

Original Article

CALCIUM STATUS OF FEMALE AND MALE MEDICAL STUDENTS

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Objective: To assess the calcium status of healthy female and male medical students.

Material & Methods: This cross sectional study was carried out in 30 female and 30 male healthy medical students in Department of Physiology, Services Institute of Medical Sciences, Lahore. Subjects were selected according to the inclusion criteria. Height and weight of each subject was determined and BMI was calculated. Serum calcium was determined by colorimetric method. Serum parathyroid and calcitonin were estimated by the ELISA.

Results: The height and weight of female students were significantly less than those of male students. BMI of female students was non-significantly lower than those of male students. In female students, serum calcium and calcitonin levels were significantly lower while serum parathyroid hormone was non significantly lower than in male students. A significant positive correlation between serum calcium and serum calcitonin levels and significant negative correlation between serum calcium and parathyroid hormone levels were found in total study population. Significant correlations of serum calcitonin with weight and height were also present.

Conclusion: The female medical students have low calcium status and are more prone to have bone loss.

Keywords: Serum calcium, parathyroid hormone and calcitonin.

Introduction

Extracellular calcium ion concentration is determined by the interplay of calcium absorption from the intestine, renal excretion of calcium and release and uptake of calcium by bones. These parameters are regulated by vitamin D, parathyroid hormone (PTH) and calcitonin.¹ Calcium is necessary for blood coagulation, muscle contraction, and nerve function. It is also involved in bone and teeth formation.²

Parathyroid hormone (PTH) is the major hormone regulating calcium metabolism and is involved in both catabolic and anabolic actions on bones. Intermittent PTH exposure can stimulate bone formation when injected. Continuous infusion of PTH stimulates bone resorption.³ It increases calcium reabsorption in the kidney. It also increases the formation of 1, 25 dihydroxycholecalciferol, which increases Ca^{++} reabsorption from the intestines and in the kidney.²

Calcitonin is a calcium lowering hormone which inhibits bone resorption and reduces bone loss.⁴ It also increases Ca^{++} excretion in the urine.² The foundation of bone health is established during the pre and postnatal developmental stages, especially in childhood and adolescence.⁵ This study was aimed to assess the gender difference of calcium status in healthy medical students.

Material and Methods

This cross sectional study was conducted on 30 female and 30 male, healthy medical students in the Department of Physiology, Services Institute of Medical Sciences, Lahore.

Subjects were selected according to the inclusion criteria. Diabetes mellitus, endocrine disorders, milk intolerance, fractures and bone malignancy were excluded on history. Informed consent from each subject was taken. Height (cm) and weight (kg) of each subject was determined by the standard scale to find out Body Mass Index (BMI). Five ml of venous blood was drawn aseptically from each subject. It was centrifuged at 3000 rpm for 10 minutes and serum was separated. The serum was stored at -20°C until used. Serum calcium was measured by colorimetric method using Randox kit. Serum parathyroid hormone and calcitonin were estimated by Enzyme Linked Immuno Sorbent Assay (ELISA). Mean±SD of all the variables was determined. Student 't' test was applied to see the significance of difference of parameters between female and male students. Pearson's correlation coefficient was determined to evaluate correlation between different parameters. students. Pearson's correlation coefficient was determined to evaluate correlation between different parameters.

Results

The height and weight of female medical students were significantly ($p=0.000$) less than those of male students. BMI of female students was non-significantly lower than that of male students (**Table-1**) In female students, serum calcium and calcitonin levels were significantly ($p=0.002$) lower than those of male students. Serum parathyroid hormone was non-significantly ($p=0.383$) higher in male as compared to female students (**Table-2, Fig-1**)

There was a significant positive correlation ($r=0.263$

$p=0.043$) between serum calcium and serum calcitonin levels in total study subjects. (**Table-3, Fig-2**) A significant negative correlation ($r=-0.387$ $p=0.002$) was found between serum calcium and parathyroid hormone levels in total study subjects (**Table-3, Fig-3**) A significant positive correlation was also found between serum calcitonin and weight ($r=0.547$ $p=0.000$) and between serum calcitonin and height ($r=0.607$ $p=0.000$) (**Table-4**) The correlation of serum parathyroid hormone with weight and height was non-significant.

Table-1: Comparison between anthropometric features of female and male students .

