Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

A study of the relationship between vitamin D deficiency and the incidence of high cholesterol and triglycerides in the blood

1. **Dr. Mohamed Bashir Elmalimadi -** Department of Chemistry - Faculty of Education - University of Misurata – Libya .
2. **Dr. Salem Mohamed Embiriekah -** Department of Chemistry - Faculty of Education - University of Misurata – Libya
3. **Elham Mustafa al-Houta-**Department of Chemistry-Faculty of Education-University of Misrata.
4. **Firdous Miftah Sultan-**Department of Chemistry-Faculty of Education-University of Misrata.

Abstract

This study examined the prevalence of vitamin D deficiency and its correlation with elevated cholesterol and triglyceride levels in the blood of individuals residing in Misurata city, with comparisons made to the permissible levels. The samples were collected between March and May 2024, and a total of 20 individuals of varying ages in Misurata city were included.

The results demonstrated that there is no statistically significant correlation between vitamin D deficiency and high cholesterol and triglycerides. This is evidenced by the fact that, in some samples, vitamin D levels were moderate, while cholesterol and triglycerides were high. Conversely, in other samples, vitamin D levels were high, while cholesterol and triglycerides were moderate.

The mean vitamin D levels were found to be between 8 and 46 ng/ml, while the mean cholesterol levels ranged from 100 to 260 mg/dl. The mean triglyceride levels were observed to be between 37 and 240 mg/dl.

While vitamin D levels were observed to be lower in younger individuals compared to the elderly, cholesterol and triglyceride levels were found to be the lowest in younger individuals and the highest in both younger and elderly individuals.

Keywords : *Vitamins - Vitamin D - Cholesterol – Triglycerides*

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

دراسة نقص فيتامين "د" و علاقته بارتفاع نسبة الكوليسترول والدهون الثلاثية في الدم

1. د . محمد بشير المليمدي – قسم الكيمياء – كلية التربية – جامعة مصراتة . ليبيا .
2. د. سالم محمد سالم إمبيريكة – قسم الكيمياء – كلية التربية – جامعة مصراتة . ليبيا .
3. إلهام مصطفى الحوته – قسم الكيمياء – كلية التربية – جامعة مصراتة
4. فردوس مفتاح سلطان–قسم الكيمياء–كلية التربية–جامعة مصراتة.

الملخص

هذه الدراسة تناولت انتشار نقص فيتامين د وعلاقته بمستويات الكوليسترول والدهون الثلاثية المرتفعة في دم الأفراد المقيمين في مدينة مصراتة، مع إجراء مقارنات مع المستويات المسموح بها. تم جمع العينات بين مارس ومايو 2024، وشملت الدراسة 20 فردًا من أعمار متنوعة في مدينة مصراتة.

أظهرت النتائج عدم وجود علاقة ذات دلالة إحصائية بين نقص فيتامين د وارتفاع مستويات الكوليسترول والدهون الثلاثية. وهذا يتضح من أن بعض العينات كانت مستويات فيتامين د فيها متوسطة، في حين كانت مستويات الكوليسترول والدهون الثلاثية مرتفعة. وعلى العكس، في عينات أخرى، كانت مستويات فيتامين د مرتفعة، بينما كانت مستويات الكوليسترول والدهون الثلاثية متوسطة.

تراوحت مستويات فيتامين د المتوسطة بين 8 و46 نانوغرام/مل، بينما تراوحت مستويات الكوليسترول المتوسطة بين 100 و260 ملغ/دل. وتمت ملاحظة أن مستويات الدهون الثلاثية كانت بين 37 و240 ملغ/دل.

بينما لوحظ أن مستويات فيتامين د كانت أقل في الأفراد الأصغر سناً مقارنة بكبار السن، كانت مستويات الكوليسترول والدهون الثلاثية الأدنى في الأفراد الأصغر سناً والأعلى في كل من الأفراد الأصغر سناً وكبار السن.

