CHAPTER – IV

RESULTS AND DISCUSSIONS

4.1 OVER VIEW

This chapter deals with the analysis of data obtained from the samples under study. The main objective of the research is to analyze the efficacy of Aerobic exercise with functional strength training (AEFSTG), Dietary supplementation (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation (CAEFST&DSG) on selected body composition, biochemical and hormonal profile of men with low bone mineral density.

In order to achieve the purpose of this study, 40 subjects were randomly selected as subjects and their age ranged between 50-60 years and they were randomly assigned into four equal groups of 10 each. Experimental group I performed Aerobic exercise with functional strength training (AEFST), Experimental group II performed Dietary supplementation (DS), Experimental group III performed combined Aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) and Control Group (CG) IV was not exposed to any experimental training other than their regular daily activities. The duration of experimental period was 12 weeks. After the experimental treatment the data collected from experimental group and control groups on selected body composition, biochemical and hormonal profile in relation to statistical analysis using paired 't' test

to analyze the significant difference if any between pre-test, post-test. Further, Analysis of Covariance (ANCOVA) to find out the significance among the mean differences, whenever the 'F' ratio for adjusted test was found to be significant, Scheffe's post hoc test was used. In all cases 0.05 level of significance was fixed to test hypotheses.

4.2 TEST OF SIGNIFICANCE

This is the vital portion of the thesis, that of achieving at the conclusion by examining the hypothesis. The tests were usually called as the test of significance, since there will be any difference between the pre-test and post-test scores of the samples are significant or not. In the present study, if the obtained F-ratio value was equal to or greater than the table value, the research hypothesis was accepted. The hypothesis was rejected if the obtained F-ratio was lesser than the table value.

4.3 LEVEL OF SIGNIFICANCE

To test the obtained results on all the variables, level of significance 0.05 was chosen and considered as sufficient for the study.

4.4 COMPUTATION OF 't' TEST

The statistical analysis on significance of the mean gains or losses made in the scores in the variables related to selected body composition, biochemical and hormonal profile among men with low bone mineral density of aerobic exercise with functional strength

training group, dietary supplementation group and combined training group are presented in tables VIII to XI.

TABLE – VIII

MEAN GAINS AND LOSSES BETWEEN PRE AND POST TEST SCORES OF AEROBIC EXERCISE WITH FUNCTIONAL STRENGTH TRAINING GROUP

S. No	Variables	Pre Test Mean	Post Test Mean	MD	Std. Dev.(±)	't' Ratio
1	Fat Mass	23.60	21.29	2.31	0.63	**11.51***
2	Lean Body Mass	42.54	44.24	1.70	0.99	**5.42***
3	Body Mass Index	27.81	25.36	2.45	2.23	**3.47***
4	Bone Mineral Density	1.04	1.09	0.05	0.05	**3.22***
5	Percentage of Body Fat	27.29	25.09	2.20	0.72	**9.61***
6	Serum Calcium	9.13	8.90	0.23	0.37	1.96
7	Serum Phosphorus	3.33	3.36	0.03	0.08	1.23
8	Serum Magnesium	2.07	2.10	0.03	0.04	1.94
9	Calcitonin	5.67	5.71	0.04	0.06	2.16
10	Parathyroid Hormone	54.2	51.2	3.0	1.3	**7.1***

***Significant at 0.05 level (2.26)**

Table VIII shows that the mean, standard deviation and mean difference values of the pre and post test data obtained from the aerobic exercise with functional strength training group (AEFSTG) on selected body composition, biochemical and hormonal profiles of men with low bone mineral density. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test data. The obtained 't' ratio values of aerobic exercise with functional strength training group (AEFSTG) on selected variables such as fat mass (11.51), body mass index (3.47) and percentage of body fat (9.61) were significantly reduced, and lean body mass (5.42), bone mineral density (3.22) and parathyroid hormone (7.1) were significantly greater than the required table value of 2.26 at 0.05 level. However, there was no significant variation on serum calcium level (1.96), serum phosphorus (1.23), serum magnesium level (1.94) and calcitonin (2.16). The obtained 't' ratio on the selected variables were found to be lesser than the required table value of 2.26 at 0.05 level. It was concluded that the aerobic exercise with functional strength training produced significant alteration on selected body composition, biochemical and hormonal profile of men with low bone mineral density. Thus the formulated hypothesis No. 1 was partially accepted.

TABLE – IX

MEAN GAINS AND LOSSES BETWEEN PRE AND POST TEST SCORES OF DIETARY SUPPLEMENTATION GROUP

S. No	Variables	Pre Test Mean	Post Test Mean	MD	Std. Dev.(±)	't' Ratio
1	Fat Mass	26.53	26.81	0.28	1.02	0.87
2	Lean Body Mass	42.58	42.70	0.12	0.33	1.15
3	Body Mass Index	27.91	27.85	0.06	0.63	0.30
4	Bone Mineral Density	1.07	1.12	0.04	0.05	**2.50***
5	Percentage of Body Fat	27.49	27.75	0.26	0.57	1.44
6	Serum Calcium	9.26	9.11	0.15	0.11	**4.42***
7	Serum Phosphorus	3.57	3.71	0.14	0.13	**3.25***
8	Serum Magnesium	2.15	2.24	0.08	0.05	**5.78***
9	Calcitonin	5.72	5.83	0.12	0.07	**5.12***
10	Parathyroid Hormone	53.10	52.19	0.91	0.45	**6.38***

*Significant at 0.05 level (2.26)

Table – IX indicates that the mean, standard deviation and mean difference values of the pre and post test data collected from the Dietary supplementation group (DSG). Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test data. The obtained 't' ratio values of Dietary supplementation group (DSG) were 0.87, 1.15, 0.30, and 1.12, for fat mass, lean body mass, body mass index and percentage of body fat were statistically insignificant. The above variables were found to be lesser than the required table value of 2.26 at 0.05 level. Further, the obtained 't' ratio values of Dietary supplementation group (DSG) were 2.50, 4.42 3.25, 5.78, 5.12 and 6.38 for bone mineral density, serum calcium level, serum phosphorus, serum magnesium, calcitonin and parathyroid hormone were found to be greater than the required table value of 2.26 at 0.05 level. From the results it was inferred that the dietary supplementation has produced significant changes only on bone mineral density, serum calcium level, serum phosphorus, serum magnesium, calcitonin and parathyroid hormone of men with low bone mineral density. Thus the formulated hypothesis No.2 was partially accepted.

TABLE – X

MEAN GAINS AND LOSSES BETWEEN PRE AND POST TEST SCORES OF COMBINED EXPERIMENTAL GROUP

S.No	Variables	Pre Test Mean	Post Test Mean	MD	Std. Dev.(±)	't' Ratio
1	Fat Mass	24.26	21.73	2.53	0.57	**14.13***
2	Lean Body Mass	42.14	43.95	1.81	0.98	**5.85***
3	Body Mass Index	24.86	21.93	2.93	1.92	**4.82***
4	Bone Mineral Density	1.03	1.10	0.08	0.05	**4.86***
5	Percentage of Body Fat	27.50	24.92	2.58	0.54	**15.19***
6	Serum Calcium	9.90	9.39	0.51	0.13	**12.41***
7	Serum Phosphorus	3.32	3.59	0.28	0.09	**9.53***
8	Serum Magnesium	2.06	2.20	0.14	0.05	**9.50***
9	Calcitonin	6.04	6.21	0.17	0.12	**4.42***
10	Parathyroid Hormone	52.50	49.00	3.50	1.43	**7.72***

***Significant at 0.05 level (2.26)**

The above table – X indicates that the mean, standard deviation and mean difference values of the pre and post test data collected from the combined Aerobic exercise with functional strength training and dietary supplementation group (CAEFST&DSG). Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post teat dat. The obtained 't' ratio values of combined Aerobic exercise with functional strength training and dietary supplementation group (AEFST&DSG) were 14.13, 5.85, 4.82, 4.86, 15.19, 12.41, 9.53, 9.50, 4.42 and 7.72 for fat mass, lean body mass, body mass index, bone mineral density, percentage of body fat, serum calcium level, serum phosphorus, serum magnesium, calcitonin and parathyroid hormone respectively. The obtained t- values to be significant at 0.05 level for degree of freedom 1, 9 the required critical value was 2.26. Hence, the obtained t-values on the variables were higher than the required critical values. It was concluded that the combined Aerobic exercise with functional strength training and dietary supplementation group (CAEFST&DSG) produced significant changes on selected body composition, biochemical and hormonal profile of men with low bone mineral density. Thus the formulated hypothesis No.3 was accepted.

TABLE – XI

MEAN GAINS AND LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF CONTROL GROUP

S. No	Variables	Pre Test Mean	Post Test Mean	MD	Std. Dev.(±)	't' Ratio
1	Fat Mass	23.44	23.65	0.21	0.54	1.23
2	Lean Body Mass	41.35	41.29	0.06	0.40	0.47
3	Body Mass Index	27.38	27.56	0.18	0.84	0.68
4	Bone Mineral Density	1.03	1.01	0.02	0.03	**2.48***
5	Percentage of Body Fat	29.11	29.45	0.34	0.49	2.20
6	Serum Calcium	9.53	9.68	0.15	0.44	1.08
7	Serum Phosphorus	3.02	3.06	0.04	0.06	2.11
8	Serum Magnesium	2.12	2.14	0.02	0.05	1.22
9	Calcitonin	5.52	5.51	0.01	0.04	0.72
10	Parathyroid Hormone	51.30	51.20	0.10	1.45	0.22

*Significant at 0.05 level (2.26)

The above table – XI indicates that the mean, standard deviation and mean difference values of the pre and post test data collected from the Control group (CG). Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post teat dat. The obtained 't' ratio values 1.23 (fat mass), 0.47 (lean body mass), 0.68 (body mass index), 2.20 (percentage of body fat), 1.08 (serum calcium level), 2.11 (serum phosphorus), 1.22 (serum magnesium), 0.72 (calcitonin) and 0.22 (Parathyroid Hormone). The obtained 't' ratio values were lesser than the required table value of 2.26. Hence the obtained t-values on the criterion variables of fat mass, lean body mass, body mass index, percentage of body fat, serum calcium level, serum phosphorus, serum magnesium, calcitonin and parathyroid hormone were failed to reach the significant level. However, the obtained t-value on bone mineral density was 2.48 higher than the required critical values. It is concluded that the changes made from pre-test to post test was statistically not significant except bone mineral density.

4.5 COMPUTATION OF ANALYSIS OF COVARIANCE ON BODY COMPOSITION

The following table illustrates the statistical result of the Aerobic exercise with functional strength training (AEFST), Dietary supplementation (DS), combined Aerobic exercise with functional strength training and Dietary supplementation (CAEFST&DS) on selected body composition parameters among men with low bone mineral density.

4.5.1 RESULTS ON FAT MASS

The below table - XII shows that the pre-test obtained F- ratio value on Fat mass of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 23.60, 26.53, 24.26 and 23.44 respectively. The obtained F- ratio value of 1.01 was statistically not significant as they failed to reach the required table value of 2.87 at 0.05 level. Thus, the obtained results on pre test mean confirm the random assignment of subjects into different groups was successful.

TABLE – XII

COMPUTATION OF ANALYSIS OF COVARIANCE FOR THE PRE, POST AND ADJUSTED POST TEST ON FAT MASS

(Scores in Kg)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F- ratio
Pre Test Means	23.60	26.53	24.26	23.44	BG	61.135	3	20.378	1.01
					WG	728.696	36	20.242	
Post Test Means	21.29	26.30	21.73	23.74	BG	156.937	3	52.312	**3.18***
					WG	592.634	36	16.462	
Adjusted Post Means	22.06	24.44	21.91	24.65	BG	65.289	3	21.763	**109.80***
					WG	6.937	35	0.198	
Mean Gain	2.31	0.23	2.53	0.30					

***Significant at 0.05 level (2.87).**

The post-test obtained f-ratio value on fat mass of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 21.29, 26.30, 21.73 and 23.74 respectively. The obtained post-test F-ratio of 3.09 was greater than the required table F- ratio of 2.87. Hence the post-test means F-ratio was significant at 0.05 level for degree of freedom 3 and 36 on fat mass. This proved that the difference between the post test means of the subject were significant.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 22.06, 24.44, 21.91 and 24.65 respectively. The obtained 'F' ratio of 109.8 for adjusted post-test means was greater than the required table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on fat mass. The results of the study indicated that there was a significant difference among the Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) on fat mass.

