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The Association between Vitamin D3 Deficiency and Cataract Formation in Baghdad Al-Karkh

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Abstract

Background: Visual impairment is a global issue that is particularly problematic for poor nations. It is linked to diminished physical activity, social isolation, reliance on everyday tasks, and even death. The clouding of the lens inside the eye is called a cataract. It is one of the main causes of blindness and visual impairment in the world. Because of its anti-inflammatory and antioxidant properties, vitamin D, a prohormone in the blood, is crucial to the pathophysiology of many ocular illnesses. Given that oxidative stress and inflammation are significant contributors to the development of cataracts, a number of research have evaluated the relationship between vitamin D3 deficiency and cataract formation.

Objective: Determine whether a vitamin D3 deficiency and cataracts are related.

Patients and Methods: A cross-sectional study that was carried out included a total of 100 cataract patients who are 60 years of age or younger from September 2023 to March 2024 in the Ophthalmology Department of Imamein Kadhimein Medical City, Baghdad, Iraq. Questionnaire form was used which consist of sociodemographic information, socioeconomic status, dietary sources of vitamin D3, sun exposure, anthropometric measures and ophthalmic examination. Vitamin D3 level had been investigated in laboratory of the hospital.

Results: Thirty percent of patients had cortical cataracts, 57% had nuclear cataracts, and 13% had posterior subcapsular cataracts. Sixty-nine percent of patients had a vitamin D3 level that is less than 20 ng/ml. Of the patients, 13% had a vitamin D3 level between 20 and 30 ng/ml, while 18% had a level greater than 30 ng/ml. There is a significant association between the level of vitamin D3 and the type of cataract (p-value = 0.013). Sixty-nine percent of patients with deficient vitamin D3 levels had 9% posterior subcapsular cataracts, 36% cortical cataracts, and 55% nuclear cataracts. Patients with insufficient vitamin D3 levels had 8% posterior subcapsular cataracts, 8% cortical cataracts, and 84% nuclear cataracts. While patients with sufficient vitamin D3 levels had 33% posterior subcapsular cataracts, 22% cortical cataracts, and 45% nuclear cataracts. The body mass index and vitamin D3 level were significantly associated (p-value = 0.003). Patients with a vitamin D3 level less than 20 ng/ml comprised 31% overweight patients, 26% class I obese patients, 26% class II obese

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patients, and 4% class III obese patients. Thirteen percent of these patients had normal weights. Patients with a vitamin D3 level 20-30 ng/ml comprised 46% overweight patients, 23% class II obese patients, and 31% with normal weight. While patients with a vitamin D3 level more than 30 ng/ml comprised 33% normal weight patients and 67% overweight.
Conclusion: Vitamin D3 deficiency has a significant association with cataract formation, especially nuclear and cortical types, sun exposure, educational level, socioeconomic status, and obesity.
Keywords: Visual impairment, Cataract, Vitamin D3.

