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Comparison of Height, Weight, Vitamin D, Calcium and Parathyroid Hormone Between Males and Females at the Tobruk University

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ABSTRACT

This study aims to compare various physiological and biochemical parameters—namely height, weight, vitamin D levels, calcium levels and parathyroid hormone (PTH) levels, between male and female students aged 21 and 22 at the University of Tobruk. By analyzing these parameters, the study seeks to identify any significant differences between genders, which could have implications for health and nutritional recommendations. The results indicated that the mean height of male students was 165.64 ± 1.1 cm, significantly taller than female students, who had a mean height of 159.39 ± 0.82 cm (p -value = 0.000). However, the mean weight difference between males (63.00 ± 1.3 kg) and females (61.30 ± 1.5 kg) was not statistically significant (p -value = 0.424). Regarding biochemical parameters, male students had significantly higher mean vitamin D levels (16.6 ± 1.3 ng/mL) compared to female students (12.75 ± 0.56 ng/mL, p -value = 0.008). Similarly, males had higher mean calcium levels (9.330 ± 0.093 mg/dL) than females (8.946 ± 0.10 mg/dL, p -value = 0.007). The mean phosphorus levels did not show a significant difference between males (3.23 ± 0.23 mg/dL) and females (3.97 ± 0.50 mg/dL, p -value = 0.179), nor did the PTH levels (p -value = 0.976). In conclusion, the study revealed significant gender differences in height, vitamin D, calcium levels, and PHT among the student population at the University of Tobruk. Males were generally taller and had higher levels of certain biochemical. These findings underscore important gender-specific physiological and biochemical differences within this population.

مقارنة الطول والوزن وفيتامين د والكالسيوم وهرمون الغدة الدرقية بين الذكور والإناث في جامعة طبرق

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الكلمات المفتاحية:

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الكالسيوم
الفسفور
PHT
جامعة طبرق

الملخص

تهدف هذه الدراسة إلى مقارنة مختلف العوامل الفسيولوجية والكيميائية الحيوية كالطول والوزن ومستويات فيتامين د ومستويات الكالسيوم ومستويات هرمون الغدة الدرقية بين الطلاب الذكور والإناث الذين تتراوح أعمارهم بين 21 و 22 عامًا. ومن خلال تحليل هذه العوامل، تسعى الدراسة إلى تحديد أي اختلافات بين الجنسين، والتي يمكن أن يكون لها آثار على التوصيات الصحية والغذائية. أشارت النتائج إلى أن متوسط ارتفاع الطلاب الذكور كان 165.64 ± 1.1 سم، وهو أطول بكثير من الطالبات اللاتي بلغ متوسط ارتفاعهن 159.39 ± 0.82 سم (قيمة $p = 0.000$). ومع ذلك، فإن متوسط فرق الوزن بين الذكور (63.00 ± 1.3 كجم) والإناث (61.30 ± 1.5 كجم) لم يكن ذو دلالة إحصائية (قيمة $p = 0.424$). وفيما يتعلق بالمعلمات البيوكيميائية، كان لدى الطلاب الذكور متوسط مستويات فيتامين د أعلى بكثير (16.6 ± 1.3 نانوغرام/مل) مقارنة بالطالبات (12.75 ± 0.56 نانوغرام/مل، قيمة $p = 0.008$). كان لدى الذكور متوسط مستويات الكالسيوم أعلى (9.330 ± 0.093 ملجم/ديسيلتر) مقارنة بالإناث (8.946 ± 0.10 ملجم/ديسيلتر، قيمة $p = 0.007$). لم تظهر مستويات الفوسفور المتوسطة فرقًا كبيرًا بين الذكور

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0.23 ± 3.23 ملجم/ديسيلتر) والإناث (0.50 ± 3.97 ملجم/ديسيلتر، قيمة $p = 0.179$)، ولا مستويات PTH (قيمة $p = 0.976$). كشفت الدراسة عن وجود فروق ذات دلالة إحصائية بين الجنسين في الطول، وفيتامين د، ومستويات الكالسيوم، بين مجتمع الطلاب. كان الذكور بشكل عام أطول وكان لديهم مستويات أعلى من بعض العلامات البيوكيميائية. تؤكد النتائج على وجود اختلافات فسيولوجية وكيميائية حيوية مهمة بين الجنسين ضمن هذه الفئة.