Since significant differences were recorded, the results were subjected to post hoc analysis Scheffe's post hoc test. The results were presented in Table – XIII.

TABLE – XIII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON FAT MASS
(Scores in Kg)

Adjusted Post- test Means				Mean Difference	Confidence Interval
CG	AEFSTG	DSG	AEFST & DSG		
24.65	22.06	-	-	**2.59***	0.58
24.65	-	24.44	-	0.21	0.58
24.65	-	-	21.91	**2.75***	0.58
-	22.06	24.44	-	**2.38***	0.58
-	22.06	-	21.91	0.16	0.58
-	-	24.44	21.91	**2.53***	0.58

*Significant at 0.05 level of confidence

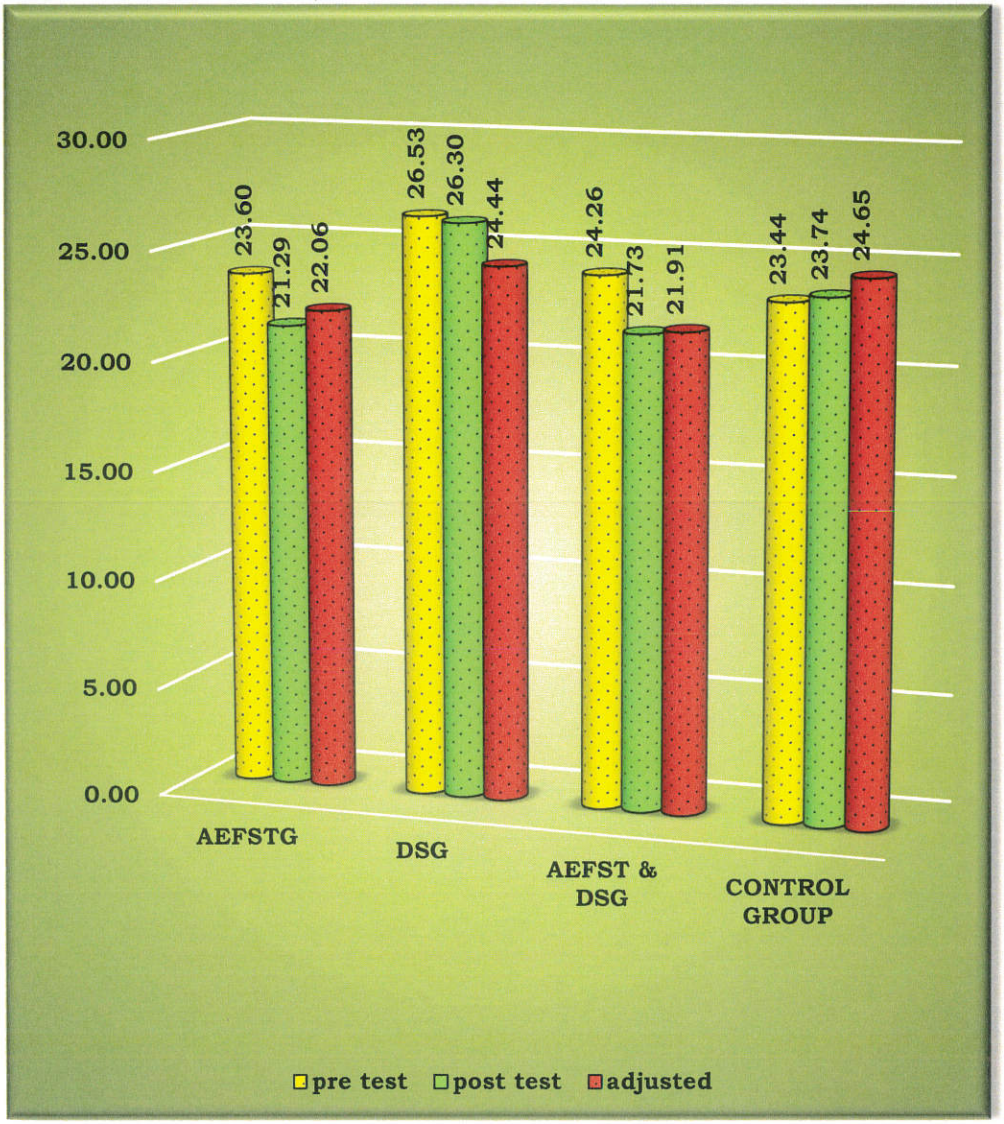
As shown in table XIII proved that significant mean differences existed between Aerobic exercise with functional strength training group and control group was 2.59, combined training group and control group was 2.75, Aerobic exercise with functional strength training group and Dietary supplementation group was 2.38, combined training group and dietary supplementation group was 2.53. Since, the mean differences were greater than the confident interval value of 0.58 at 0.05 level of significant. However, there was no significant difference

between, Dietary supplementation group and control group, Aerobic exercise with functional strength training group and combined training group at 0.05 level of confidence with the confidence interval value of 0.58. It was also concluded that the combined Aerobic exercise with functional strength and dietary supplementation treatment was better than dietary supplementation alone in changing fat mass.

The pre, post and adjusted post test means on fat mass were presented through bar diagram for better understanding of the results of this study in Figure-1.

Figure – 1

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON FAT MASS OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in Kg)



4.5.1.1 DISCUSSION ON FAT MASS

Body composition may be considered as an independent factor in influencing osteoporosis manifestations. As the physical dimensions such as weight, fat mass and overall BMI, increase the persons may have more chances of developing lifestyle disorders including osteopenia or osteoporosis. Particularly, obesity can attenuate symptoms of bone loss, thereby leading to higher degree of morbidity and immobility. Fat mass increase obviously could pave way for acquiring osteopenia or may at least favor its manifestations. Regular exercise is important throughout life, regardless of the age.

Taking into consideration of above research findings, the results of the study suggested that due to twelve weeks treatment of aerobic exercise with functional strength training and combined aerobic exercise with functional strength training and dietary supplementation have shown significant changes on fat mass than the control group and the differences were significant at 0.05 level. However, it proved that there was significant difference between the aerobic exercise with functional strength training and dietary supplementation group, combined treatment group and dietary supplementation group in decreasing fat mass of men with low bone mineral density. Further, it proved that there was no significant difference between the dietary supplementation and control group, aerobic exercise with functional strength training and combined treatment group in decreasing fat mass of men with low bone mineral density. Participation in aerobic exercise with functional strength

training and Eating healthy diet or dietary supplements or combined enough to decreasing the fat mass.

The result of the present study is also in conformity with the findings of the previous research studies. According to **Perez-Gomez et al., (2013)** 10-week of endurance training or resistance training on regional and abdominal fat, the endurance group significantly decreased after training on the body weight and fat mass. Further, **Nindl et al., (2000)** also founded that the Physical training consisted of a combination of aerobic and resistance exercise in which the subjects engaged for 5 days/week for 24 weeks. The training group experienced a 10% decrease in fat mass.

Willis et al., (2012) aerobic exercise is the optimal mode of exercise for reducing fat mass in middle aged, overweight/obese individuals. **Ragaieg et al., (2013)** founded that the aerobic training showed significant reduction in fat mass in the experimental group. **Binder (2005)** studied the effect of progressive resistance exercise training (PRT) on fat mass did not change in response to progressive resistance exercise training (PRT) in elderly persons. **Ramirez-Campillo et al., (2013)** examined the effects of a localized muscle endurance resistance training program on total body and regional tissue composition. They concluded that fat mass was significantly reduced in the upper extremities and trunk. **Chilibeck, et al., (2002)** evaluated the combined the effects of exercise training significantly greater loss of fat mass compared with controls.

4.5.2 RESULTS ON LEAN BODY MASS

An examination of table - XIV indicated that the pre test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 42.54, 42.58, 4214 and 41.35 respectively. The obtained F- ratio value of 1.37 was statistically not significant, since they failed to reach the critical value 2.87 at 0.05 level. Thus the obtained results on pre test mean confirm the random assignment of subjects in to different groups was successful.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 44.24, 42.70, 43.95 and 41.29 respectively. The obtained post-test F-ratio of 7.98 was greater than the required table F- ratio of 2.87. Hence the obtained f-ratio on lean body mass was statistically significant since they were found as higher than the required critical values. It was concluded that the experimental treatment produced significant improvement in lean body mass of men with low bone mineral density.

TABLE – XIV

COMPUTATION OF ANALYSIS OF COVARIANCE ON LEAN BODY MASS OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in Kg)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	42.54	42.58	42.14	41.35	BG	9.771	3	3.257	1.37
					WG	85.409	36	2.372	
Post Test Means	44.24	42.70	43.95	41.29	BG	54.461	3	18.154	**7.98***
					WG	81.938	36	2.276	
Adjusted Post Means	43.91	42.33	43.96	41.98	BG	31.380	3	10.460	**20.01***
					WG	18.292	35	0.523	
Mean Gain	1.70	0.12	1.81	0.06					

***Significant at 0.05 level (2.87).**

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 43.91, 42.33, 43.96 and 41.98 respectively. The obtained 'F' ratio of 20.01 was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on lean body mass.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XV.

TABLE – XV

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON LEAN BODY MASS
(Scores in Kg)

Adjusted Post- test Means				Mean Difference	Confidence Interval
CG	AEFSTG	DSG	AEFST & DSG		
41.98	43.91	-	-	**1.92***	0.95
41.98	-	42.33	-	0.35	0.95
41.98	-	-	43.96	**1.98***	0.95
-	43.91	42.33	-	**1.57***	0.95
-	43.91	-	43.96	0.06	0.95
-	-	42.33	43.96	**1.63***	0.95

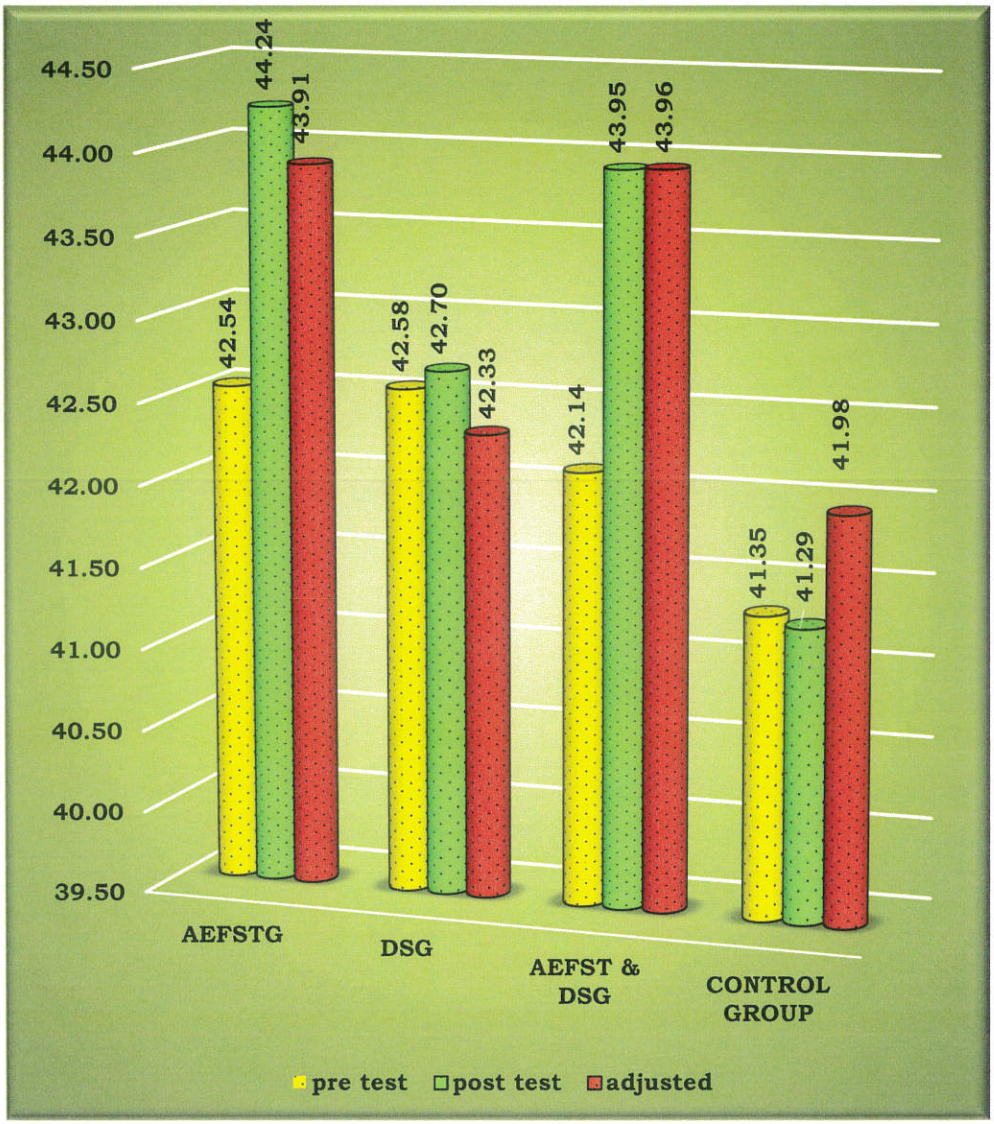
*Significant at 0.05 level of confidence

As shown in table XIII proved that significant mean differences existed between Aerobic exercise with functional strength training group and control group was 1.92, combined training group and control group was 1.98, Aerobic exercise with functional strength training group and Dietary supplementation group was 1.57, combined training group and dietary supplementation group was 1.63. Since, the mean differences were greater than the confident interval value of 0.95 at 0.05 level of significant. However, there were no significant differences between, Dietary supplementation group and control group and Aerobic exercise with functional strength training group and combined group at 0.05 level of confidence with the confidence interval value of 0.95. It was also concluded that the combined training was better than dietary supplementation in altering lean body mass.