Introduction

Visual impairment is a global issue, particularly in developing nations (1). Age has been found to be a significant non-modifiable risk factor for cataract disease, which is a complex condition (1). It is prevalent in older adults (2), and it has been linked to decreased physical activity, social isolation, dependence on daily tasks, and even death (3). Opacification of the lens within the eye is known as a cataract (4, 5). It is the primary cause of blindness and loss of usable vision globally, accounting for half of all cases of blindness (16 million cataract cases were reported globally) (4, 5, 6). Although it can occur at any age, it usually manifests itself in later life (1, 4, 5). As the world's population ages, especially in developed nations, the prevalence of this disorder is rising quickly (6). According to studies, the visually significant cataract reduces visual acuity to roughly below the 20/40 level in 2.5% of cases in people ages 40–49, 6.8% in people ages 50–59, 20% in people ages 60–69, 42.8% in people ages 70–79, and 68.3% in people ages 80 and above (4,7). When cataracts occur in young children, they are typically linked to other disorders. For example, diabetes has been shown to increase the likelihood of cataract formation by two to five times (4, 5, 8). When compared to the general population under 40 years of age, the prevalence in diabetic patients may rise to 15–25 times higher (4, 5, 8, 9). Atopic dermatitis, neurofibromatosis, Down syndrome, myotonic dystrophy, and hypoparathyroidism are additional conditions linked to the early development of cataracts (5). In addition to steroid usage, ocular diseases such as uveitis, extreme myopia, retinitis pigmentosa, and blunt and penetrating ocular trauma are among the causes of early cataract formation (5). One controllable risk factor that raises oxidative stress and inflammation is malnutrition (1). As of right now, lens extraction is the only treatment for cataracts (6). Although there are many different kinds of cataracts, the most prevalent ones are cortical, nuclear, and sub-capsular (anterior and posterior) cataracts (10, 11). Depending on the cataract's maturity, it can be categorized as Morgagni an, hyper mature, mature, or immature (10, 11). As a prohormone in the bloodstream, vitamin D is essential for maintaining calcium homeostasis. It is produced in the skin endogenously by exposure to sunlight and diet (4, 12- 14). Vitamin D comes in two different forms: D3 and D2 (4,14). In reality, the skin produces calcitriol, often known as vitamin D3, when it is exposed to ultraviolet Blight. It possesses two metabolic conversions that are necessary for the activation of vitamin D: 1-α hydroxylation in the kidney and 25-α hydroxylation in the liver (4, 12-14). Dietary food intake originating from plants provides the D2 form (4, 14). A number of visual disorders, including glaucoma and diabetic retinopathy, are influenced by vitamin D (15). By preventing the overstimulation of cytotoxic T cells and by blocking the release of pro-inflammatory cytokines and increasing the release of anti-inflammatory cytokines, vitamin D has an anti-inflammatory impact (4, 14, 16, 17, 18). One of the antioxidant vitamins, vitamin D is known to reduce oxidative stress through controlling the expression of genes that are linked to antioxidant defenses (4,14,17,18,19). According to recommendations from the Institute of Medicine, a plasma vitamin D level of ≥30 ng/mL is considered normal, whereas a level of ≥21–30 ng/ml indicates insufficiency, and <20 ng/ml indicates vitamin D deficiency (4, 11, 20, 21). Recent research indicates that vitamin D3 insufficiency is linked to systemic and ocular disorders (1, 4). Given that oxidative stress and inflammation are significant contributors to the development of cataracts, several researches had evaluated the relationship between vitamin D3 deficiency and cataract formation (1, 4, 22).

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In our study, we hope to identify a relationship between the existence of cataract in patients aged 60 years or younger and their serum vitamin D3 level. Previous studies have focused on the link between senile cataract formation and vitamin D3 deficiency (4, 7).

Patients and Methods

The Department of Ophthalmology of Imamein Kadhimein Medical City, Baghdad, Iraq was the site of the current cross-sectional study, for 6 months duration of data collection from 1st of September 2023 to 1st of March 2024. One-hundred cataract patients were collected from outpatient in ophthalmology department of this hospital; Patients were only included if they met our inclusion criteria. Patients who are 60 years of age or younger meet the inclusion criteria, cortical, nuclear and posterior sub capsular cataract. Exclusion criteria are: ocular (surgery, disease, medications, glaucoma, congenital cataract and trauma), complicated cataract, post ocular or systemic cause, steroid use, high myopia, alcohol, smoking, atopic dermatitis, hyperthyroidism, neurofibromatosis, myotonic dystrophy, use of osteoporosis drugs or calcium supplements, diabetes, autoimmune diseases or skin cancer disorders, diagnoses of cancer, or cardiopulmonary diseases.

Questionnaire form

was used in current study and consist of sociodemographic information, socioeconomic status, dietary sources of vitamin D3, sun exposure, anthropometric measures and ophthalmic examination.

1- Sociodemographic information consist of age, sex, education, smoking, alcohol consumption, history of drug use, history of chronic diseases and family history.

2- Socioeconomic status was determined based on standard equation: Education + Occupation + house ownership ×0.5 +car ownership × 0.1 (23).

