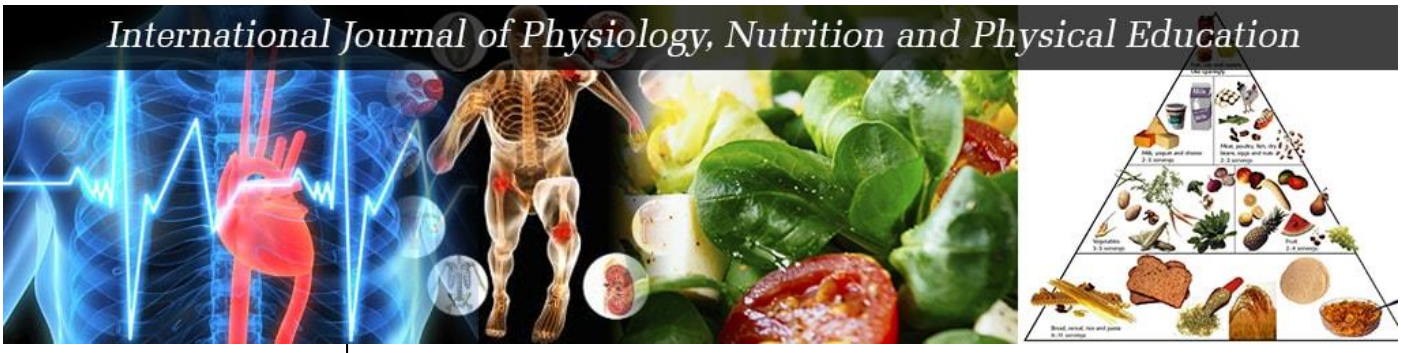

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Analysis of bone mineral density of different sports and games in university level players

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Abstract
The purpose of the study was to analysis of bone mineral density of different sports and games in university level players. To achieve the purpose of the study, one hundred and twenty men players were selected as subjects. The age, height and weight of the subjects ranged from 17 to 25 years, 162 to 175 centimetres and 56 to 70 kilograms respectively. The selected subjects were randomly assigned into four equal groups of 30 subjects each. Group I taken from badminton players, group II taken from football players, group III taken from swimmers and group IV taken from Non-sports men. The data collected from the four groups on selected dependent variables were statistically analysed to find out the significant difference if any, by applying the 4 x 3 two-way analysis of covariance (ANCOVA). Since four groups were involved, whenever the obtained 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences. Result of the study showing that significant difference exists among the sports wise players and also the diet wise on bone mineral density.

Keywords: Bone mineral density, sports and diet

Introduction

A bone is a rigid organ that constitutes part of the vertebrate skeleton. Bones support and protect the various organs of the body, produce red and white blood cells, store minerals, provide structure and support for the body, and enable mobility. Bones come in a variety of shapes and sizes and have a complex internal and external structure. They are lightweight yet strong and hard, and serve multiple functions.

In the human body at birth, there are over 270 bones (Steele, *et al*., 1988) [7] but many of these fuse together during development, leaving a total of 206 separate bones in the adult (Mammal Anatomy, 2010) [5], not counting numerous small sesamoid bones. The largest bone in the body is the femur or thigh-bone, and the smallest is the stapes in the middle ear. The Latin word for bone is *os*, hence the many terms that use it as a prefix – such as osseous and osteopathy. Bone mineral (*also called inorganic bone phase, bone salt, or bone apatite*) is the inorganic component of bone tissue. It gives bones their compressive strength. Bone mineral is formed from carbonated hydroxyapatite (Field, *et al*., 1974) [2], with lower crystallinity (Legros, *et al*., 1987) [4]. Bone mineral is formed from globular and plate structures distributed among the collagen fibrils of bone and forming yet a larger structure (Bertazzo and others, 2006) [1]. The bone salt and collagen fibers together constitute the extracellular matrix of bone tissue. Often the plural form "bone salts" is used; it reflects the notion of various salts that, on the level of molecular metabolism, can go into the formation of the hydroxyapatite.