The pre, post and adjusted post test means on lean body mass were presented through bar diagram for better understanding of the results of this study in Figure-2.

Figure – 2

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON LEAN BODY MASS OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in Kg)



4.5.2.1 DISCUSSION ON LEAN BODY MASS

An increase in caloric expenditure associated with increased physical activity often results in body-composition changes. Participation in regular weight-bearing and muscle-strengthening exercise reduces the risk of osteoporosis and osteopenia. In addition, exercise may modestly increase lean body mass. Exercise and eating healthy diet is recognised as one of the most effective lifestyle strategies to improving or maintaining bone density, exercise increases the size, strength and increases in functional capacity of muscles and changed body composition.

The results of the study suggested that due to twelve weeks treatment of aerobic exercise with functional strength training and combined aerobic exercise with functional strength training and dietary supplementation have shown significant alteration in lean body mass than the control group and the differences were significant at 0.05 level. However, it proved that there was significant difference between the aerobic exercise with functional strength training and dietary supplementation group, combined treatment group and dietary supplementation group in increasing in lean body mass of men with low bone mineral density. Further, it proved that there was no significant difference between the dietary supplementation and control group, aerobic exercise with functional strength training and combined treatment group in increasing in lean body mass of men with low bone mineral density. Participation in regular aerobic

exercise with functional strength training and dietary supplements or combined enough to increasing in lean body mass.

In the present study, the above findings were confirmed with the observation of other researchers in their recent studies. **Binder (2005)** founded that the progressive resistance exercise training (PRT) significantly increase muscle strength and Lean Mass (LM) in elderly persons, but not in the control group. **Nindiet al., (2000)** stated that the physical training among women, the training group experienced a 2.2% increased Lean Mass. Further, **Stewart et al., (2005)** examined that the exercise induced changes in lean body mass. **Nichols, Sanborn & Love (2001)** stated that the resistance training in does not show significant changes in lean mass after 15 months in female adolescents. **Perez-Gomez, et al., (2013)** proved that 10-week of resistance training increased total lean mass.

Strandberg (2015) examined the effects of 24 weeks of resistance training combined with a healthy dietary approach in a population of healthy and physically active older women interestingly, leg lean mass significantly increased only in resistance training + healthy diet group. **Chilibeck, et al., (2002)** studied the combined the effects of exercise training significantly greater increases in lean tissue mass compared with controls.

4.5.3 RESULTS ON BODY MASS INDEX

An examination of table - XVI indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 27.81, 27.91, 24.86 and 27.38 respectively. The obtained F- ratio value of 1.64 was statistically not significant, since they failed to reach the required table value of 2.87 at 0.05 level. Thus, the obtained results on pre test mean confirm the random assignment of subjects into different groups was successful.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 25.36, 27.75, 21.93 and 27.56 respectively. The obtained post-test F-ratio of 7.61 was greater than the required table F- ratio of 2.87. Hence the post-test means F-ratio was significant at 0.05 level for degree of freedom 3 and 36 on body mass index. This proved that the difference between the post test means of the subject were significant.

TABLE –XVI

COMPUTATION OF ANALYSIS OF COVARIANCE ON BODY MASS INDEX OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in Kg/m^2)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F- ratio
Pre Test Means	27.81	27.91	24.86	27.38	BG	62.08	3	20.69	1.64
					WG	453.06	36	12.58	
Post Test Means	25.36	27.75	21.93	27.56	BG	215.51	3	73.17	**7.61***
					WG	346.00	36	9.61	
Adjusted Post Means	24.72	27.03	23.60	27.25	BG	89.42	3	29.81	**15.53***
					WG	67.17	35	1.92	
Mean Gain	2.45	0.16	2.93	0.18					

***Significant at 0.05 level (2.87).**

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 24.72, 27.03, 23.06 and 27.25 respectively. The obtained 'F' ratio of 15.53 for adjusted post-test means was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on body mass index.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XV.

TABLE –XVII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON BODY MASS INDEX
(Scores in Kg/m²)

Adjusted Post- test Means				Mean Difference	Confidence Interval
CG	AEFSTG	DSG	AEFST & DSG		
27.25	24.72	-	-	**2.54***	1.82
27.25	-	27.03	-	0.23	1.82
27.25	-	-	23.60	**3.65***	1.82
-	24.72	27.03	-	**2.31***	1.82
-	24.72	-	23.60	1.11	1.82
-	-	27.03	23.60	**3.42***	1.82

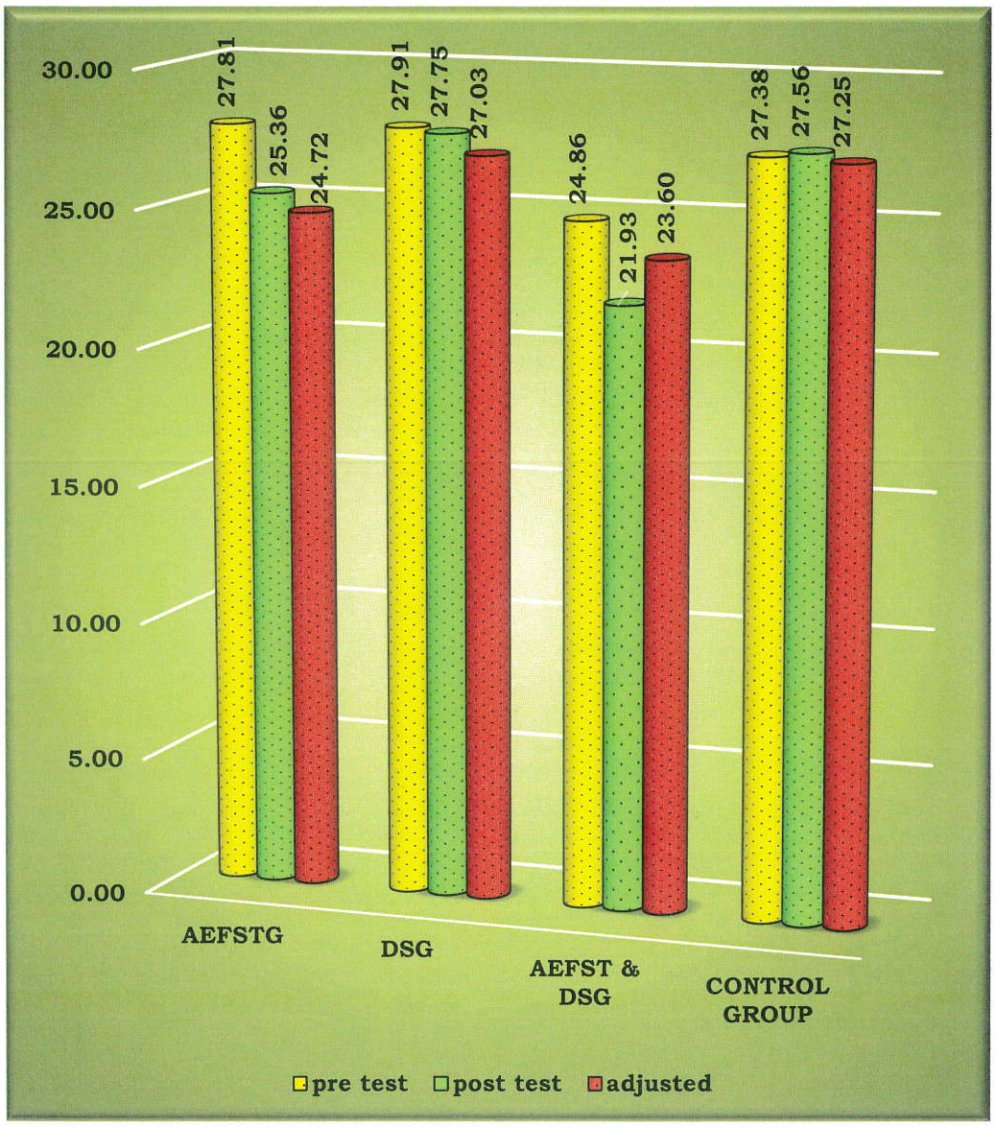
*Significant at 0.05 level of confidence

As shown in Table XVII Scheffe's post hoc proved that significant mean differences existed between Aerobic exercise with functional strength training and control group was 2.54, combined training group and control group was 3.65, Aerobic exercise with functional strength training and Dietary supplementation was 2.31, combined training group and Dietary supplementation was 3.42. Since, the mean differences were higher than the confidence interval value of 1.82 at 0.05 level of significant. Further, there was no significant difference between Dietary supplementation and control group and Aerobic exercise with functional strength training and combined training group at 0.05 level of confidence with the confidence interval value of 2.40. It was concluded that the combined training was better than dietary supplementation in altering body mass index.

The pre, post and adjusted post test means on body mass index were presented through bar diagram for better understanding of the results of this study in Figure-2.

Figure – 3

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON BODY MASS INDEX OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in Kg/m²)



4.5.3.1 DISCUSSION ON BODY MASS INDEX

Body composition may be considered as an independent factor in influencing osteoporosis manifestations. As the physical dimensions such as weight, fat mass and overall BMI, increase the persons may have more chances of developing lifestyle disorders including osteopenia or osteoporosis. Particularly, obesity can attenuate symptoms of bone loss, thereby leading to higher degree of morbidity and immobility. Body mass index increase obviously could pave way for acquiring osteopenia or may at least favor its manifestations. Exercise and eating healthy diet is recognised as one of the most effective lifestyle strategies to improving or maintaining bone density, exercise increases the size, strength and capacity of muscles.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training and combined training has shown significant difference on body mass index than the control group and the differences were significant at 0.05 level ($P<0.05$). Further, when compared between the treatment groups such as combined training group and dietary supplementation, aerobic exercise with functional strength training and dietary supplementation group showed greater influence in decreasing body mass index of men with low bone mineral density. However, there were no significant differences between dietary supplementation and control group, combined training group and aerobic exercise with functional strength

training group, in decreasing the body mass index of men with low bone mineral density. Participated in regular aerobic exercise with functional strength training and Eating healthy diet or dietary supplements or combined to decreasing the body mass index and builds the muscles that increase the overall quality of life.

In the present study, the results findings were in agreement with the observation of other researchers in their recent studies. **Regaieg, et al., (2013)** found that the aerobic exercises in addition to the school physical education showed significant reduction in body mass index (BMI) compared with the baseline values. **Mathews Hosiso, Sangeetha Rani and Shemelis Rekoninne, (2013),** stated that 12 weeks aerobics exercise reduction in body mass index and body weight.