3- Dietary sources of vitamin D3: fish, salmon, tuna, almond, brazilnut, pumpkin seed, sesame seed, avocado, mushroom, spinach, collard green, egg yolk, beef liver, cheese, yogurt, fortified milk, fortified cereal, fortified juice, dark green vegetables and dark chocolate (24).

4- Sun exposure: is classified into no sun exposure, 10-30 minutes of midday sunshine per day, multiple times / weeks. Individuals with darker skin tones might want slightly more (21).

5- Anthropometric measures: A stadiometer is a portable medical equipment was used to measure body weight and height for all patients, and the formula used to determine body mass index (BMI) was weight in kilograms divided by square height in meters. Class I obesity (BMI 30-34.9), class II obesity (BMI 35-39.9), class III obesity (BMI ≥ 40), underweight (BMI < 18.5), normal weight (BMI = 18.5 -24.9), and overweight (BMI = 25-29.9) were the BMI classifications assigned to the patients (25).

6- Ophthalmic examination: All patients were examined by senior ophthalmologist using slit-lamp bio microscopy for:

a-Anterior segment examination (Cornea. Anterior chamber, pupil, lens and anterior chamber angle) to exclude any abnormalities.

b- Posterior segment (vitreous and retina) examination to exclude any retinal abnormalities.

Slit-lamp retro illumination bio microscopy was used by senior ophthalmologist to classify types of cataract (nuclear, cortical and posterior subcapsular).

Assessment of vitamin D3 level

Vitamin D3 level had been investigated in laboratory of Imamein Kadhimein Medical City. Samples were collected from peripheral blood. To measure the serum vitamin D3 level, 1-2 milliliters of blood were drawn from 100 participants in a sterile tube. Vitamin D3 level was estimated on a FinecareTM FIA Meter II plus SE system using Finecare kits. An immunofluorescent technique was used to estimate vitamin D3 level. The Institute of Medicine has classified vitamin D3 levels based on reference ranges. A plasma level of ≥30 ng/mL is regarded normal, a level of 21–30 ng/ml is considered insufficiency, and a level <20 ng/ml is termed vitamin D3 deficiency (4, 11, 20, 21).

The Statistical analysis

Data input and analysis were performed using the Statistical Package for Social Sciences, version 24 (SPSS 24) program. Simple frequency and percentage measures were used to display the data. The chi square test was used to determine the significance of the association between the

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variables, and a p value of 0.05 or less was deemed statistically significant.

Ethical approval

Imamein Kadhimein Medical City and the Arabic Council of Medical Specialization had granted their official approval. After informing the patients about the purpose and goals of the study, assuring their privacy, and ensuring that the questionnaires were completed anonymously, the patients gave their informed consent. (Document no. 2024HRS863).

Results

The study comprised 100 cataract patients who were 60 years of age or younger. Forty five percent of patients with age group (50-59) years, 36% of them with age 60 years, while patients with age group (40-49) were 15% and 4% of them with age group (30-39) years. Male patients made up 39% of the total, while female patients made up 61%. In 30% of cases, cortical cataracts are present, 57% nuclear cataract and 13% posterior subcapsular cataract. Sixty nine percent of patients have vitamin D3 level less than 20 ng/ml, 13% have a level of 20-30 ng/ml, and 18% have a level greater than 30 ng/ml as shown in table 1. Table 1 also shows that 54% of patient with low socioeconomic status and percentage of medium socioeconomic status was 46% and there is no high socioeconomic status in our study. Class I obesity was 18%, class II obesity was 21%, class III obesity was 3%, and normal weight was 19%. Overweight was 39%. The educational level of patients was 42% illiterate, primary education 24%, secondary education 31% and high education 3%. The percentage of patients who has no sun exposure 49%, daily sun exposure 36%, once /week sun exposure 6% and more than once/week sun exposure 9%.