الكلمات المفتاحية الفيتامينات – فيتامين د – الكوليسترول – الدهون الثلاثية.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

Introduction

Vitamins are a group of organic compounds that are indispensable for maintaining optimal health and facilitating growth and development in the human body. Vitamins play a pivotal role in numerous bodily functions, including the maintenance and advancement of overall health, the fortification of skeletal integrity and the immune system, the optimization of nervous system performance, and the facilitation of metabolic processes. (Using and Area 2023) Vitamins are essential components of the diet and have long been known to affect the immune system. In light of these findings, vitamins A and D have garnered particular attention in recent years, given their demonstrated capacity to exert a pivotal and unanticipated influence on the immune response. (Mora, Iwata, and Von Andrian 2008)

Vitamins are low-molecular-weight organic compounds that are not synthesised within the body, or are synthesised in quantities that are insufficient for the body's needs. The factors that determine the body's need for vitamins are dependent on a number of variables, including the individual's gender, age, physiological condition, and personal characteristics. Vitamins are of great importance to the human body. A deficiency in vitamins can lead to a reduction in an individual's capacity to perform work-related tasks, as well as a diminished ability to resist disease and the harmful effects of external environmental factors. Vitamin deficiency may also result from impaired absorption in the intestine, inadequate delivery to tissues, and insufficient conversion to a biologically active form. (*Omonnazarova et al. 2022)*

Vitamins are classified into two principal categories: water-soluble and fat-soluble. The former includes vitamins B and C.

The second category comprises fat-soluble vitamins, including vitamins K, A, D, and E, as well as vitamin.

The benefits of vitamins extend to numerous aspects of human health. They have been linked to the promotion of healthy skin, hair and nails, the strengthening of the immune system, the protection of the body from diseases and infections, the improvement of vision and general eye health, the promotion of cardiovascular health, the enhancement of brain function and the increase of understanding and cognition. It is therefore recommended that vitamins be obtained from a variety of food sources in order to ensure

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

optimal absorption by the body, which is more efficient when nutrients are consumed in a balanced diet. (Using and Area 2023)

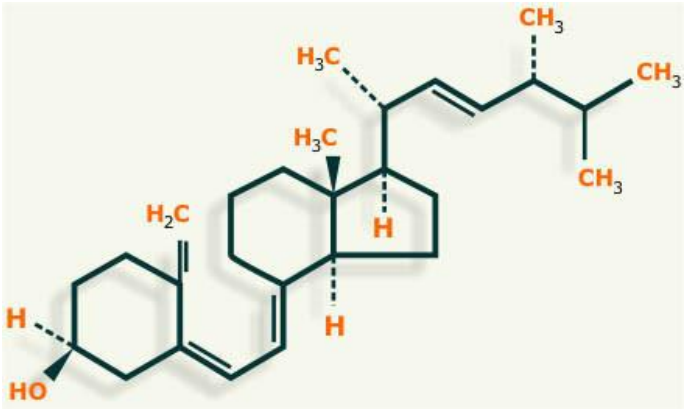
In recent years, there has been a growing recognition of the importance of vitamin D in maintaining overall human health and preventing a range of diseases, including osteomalacia, osteoporosis, cancer, and cardiovascular diseases. *(Chaudhry et al. 2018*)Vitamin D deficiency has been identified as a contributing factor in the development of at least two metabolic bone diseases, namely osteomalacia and osteoporosis. The mineral deficiencies that result in osteomalacia or rickets in children can be resolved by restoring the balance of calcium and phosphate in the plasma, regardless of vitamin D activity. The well-characterised endocrine pathway of vitamin D metabolism and its activities is the sole determinant of vitamin D regulation of plasma calcium and phosphate balance, and thus protection from osteomalacia (*Ryan et al. 2013*)Ultraviolet (UV) radiation emitted by the sun is the primary source of vitamin D. Synthesis of this vitamin occurs when the body is exposed to these rays. Vitamin D plays a pivotal role in bone health, facilitating the absorption of calcium from the bones in the intestine and contributing to robust skeletal growth.

Additionally, two forms of vitamin D are essential for nutritional purposes. Vitamin D2 is produced by plants and yeast progenitors and is the form most commonly used in high-dose supplements.