Further, **Patricia, et al., (2008)** conducted a study on the effects of a 12 week twice weekly combination of circuit based resistance training and aerobic exercises. Exercise training significantly improved body mass index. **Perez-Gomez et al., (2013)** investigated the effect of 10-week of endurance training or resistance training, significantly decreased after training the body weight, body mass index.

4.5.4 RESULTS ON BONE MINERAL DENSITY

Table - XVIII showed that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 1.04, 1.07, 1.03 and 1.03 respectively. The obtained F- ratio value of 1.04 was statistically not significant, since they failed to reach the required table value of 2.87 at 0.05 level. Thus, the obtained results on pre test mean confirm the random assignment of subjects into different groups was successful.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 1.09, 1.12, 1.10 and 1.01 respectively. The obtained post-test F-ratio of 7.47 was greater than the required table F- ratio value of 2.87. Hence the post-test means F-ratio was significant at 0.05 level for degree of freedom 3 and 36 on bone mineral density. This proved that the difference between the post test means of the subject were significant.

TABLE –XVIII

COMPUTATION OF ANALYSIS OF COVARIANCE ON BONE MINERAL DENSITY OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in g/cm²)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F- ratio
Pre Test Means	1.04	1.07	1.03	1.03	BG	0.01	3	0.004	1.04
					WG	0.14	36	0.004	
Post Test Means	1.09	1.12	1.10	1.01	BG	0.07	3	0.023	**7.47***
					WG	0.11	36	0.003	
Adjusted Post Means	1.09	1.10	1.11	1.02	BG	0.05	3	0.019	**11.67***
					WG	0.06	35	0.002	
Mean Gain	0.05	0.02	0.08	0.02					

***Significant at 0.05 level (2.87).**

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 1.09, 1.10, 1.11 and 1.02 respectively. The obtained 'F' ratio value of 11.67 for adjusted post-test means was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on bone mineral density.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XIX.

TABLE –XIX

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON BONE MINERAL DENSITY
(Scores in g/cm^2)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
1.02	1.09	-	-	**0.07***	0.05
1.02	-	1.10	-	**0.08***	0.05
1.02	-	-	1.11	**0.10***	0.05
-	1.09	1.10	-	0.01	0.05
-	1.09	-	1.11	0.03	0.05
-	-	1.10	1.11	0.02	0.05

*Significant at 0.05 level of confidence

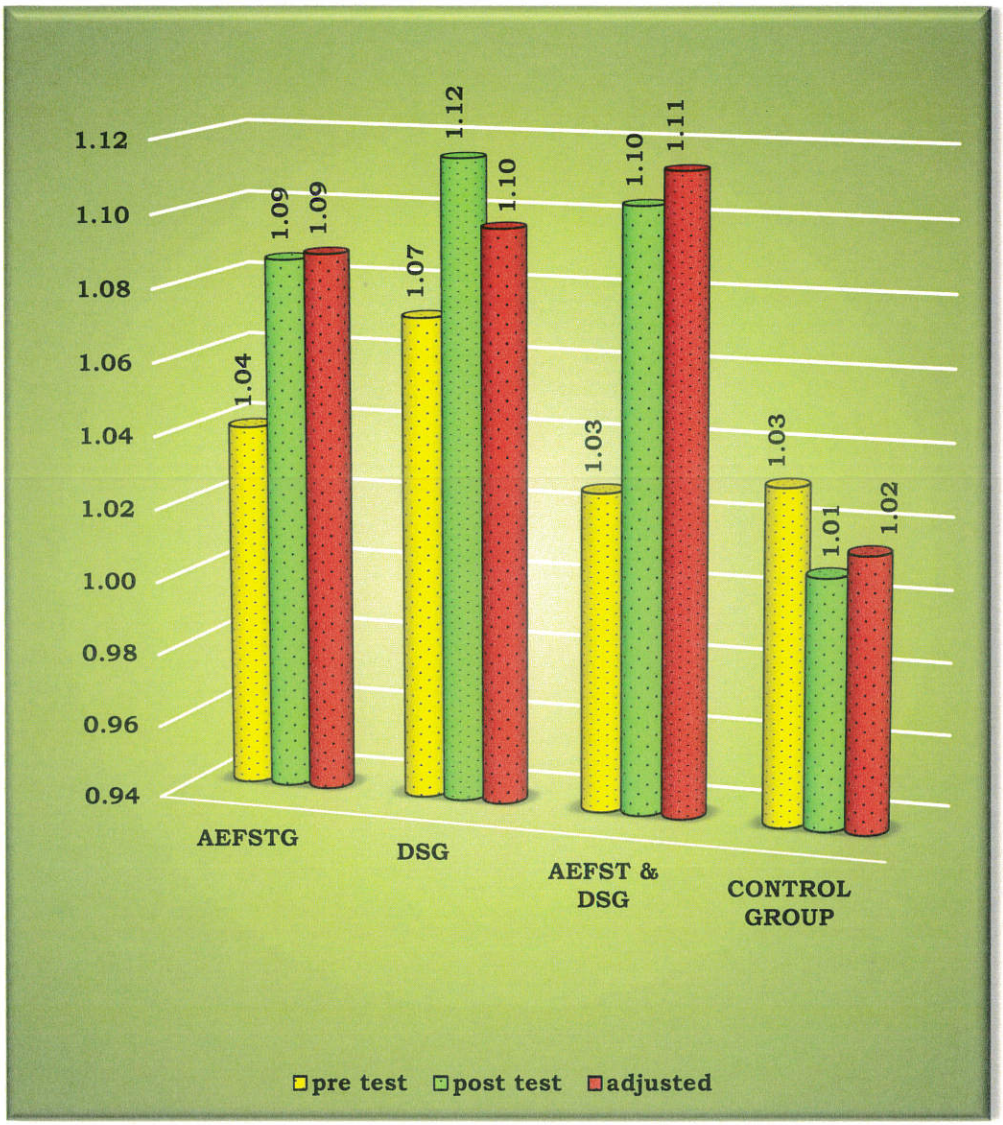
As shown in Table XIX Scheffe's post hoc analysis proved that significant mean differences existed between Aerobic exercise with functional strength training and control group was 0.07, Dietary supplementation and control group was 0.08, and combined training group and control group was 0.10. Since, the mean differences were higher than the confidence interval value of at 0.05 level of significant. Further, there was no there was no significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.06. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced greater changes in lean body mass.

The pre, post and adjusted post test means on bone mineral density were presented through bar diagram for better understanding of the results of this study in Figure-4

Figure – 4

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON BONE MINERAL DENSITY OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in g/cm²)



4.5.4.1 DISCUSSION ON BONE MINERAL DENSITY

Bone is scaffolding which supports the body against the force of gravity. Bones resist the pull of our muscles to allow movement. As bone is a living tissue, it reacts to appropriate weight bearing exercise by growing stronger. Exercise can play an important part in helping to reduce the risk of Osteopenia/ Osteoporosis and it is also an important aspect of treatment. High prevalence of vitamin D deficiency in India is a major contributor to low bone mass. This will ensure adequate calcium intake, vitamin D synthesis, and exercise. These three are the crucial elements in determining peak bone mass. Regular physical activity and exercise plays an important role in maintaining healthy bones.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training, dietary supplementation and combined training group has shown significant improvement in bone mineral density than the control group and the differences were significant at 0.05 level. Further, the post hoc analysis showed that there was no significant difference between the experimental groups in improving bone mineral density of men with low bone mineral density. Bone health is an important issue for everyone, consumed a nutritious balanced diet, with average calcium intakes of over 1000 mg/day in men. When bone is subjected to higher loads such as uncustomary exercise, bone will become stronger by altering its structure and increasing in mass.

In the present study, the results findings were in agreement with several research studies have revealed a positive relationship between, aerobic exercise with functional strength training and dietary supplementation on bone density. According to **Nichols, Sanborn & Love (2001)** resistance training is a potential method for increasing bone density in adolescents. **Kim et al., (2016)** concluded that the supplemental group with calcium intake >400 and ≤800 mg daily had significantly increased bone mineral density both men and postmenopausal women. Further, **Reid, & Ibbertson, (1986)** calcium supplementation suppresses bone re-absorption without detectable suppression of indices of bone formation and is, therefore, likely to result in increased bone mass. **Jorde, Szumlas, Haug & Sundsfjord (2002)** founded that the daily calcium intake below 450 mg were given calcium supplementation (500 mg Ca (2+)), and those with an intake above 450 mg was a significant increase in bone mineral density. According to **Kelley, Kelley, & Tran, (2000)** site-specific exercise may help improve and maintain bone mineral density.

However, some of the study showed contra indications, according to **Lau et al., (2001)** supplementing the diet of postmenopausal Chinese women with high calcium milk powder retarded bone loss. **Nindi et al., (2000)** examined physical training group does not have significant changes in bone mineral density among women.

TABLE –XX

COMPUTATION OF ANALYSIS OF COVARIANCE ON PERCENTAGE OF BODY FAT OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in Percentage)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F- ratio
Pre Test Means	27.29	27.49	27.50	29.11	BG	21.53	3	7.18	1.04
					WG	247.53	36	6.88	
Post Test Means	25.09	27.75	24.92	29.45	BG	143.83	3	47.94	**6.81***
					WG	253.58	36	7.04	
Adjusted Post Means	25.64	28.10	25.26	28.20	BG	71.45	3	23.82	**67.43***
					WG	12.36	35	0.35	
Mean Gain	-2.20	0.26	-2.58	0.34					

***Significant at 0.05 level (2.87).**

4.5.5 RESULTS ON PERCENTAGE OF BODY FAT

An examination of table - XX indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 27.29, 27.49, 27.50 and 29.11 respectively. The obtained F- ratio value of 1.04 was statistically not significant, since they failed to reach the required table value of 2.87 at 0.05 level. Thus, the obtained results on pre test mean confirm the random assignment of subjects into different groups was successful.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 25.09, 27.75, 24.92 and 29.45 respectively. The obtained post-test F-ratio of 6.81 was greater than the required table F- ratio of 2.87. Hence the post-test means F-ratio was significant at 0.05 level for degree of freedom 3 and 36 on percentage of body fat. This proved that the difference between the post test means of the subject were significant.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 25.64, 28.10, 25.26 and 28.20 respectively. The obtained 'F' ratio of 67.43 for adjusted post-test means was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on percentage of body fat.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXI.

TABLE – XXI

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON PERCENTAGE OF BODY FAT
(Scores in Percentage)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
28.20	25.64	-	-	**2.56***	0.78
28.20	-	28.10	-	0.10	0.78
28.20	-	-	25.26	**2.94***	0.78
-	25.64	28.10	-	**2.46***	0.78
-	25.64	-	25.26	0.38	0.78
-	-	28.10	25.26	**2.84***	0.78