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Table 1: Frequency distribution of study variables in participant patients

Variables		Frequency	Percent
Age	30-39 year	4	4.0
	40-49 year	15	15.0
	50-59 year	45	45.0
	60 year	36	36.0
Sex	Male	39	39.0
	Female	61	61.0
Socioeconomic status	Low	54	54.0
	Medium	46	46.0
Body mass index	Normal weight	19	19.0
	Overweight	39	39.0
	Obesity class I	18	18.0
	Obesity class II	21	21.0
	Obesity class III	3	3.0
Education	illiterate	42	42.0
	primary	24	24.0
	Secondary	31	31.0
	High	3	3.0
Sun exposure	No sun exposure	49	49.0
	Daily	36	36.0
	Once /week	6	6.0
	> once /week	9	9.0
Type of cataract	Cortical Cataract	30	30.0
	Nuclear Cataract	57	57.0
	Posterior Sub-capsular Cataract	13	13.0
Vitamin D3 level	<20 ng/ml deficient	69	69.0
	20-30 ng/ml insufficient	13	13.0
	> 30 ng/ml sufficient	18	18.0
	Total	100	100.0

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Table 2 shows that Sun exposure and vitamin D3 levels had significant association (p-value = 0.001), Sixty nine percent of patients had vitamin D3 level <20 ng/ml, 52% of them with no sun exposure, 39% with daily 10-30 min sun exposure, 9% with 10-30 min sun exposure once/week. Thirteen percent of patients had insufficient vitamin D3 level, 31% of them with no sun exposure, 46% with daily exposure and 23% with 10-30 min sun exposure once/week. Eighteen percent of patients had sufficient vitamin D3 level, 50% of them with no sun exposure, 17% with daily exposure and 33% with 10-30 min sun exposure once/week.

Table 2: Relationship between sun exposure and vitamin D3

Vitamin D3 level		Sun exposures				Total	P value
		No sun exposure	Daily	Once /week	> once /week		
<20 ng/ml deficient	No.	36	27	6	0	69	0.001
	%	52	39	9	0	100	
20-30 ng/ml insufficient	No.	4	6	0	3	13	
	%	31	46	0	23	100	
> 30 ng/ml sufficient	No.	9	3	0	6	18	
	%	50	17	0	33	100	

Table 3 shows that the level of vitamin D3 and educational attainment are significantly associated, with a p-value of 0.01. Forty eight percent of patients with deficient vitamin D3 level were illiterate and 26%, 22%, 4% had primary, secondary and high educational level respectively. While 46% of patients with insufficient vitamin D3 level were illiterate and 46%, 8%, 4% had primary, secondary educational level respectively. Seventeen percent of patients with sufficient vitamin D3 level were illiterate and 83% of them were with secondary level of education.

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Table 3: Association between Vitamin D3 and Education level

Vitamin D3 level		Education level				Total	P value
		Illiterate	primary	secondary	High		
<20 ng/ml deficient	No.	33	18	15	3	69	0.01
	%	48	26	22	4	100	
20-30 ng/ml insufficient	No.	6	6	1	0	13	
	%	46	46	8	0	100	
> 30 ng/ml sufficient	No.	3	0	15	0	18	
	%	17	0	83	0	100	

Table 4 shows the level of vitamin D3 and socioeconomic status are significantly associated (p-value = 0.001). Sixty five percent of patients with low socioeconomic status had deficient vitamin D3 level (less than 20ng/ml) and 35% of them with medium socioeconomic status. Patients with insufficient vitamin D3 level were 46% low socioeconomic and 54 % medium socioeconomic status. While patients with sufficient vitamin D3 level (> 30 ng/ml) had 17% and 83% with low and medium socioeconomic status respectively.