Parameters	Female Students (n=30)	Male Students (n=30)	P-value
Age (years)	20.23±0.57	20.40±1.13	-
Height (cm)	156.90±6.33	171.60±7.83	0.000*
Weight (kg)	66.94±13.66	72.074±12.78	0.000*
BMI (kg/m ²)	22.50±3.49	24.11±3.16	0.068

Table-2: Serum calcium, calcitonin and parathyroid hormone levels in female and male students.

Factors	Female Students (n=30)	Male Students (n=30)	P-value
Serum Ca ⁺⁺ (mg/dl)	8.86±0.62	9.36±0.56	0.002*
Serum Calcitonin (pg/ml)	5.67±1.79	11.66±3.80	0.000*
Serum PTH (pg/ml)	43.52±24.05	48.67±21.32	0.0383

Table-3: Correlation of serum calcium with serum calcitonin and parathyroid hormone in total study subjects (n=60).

Correlation of serum calcium with	Correlation coefficient (r)	P-value
Serum calcitonin	0.263	0.043*
Negative	-0387	0.002*

Table-4: Correlation of serum calcitonin with physical parameters in total study subjects (n=60).

Correlation of serum calcium with	Correlation coefficient (r)	P-value
Age	0.109	0.405
Weight	0.547	0.000*
Height	0.607	0.000*
BMI	0.162	0.218

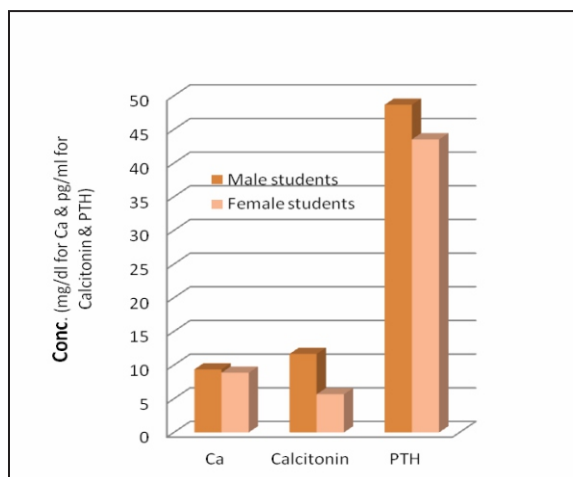


Fig-1: Serum calcium, calciton and parathyroid hormone levels in female and male students.

Fig: 2. Scatter plot showing correlation between serum calcium and calcitonin levels ($r= 0.263$, $p= 0.043$)

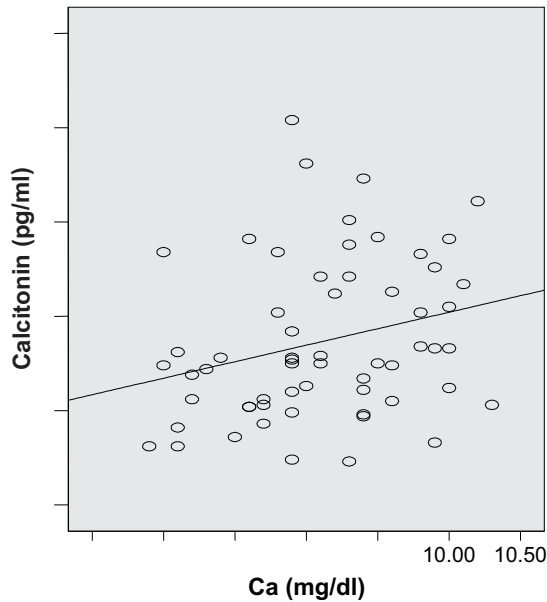
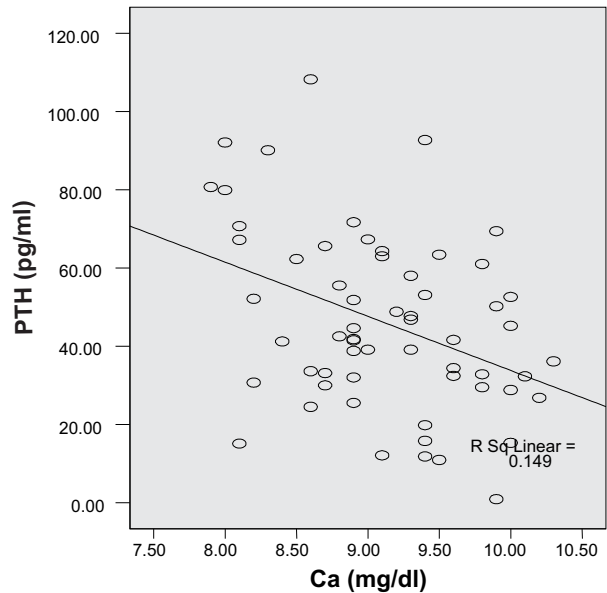