Vitamin D3 is the most active form of vitamin D. It is formed in the skin when exposed to direct sunlight. Foods fortified with this vitamin are derived from milk and grains. It is also found in fish oils, fatty fish, and liver. (DOUIB, REKIS, and SMAALI 2022)

One of the most serious consequences of vitamin D deficiency is the onset of cognitive impairment, characterised by difficulties in cognitive functioning, behaviour and memory, which in turn affects an individual's ability to function in daily life. Notwithstanding the extensive availability of pharmaceuticals and nutritional supplements, there are individuals who are particularly vulnerable to vitamin D deficiency. (Using and Area 2023)The available data for this vitamin indicate that its primary functions are to improve intestinal calcium absorption and to reduce hyperthyroidism, which is a model of ageing, as well as to reduce osteoporotic fractures. (Heaney 2005)

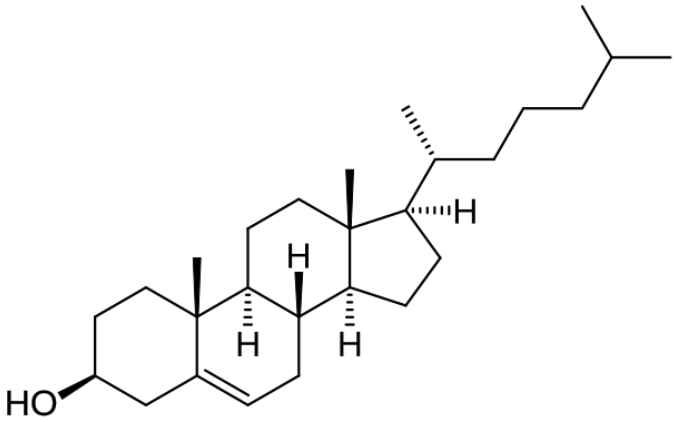
Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14



(Figure 1) Structural formula of vitamin D

Cholesterol is a waxy substance present in all cells of the body. It is one of several types of fat that plays an essential role in the functioning of the human body. The body requires cholesterol for the synthesis of hormones, vitamin D, and digestive enzymes. The liver is responsible for producing the requisite cholesterol for these functions, which is then transported into the bloodstream in a fat-like form (Wilkinson and Cockcroft 2007). Additionally, cholesterol is produced externally by the body, with dietary sources representing this external production. It is crucial to acknowledge that elevated cholesterol levels in the blood are predominantly associated with an individual's lifestyle. Not all cholesterol types in the blood are detrimental; some are essential for the production of vital hormones, including estrogen in women and testosterone in men (Omonnazarova et al. 2022) .Cholesterol is a compound comprising 27 carbon atoms and exhibiting a distinctive structure, characterised by a hydrocarbon tail and a hydroxyl group (Craig, Yarrarapu, and Dimri 2018) .

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14



(Figure 2) Structural formula of cholesterol

Cholesterol is transported in the bloodstream in the form of lipoproteins, which are macromolecules comprising a core of lipids surrounded by a protein coating. The most prevalent lipoprotein types are low-density lipoproteins (LDL) and high-density lipoproteins (HDL). Cholesterol has two sources: it is produced by the body itself and it is also obtained from foodstuffs of animal origin, including meat, milk, eggs and any products derived from them. Consuming an excess of this foodstuff results in an overall increase in the total cholesterol content of the body(*Jiang et al.* 2019*).* Triglycerides represent a form of blood fat present within the body. A diet that is excessive in terms of caloric intake can result in elevated triglyceride levels. Triglycerides are composed of a variety of fatty acids, each bonded to a glycerol molecule. Elevated blood triglyceride levels may be indicative of an unhealthy lifestyle (Laftah and Al-Niaimi 2018). The traditional fats and oils are composed of glycerides of long-chain fatty acids, which are referred to as triglycerides (LCT). The category also encompasses body fats and the fats and oils that are consumed on a daily basis. It is possible to identify LCT fats and oils. (Jadhav and Annapure 2023).