Table 4: Association between Vitamin D3 and socioeconomic status

Vitamin D3 level		Socioeconomic status		Total	P value
		Low	Medium		
<20 ng/ml Deficient	No.	45	24	69	0.01
	%	65	35		
20-30 ng/ml Insufficient	No.	6	7	13	
	%	46	54		
> 30 ng/ml Sufficient	No.	3	15	18	
	%	17	83		

Table 5 shows that the body mass index and vitamin D3 level are significantly associated (p-value = 0.003). Patients with a vitamin D3 level less than 20 ng/ml comprised 31% overweight patients, 26% class I obese patients, 26% class II obese patients, 4% class III obese patients and 13% with normal weight. Patients with a vitamin D3 level 20-30 ng/ml comprised 46% overweight patients, 23% class II obese patients, and 31% with normal weight. While patients with a vitamin D3 level more than 30 ng/ml comprised 33% normal weight patients and 67% overweight.

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Table 5: Association between Vitamin D3 and body mass index.

Vitamin D3 level		body mass index					Total	P value
		Normal weight	Over weight	Obesity Class I	Obesity Class II	Obesity Class III		
<20 ng/ml deficient	No.	9	21	18	18	3	69	0.003
	%	13	31	26	26	4	100	
20-30 ng/ml insufficient	No.	4	6	0	3	0	13	
	%	31	46	0	23	0	100	
> 30 ng/ml sufficient	No.	6	12	0	0	0	18	
	%	33	67	0	0	0	100	

Table 6 shows that the type of cataract and vitamin D3 level are significantly associated (p-value = 0.013). Sixty-nine percent of patients with deficient vitamin D3 levels (<20 ng/ml) had 55% nuclear cataracts, 36% cortical cataracts and 9% posterior subcapsular cataracts. Patients with insufficient vitamin D3 levels (20-30 ng/ml) had 84% nuclear cataracts, 8% cortical cataracts and 8% posterior subcapsular cataracts. While patients with sufficient vitamin D3 levels (> 30ng/ml) had 45% nuclear cataracts, 22% cortical cataracts and 33% posterior subcapsular cataracts.

Table 6: Association of vitamin D3 level and type of cataract

Vitamin D3 level		Types of cataract			Total	P value
		Cortical	Nuclear	Posterior Subcapsular		
<20 ng/ml Deficient	No.	25	38	6	69	0.013
	%	36	55	9	100	
20-30 ng/ml insufficient	No.	1	11	1	13	
	%	8	84	8	100	
> 30 ng/ml sufficient	No.	4	8	6	18	
	%	22	45	33	100	

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Discussion

One of the main issues with public health is the lack of vitamin D3 (26, 27, 28), and it is now recognized as a pandemic (27). Numerous factors, including decreased sun exposure, poor consumption of vitamin D-rich foods, skin tone, garment selections, obesity, impaired vitamin D synthesis and metabolism and malabsorption syndromes, can contribute to it (26,- 36). The cutaneous generation of vitamin D3 is affected by the following factors: glass, age, skin pigmentation, latitude, time of day, and season (37). In the current study, A strong relationship was found between vitamin D3 level and sun exposure (p-value = 0.001); 69% of patients had a vitamin D3 level <20 ng/ml, 13% had a level 20–30 ng/ml, and 18% had a level > 30 ng/ml. UVB is more common in the spring, summer, and fall between the hours of 10 a.m. and 3 p.m. For light-skinned people, 10 to 15 minutes of sun exposure (over the arms and face, or the arms and legs/hands) is sufficient to produce adequate vitamin D. For people with darker skin, however, further exposure is necessary to manufacture enough cutaneous vitamin D from their melanin. Africans may need six to ten times more sun exposure than Caucasians, whereas Asians from the Indian subcontinent are thought to need three times as much (21). With a p-value of 0.003, this study demonstrates a strong inverse relationship between vitamin D3 levels and obesity. Research has indicated that obesity and being overweight with little sun exposure are linked to a higher risk of vitamin D deficiency, and that there is a inverse relationship between vitamin D levels and obesity (38 - 44) which are agree with the result of current study. Vitamin D shortage and insufficiency in obese people are associated with the sequestration of vitamin D into adipose tissue (44, 45). Research has indicated a noteworthy association between BMI classes and the observation of vitamin D deficiency (40, 46- 48). Vitamin D regulates the expression of genes linked to the process of adipogenesis, inflammation, oxidative stress, and metabolism in adult adipocytes (48). A complex condition, cataracts are one of the main causes of blindness and useful vision loss in the globe (4, 6). In industrialized nations especially, age has been found to be a significant non-modifiable risk factor for the development of cataracts (1, 4, 5, 6, 49). Due to its anti-inflammatory and antioxidant properties (4, 16, 17, 18, 42), vitamin D3 plays a significant role in lens metabolism (50). The results of the current study indicate a significant inverse association (p-value = 0.013) between vitamin D3 level and cataract. Sixty nine percent of patients had deficient vitamin D3 level with different types of cataract, 36% cortical cataract, 55% nuclear cataract and 9% posterior sub capsular cataract. Studies conducted in Iran, South Korea, Turkey, and Egypt showed that serum vitamin D3 levels were inversely associated with nuclear cataract and cortical cataract and not associated with posterior sub-capsular cataract, higher serum vitamin D3 level may be associated with lower risk of cataract. (1, 4, 51, 52, 53, 54, 55), while studies conducted in the United States and Turkey indicated that vitamin D3 deficiency was linked to posterior sub capsular cataract, indicating that increasing vitamin D level intake may lower its incidence (56, 57) the result of current study are agree with previous studies. According to our research, there is a significant association (p-value = 0.001) between vitamin D3 levels and educational attainment. Forty eight percent of patients with deficient vitamin D3 level were illiterate and 26%, 22%, 4% had primary, secondary and high educational level respectively. The explanation of these results may be attributed to that patient had insufficient