Fig: 3. Scatter plot showing correlation between serum calcium and parathyroid hormone levels ($r= - 0.387$, $p= 0.002$)



Discussion

The present study evaluated the calcium status in healthy female and male medical students. In female medical students, serum calcium and calcitonin levels were significantly lower as compared to those in male students. Serum parathyroid hormone levels were non-significantly lower in females. Serum parathyroid hormone levels indicate bone turnover in the body.⁶ There was low bone turnover in female students. Calcitonin is the only hormone which binds to the osteoclast membrane and has anti-resorptive effect in bones.⁷ Because of low calcitonin levels female students were more prone to have bone loss.

A positive significant correlation was found between serum calcium and calcitonin. A significant negative correlation was found between serum calcium and parathormone. These findings are in agreement with the results reported by Saleh et al.⁸ A significant positive correlation of serum calcitonin with height and weight was present. This finding is in contrary to the results of study by Chou et al, who did not find any significant correlation of serum calcitonin with

height and weight.⁹ This difference may be due to racial and environmental factors.

The low calcium status, in young females, predisposes them to early development of osteoporosis. The prevalence of osteoporosis is high, especially among young Pakistani women.^{10,11} A study conducted at Karachi reported that younger women were at increased risk for low bone mass and premature osteoporosis.¹² It is concluded that female medical students have low calcium status and are more prone to have bone loss.

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References

- Guyton AC, Hall JE. Text book of Medical Physiology. 12th ed. Philadelphia: Elsevier Saunders 2010.
- Barrett KE, Barman SM,
- Boittano S, Brooks HL. Ganong's Review of Medical Physiology. 23rd ed. New Delhi: Tata McGraw Hill 2010: 363-73.
- Bouassida A, Latiri J, Bouassida S,
- Zalleg D, Zaouali M, Feki Y. Parathyroid hormone and physical exercise: a brief review. J Spo Scien Med 2006; 5:367-74.
- Nieves JW, Komar L, Cosman F,

- Lindsay R. Calcium potentiates the effect of estrogen and calcitonin on bone mass: review and analysis. *Am J Clin Nutr* 1998;67:18-24.
5. Bachrach LK. Assessing born health in children: Who to test and what does it mean? *Pediatr Endocrinol Rev* 2005; 3:332-6.
 6. Eastell R, Yergey AL, Vieira N, Cedel SL, Kumar R, Riggs BL. Interrelationship among vitamin D metabolism, true calcium absorption, parathyroid function and age in women: evidence of an age-related intestinal resistance to 1, 25 (OH)² D action. *J Bone Miner Res* 1991;6: 125-32.
 7. Taboulet J, Frenkian M, Frendo JL, Feingold N, Jullienne A, De Vernejoul MC. Calcitonin receptor polymorphism is associated with a decreased fracture risk in postmenopausal women. *Human Mole Genet* 1998;7:2129-33.
 8. Saleh MT, Sherif LS, Mourice W, Fakhry D, Elkhayat Z, Awadalla R. Assessment of serum calcium, calcitonin and parathyroid hormone levels in critically ill children. *J App Scie Res* 2008; 4:360-6.
 9. Chou YH, Kao CH, ChangLai SP. Calcitonin, parathyroid hormone and osteocalcin in normal Chinese women. *Ann Nucl Med Sci* 1999; 12:17-21.
 10. Fatima M, Nawaz H, Kassi M, Rehman R, Kasi PM, Kassi M et al. Determining the risk factors and prevalence of osteoporosis using quantitative ultrasonography in Pakistani adult women. *Singapore Med J* 2009; 50;20-8.
 11. Jaleel R, Nasrullah FD, Khan A. Osteopenia in the younger females. *J Surg Pak* 2010; 15: 29-33.
 12. Riaz M, Abid N, Patel J, Tariq M, Khan MS, Zuberi L. Knowledge about osteoporosis among healthy women attending a tertiary care hospital. *J Pak Med Assoc* 2008; 54: 190-4.

Picture Quiz

What is the diagnosis?

1. Melanoma
2. Addison's disease
3. Warfarin therapy
4. Trauma
5. Fungal Infection



See answer on Page 38