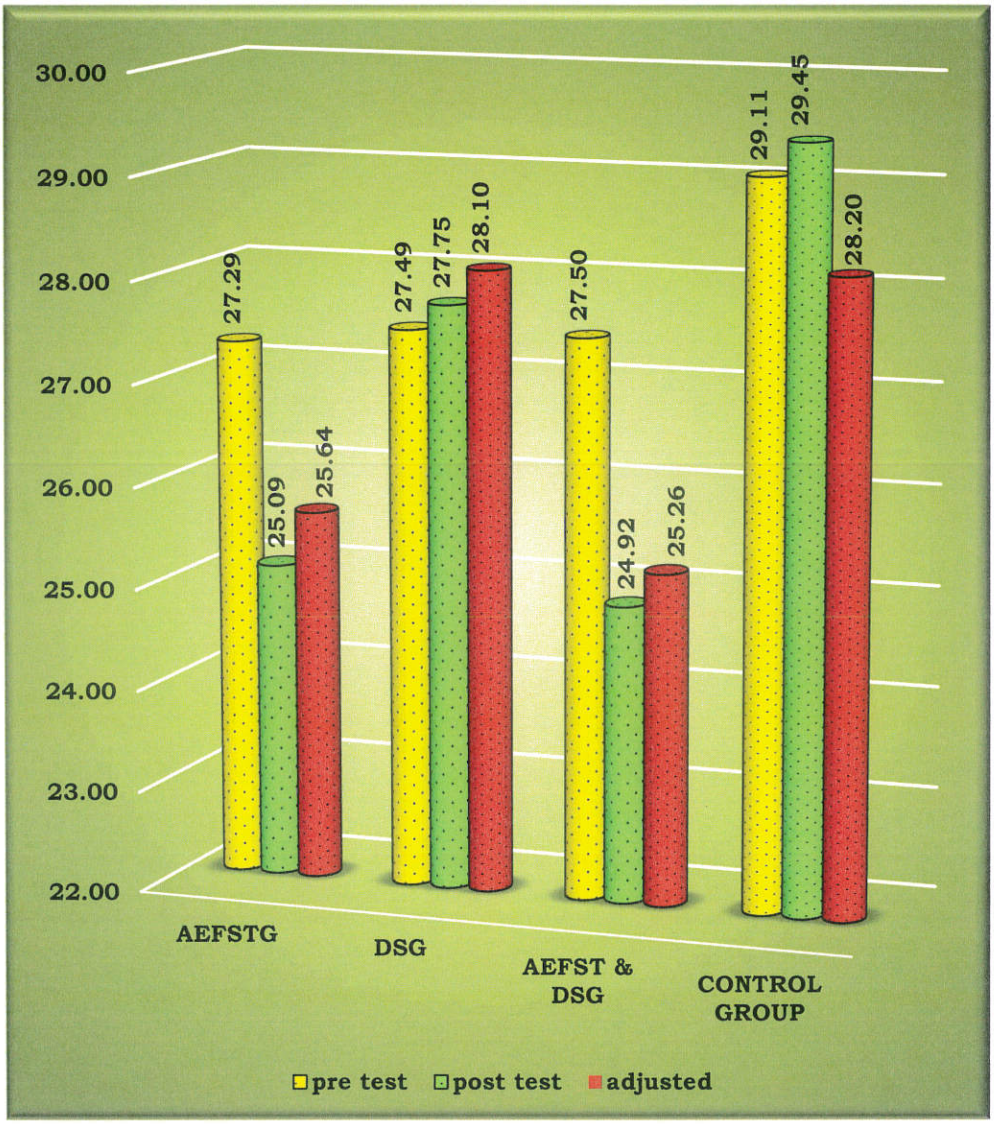
*Significant at 0.05 level of confidence

As shown in Table XXI the Scheffe's post hoc analysis proved that significant mean differences existed between Aerobic exercise with functional strength training and control group was 2.56, combined training group and control group was 2.94, Aerobic exercise with functional strength training and Dietary supplementation group was 2.46 and Dietary supplementation and combined training group was 2.84. Since, the mean differences were higher than the confidence interval value of 0.78 at 0.05 level of significant. Further, there was no significant difference between Dietary supplementation and control group, Aerobic exercise with functional strength training and combined training group at 0.05 level of confidence with the confidence interval value of 1.54. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced greater changes than Dietary supplementation alone in decreasing percentage of body fat.

The pre, post and adjusted post test means on percentage of body fat were presented through bar diagram for better understanding of the results of this study in Figure-5.

Figure – 5

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON PERCENTAGE OF BODY FAT OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in Percentage)



4.5.5.1 DISCUSSION ON PERCENTAGE OF BODY FAT

Body fat loss through an exercise program is reliant on the fuels metabolized. Oxidation of fats occurs when the exercise intensity is moderate to low and when prolonged. Exercise alone can be used to increase the energy expenditure and so result in weight loss. Likewise, reduced energy intake also leads to weight loss, as would a combination of diet and exercise.

The results of the study suggested that due to twelve weeks of treatment of aerobic exercise with functional strength training and combined training group has shown significant reduction on percentage of body fat than the control group and the differences were significant at 0.05 level. Further, when compared between the experimental groups such as combined training group and dietary supplementation group, aerobic exercise with functional strength training and dietary supplementation group significantly decreasing percentage of body fat of men with low bone mineral density. However, there was no significant difference between dietary supplementation and control group, aerobic exercise with functional strength training and combined training group on percentage of body fat of men with low bone mineral density.

In the present study, the results findings were in agreement with several research studies have revealed a positive relationship between, aerobic exercise with functional strength training and dietary supplementation on percentage of body fat.

Nichols, Sanborn & Love (2001) founded that there was significant changes in percentage of body fat after 15 months of resistance training in female adolescents. Further, **Perez-Gomez et al., (2013)** investigated the effect of 10-week of endurance training or resistance training on regional and abdominal fat, the resistance training group significantly decreased percentage of body fat after training. **Ryan et al., (2013)** founded the effects of 6 months of whole-body resistive training (RT), showed that there was significant changes in percentage of body fat in young men

Ademola Olasupo Abass and Monday Omonyl Moses, (2013) founded the effectiveness of aerobic exercise and resistant training on the body composition measured in terms of percent of body fat. Result showed that there were significant differences in the effect of the training regimen on body mass index and that Aerobic Exercise enhanced better improvement in percent body fat.

TABLE –XXII

COMPUTATION OF ANALYSIS OF COVARIANCE ON SERUM CALCIUM OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	9.14	9.26	9.57	9.06	Between	1.540	3	0.514	1.87
					Within	9.867	36	0..274	
Post Test Means	8.88	9.11	9.25	9.13	Between	0.734	3	0.245	0.69
					Within	12.847	36	0.357	
Adjusted Post Means	9.01	9.11	8.90	9.35	Between	1.037	3	0.346	**17.58***
					Within	0.688	35	0.020	
Mean Gain	0.26	0.15	0.32	0.07					

***Significant at 0.05 level (2.87).**

4.6 COMPUTATION OF ANALYSIS OF COVARIANCE ON BIOCHEMICAL PROFILE

The following table illustrates the statistical result of the aerobic exercise with functional strength training (AEFST), dietary supplementation (DS) and combined training group (CAEFST&DSG) and control group (CG) on selected biochemical profile among men with low bone mineral density.

4.6.1 RESULTS ON SERUM CALCIUM

An examination of table - XXII indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 9.14, 9.26, 9.57 and 9.06 respectively. The obtained F-ratio of 1.87 was statistically not significant as they failed to reach the required table value of 2.87 at 0.05 level. Thus, the obtained results on pre test mean confirm the random assignment of subjects into different groups was successful.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 8.88, 9.11, 9.25 and 9.13 respectively. The obtained post-test F-ratio of 0.69 was lower than the required table

F- ratio of 2.87. It implies that no significant differences existed between the four groups during post test period on serum calcium in men with low bone mineral density.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 9.01, 9.11, 8.90 and 9.35 respectively. The obtained 'F' ratio of 17.58 was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence. This proved that the differences between the adjusted post-test means of the subject on serum calcium level were significantly changed in men with low bone mineral density due to experimental treatments. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced greater changes in decreasing serum calcium.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXIII.

TABLE – XXIII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SERUM CALCIUM (Scores in mg/dl)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
9.35	9.01	-	-	**0.35***	0.18
9.35	-	9.11	-	**0.25***	0.18
9.35	-	-	8.90	**0.45***	0.18
-	9.01	9.11	-	0.10	0.18
-	9.01	-	8.90	0.11	0.18
-	-	9.11	8.90	0.21	0.18

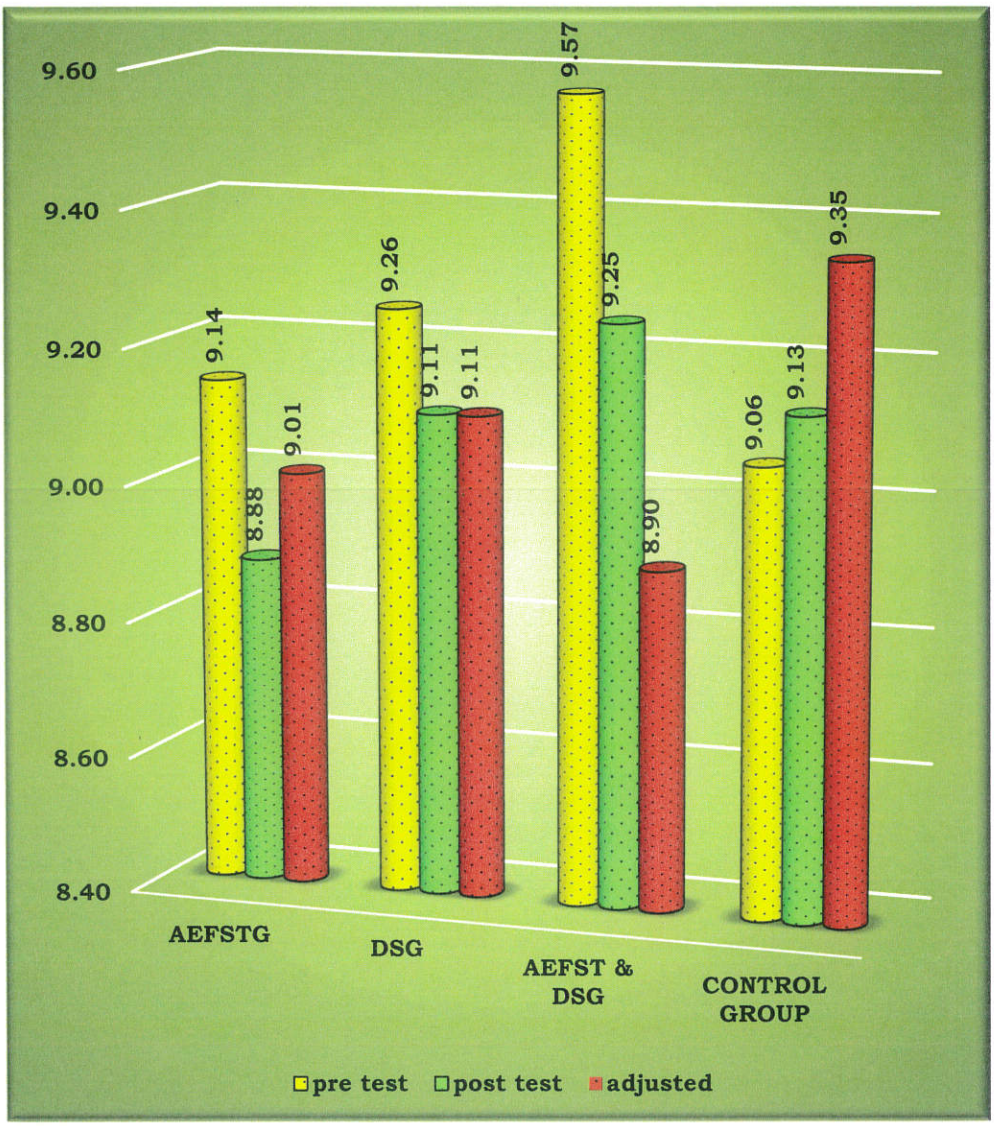
*Significant at 0.05 level of confidence

As shown in table XXIII proved that significant mean differences existed between Aerobic exercise with functional strength training and control group was 0.35, Dietary supplementation and control group was 0.25, combined training and control group was 0.45. Since, the mean differences were higher than the confidence interval value of 0.18. However, there was no significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.18.

The pre, post and adjusted post test means on serum calcium were presented through bar diagram for better understanding of the results of this study in Figure-6.

Figure – 6

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON SERUM CALCIUM OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in mg/dl)



4.6.1.1 DISCUSSION ON SERUM CALCIUM

Calcium is needed for our heart, muscles, and nerves to function properly and for blood to clot. Inadequate calcium significantly contributes to the development of low bone mineral density and osteoporosis.

A balanced diet rich in calcium and vitamin D is only one part of a low bone mineral density and osteoporosis prevention or treatment program. Like exercise, getting enough calcium is a strategy that helps strengthen bones at any age. For strong bones, a sufficient amount of calcium should be included in the daily diet.

The results of the study suggested that due to twelve weeks of treatment of aerobic exercise with functional strength training, dietary supplementation and combined aerobic exercise with functional strength training, dietary supplementation has shown significant variation on serum calcium than the control group and the differences were significant at 0.05 level. Further, the post hoc analysis showed that there was no significant difference between the experimental groups in modifying serum calcium level of men with low bone mineral density. Exercise can only be beneficial to bone density if complemented with a minimum calcium intake of 1000 mg; moreover, calcium supplements can only be beneficial to bone health if complemented with adequate physical activity.

