Effect of Sunlight and Vitamin D3on some Men Fertility Parameters

Riyadh Hussein Wally

Lecturer / *Medical laboratories techniques /Kut-Technical Institute/Middle Technical University*

Abstract

The current study aim to clarify the effect of the exposure to sunlight on the vitamin D level and the effect of this on characteristics of seminal fluid and some hormones in infertile men. The study included 45 men (aged between 18-44 years) who suffer from infertility. These men attend the Infertility Treatment Center at Kut Hospital, Wasit, Iraq. infertile men were exposed to the sunlight without using sunscreen for ten minutes at daily intervals over 3 months. Seminal fluid parameters, as well as the level ofVitamin D3, Folliclestimulating hormone (FSH), Luteinizing hormone (LH) and Testosterone, were measured before and after exposure to sunlight. The study showed that there was a significant increase in count, activity and normal morphology of seminal fluid as well as elevation in LH, FSH, testosterone and vitamin D3 level in blood after the exposure to sunlight.

Keywords: *Sunlight, Seminal Fluid,Vitamin D3, LH, FSH, Testosterone.*

Introduction

Sunshine contains ultraviolet (UV) rays, which are three types: type A (320 nm - 400 nm), known as UVA, which causes skin damage and the appearance of signs of aging, type B (290 nm - 320 nm) and symbolized by the (UVB) and type C (100 nm - 290 nm) known as UVC which is absorbed mostly by the ozone layer at the upper atmosphere and does not reach to the earth [1]. UVB gives the skin the energy needed to make vitamin D3 when 7-dihydroxy cholesterol reacts with ultraviolet (type B) at wavelengths between 270 and 300 nm, and peak formation is between 295 and 297 nm. [2]. These wavelengths are in sunlight when the UV index is greater than three [3]. Vitamin D manufacture in the human skin following sun exposure is depend on the location of the sun in the sky and the zenith angle [4] .Zenith angle depends on the latitude, season, weather conditions, and time of the day [5]. even though the sun is closer to the earth in winter, it enters a more slanted angle (azimuth angle) and more UV radiation is absorbed by the ozone layer and passing in more distance which leading to fewer UV rays reaching to earth [6]. The latitude above 37 ° affects the angle of the sun's peak from November to February, where there is a marked decrease in the amount of UV radiation reaching to the earth surface. Therefore, very little vitamin D3 is produced in the skin during the winter, while the latitude less than 37 degrees and closer to the equator, the production of vitamin D3 in skin is higher throughout the year [7]. In the case of the first morning or late in the day, the azimuth angle is highly tilted and the production of vitamin D3 is very low in the skin even in the summer and exposure to the sun is need between 1000 and 1500 hours, as a result, the optimal times for vitamin D manufacture in human skin is in the summer among the hours of 10 AM and 3 PM [8].A 15-minute exposure to sunlight on the face, arms, and legs without sunscreen is enough to produce 1500-3000 vitamin D units. This is enough for one to three days [9].

Generally, exposure to sunlight for 15-20 minutes three times a week is safe, does not cause skin damage, and enough to provide healthy amounts of vitamin D to the body [10].Dark-skinned people have increased melamine, which absorbs UV rays more effectively, and therefore need longer exposure to the sun to get the similar amount of vitamin D3 when compared with people with white skin [11]. It should be noted that the production of vitamin D3 by sunlight has a comparative advantage, such as fish oil, where the production of vitamin D through the sun does not reach the excess rates or harmful. As there is a process of balance performed by the skin automatically, and the excess of vitamin is eliminated [12].Vitamin D that produces by skin or comes from the diet is physically inactive and needto add hydroxyl group in the liver

by aidthe 25-hydroxylase enzyme to 25(OH)D. Also, vitamin 25(OH)D needto additional hydroxyl group in the kidney byenzyme 25(OH)D-1-OH-ase to produce 1,25(OH)2D the physically active of this vitamin [13].Vitamin D is one of the most powerful vitamins necessary for bone health because it helps absorb important calcium for bone and dental health and plays a vital role in building muscle mass, strengthening the immune system and nerve signals [14].According to some research, vitamin D affects the health of internal cells. The lack of vitamin D in men leads to what is known as erectile dysfunction problems due to weak blood flow in the male genitalia, so men are not able to have an erection, which results in erectile dysfunction [15].Another study showed that sexual desire is linked to the level testosterone is associated with vitamin D. The elevated the level of vitamin D, the elevated the testosterone. When the vitamin decreases, the sexual ability of men is diminished. This is mostly in the winter because of the lack of the sun to supply vitamin D, which raises the level of testosterone [16].

Several factors contribute to the process of production and activation of sperm and sexual activity for men, including vitamin D, which shows that the presence of the receptor on the head and the med body of sperm [17].Vitamin D is essential in the absorption and metabolism of calcium where it is vital for spermatogenesis and sperm activity [18].

Materials and Method

The study was conducted on 45 infertile males between the ages of 18-45 years and who attended the Infertility Treatment Center at Kut Hospital, Wasit, Iraq. The information required for the study was collected from the subjects including age and duration of the marriage. Also, we looked at the previous surgery, stimulant therapies for the reproductive system during the past 6 months, and chronic diseases with excluded smoking persons .