1. Introduction

Vitamin D, calcium, parathyroid hormone "PTH", height and weight are critical physiological and biochemical parameters that play significant roles in maintaining human health. Understanding the interplay between these factors is essential for developing targeted health interventions and nutritional guidelines. This research explores the relationships between these parameters among university students in their twenties, providing insights into gender-specific health dynamics. This study aims to compare various physiological and biochemical parameters—namely height, weight, vitamin D levels, calcium levels, parathyroid hormone "PTH" levels, and complete blood count "CBC"—between male and female students aged 21 and 22 at the University of Tobruk. By analyzing these parameters, the study seeks to identify any significant differences between genders, which could have implications for health and nutritional recommendations. The fat-soluble vitamin D is necessary for the body to absorb calcium and phosphorus, two minerals that are vital for strong bones. It also plays important functions in cellular development, inflammation reduction, and immunological function. A global health concern, vitamin D insufficiency has been related to osteoporosis, cardiovascular disease, and several types of cancer [1]. According to [2], recent research has shown that vitamin D deficiency is common even in areas with plenty of sunshine, emphasizing the need for efficient methods to treat this shortage. Calcium is an essential mineral required for many body processes, such as nerve transmission, muscular contraction and dilatation, intracellular communication, vascular contraction and vasodilation, and hormone secretion. About 99% of the calcium in the human body is stored in the bones and teeth, making up 1.5% of the body's total weight[3]. Throughout life, consuming enough calcium is crucial to maintaining optimal bone mass, preventing osteoporosis, and avoiding fractures. The hormone parathyroid is essential for controlling blood calcium levels. The parathyroid glands release it, which raises blood calcium levels by promoting renal calcium reabsorption, intestinal calcium absorption (via vitamin D activation), and bone resorption [4]. Disorders like hyperparathyroidism or hypoparathyroidism, which impact general calcium homeostasis, can be brought on by abnormal PTH levels. Anthropometric metrics, such as weight and height, are essential markers of a person's nutritional and overall health. Underweight, normal weight, overweight, and obesity are all classified using the body mass index "BMI", which is calculated using height and weight and is linked to various health hazards[5]. Monitoring these metrics facilitates the comprehension of growth trends and the early detection of possible health hazards. There are many different and intricate relationships between vitamin D, calcium, PTH, height, and weight. For example, sufficient vitamin D levels are necessary for the best possible absorption of calcium, which is critical for the development and preservation of bones. PTH controls calcium levels, which affects general metabolic processes as well as bone health. Furthermore, as indicated by differences in height and weight can both affect and be influenced by dietary and hormonal states[6].

2. Materials and methods

This comparative study was conducted at the University of Tobruk, focusing on the differences in height, weight, vitamin D levels, calcium levels, parathyroid hormone (PTH) levels, and blood count between male and female students. A total of 60 participants were recruited for this study, comprising 30 males and 30 females. The selection criteria ensured that participants were healthy and free from chronic diseases that could affect the study's parameters. Participants were included in the study if they were between the ages of 18 and 25, enrolled as full-time students at the University of Tobruk, and provided informed consent. Exclusion criteria included a history of metabolic bone disease, chronic kidney disease, liver disease, or any condition that could affect vitamin D, calcium, or parathyroid

hormone levels. Pregnant or lactating women were also excluded. Anthropometric measurements (height and weight) were taken using standard procedures. Height was measured using a stadiometer, and weight was measured using a calibrated digital scale.

