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Evaluation of Serum Calcium Levels Between Inter-University Soccer Players and Non-Sports Persons in Punjab

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Abstract

Background: Calcium is essential for preserving the firmness and structure of bones. Athletes have a higher calcium turnover, particularly those who engage in weight-bearing and endurance exercises. Conversely, because they engage in less physical activity, non-athletes with sedentary lifestyles have lower calcium turnover. The impact of physical activity on calcium metabolism is demonstrated by comparing the groups' calcium contents.

Objective: The study aimed to diagnose the calcium level of soccer players in comparison to non-sports persons who are the inter-university players of Punjab.

Materials and Methods: A random sampling method was used to select forty (N = 40) interuniversity male athletes. The sample consisted of soccer players (n = 20) and non-sports persons (n = 20). The calcium was assessed among the group by using the Erbachem Manheim Chem 5 Plus V2 semi-auto biochemistry analyser.

Results: An independent sample t-test was performed to compare calcium levels between soccer players and non-sports persons. The analysis revealed a statistically significant difference between the groups ($t = 6.00$, $p = 0.0001$), with soccer players exhibiting significantly higher serum calcium levels than non-sports persons.

Conclusion: Regular participation in high-intensity, weight-bearing physical activity affects the whole metabolism and calcium content too.

Keywords: Biochemical, Calcium, Soccer, Non-sports person, Active adult, Inactive Adult

INTRODUCTION

Calcium plays a fundamental role in bone strength, neuromuscular function, and muscle contraction, all of which are essential for athletic performance and skeletal System health. It is only the level of physical activity and type of sport pointedly influence calcium metabolism and bone mineral density (BMD) among individuals **(Kohrt et al., 2004)**

Soccer players often establish bone mineral density and higher serum calcium concentrations compared to other athletes and sedentary lifestyle individuals. This can be attributed to the weight-bearing, high-intensity, and fast agility movements, which imposes mechanical stress on bones and stimulates osteoblastic activity and calcium deposition **(Nikander et al., 2010).** Regular strength-based training enhances skeletal loading, leading to greater calcium retention and improved bone health **(Bemben & Lamont, 2005).** Which further contributes to increased Bone Mineral Density and calcium utilization efficiency. According to **Tenforde & Fredericson (2011),** athletes who are participating in impact-loading sports such as soccer tend to exhibit higher bone mineral density and better calcium balance compared to those who are engaged in low-impact sports. Continuous running, jumping, and tackling promote bone remodelling and calcium deposit, enhancing both skeletal and muscular performance.

Regular exercise also influences hormones involved in calcium regulation, including parathyroid hormone (PTH) and vitamin D. These hormones help maintain serum calcium within a narrow physiological range by regulating intestinal calcium absorption, renal calcium reabsorption, and bone turnover**.** The mixture of collagen and calcium makes bone powerful and flexible enough to endure stress. Further than 99 percent of the body's calcium is included in the teeth and bones. The left-over 1 percent is located in the blood plasma (**Singh & Deol, 2018).**

Non-sportspersons or sedentary lifestyle individuals show lower calcium levels and bone mineral density due to the absence of mechanical bone loading. Inactivity reduces the stimulation of osteoblasts, leading to bone resorption exceeding formation **(Kohrt et al., 2004)**. Consequently, non-active individuals are more prone to osteopenia and osteoporosis compared to physically active populations.

MATERIAL AND METHODS

Study Participants

In this study, Total forty (N = 40) male university-level participants from Punjabi University, Patiala, India, were selected using a random sampling technique. The participants included (n = 20 soccer Players, and (n = 20) non-sports persons. All aged ranging between 18 and 25 years and all participants are national as well as interuniversity players in their respective sports

Operational Definitions

- **Calcium:** Calcium is a chemical element with the symbol Ca and atomic number 20. Calcium is the most abundant mineral in the human body and is essential for maintaining the structure and function of bones and teeth. **(Guyton & Hall, 2021).**
- **Soccer:** soccer is a team sport that is played in an outdoor field and requires a high standard of preparation through the development of physical performance skills, as well as tactical and technical expertise, in order to complete 90 minutes of competitive play. (**Joksimovic et al. 2015)**
- **Non-Sports Persons:** A non-sportsperson refers to a person who does not take part in regular sports or athletic activities and leads a comparatively inactive lifestyle. **(Singh & Verma, 2021)**