It has been demonstrated that a lack of sunlight and vitamin D deficiency are associated with elevated serum cholesterol concentrations, as vitamin D is produced in the skin by photolysis of ultraviolet radiation (*Wang et al. 2009*) . In contrast to the established association between low 25-hydroxyvitamin D levels and dyslipidaemia, the correction of vitamin D deficiency in the short term has been demonstrated to have no impact on the lipid profile. An increase in 25-hydroxyvitamin D levels was observed to result in elevated

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

serum calcium levels and a reduction in serum parathyroid hormone levels. The anticipated physiological responses to vitamin D treatment were found to be associated with a notable elevation in LDL cholesterol. Given the prevalence of vitamin D deficiency and its association with dyslipidaemia, it remains uncertain whether oral vitamin D supplementation is an effective strategy for improving lipid profiles. (*Wang et al. 2009)* .

The proposed mechanisms indicate that vitamin D may exert a direct influence on blood lipid levels, including triglycerides, total cholesterol, and LDL cholesterol, by stimulating bile salt production, and an indirect effect through its impact on calcium absorption. In light of the aforementioned vital role of vitamin D levels in the blood, it can be posited that the improvement of vitamin D levels in the blood may have a significant impact on the improvement of associated conditions such as hyperlipidaemia in affected individuals. Accordingly, the objective of this study is to examine the relationship between vitamin D levels and blood lipid levels. (*Gholamzad et al. 2023).*

Previous studies

(Dawodu, Kochiyil, and Altaye 1995)have demonstrated that vitamin D deficiency is a prevalent issue among Arab women. Following an investigation into the impact of sun exposure at recommended levels on vitamin D status in Arab women, it was determined that extending sun exposure for a period exceeding four weeks could be an effective strategy for enhancing vitamin D status in Arab women at high risk who have limited exposure to sunlight. (*Dawodu et al. 1995*) . Ha et al. indicated that low serum vitamin D levels were associated with an unfavourable lipid profile and the development of atherosclerosis. The results of clinical trials that evaluated the effects of vitamin D supplementation on blood lipids and total cholesterol (TC, HDL, LDL, and TG) demonstrated that there were no statistically significant effects of vitamin D supplementation observed for TC, HDL, LDL, and TG. However, some minor differences in values were noted. (*Wang et al. 2012*) . A study conducted by M-C Chapuy et al. aimed to estimate the prevalence of vitamin D deficiency in the general urban population of adults residing in a French city between the months of November and April. The study revealed significant regional variations in 25-hydroxyvitamin D concentrations. These findings indicate that the average French adult residing in an urban setting lacks direct sunlight exposure and dietary sources of vitamin D. It is noteworthy that this

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

represents a relatively high prevalence of vitamin D deficiency in the general adult population. *(Chapuy et al. 1997)* . Xiongjing et al. conducted a study comprising a total of 3,788 adults in northern China during their routine health check-ups. A deficiency of vitamin D was found to be associated with dyslipidaemia in a group of 3,788 individuals. The inverse association between serum 25(OH)D and LDL cholesterol and triglyceride levels was observed, while a positive association was noted between serum 25(OH)D and HDL cholesterol levels. *(Jiang et al. 2019)* .

In a recent study, Manich and colleagues analysed four million anonymous patient laboratory test results. A cross-sectional study was conducted on this population to determine the associations between 25-hydroxyvitamin D levels and lipids across clinically defined strata. A total of 107,811 patients with serial tests were included in the cross-sectional analysis, which was compared with patients with vitamin D deficiency (less than 20 ng/ml). Although vitamin D deficiency is associated with an unfavourable lipid profile in cross-sectional analyses, the correction of deficiency may not result in clinically meaningful changes in lipid concentrations. Nevertheless, further data from trials are required. The confirmation of these results is hindered by the presence of interference. *(Ponda et al. 2012).*

Research objectives

In the absence of prior research on the correlation between vitamin D deficiency and elevated cholesterol and triglyceride levels in the blood of individuals residing in Misurata City and Libya in general, this study aims to address this gap in knowledge. Accordingly, the objective of this study is to:

1. The objective is to determine and measure the percentage of vitamin D, cholesterol and triglycerides in the blood of samples from the first category, comprising individuals aged between 17 and 32.
2. The second category of samples, comprising individuals aged between 34 and 60, will be analysed to determine and measure the percentage of vitamin D, cholesterol and triglycerides in their blood.
3. A comparison will be made between the high and low levels of vitamin D, cholesterol and triglycerides among different age groups.
4. The objective is to ascertain whether there is a correlation between vitamin D deficiency and elevated cholesterol and triglyceride levels.
5. A database should be created for the aforementioned analyses, thus enabling their utilisation in future research.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

Materials and methods

Sample collection and preparation

A random sample was obtained from the population residing in Misurata city. A total of 20 samples were collected, representing a range of age groups, in order to facilitate the measurement of: Vitamin D, cholesterol, triglycerides
The samples were collected in their original containers and transferred to the Medical Secret laboratory in Misurata city for analysis. This was done in order to measure the increase and decrease of Vitamin D, cholesterol and triglycerides for each sample. The samples were divided into two categories.
The initial category comprises ten samples from individuals aged between 17 and 32 years old, while the subsequent category consists of ten samples from individuals aged between 34 and 60 years old.
Table (1) The normal ratios for the analysis of Vitamin D, cholesterol and triglycerides as in the following table:

PARMETER	Ref. Range	Unit
Vitamin D	(30-100)	ng\ml
Cholesterol	<200	mg\dl
Triglycerides	<200	mg\dl

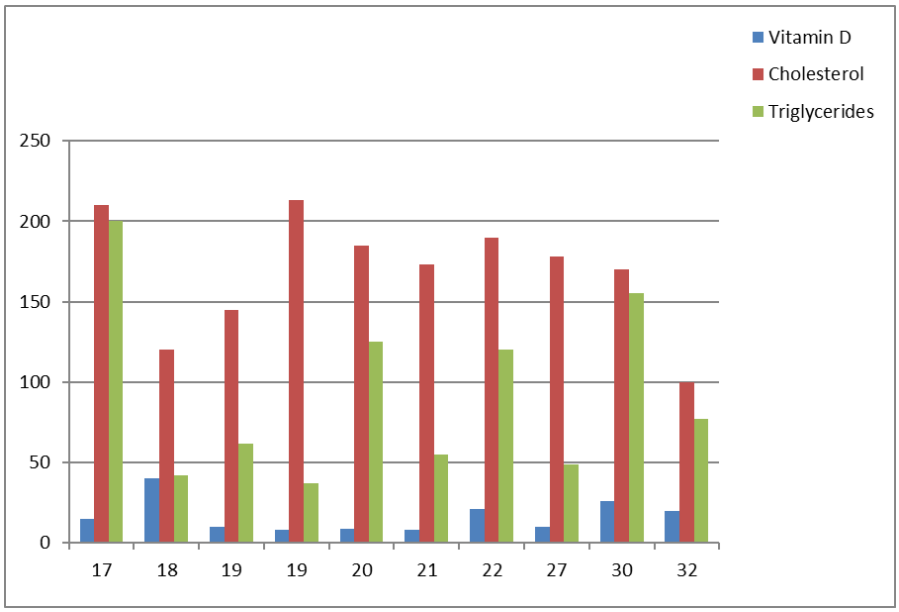
The methodology entailed the withdrawal of a blood sample and its placement in tubes devoid of anticoagulants. The sample was then permitted to clot at room temperature for a period of 10 to 15 minutes. Subsequent to this, the sample was subjected to centrifugation at a speed of up to 3500 rpm for 10 minutes. The upper portion of the sample constituted
the serum (plasma), which exhibited a natural yellow colouration. The serum was then transferred to a dedicated device for the presentation of results.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

Results and Discussion

Table No. (2) shows the average percentage of vitamin D, cholesterol and triglycerides in the blood for the first group from the age of 17 to the age of 32 years.