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information about the benefit of sun exposure and rich sources of vitamin D3 in the food. The amount of vitamin D3 and socioeconomic status was significantly associated in this study (p-value = 0.001). Sixty five percent of patients with low socioeconomic status had deficient vitamin D3 level (less than 20ng/ml) and 35% of them with medium socioeconomic status. These results may be related to unemployment, poverty and expensiveness of food rich with vitamin D3. Research has indicated that those with a lower socioeconomic class get less vitamin D from their food and spend less time in the sun (58,59)

which are agree with the result of current study.

Conclusion

Vitamin D3 deficiency has significant association with cataract formation especially nuclear and cortical types, sun exposure, educational level, socioeconomic status and obesity.

Source of funding

No source of funding

Conflict of interest

The author acknowledges no conflict of interest in this study

Recommendation

1- Appropriate sun exposure.

2- Encourage weight reduction.

3- Suggested daily consumption of vitamin D rich food.

4- Vitamin D3 level assessment for early detection of vitamin D3 deficiency

5- Routine ophthalmic examination.

Limitations:

1- Limited time.

2- Overcrowded of ophthalmology outpatients.

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العلاقة بين نقص فيتامين د٣ وتشكيل اعتام عدسة العين في بغداد الكرخ

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الملخص

الخلفية الدراسية: يعد ضعف البصر مشكلة عالمية، خاصة بالنسبة للبلدان النامية ويرتبط بالاعتماد على الأنشطة اليومية وانخفاض النشاط البدني والعزلة الاجتماعية وحتى الوفيات. إعتام عدسة العين هو عتامة العدسة داخل العين. وهو أحد الأسباب الرئيسية لفقدان البصر والعمى في جميع أنحاء العالم. فيتامين د هو هرمون في الدورة الدموية ويلعب دورا هاما في التسبب في أمراض العين المختلفة من خلال آثاره المضادة للالتهابات ومضادات الأكسدة. قامت دراسات مختلفة بتقييم العلاقة بين نقص فيتامين د٣ وتكوين إعتام عدسة العين اعتمادًا على حقيقة أن الإجهاد التأكسدي والالتهاب هما عاملان مهمان في تكوين إعتام عدسة العين.

الهدف من الدراسة: تحديد العلاقة بين نقص فيتامين د٣ وإعتام عدسة العين.