Blood samples were collected from all participants after an overnight fast. Serum levels of vitamin D, calcium, and parathyroid hormone were measured using standard biochemical assays. The specific assays used were: Vitamin D: 25-hydroxyvitamin D [25(OH)D] levels were measured using an enzyme-linked immunosorbent assay (ELISA). Vitamin D was measured using the ELISA method (Immune Diagnostic Systems, UK). A blood level of vitamin D above 30 ng/ml was considered sufficient, while values between 20 and 30 ng/ml as insufficient, and values below 20 ng/ml as deficient. Calcium: Serum calcium levels were measured using colorimetric methods. Parathyroid Hormone: PTH levels were measured using a chemiluminescent immune assay. Statistical analysis. "When appropriate, statistical analysis was performed using Graph Prism Pad and Minitab software (version 17). After detecting a normal distribution in the data and selecting a $P < 0.05$ threshold for significance, ANOVA analysis with the Tukey multiple comparison test was used to determine statistical significance [7]."

3. RESULTS

The mean height of the male students was 165.64 ± 1.1 cm, while the mean height of the female students was 159.39 ± 0.82 cm. The difference in height between males and females was statistically significant, with a p-value of 0.000. This indicates that, on average, male students were significantly taller than female students in this sample. The mean weight of the male students was 63.00 ± 1.3 kg, and the mean weight of the female students was 61.30 ± 1.5 kg. The difference in weight between males and females was not statistically significant, with a p-value of 0.424. This suggests that, in this sample, there was no significant difference in the average weight of male and female students. In summary, the study found a significant difference in height between male and female students at the University of Tobruk, with males being taller on average. However, there was no significant difference in weight between the two groups. These findings highlight a notable gender difference in height but not in weight among the student population studied.

Table 1: Comparison of Length and Weight Between Males and Females.

Parameters	Males Mean± SEM (n=59)	Females Mean± SEM (n=59)	P-value
Length	165.64 ±1.1	159.39 ±.82	0.000
Weight	63.00 ± 1.3	61.30 ± 1.5	0.424

	Weight	Length
Male	63.00	165.64
Female	61.30	159.39

Fig. 1: Comparison of Length and Weight Between Males and Females.

The mean vitamin D level in male students was 16.6 ± 1.3 ng/mL, whereas in female students, it was 12.75 ± 0.56 ng/mL. The difference in vitamin D levels between males and females was statistically significant, with a p-value of 0.008. This indicates that male students had significantly higher levels of vitamin D compared to female students in this sample. The mean calcium level in male students was 9.330 ± 0.093 mg/dL, while in female students, it was 8.946 ± 0.10 mg/dL. The difference in calcium levels between males and females was also statistically significant, with a p-value of 0.007. This suggests that male students had significantly higher calcium levels compared to female students. The mean phosphorus level in male students was 3.23 ± 0.23 mg/dL, and in female students, it was 3.97 ± 0.50 mg/dL. The difference in phosphorus levels between males and females was not statistically significant, with a p-value of 0.179. This implies that there was no significant difference in the average phosphorus levels between male and female students in this sample. There is no significant difference in PTH levels between males and females, with a p-value of 0.976. In summary, the study found significant differences in vitamin D and calcium levels between male and female students, with males having higher levels of both. However, there was no significant difference in phosphorus levels between the two groups. These findings highlight gender-specific differences in certain biochemical parameters among the student population at the University of Tobruk.

Table 2: Comparison of Vitamin D, Calcium, Phosphorus and Parathyroid hormone Between Males and Females.