Age	Vitamin D ng\ml	Cholesterol mg\dl	Triglycerides mg\dl
17	15	210	200
18	40	120	42
19	10	145	62
19	8	213	37
20	9	185	125
21	8	173	55
22	21	190	120
27	10	178	49
30	26	170	155
32	20	100	77

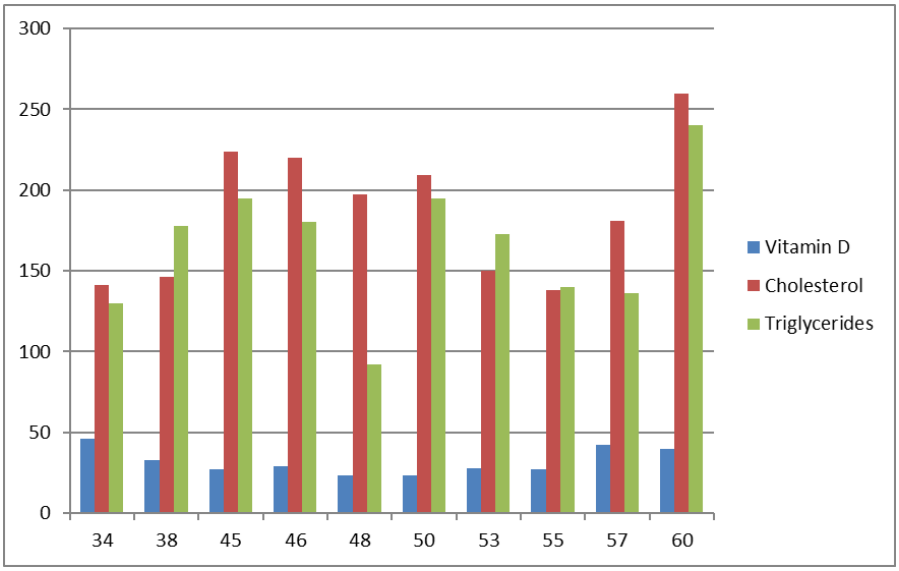


(Figure 3) represents the levels of vitamin D, cholesterol and triglycerides.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

Table No. (3) shows the average percentage of vitamin D, cholesterol, and triglycerides in the blood for the age group from 34 to 60 years.

Age	Vitamin D ng\ml	Cholesterol mg\dl	Triglycerides mg\dl
34	46	141	130
38	33	146	178
45	27	224	195
46	29	220	180
48	23	197	92
50	23	209	194
53	28	150	173
55	27	138	140
57	42	181	136
60	40	260	240



(Figure 4) represents levels of vitamin D, cholesterol and triglycerides

Manish et al. conducted a randomised controlled trial involving 151 adults with vitamin D deficiency (25-hydroxyvitamin D20 > ng/ml) and an increased risk of cardiovascular disease. In contrast with the established

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

association between low levels of 25-hydroxyvitamin D and dyslipidaemia, the correction of vitamin D deficiency in the short term did not result in an improvement in the lipid profile. (18) The results for vitamin D in the age group <(5-13) were (8-46)ng/ml, while the present study yielded values of (100-224)mg/dl. The triglyceride results were (62-109) and (37-200)mg/dl, respectively.

In a study conducted by Sakineh et al., 541 volunteers aged between 5 and 60 years were randomly selected from a pool of normal individuals, and their history of sun exposure was recorded on a daily or weekly basis. Vitamin D levels were assessed in two consecutive seasons: winter and summer. Venous blood samples were collected after an overnight fast, with a total of 10ml of blood drawn from each subject. The findings revealed that vitamin D levels exhibited seasonal variations, irrespective of gender differences. The results differed between the winter and summer seasons, depending on the gender of the participants. The findings of this study indicate that vitamin D deficiency is more prevalent in individuals aged over 18 years, with a greater prevalence among women than men. Furthermore, the prevalence of vitamin D deficiency was higher during the winter months than in the summer. (*Nouri Saeidlou et al. 2017*) . The total population for winter and summer were (24.26-45.8) ng/ml and (37.47-55.24), while our results were (8-46).