الحالات والمنهجية: تضمنت دراسة مستعرضة اجمالي ١٠٠ مريض أعمارهم ٦٠ سنة واقل يعانون من إعتام عدسة العين أجريت في الفترة من ايلول ٢٠٢٣ إلى اذار ٢٠٢٤ في قسم طب العيون في مدينة الإمامين الكاظمين (ع) الطبية، بغداد، العراق. تم استخدام قائمة الاستبيانات التي تتكون من المعلومات الاجتماعية والديموغرافية، الحالة الاجتماعية والاقتصادية، المصادر الغذائية لفيتامين د ، التعرض لأشعة الشمس، القياسات البشرية، وفحص العيون. تم فحص مستوى فيتامين د٣ في مختبر المستشفى.

النتائج: في هذه الدراسة، كان ٣٠٪ من المرضى مصابين بإعتام عدسة العين القشري، و٥٧٪ مصابين بإعتام عدسة العين النووي، و١٣٪ مصابين بإعتام عدسة العين الخلفي تحت المحفظة. تسعة وستون بالمائة من المرضى لديهم مستوى فيتامين د٣ أقل من ٢٠ نانوجرام/مل. من بين المرضى، كان لدى ١٣٪ مستوى فيتامين د٣ بين ٢٠ و٣٠ نانوغرام/مل، في حين أن ١٨٪ لديهم مستوى أكبر من ٣٠ نانوغرام/مل. هناك ترابط معتد به احصائيا بين مستوى فيتامين د٣ ونوع إعتام عدسة العين (القيمة الاحتمالية = ٠,٠١٣). تسعة وستون في المائة من المرضى الذين يعانون من نقص مستويات فيتامين د٣ لديهم ٩٪ إعتام عدسة العين الخلفي تحت المحفظة، و٣٦٪ إعتام عدسة العين القشرية، و٥٥٪ إعتام عدسة العين النووي. كان لدى المرضى الذين يعانون من نقص مستويات فيتامين د٣ ٨٪ إعتام عدسة العين الخلفي تحت المحفظة، و٨٪ إعتام عدسة العين القشري، و٨٤٪ إعتام عدسة العين النووي. في حين أن المرضى الذين لديهم مستويات كافية من فيتامين د٣ كان لديهم ٣٣٪ إعتام عدسة العين الخلفي تحت المحفظة، و٢٢٪ إعتام عدسة العين القشري، و٤٥٪ إعتام عدسة العين النووي. هناك ترابط معتد به احصائيا بين مؤشر كتلة الجسم ومستوى فيتامين د٣ (قيمة p = 0.003). المرضى الذين لديهم مستوى فيتامين د٣ أقل من ٢٠ نانوجرام/مل هم ٣١٪ من المرضى الذين يعانون من زيادة الوزن، و٢٦٪ من المرضى الذين يعانون من السمنة المفرطة من الدرجة الأولى، و٢٦٪ من المرضى الذين يعانون من السمنة المفرطة من الدرجة الثانية، و٤٪ من المرضى الذين يعانون من السمنة المفرطة من الدرجة الثالثة. ثلاثة عشر في المئة من هؤلاء المرضى لديهم أوزان طبيعية. كان المرضى الذين لديهم مستوى فيتامين د٣ ٢٠-٣٠ نانوجرام/مل ٤٦٪ من المرضى الذين يعانون من زيادة الوزن، و٢٣٪ من المرضى الذين يعانون من السمنة المفرطة من الدرجة الثانية، و٣١٪ من ذوي الوزن الطبيعي. في حين أن المرضى الذين لديهم مستوى فيتامين د٣ أكثر من ٣٠ نانوجرام/مل يشكلون ٣٣٪ من المرضى ذوي الوزن الطبيعي و٦٧٪ من المرضى الذين يعانون من زيادة الوزن.

الاستنتاجات: نقص فيتامين د٣ له علاقة كبيرة بإعتام عدسة العين وخاصة النووية والقشرية، والتعرض لأشعة الشمس، والمستوى التعليمي، والحالة الاجتماعية والاقتصادية والسمنة.

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