Parameters	Male Mean± SEM (n=59)	Female Mean± SEM (n=59)	P-Value
Vitamin D(ng/dl)	16.6 ±1.3	12.75±0.56	0.008
Calcium(mg/dl)	9.330 ±0.093	8.946 ±0.10	0.007
Phosphour(mg/dl)	3.23 ±0.23	3.97±0.50	0.179
Parathyroid (PTH)	35.8 ±3.4	35.7±4.1	0.976

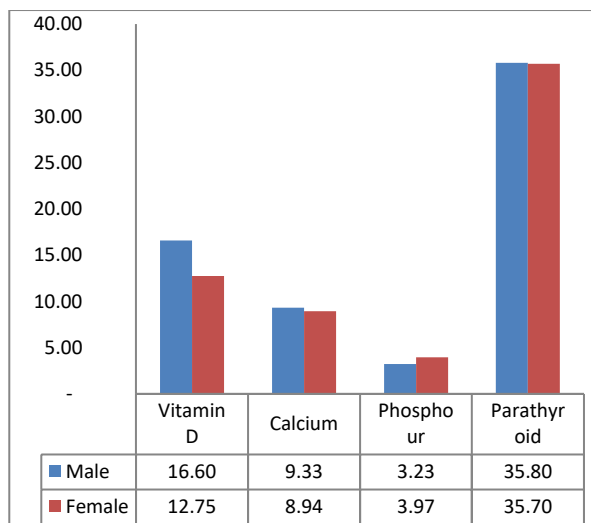


Fig. 2: Comparison of Vitamin D, Calcium, Phosphour and Parathyroid Between Males and Females.

4. Discussion

The study revealed, (see Figure 1 & 2 and Table 1 & 2), that the mean height of male students (165.64 ± 1.1 cm) was significantly greater than that of female students (159.39 ± 0.82 cm), with a p-value of 0.000. This finding is consistent with numerous studies indicating that males generally have greater average height compared to females. This difference can be attributed to various genetic and hormonal factors that influence growth patterns in males and females during puberty and adolescence [8]. In terms of weight, the mean weight of male students was 63.00 ± 1.3 kg, whereas the mean weight of female students was 61.30 ± 1.5 kg. The difference in weight between males and females was not statistically significant, with a p-value of 0.424. This result suggests that, in this sample, the average weight of male and female students was comparable. Previous research has shown mixed results regarding weight differences between genders, often influenced by factors such as age, lifestyle, diet, and physical activity

levels [9]. The mean vitamin D level in male students (16.6 ± 1.3 ng/dL) was significantly higher than that in female students (12.75 ± 0.56 ng/dL), with a p-value of 0.008. This significant difference suggests that males had better vitamin D status compared to females. The lower levels in females may be attributed to factors such as less sun exposure, dietary habits, and differences in body composition, which are known to affect vitamin D synthesis and storage[10,11]. The mean calcium level was also significantly higher in male students (9.330 ± 0.093 mg/dL) compared to female students (8.946 ± 0.10 mg/dL), with a p-value of 0.007. This result aligns with existing literature indicating that males generally have higher calcium levels. This difference could be due to variations in dietary calcium intake and hormonal influences that affect calcium metabolism differently in males and females[12,13]. The mean phosphorus level did not show a significant difference between male (3.23 ± 0.23 mg/dL) and female students (3.97 ± 0.50 mg/dL), with a p-value of 0.179. The lack of a significant difference suggests that phosphorus levels are more uniformly regulated across genders, likely due to its critical role in numerous physiological processes that are maintained tightly within a narrow range [14]. The mean parathyroid hormone (PTH) levels were nearly identical between males (35.8 ± 3.4 pg/mL) and females (35.7 ± 4.1 pg/mL), with a p-value of 0.976, indicating no significant difference. This similarity suggests that PTH regulation, which is crucial for maintaining calcium and phosphorus homeostasis, operates similarly in both genders, reflecting balanced physiological control mechanisms [15].

5. Conclusion

The study revealed significant gender differences in height, vitamin D and calcium levels among the student population at the University of Tobruk. Males were generally taller and had higher levels of certain biochemical markers. These findings underscore important gender-specific physiological and biochemical differences within this population.

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