The study conducted by Kamil et al. included 13,039 participants from the study (Risk of Atherosclerosis in Communities), whose 25-hydroxyvitamin D and lipids were measured. It was observed that vitamin deficiency was associated with low levels of triglycerides and cholesterol, and that the average age of the participants was 6-57 years. (14), and vitamin D ranged from (9-24) while our results ranged from (8-46) ng/ml. The study also reported results for cholesterol, which ranged from (39.5-210) while our results ranged from (100-224) mg/ml. Finally, the study reported results for triglycerides, which ranged from (87-135) while our results ranged from (37-195) mg/ml.

Therefore, our findings indicate that there is no correlation between vitamin D deficiency and elevated cholesterol and triglyceride levels.

Conclusions

Some research has indicated a potential correlation between vitamin D deficiency and elevated levels of cholesterol and triglycerides in the blood. However, the precise nature of this relationship remains uncertain and is contingent upon further investigation.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

The available evidence suggests that individuals with vitamin D deficiency may have higher levels of total cholesterol and triglycerides, which can increase the risk of cardiovascular disease, atherosclerosis, angina, and hypertension. Nevertheless, the results of these studies do not necessarily indicate a direct causal relationship between vitamin D deficiency and high cholesterol and triglycerides. It is possible that other factors, such as diet and lifestyle, may affect this relationship. A comparison of vitamin D deficiency and high cholesterol and triglycerides among different age groups revealed no discernible relationship between the two.

In some samples, vitamin D levels were moderate, while cholesterol and triglyceride levels were high. In other samples, however, vitamin D levels were high, while cholesterol and triglyceride levels were moderate. It is therefore recommended that vitamin D levels be monitored and discussed with a medical professional to assess overall health and take appropriate action if necessary.

Recommendations

In order to enhance the levels of vitamin D, cholesterol and triglycerides, the results obtained are taken into account in order to provide some tips and recommendations.

1. It is recommended that the skin be exposed to sunlight on a daily basis or at least twice a week between the hours of 10 a.m. and 4 p.m. for a minimum of five to 30 minutes.
2. Regular exercise has been demonstrated to be an effective method for reducing harmful cholesterol levels and increasing beneficial cholesterol levels, while also improving vitamin D levels.
3. Vitamin D can be increased naturally by consuming foods rich in vitamin D, including seafood, egg yolks, mushrooms, and dairy products. Alternatively, vitamin D can be increased medically through the use of vitamin D supplements or cod liver oil.
4. Individuals with a high body mass index should exercise caution, as losing weight can help lower cholesterol and triglycerides.
5. Adherence to a healthy diet is associated with a reduction in cholesterol and triglyceride levels, which in turn lowers the risk of developing chronic diseases such as heart disease, obesity, and type 2 diabetes.
6. In order to prevent vitamin D, cholesterol, and triglyceride deficiency, it is essential to adhere to the aforementioned instructions, in addition to

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

scheduling regular appointments with a medical professional to monitor blood levels and ensure adherence to a balanced and varied diet.

References

Chapuy, M. C., P. Preziosi, M. Maamer, S. Arnaud, P. Galan, S. Hercberg, and P. J. Meunier. 1997. "Prevalence of Vitamin D Insufficiency in an Adult Normal Population." *Osteoporosis International* 7:439–43.

Chaudhry, Aeysha Bushra, Shakoor Hajat, Najwa Rizkallah, and Ala'a Abu-Rub. 2018. "Risk Factors for Vitamin A and D Deficiencies among Children Under-Five in the State of Palestine." *Conflict and Health* 12:1–12.

Craig, Micah, Siva Naga S. Yarrarapu, and Manjari Dimri. 2018. "Biochemistry, Cholesterol."

Dawodu, A., J. Kochiyil, and N. Altaye. 1995. "Pilot Study of Sunlight Exposure and Vitamin D Status in Arab Women of Childbearing Age." *EMHJ* 17(7).

DOUIB, INES, HOUSSNA REKIS, and SALMA SMAALI. 2022. "Etude Bibliographique de La Toxicité de La Vitamine D3."