Methodology

The purpose of the study was to analysis of bone mineral density of different sports and games in university level players. To achieve the purpose of the study, one hundred and twenty men players were selected as subjects. The age, height and weight of the subjects ranged from 17 to 25 years, 162 to 175 centimetres and 56 to 70 kilograms respectively. The selected subjects were randomly assigned into four equal groups of 30 subjects each. Group I taken from badminton players, group II taken from football players, group III taken from swimmers and group IV taken from Non-sports men.

The comparative design in this study was random group design involving 120 subjects, who were divided at random in to four group of thirty each. All the four groups selected from the different sports and games players. Bone mineral density was assessed by ultrasound system. The data collected from the four groups on selected dependent variables were statistically analysed to find out the significant difference if any, by applying the 4 x 3 two-way analysis of covariance (ANCOVA). Since four groups were involved, whenever the obtained 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences. In all the cases level of confidence was fixed at 0.05 for significance.

Results

Table 1: Descriptive analysis of the data on bone mineral density of different sports players and diet followers

		N	Badminton	Soccer	Swimmer	Non-sports men
Vegetarian	Mean	10	1.27	1.24	1.31	0.74
	SD		0.03	0.03	0.06	0.02
Semi-vegetarian	Mean	10	1.45	1.55	1.45	0.94
	SD		0.97	0.11	0.02	0.02
Non-vegetarian	Mean	10	1.34	1.35	1.32	0.85
	SD		0.08	0.02	0.01	0.02
Total	Mean	30	1.35	1.38	1.36	0.84
	SD		0.11	0.14	0.07	0.08

Presented in Table – I the means and standard deviations on bone mineral density of badminton players, soccer, swimmer and non-sports men are 1.27 ± 0.03, 1.24 ± 0.03, 1.31 ± 0.06 and 0.74 ± 0.02 respectively belongs to vegetarian.

The means and standard deviations on bone mineral density of badminton players, soccer, swimmer and non-sports men are 1.45 ± 0.97, 1.55 ± 0.11, 1.45 ± 0.02 and 0.94 ± 0.02 respectively belongs to semi-vegetarian.

The means and standard deviations on bone mineral density of badminton players, soccer, swimmer and non-sports men are 1.35 ± 0.11, 1.38 ± 0.14, 1.36 ± 0.07 and 0.85 ± 0.08 respectively belongs to non-vegetarian.

The total mean and standard deviations cumulative values of vegetarian, semi-vegetarian and non-vegetarian on bone mineral density of badminton players, soccer, swimmer and non-sports men are 1.29 ± 0.11, 1.40 ± 0.16, 1.32 ± 0.11 and 0.84 ± 0.08 respectively.

Table 2: 4 x 3 Two-way analysis of variance on bone mineral density among different sports players and diet followers

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio	Sig.
Model	7.05	11	0.641	201.78	.000
Sports	6.08	3	2.028	638.45	.000
Diet	0.875	2	0.438	137.74	.000
Sports X Diet	0.092	6	0.015	4.80	.000
Error	0.343	108	0.003		
Total	7.39	119			

(Table values required for significance at 0.05 levels with df 3 and 119 is 2.70)

Table – II stated that the obtained 'F' ratio value of sports, diet and sports x diet are 638.45, 137.74 and 4.80 which are higher than the required table value of 2.70 with df 3 and 108, 2 and 108 6 and 108 for the significance at 0.05 level of confidence. This value showed that significant difference exists among the different sports players and their diet practices on bone mineral density.

Table 3: Scheffe's Pair Wise Comparison for the different sports players

(I) Sports	(J) Sports	Mean Difference (I-J)	Std Error	Sig
Badminton players	Soccer	-.0243	.0145	.428
	Swimmer	-.0053	.0145	.987
	Non-sports men	.5097	.0145	.000
Soccer	Swimmer	.0190	.0145	.637
	Non-sports men	.5340	.0145	.000
Swimmer	Non-sports men	.5150	.0145	.000

* The mean difference is significant at the 0.05 level.