Inclusive and exclusive criteria

The participants included in the study were apparently healthy and free from any musculoskeletal

problems. This study included only those athletes who had participated in interuniversity level competition in their respective sports

Analysis and Interpretation

Test procedure

To assess the participant's biochemical profile. Prior to blood collection, all participants were instructed to maintain an overnight fast of approximately 10-12 hours and to avoid strenuous physical activity for at least 24 hours. Blood samples were collected between 9:30 a.m. And 2:00 p.m. **Ramezani et al. 2026**. Data was collected from 60 male athletes of Punjab. All the subjects were male athletes who were associated with different sports domains. The necessary data was collected through the administration of standardized instruments for the measurement of chosen variables. The test was conducted at the physiology lab in the Department of Physical Education, Punjabi University, Patiala. All the queries of the participant were answered and test administration was clearly defined to the participants before proceeding for the blood sampling. In Blood sampling, First of all, investigators advised an athlete to sit in a comfortable position on the chair. The phlebotomist cleans the site with an antiseptic to kill germs. After that phlebotomist places a tourniquet or elastic band around the upper arm to squeeze the vein and make it swell with blood (**Nikolaidis et al. 2003)** Venous blood is collected via venipuncture, Venous blood samples will be collecting into plain evacuated tubes from a forearm vein with minimal stasis after approximately10 min of rest in a sitting position. And the sample is processed in a clinical laboratory with appropriate quality control procedures **(Mathew et al. 2026)** An aliquot of each sample was immediately mixed with EDTA solution to prevent clotting for hematology. The rest of the sample was left to coagulate for 30 min at room temperature and centrifuge it at 3000 rpm for 10 minutes and then separate the serum. The serum was stored at ±20 Degree Celsius **(Joksimovic, A et al., 2015)** (Trinder P, 1969) , **(**Marakala et al., 2012)

Procedure

Administration of the test:

- **Objective**: To measure biochemical parameters of soccer players and non sports persons.
- **Equipment required**: Erba Chem – 5 V_2 Plus Analyzer, Incubator, Centrifuge Machine, Needle Cutter, Test Tubes (Ria vials), Disposable Syringes, Cotton, Spirit, Test tube Stands, Distilled water, Hypochlorite Solution (HCL), Tourniquet, Auto Pipettes, Micro tips, Pen, Copy.
- **Reagents**:
    1. Biochemical Reagent
    2. Biochemical Standard

Procedure

1. Approximately 3–5 ml of venous blood was collected under aseptic conditions into a plain blood collection tube.
2. The blood sample was allowed to incubate in incubator machine for at least 10 minutes
3. The clotted blood sample was centrifuged at approximately 3000 rpm for 10 minutes (or according to the laboratory's standard operating procedure) to separate the serum from the blood clot.
4. The clear serum was carefully transferred into a clean sample tube or sample cup for biochemical analysis.
5. Three clean, dry test tubes were labelled as Blank (B), Standard (S), and Test (T).
6. The working reagent was added to each tube according to the manufacturer's instructions.
7. Distilled water was added to the Blank, biochemical standard to the Standard, and the separated

serum sample to the Test tube.

8. The contents of each tube were mixed gently and incubated at 37°C for 10 minutes (or as recommended in the reagent kit insert).
9. The reaction mixture was analyzed using the Erba Chem-5 V2 Plus Fully Automated Clinical Chemistry Analyzer. The analyzer measured the absorbance at 505 nm and automatically calculated the glucose concentration.
10. The result was displayed by the analyzer in mg/dl and recorded for statistical analysis. **(Trinder P, 1969) , (Marakala et al., 2012) (Schumann et al. 2002) (Burstein et al. 1970) ,(Lippi & Plebani, 2020**

Analysis and interpretation

The data was carefully recorded and a descriptive statistical technique to test was employed to analyze the difference between the groups; the level of significance was set at 0.05. The study found that there exists a significant difference in calcium content between soccer players and non-sports persons.

Table 1. Represents the comparison of calcium levels between Soccer Players and Non-Sports Persons using an independent samples *t*-test. Each group consisted of 20 participants. Soccer Players recorded a higher mean calcium level (M = 9.2630, SD = 2.0219, SEM = 0.4521) compared with Non-Sports Persons (M = 6.4550, SD = 0.5326, SEM = 0.1191).

Table 1. Descriptive statistics of Calcium of Soccer players and non-sports persons.