In the present study, the results and findings are also in agreement with the several research studies conducted by **Jorde, Szumlas, Haug & Sundsfjord (2002)** reported that low calcium intake might cause increased bone loss and thus aggravate osteoporosis and there was a non - significant increase in serum calcium in supplemental group. **Linda & Hsieh (2005)** founded that mode and intensity of physical activity have no significant effects on the body's calcium regulating hormones but the level of physical activity plays a major role in increasing bone density.

According to **Mohamed (2016)** the role of resistant training on bone density of female students, significantly increased BMD, calcium and parathyroid hormone increased significantly. These findings suggest that resistant training may be effective in retardation osteoporosis and modify risk factors.

Islam et al., (2012) stated the effect of calcium and multiple micronutrient supplementations in Bangladeshi young female garment factory workers for 12 months have significant effect on calcium and recommended as a strategic option to reduce the risk of osteomalacia and osteoporosis in these subjects.

TABLE –XXIV

COMPUTATION OF ANALYSIS OF COVARIANCE ON SERUM PHOSPHORUS OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	3.33	3.57	3.32	3.02	BG	1.52	3	0.51	1.09
					WG	16.63	36	0.46	
Post Test Means	3.56	3.83	3.67	3.06	BG	3.31	3	1.10	2.31
					WG	17.20	36	0.48	
Adjusted Post Means	3.54	3.57	3.67	3.35	BG	0.52	3	0.17	**8.72***
					WG	0.69	35	0.02	
Mean Gain	0.23	0.26	0.36	0.04					

***Significant at 0.05 level (2.87).**

4.6.2 RESULTS ON SERUM PHOSPHORUS

An examination of table - XXIV indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 3.33, 3.57, 3.32 and 3.02 respectively. The obtained F-ratio of 1.09 was lower than the expected table F-ratio of 2.87. This proved that the random assignment of the subjects was successful and their scores on serum phosphorus before the training were equal and there was no significant difference among the groups.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 3.56, 3.83, 3.67 and 3.06 respectively. The obtained post-test F-ratio of 2.31 was lower than the required table F-ratio was 2.87. Hence the post-test mean F-ratio was not significant at 0.05 level of confidence for the degree of freedom 3 and 36. This proved that the differences between the post test means of the subjects were not significant.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 3.54, 3.57, 3.67 and 3.35 respectively. The obtained 'F' ratio of 8.74 on serum phosphorus was greater than the required table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXV.

TABLE –XXV

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SERUM PHOSPHORUS
(Scores in mg/dl)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
3.35	3.54	-	-	**0.19***	0.18
3.35	-	3.57	-	**0.22***	0.18
3.35	-	-	3.67	**0.32***	0.18
-	3.54	3.57	-	0.03	0.18
-	3.54	-	3.67	0.13	0.18
-	-	3.57	3.67	0.10	0.18

*Significant at 0.05 level of confidence

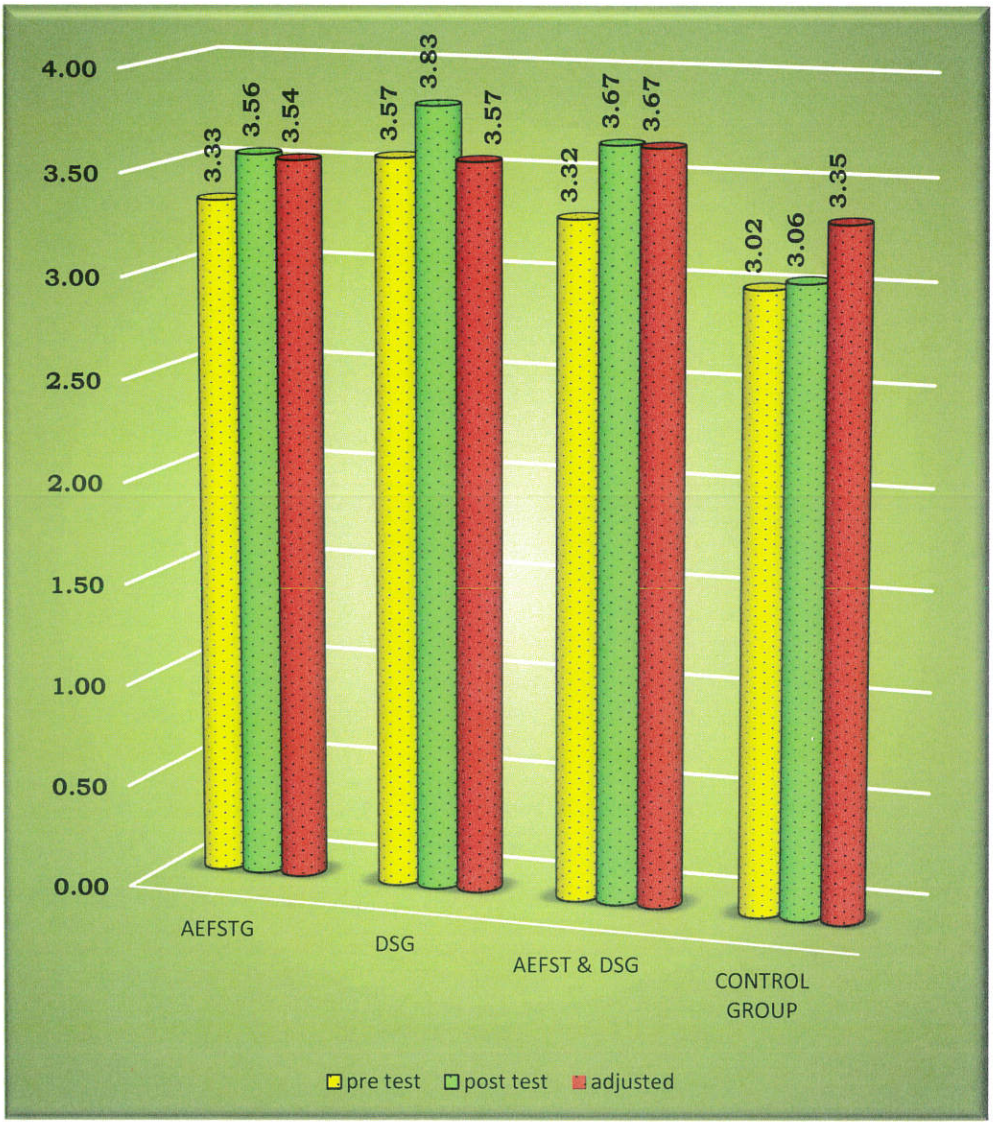
As showed in Table XXV Scheffes post hoc analysis proved that significant mean differences existed between Aerobic exercise with functional strength training and control group was 0.19, Dietary supplementation and control group was 0.22 and combined training group and control group was 0.32, it proved that there was significant variation on serum phosphorus at 0.05 level of confidence with the confidence interval value of 0.18. However, there was no significant difference between experimental groups at 0.05 level of confidence with the confidence interval value of 0.14. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced greater changes in decreasing serum phosphorus.

The pre, post and adjusted post test means on serum phosphorus were presented through bar diagram for better understanding of the results of this study in Figure-7.

Figure – 7

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON SERUM PHOSPHORUS OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)



4.6.2.1 DISCUSSION ON SERUM PHOSPHORUS

Regular exercises can be an inexpensive way to prevent osteopenia. It makes the bones stiff and retains the bone density. Exercise makes muscles stronger and protects against fractures.

Osteoporosis is a multi-factorial disease. There is a plethora of factors that affect the risk of osteoporosis, such as age, sex, race, exercise, diet, stature, and hormonal status; among these factors, only nutrition and exercise can be manipulated by the individual **(Kuntze et al., 1989).** While an excess of nutrients such as sodium, caffeine, phosphorus, or protein potentially affect bone mineral through increased calcium excretion, phytoestrogens in soy foods may attenuate bone loss through estrogen like activity **(Lewis and Modlesky, 1998)**.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training, dietary supplementation and combined aerobic exercise with functional strength training, dietary supplementation has shown significant variations on serum phosphorus level than the control group and the differences were significant at 0.05 level. When compared between the experimental groups there was no significant difference between the groups in increasing serum phosphorus level of men with low bone mineral density.

In the present study, the findings of the study are consistent with the several reports. The study conducted by **Ljunghall et al., (2008)** stated that 7-day field exercise maneuver with intense physical activity reduces Serum phosphate levels gradually returned during recovery. **Islam et al., (2012)** stated the effect of calcium and multiple micronutrient supplementations in Bangladeshi young female garment factory workers for 12 months, there is no significant effect on phosphorus

TABLE –XXVI

COMPUTATION OF ANALYSIS OF COVARIANCE ON SERUM MAGNESIUM OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	2.07	2.13	2.06	2.12	BG	0.043	3	0.014	1.00
					WG	0.510	36	0.014	
Post Test Means	2.17	2.24	2.20	2.14	BG	0.058	3	0.019	1.11
					WG	0.624	36	0.017	
Adjusted Post Means	2.19	2.21	2.23	2.12	BG	0.075	3	0.025	**6.15***
					WG	0.142	35	0.004	
Mean Gain	0.10	0.11	0.14	0.02					

***Significant at 0.05 level (2.87).**

4.6.3 RESULTS ON SERUM MAGNESIUM

An examination of table - XXVI indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 2.07, 2.13, 2.06 and 2.12 respectively. The obtained F-ratio of 1.00 was lower than the expected table F-ratio of 2.87. This proved that the random assignment of the subjects was successful and their scores on serum magnesium before the training were equal and there was no significant difference among the groups.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 2.17, 2.24, 2.20 and 2.14 respectively. The obtained post-test F-ratio of 1.11 and the table F-ratio was 2.87. Hence the post-test mean F-ratio was not significant at 0.05 level of confidence for the degree of freedom 3 and 36. This proved that the differences between the post test means of the subjects were not significant.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 2.19, 2.21, 2.23 and 2.12 respectively. The obtained 'F' ratio of 6.15 for adjusted post-test means was greater than the table value of 2.87. Hence, it was proved that due to the experimental treatment the serum magnesium level were significantly increased in men with low bone mineral density.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXVII.

TABLE –XXVII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SERUM MAGNESIUM
(Scores in mg/dl)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
2.12	2.19	-	-	**0.08***	0.08
2.12	-	2.21	-	**0.09***	0.08
2.12	-	-	2.23	**0.12***	0.08
-	2.19	2.21	-	0.02	0.08
-	2.19	-	2.23	0.04	0.08
-	-	2.21	2.23	0.02	0.08

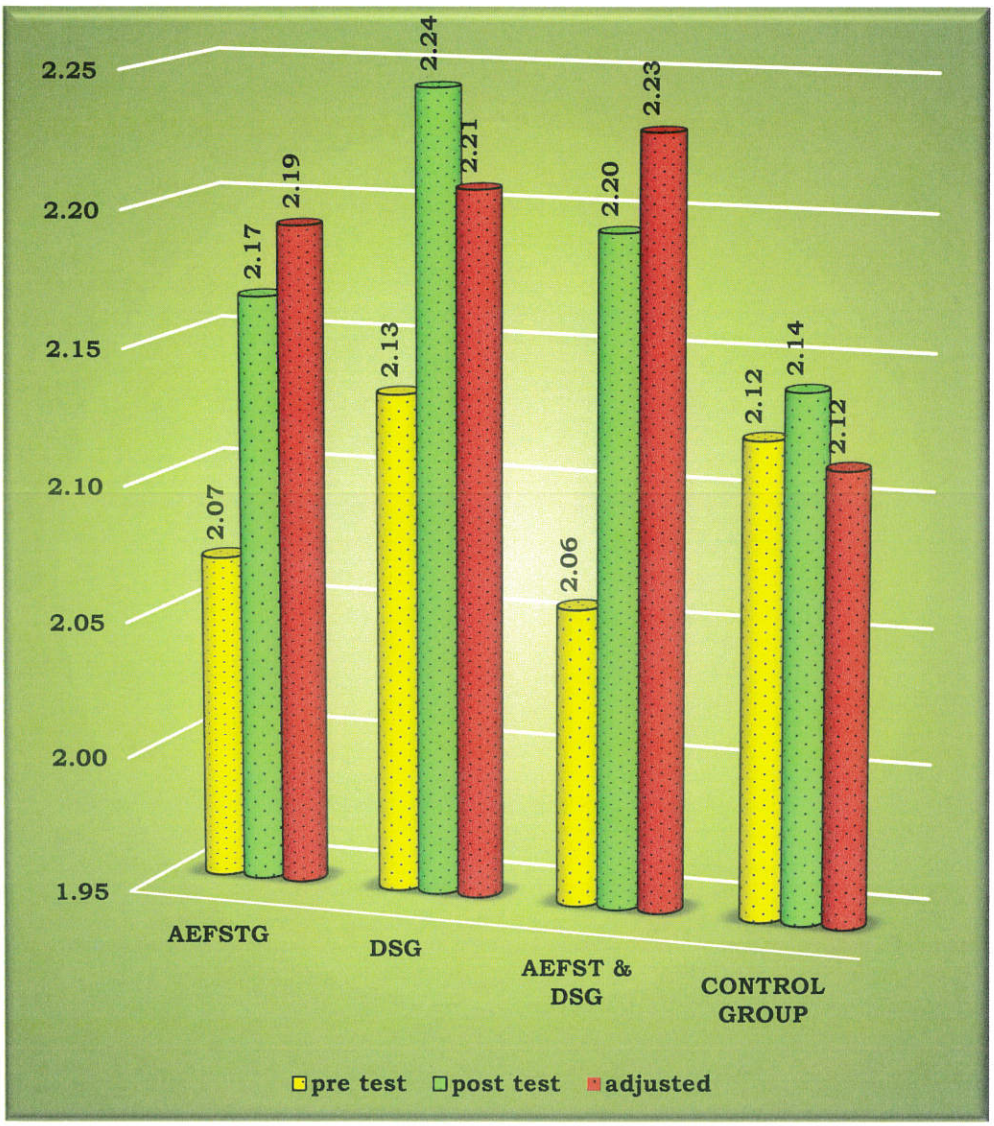
*Significant at 0.05 level of confidence