The results indicated that the mean difference between the badminton players and non-sports men, soccer and non-sports men, swimmer and non-sports men are 0.5097, 0.5340 and 0.5150 respectively. The results indicated that the mean difference between the badminton players and non-sports men, soccer and non-sports men, swimmer and non-sports men are significant at 0.05 level on bone mineral density. The result also indicated that there is no significant difference between the badminton players and soccer, badminton players and swimmer, soccer and swimmer are -0.0243, -0.0053 and .0190 respectively on bone mineral density.

Table 4: Scheffe's Pair Wise Comparison for the different diet followers

(I) Diet	(J) Diet	Mean Difference (I-J)	Std. Error	Sig.
Vegetarian	Semi-vegetarian	-.2070	.0126	.000
	Non-vegetarian	-.0775	.0126	.000
Semi-vegetarian	Non-vegetarian	.1295	.0126	.000

Based on estimated marginal means * The mean difference is significant at the 0.05 level.

The results indicated that the mean difference between the vegetarian and semi-vegetarian, vegetarian and non-vegetarian, semi-vegetarian and non-vegetarian are -0.2070, -0.0775 and 0.1295 respectively. The results indicated that the mean difference between the vegetarian and semi-vegetarian, vegetarian and non-vegetarian, semi-vegetarian and non-vegetarian are significant at .05 level on bone mineral density.

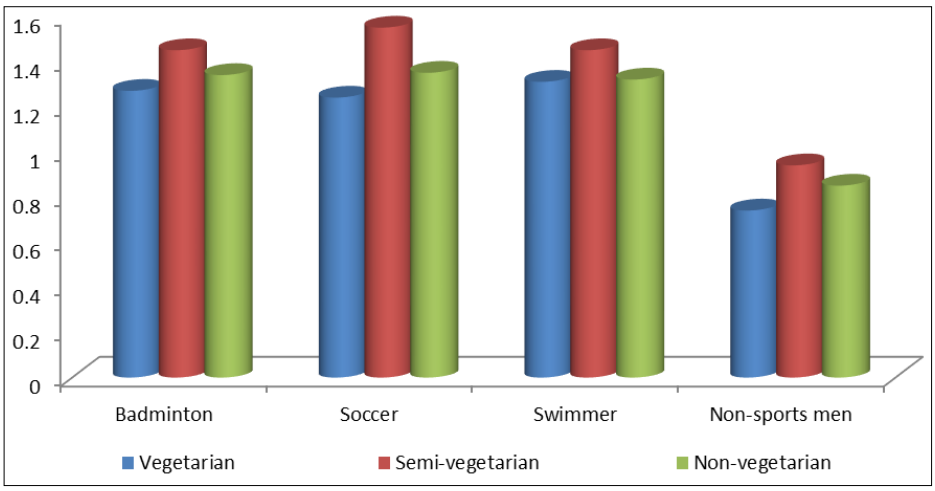

Fig 1: Cylinder diagram shows the mean value of different sports and diet followers on bone mineral density

Discussion and Findings

In the present study seeing on the sports (game), wise result showed that significant difference exists between the badminton players and non-sports men, soccer and non-sports men, swimmer and non-sports men and there is no significant difference exists between badminton players and soccer, badminton players and swimmer, soccer and swimmer on bone mineral density. Also the present study seeing on the diet follower's wise result showed that significant difference exists between vegetarian and semi-vegetarian, vegetarian and non-vegetarian, semi-vegetarian and non-vegetarian on bone mineral density. The following studies are supporting our research findings.

Stanforth, *et al*., (2016) [6] examined the bone mineral content and density among female NCAA Division I athletes across the competitive season and over a multi-year time frame. The result stated that bone mineral content and bone mineral density differences between impact and nonimpact sports are large compared with smaller differences within impact sports.

Igor and others (2016) [3] analyzed the relationship between martial arts practice (*judo, karate and kung-fu*) and bone mineral density in adolescents. The result showed that different modalities of martial arts are related to higher bone mineral density in different body regions among adolescents.

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