Group	N	Mean (M)	SD	SEM	T- value	P-value
Soccer Players	20	9.2630	2.0219	0.4521	6.00	0.0001
Non-Sports Persons	20	6.4550	0.5326	0.1191		

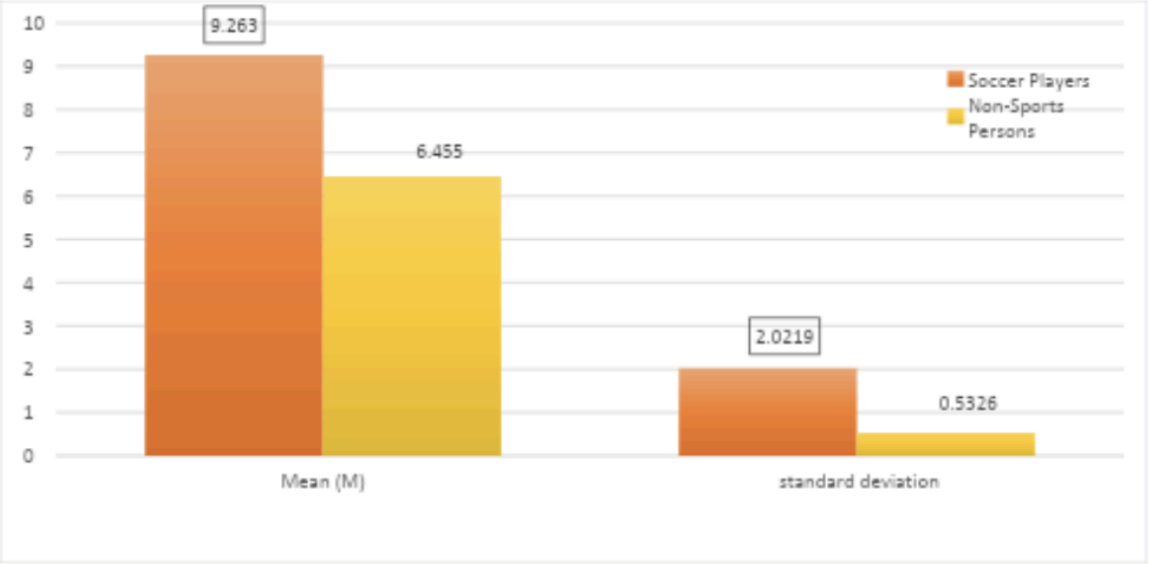

Figure 1. Showing the mean and standard deviation of calcium among group

Discussion of the finding

The present study confirmed that soccer players had significantly higher calcium levels than non-sports persons (t = 6.00, p = 0.0001). This difference may be ascribed to the physiological adaptations related with regular participation in high-intensity, weight-bearing physical activity. Soccer involves repeated running, jumping, sprinting, and rapid changes in direction, all of which impose mechanical loading on the skeleton. Such loading stimulates bone remodeling and promotes the maintenance of calcium homeostasis, contributing to improved bone health **(Kohrt et al., 2004).**

Regular exercise also influences hormones involved in calcium regulation, including parathyroid hormone (PTH) and vitamin D. T. Athletes who participate in regular training often exhibit more efficient calcium metabolism, particularly when supported by adequate dietary calcium and vitamin D intake **(Institute of Medicine, 2011).**

In addition, soccer players generally have healthier dietary habits and higher nutrient intake than sedentary individuals because of greater awareness of sports nutrition. Adequate calcium intake is essential for muscle contraction, nerve conduction, bone mineralization, and recovery from training. Consequently, physically active individuals are more likely to maintain optimal calcium status than non-sports persons, especially when nutritional intake is sufficient **(Thomas, Erdman, & Burke, 2016).**

On the other hand, because they lead sedentary lives, non-athletes may have lower amounts of mechanical stimulation to the skeleton. Over time, reduced physical activity may lead to less favorable calcium metabolism and is associated with poorer bone remodeling activity. The significantly higher serum calcium found among soccer players in the current study may be partially explained by variations in physical activity, dietary status, and hormonal responses, despite the tight regulation of serum calcium.

Overall, the results indicate that, in contrast to a sedentary lifestyle, regular soccer involvement, along with a healthy diet and weight-bearing exercise, may promote calcium metabolism and bone health.

Conflict of interest

The authors declare no conflicts of interest.

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