As shown in Table XXVII scheffes post hoc proved that significant differences existed between Aerobic exercise with functional strength training and control group was 0.08, Dietary supplementation and control group was 0.09, combined training group and control group was 0.12. Hence, it proved that there was significant difference at 0.05 level of confidence with the confidence interval value of 0.08. When compared between experimental groups there was no significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.08. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced significant changes in serum magnesium.

The pre, post and adjusted post test means on serum magnesium were presented through bar diagram for better understanding of the results of this study in Figure-8.

Figure – 8

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON SERUM MAGNESIUM OF EXPERIMENTAL AND CONTROL GROUPS (Scores in mg/dl)



4.6.3.1 DISCUSSION ON SERUM MAGNESIUM

Magnesium as an essential element that regulates membrane stability and neuromuscular, cardiovascular, immune, and hormonal functions and is a critical cofactor in many metabolic reactions, increased dietary intake of magnesium will have beneficial effects on exercise performance in magnesium-deficient individuals. Magnesium supplementation of physically active individuals with adequate magnesium status has not been shown to enhance physical performance.

Minerals like calcium and magnesium play a vital role in the growth and maintenance of bones. Deficiency of these minerals and vitamins like vitamin D and vitamin K make the bones lose their mass, thus becoming weaker and thinner, leading to osteopenia. Osteoporosis is a multi-factorial disease. There is a plethora of factors that affect the risk of osteoporosis, such as age, sex, race, exercise, diet, stature, and hormonal status; among these factors, only nutrition and exercise can be manipulated by the individual **(Kuntze et al., 1989)**.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training, dietary supplementation and combined aerobic exercise with functional strength training, dietary supplementation has shown significant changes on serum magnesium level than the control group and the differences were significant at 0.05 level. Further there was no

significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.08.

In the present study, the findings of the study are consistent with the several reports. The study conducted by **Bohl & Volpe (2002)** reviewed physical exercise may deplete magnesium, which, together with a marginal dietary magnesium intake, may impair energy metabolism efficiency and the capacity for physical work. According to **Brilla & Haley (1992)** the effect of dietary magnesium (Mg) on strength development during a double-blind, 7-week strength training program in 26 untrained subjects there was significant differences in T gains after strength training and dietary supplement in magnesium vs control group.

Sojka, (1995) Stated that magnesium regulated active calcium transport and assessed the effects of magnesium on bone density. At the end of the 2-year study, magnesium therapy appears to have prevented fractures and resulted in a significant increase in bone density.

TABLE –XXVIII

COMPUTATION OF ANALYSIS OF COVARIANCE ON CALCITONIN OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	5.67	5.72	6.04	5.52	BG	1.41	3	0.47	1.08
					WG	15.65	36	0.43	
Post Test Means	5.91	5.91	6.35	5.51	BG	3.53	3	1.17	2.84
					WG	14.92	36	0.41	
Adjusted Post Means	5.98	5.93	6.06	5.72	BG	0.59	3	0.19	**18.21***
					WG	0.38	35	0.01	
Mean Gain	0.24	0.20	0.32	0.01					

***Significant at 0.05 level (2.87).**

4.7 COMPUTATION OF ANALYSIS OF COVARIANCE ON HORMONAL PROFILE

The following table illustrates the statistical results of the aerobic exercise with functional strength training (AEFST), dietary supplementation (DS) and combined training group (CAEFST&DS) and control group (CG) on selected hormonal profile among men with low bone mineral density.

4.7.1 RESULTS ON CALCITONIN

An examination of table - XXVIII indicated that the pretest means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 5.67, 5.72, 6.04 and 5.52 respectively. The obtained F-ratio of 1.08 was lower than the required table F-ratio of 2.87. This proved that there was no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 5.91, 5.91, 6.35 and 5.51 respectively. The obtained post-

test F-ratio of 2.84 was lower than the required table F-ratio was 2.87.Hence the post-test mean F-ratio was not significant at 0.05 level of confidence for the degree of freedom 3 and 36. This proved that the differences between the post test means of the subjects were not significant.

The adjusted post-test means of Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 5.98, 5.93, 6.06 and 5.72 respectively. The obtained 'F' ratio of 18.21 was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence. This proved that there was a significant difference among group due to the experimental treatment on calcitonin level of men with low bone mineral density. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced significant changes in calcitonin level.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXIX.

TABLE –XXIX

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON CALCITONIN
(Scores in mg/dl)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
5.72	5.98	-	-	**0.26***	0.14
5.72	-	5.93	-	**0.21***	0.14
5.72	-	-	6.06	**0.34***	0.14
-	5.98	5.93	-	0.04	0.14
-	5.98	-	6.06	0.09	0.14
-	-	5.93	6.06	0.13	0.14

*Significant at 0.05 level of confidence

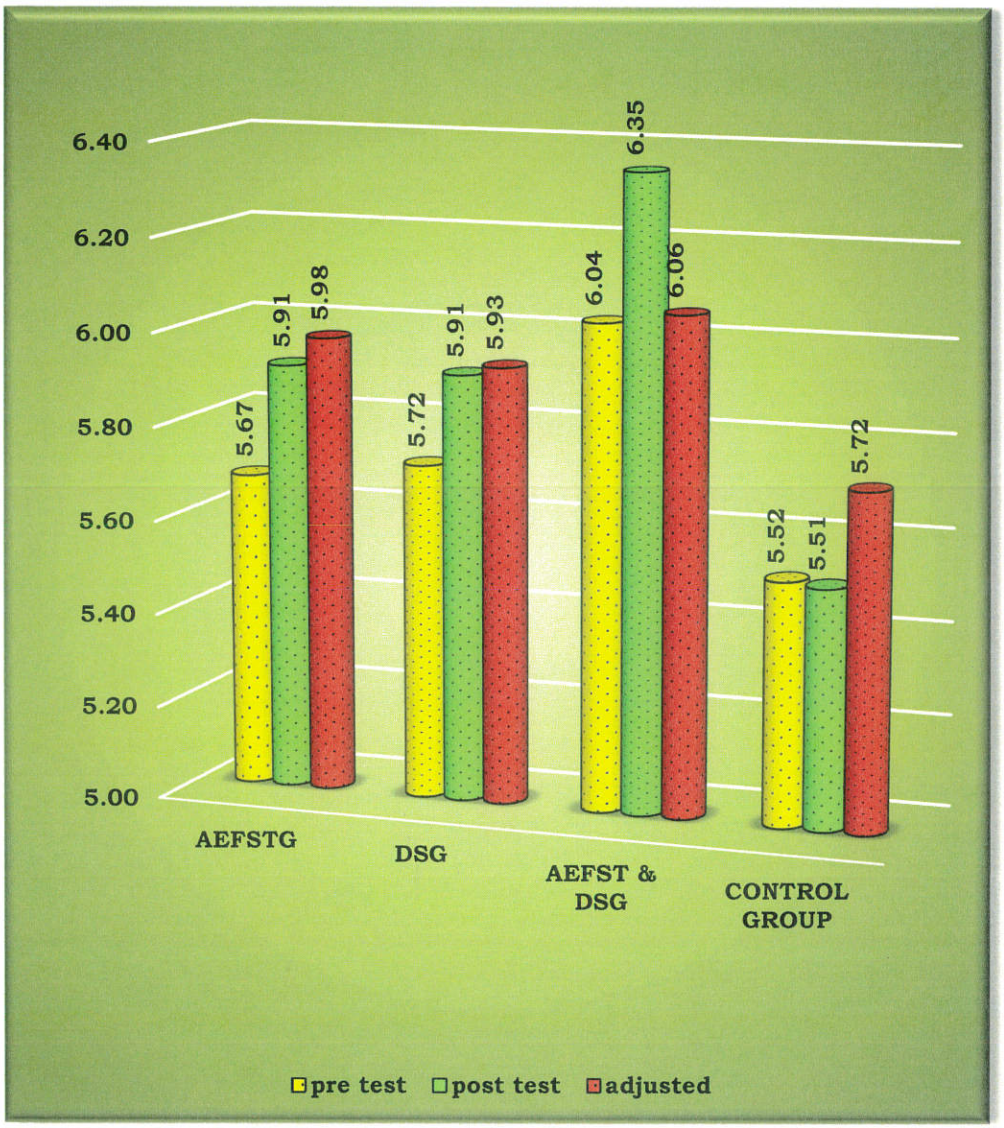
As shown in Table XXIX proved that significant differences existed between Aerobic exercise with functional strength training and control group was 0.26, Dietary supplementation and control group was 0.21, combined training group and control group was 0.34. Hence, it proved that there was significant difference at 0.05 level of confidence with the confidence interval value of 0.14. Further, there was no significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.14 on calcitonin level of men with low bone mineral density.

The pre, post and adjusted post test means on calcitonin were presented through bar diagram for better understanding of the results of this study in Figure-9.

Figure – 9

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON CALCITONIN OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)



4.7.1.1 DISCUSSION ON CALCITONIN

Calcitonin plays a role in calcium and phosphorus metabolism. In certain, calcitonin has the ability to decrease blood calcium levels. Calcitonin suppresses resorption of bone by inhibiting the activity of osteoclasts, a cell type that "digests" bone matrix, releasing calcium and phosphorus into blood. Elevated blood calcium levels strongly stimulate calcitonin secretion, and secretion is suppressed when calcium concentration falls below normal.

Physical activity is clinically accepted as a beneficial activity for osteoporotic patients, although little information exists regarding the best and most appropriate type, duration and intensity of exercise and dietary supplementation to provide the maximum protective effect against bone loss.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training, dietary supplementation and combined training group has shown significant difference on calcitonin level than the control group and the differences were significant at 0.05 level. Further there was no significant difference between the experimental groups at 0.05 level of confidence with the confidence interval value of 0.14.

In the present study, the findings of the study are consistent with the several reports. The study conducted by **Soltani, Soltani, Abrishami, Zeiaadini & Ashkanifar (2015)** concluded that the relationship between physical activity level (low, medium, high) and

PTH hormones level and calcitonin in the middle-aged women and there is no significant relationship between the level of physical activity and calcitonin. Contrary to the above result, **Linda & Hsieh (2005)** observed that the mode and intensity of physical activity have no significant effects on the calcitonin. **O'Neill et al., (2004)** noticed that dynamic weight-bearing moderate-duration exercise did not elevate calcitonin in healthy males.