Gholamzad, Amir, Niloofar Khakpour, Tina Kabipour, and Mehrdad Gholamzad. 2023. "Association between Serum Vitamin D Levels and Lipid Profiles: A Cross-Sectional Analysis." *Scientific Reports* 13(1):21058.

Heaney, Robert P. 2005. "The Vitamin D Requirement in Health and Disease." *The Journal of Steroid Biochemistry and Molecular Biology* 97(1–2):13–19.

Jadhav, Harsh B., and Uday S. Annapure. 2023. "Triglycerides of Medium-Chain Fatty Acids: A Concise Review." *Journal of Food Science and Technology* 60(8):2143–52.

Jiang, Xiongjing, Meng Peng, Shuohua Chen, Shouling Wu, and Weiguo Zhang. 2019. "Vitamin D Deficiency Is Associated with Dyslipidemia: A Cross-Sectional Study in 3788 Subjects." *Current Medical Research and Opinion* 35(6):1059–63.

Laftah, Zainab, and Firas Al-Niaimi. 2018. "Xanthelasma: An Update on Treatment Modalities." *Journal of Cutaneous and Aesthetic Surgery* 11(1):1–6.

Mora, J. Rodrigo, Makoto Iwata, and Ulrich H. Von Andrian. 2008. "Vitamin Effects on the Immune System: Vitamins A and D Take Centre Stage." *Nature Reviews Immunology* 8(9):685–98.

Scientific Journal of Faculty of Education, Misurata University-Libya, No26, Mar 2025
Published online in March
المجلة العلمية لكلية التربية، جامعة مصراتة، ليبيا -العدد السادس والعشرون، مارس 2025
Issn: 2710-4141
تاريخ الاستلام:2024/11/21 تاريخ النشر:2025/01/14

Nouri Saeidlou, Sakineh, Davoud Vahabzadeh, Fariba Babaei, and Zakaria Vahabzadeh. 2017. "Seasonal Variations of Vitamin D and Its Relation to Lipid Profile in Iranian Children and Adults." *Journal of Health, Population and Nutrition* 36:1–7.

Omonnazarova, Maxinur, Anvarxon Muysinov, Mirzabek Mardonov, Davronbek Tojiddinov, and Doston Ubaydullayev. 2022. "VITAMINS. CONCEPT OF VITAMIN. IMPORTANCE OF VITAMINS IN HUMAN LIFE TODAY." *Theoretical Aspects in the Formation of Pedagogical Sciences* 1(6):270–74.

Ponda, Manish P., Xiaohua Huang, Mouneer A. Odeh, Jan L. Breslow, and Harvey W. Kaufman. 2012. "Vitamin D May Not Improve Lipid Levels: A Serial Clinical Laboratory Data Study." *Circulation* 126(3):270–77.

Ryan, Jackson W., Paul H. Anderson, Andrew G. Turner, and Howard A. Morris. 2013. "Vitamin D Activities and Metabolic Bone Disease." *Clinica Chimica Acta* 425:148–52.

Using, Hydrochloride, and Peak Area. 2023. "African Journal of Advanced Pure and Applied Sciences (AJAPAS) Spectrophotometric Determination of Trifluoperazine Hydrochloride Using Peak Area." 2(1):21–27.

Wang, Hao, Ning Xia, Yang Yang, and Dao-Quan Peng. 2012. "Influence of Vitamin D Supplementation on Plasma Lipid Profiles: A Meta-Analysis of Randomized Controlled Trials." *Lipids in Health and Disease* 11:1–9.

Wang, Jing-Huan, Tiina Keisala, Tiina Solakivi, Anna Minasyan, Allan V Kalueff, and Pentti Tuohimaa. 2009. "Serum Cholesterol and Expression of ApoAI, LXRβ and SREBP2 in Vitamin D Receptor Knock-out Mice." *The Journal of Steroid Biochemistry and Molecular Biology* 113(3–5):222–26.

Wilkinson, Ian, and John R. Cockcroft. 2007. "Cholesterol, Lipids and Arterial Stiffness." *Atherosclerosis, Large Arteries and Cardiovascular Risk* 44:261–77.