TABLE –XXX

COMPUTATION OF ANALYSIS OF COVARIANCE ON PARATHYROID HORMONE OF EXPERIMENTAL AND CONTROL GROUPS

(Scores in mg/dl)

Test	AEFSTG	DSG	AEFST & DSG	CG	Source of Variance	Sum of squares	df	Mean Squares	F-ratio
Pre Test Means	54.20	53.10	52.50	51.30	Between	43.88	3	14.63	1.43
					Within	367.10	36	10.20	
Post Test Means	51.20	52.19	49.00	51.20	Between	54.54	3	18.18	1.35
					Within	483.75	36	13.44	
Adjusted Post Means	49.66	51.84	49.30	52.80	Between	82.41	3	27.47	**18.26***
					Within	52.66	35	1.50	
Mean Gain	3.00	0.91	3.50	0.10					

***Significant at 0.05 level (2.87).**

4.7.2 RESULTS ON PARATHYROID HORMONE

An examination of table - XXX indicated that the Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 54.20, 53.10, 52.50 and 51.30 respectively. The obtained F-ratio of 1.43 was lesser than the required table F-ratio of 2.87. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 3 and 36. This proved that there was no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 51.20, 52.19, 49.00 and 51.20 respectively. The obtained post-test F-ratio of 1.35 was lower than the required table F- ratio of 2.87. Hence, the post-test means F-ratio was significant at 0.05 level for degree of freedom 3 and 36. This proved that the difference between the post test means of the subject were not significant on parathyroid hormone of men with low bone mineral density.

The adjusted post-test means of the Aerobic exercise with functional strength training group (AEFSTG), Dietary supplementation group (DSG), combined Aerobic exercise with functional strength training and Dietary supplementation group (CAEFST&DSG) and control group (CG) were 49.66, 51.84, 49.30 and 52.80 respectively. The obtained 'F' ratio of 18.26 for adjusted post-test mean was greater than the table value of 2.87 for degree of freedom 3 and 35 required for significance at 0.05 level of confidence on parathyroid hormone.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's post hoc test. The results were presented in Table XXXI.

TABLE –XXXI

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCE AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON PARATHYROIDHORMONE
(Scores in mg/dl)

Adjusted Post- test Means				Mean Difference	Confidence Interval value
CG	AEFSTG	DSG	AEFST & DSG		
52.80	49.66	-	-	**3.14***	1.6
52.80	-	51.84	-	0.96	1.6
52.80	-	-	49.30	**3.50***	1.6
-	49.66	51.84	-	**2.18***	1.6
-	49.66	-	49.30	0.36	1.6
-	-	51.84	49.30	**2.54***	1.6

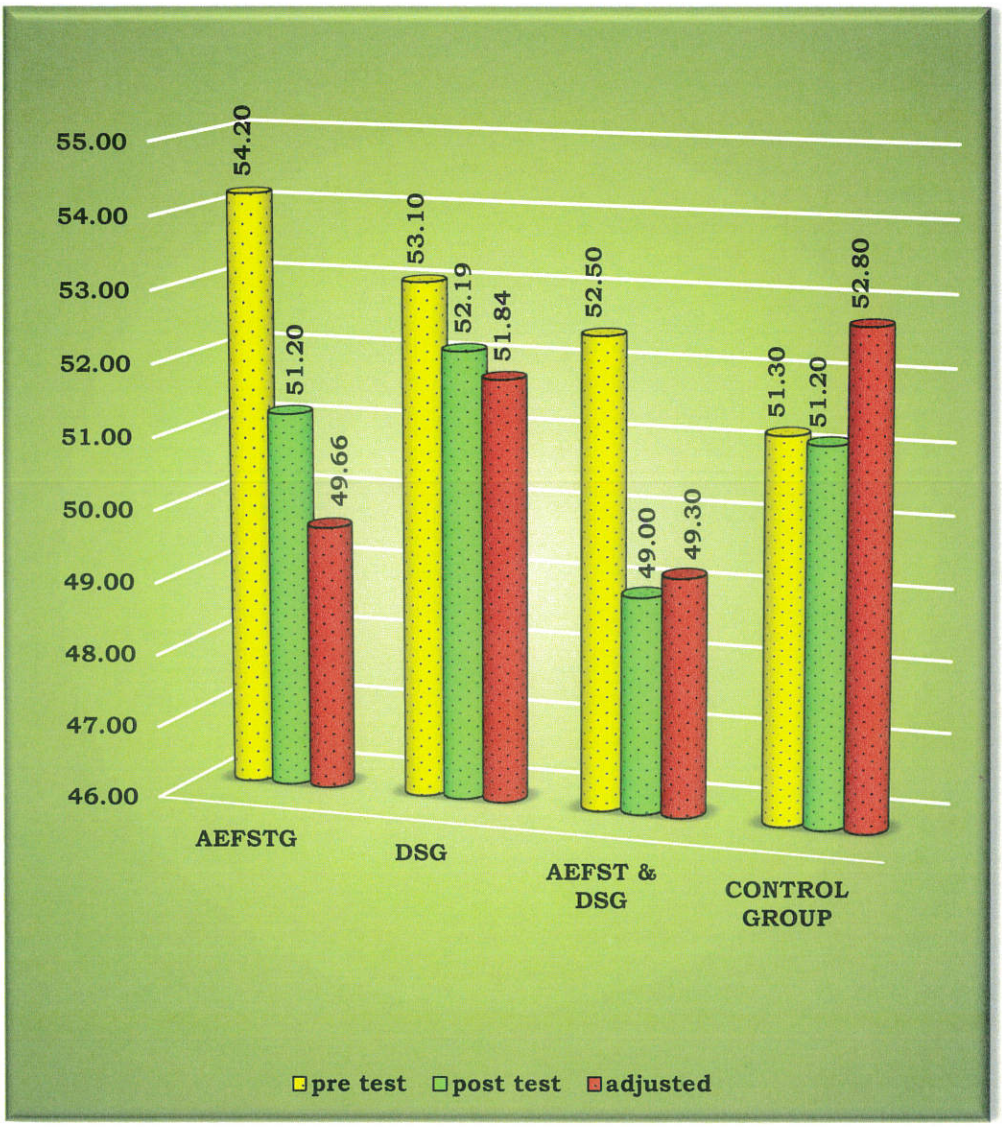
*Significant at 0.05 level of confidence

As shown in Table XXXI Scheffes post hoc proved that existence mean significant difference between Aerobic exercise with functional strength training group and control group was 3.14, combined training group and control group was 3.50, Aerobic exercise with functional strength training group and Dietary supplementation group was 2.18, combined training group and dietary supplementation group was 2.54. Hence, it was greater than the confident interval value of 1.60 at 0.05 level of significant. Further, there were no significant differences between, Dietary supplementation group and control group and Aerobic exercise with functional strength training group and combined group at 0.05 level of confidence with the confidence interval value of 1.60 in parathyroid hormone level of men with low bone mineral density. It was concluded that the combined Aerobic exercise with functional strength training and Dietary supplementation produced significant changes in parathyroid hormone level.

The pre, post and adjusted post test means on parathyroid hormone were presented through bar diagram for better understanding of the results of this study in Figure-10.

Figure – 10

BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEAN VALUES ON PARATHYROID HORMONE OF EXPERIMENTAL AND CONTROL GROUPS
(Scores in mg/dl)



4.7.2.1 DISCUSSION ON PARATHYROID HORMONE

Exercise can play an important part in helping to reduce the risk of Osteopenia/ Osteoporosis and it is also an important aspect of treatment. Bone is scaffolding which supports the body against the force of gravity. Bones resist the pull of our muscles to allow movement. As bone is a living tissue, it reacts to appropriate weight bearing exercise by growing stronger. Functional Resistance training using weights and gym machines has been shown to promote bone health by increasing the muscle strength and bone density.

The results of the study suggested that due to twelve weeks of treatment, aerobic exercise with functional strength training and combined training group has shown significant difference on parathyroid hormone than the control group and the differences were significant at 0.05 level. Further, it was also concluded that there was significant differences between aerobic exercise with functional strength training and dietary supplementation group, combined training group and dietary supplementation group was in changing parathyroid hormone level of men with low bone mineral density. However, there was no significant difference between dietary supplementation group and control group, aerobic exercise with functional strength training and combined training group on parathyroid hormone.

In the present study, the findings of the study are consistent with the several reports. The study conducted by **Linda & Hsieh**

(2005) founded that the mode and intensity of physical activity have no significant effects on the parathyroid hormone.

Mohamed (2016) stated the role of resistant training on bone density of female students, Resistance training improved leg strength tests, and also increased significantly BMD, calcium and parathyroid hormone increased significantly $P > 0.05$. These findings suggest that resistant training may be effective in retardation osteoporosis and modify risk factors.

Ljunghall et al., (2008) stated that 7-day field exercise maneuver with intense physical activity stimulates secretion of Parathyroid hormone after short term investigation.

Heaney, (2001) stated that mechanism of action of supplementary Calcium on bone is thought to be mediated by reduced secretion of parathyroid hormone. This decreases osteoclast (bone resorbing cells) activation and skeletal turnover rate is in turn reduced. This phenomenon has been described as a bone-re modelling transient and the gains in bone mineral are usually reversed once bone turnover rate is restored to its basal rate.

4.8 DISCUSSION ON HYPOTHESIS

1. The results presented provide evidence towards answering the research hypothesis. The first hypothesis of this research was stated that there would be significant changes on selected Body composition, Biochemical and Hormonal profile due to aerobic exercise with functional strength training (AEFST) among men with low bone mineral density.

   It was concluded that due to the efficacy of aerobic exercise with functional strength training (AEFST) on the selected body composition indices such as fat mass (FM), lean body mass (LBM), body mass index (BMI), percentage of body fat (%BF), bone mineral density (BMD) and biochemical profile such as Serum Calcium level (SCL), Serum Phosphorus level (SPL), Serum Magnesium (SM) and hormone profile such as Calcitonin levels (CT) and Parathyroid Hormone (PTH) of the men with low bone mineral density were significantly altered. Hence, the researcher's first hypothesis was accepted at 0.05 level.

2. The formulated second hypothesis stated that there would be significant changes on selected Body composition, Biochemical and Hormonal profile due to dietary supplementation (DS) among men with low bone mineral density.

The results of the study shows that due to the dietary supplementation (DS) in some causes positive influence were found on bone mineral density (BMD), Serum Calcium level (SCL), Serum Phosphorus levels (SPL), Serum Magnesium(SM) and Calcitonin level (CT) of the men with low bone mineral density. Whereas fat mass (FM), lean body mass (LBM), body mass index (BMI), percentage of body fat (%BF), and Parathyroid Hormone (PTH) were failed to reach the significant level. Hence, the researcher's second hypothesis was partially accepted at 0.05 level.

3. The formulated third hypothesis stated that there would be significant changes on selected Body composition, Biochemical and Hormonal profile due to combined aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) among men with low bone mineral density.

It was observed that combined aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) showed better changes on fat mass (FM), lean body mass (LBM), body mass index (BMI), percentage of body fat (%BF), bone mineral density (BMD), Serum Calcium levels (SCL), Serum Phosphorus levels (SPL), Serum Magnesium(SM), Calcitonin levels (CT) and Parathyroid Hormone (PTH). As the effect of complex nature exists in the aerobic exercise with

functional strength training and dietary supplementation (CAEFST&DS) are also attributed to the combine effect rather than alone. Hence, the researcher's third hypothesis was accepted at 0.05 level.

4. The formulated fourth hypothesis stated that the combined aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) intervention would have significantly greater influence on selected Body composition, Biochemical and Hormonal profile than the aerobic exercise with functional strength training (AEFST) and dietary supplementation (DS) among men with low bone mineral density.

It was observed that combined aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) have produced similar effects on fat mass (FM), lean body mass (LBM), body mass index (BMI), percentage of body fat (%BF), bone mineral density (BMD), Serum Calcium level (SCL), Serum Phosphorus level (SPL), Serum Magnesium(SM), Calcitonin level (CT) and Parathyroid Hormone (PTH) as compared to the aerobic exercise with functional strength training (AEFST).

Whereas, the changes on fat mass (FM), lean body mass (LBM), body mass index (BMI), percentage of body fat (%BF),

Serum Calcium level (SCL) and Parathyroid Hormone (PTH), the observed results are favored to the group practiced with aerobic exercise with functional strength training and dietary supplementation (CAEFST&DS) intervention as compared to the dietary supplementation group (DS). Hence, the researcher's fourth hypothesis was partially accepted at 0.05 level.