Semen samples were collected in a clean screw plastic tube by masturbation method from subjects after a period of abstinence for 3-5 days and placed in the incubator at 37 ° C to allow them to have normal liquefaction. After the liquefaction occurred, the semen was examined for sperm count, movement, availability and sperm morphology. The blood samples were collected in sterile plastic tubes and the serum separated by centrifugation at 3000 rpm for estimating of hormones and vitamin D3 before exposure to sunlight and sent to the laboratory immediately for analysis .Participants then exposed to direct sunlight for continuous 10 minutes daily during 10.0 am and 3.0 pm o'clock without using any sunscreen for three months from 1-3 to 1-6-2019, samples of semen and blood collected after the end of the sunlight exposure and sent to laboratory for analysis. Seminal fluidconcentration and motility estimated by using a Microcells counting chamber methodand sperm morphology estimated by use Diff-Quick kit according to World Health Organization criteria[11].25-hydroxyvitamin D (vitamin D3) , total testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH), were estimated by using Electro-*chemiluminescence*-Immunoassay (ECLIA) kits[20].

Statistical Analysis

Statistical analysis was completed with use the student T-test. The results were expressed as a mean and standard-deviation (SD). The P values of ≤ 0.01 were expressed as significant values.

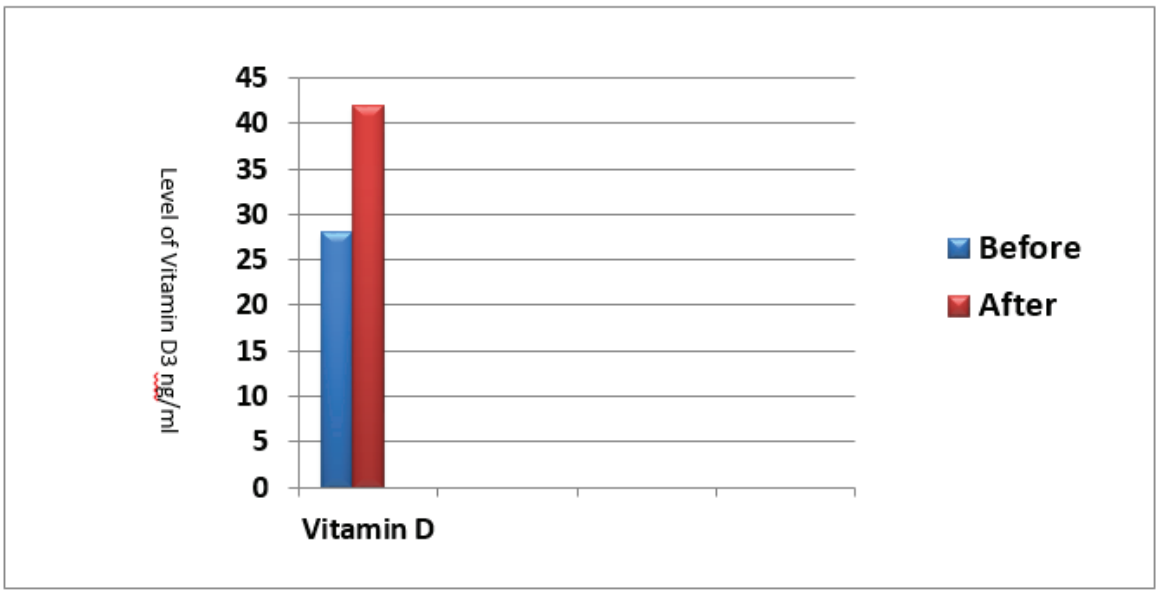
Finding

Study showed there were significant increase in serum vitamin D3 (42±2.62) in men after exposed to sunshine as compare with before exposure (28±1.59) (table 1, figure 1) , significant increase in serum LH (7.13 ± 1.37) in men after exposed to sunshine as compare with before exposure (5.06 ± 2.77) , significant increase in serum FSH (6.24 ± 2.58) in men after exposed to sunshine as compare with before exposed (4.87 ± 1.75) and significant increase in serum testosterone (12.84 ± 2.77) in men after exposed to sunshine as compare with before exposed (9.23 ± 3.82) (table 1, figure 2). In addition, the study showed a significant increase in sperm count (42.23 ± 29.8) in men after exposed to sunshine as compare with before exposed (28.72 ± 23.48) , significant increase in sperm active motility (29.07 ±20.2) in men after exposed to sunshine as compare with before exposed (12.93 ±11.92) significant increase in normal sperm viability (45.26 ± 27.4) in men after exposed to sunshine as compare with before exposed (28.33 ±18.6) and showed a significant increase in normal sperm morphology (58± 11.54) in men after exposed to sunshine as compare with before exposed (39.5 ± 16.49) (Table-2, Figure-3).

Table (1):- The mean and standard-deviation of serum vitamin D3, LH, FSH and testosterone hormones before and after exposure to sunshine

Parameters	Before sunlight exposure	After sunlight exposure	P value
Vitamin D3(ng / ml)	28 ± 1.59	42 ± 2.62	P<0.001*
Serum LH (mlU/ml)	5.06 ± 2.77	7.13 ± 1.37	P<0.001*
Serum FSH (mlU/ml)	4.87 ± 1.75	6.24 ± 2.58	P<0.0001*
Serum testosterone (ng/ml)	9.23 ± 3.82	12.84 ± 2.77	P<0.001*

P value ≤ 0.01were expressed as significant values*



Figure(1):- Show Vitamin D level before and after exposure to sunlight.

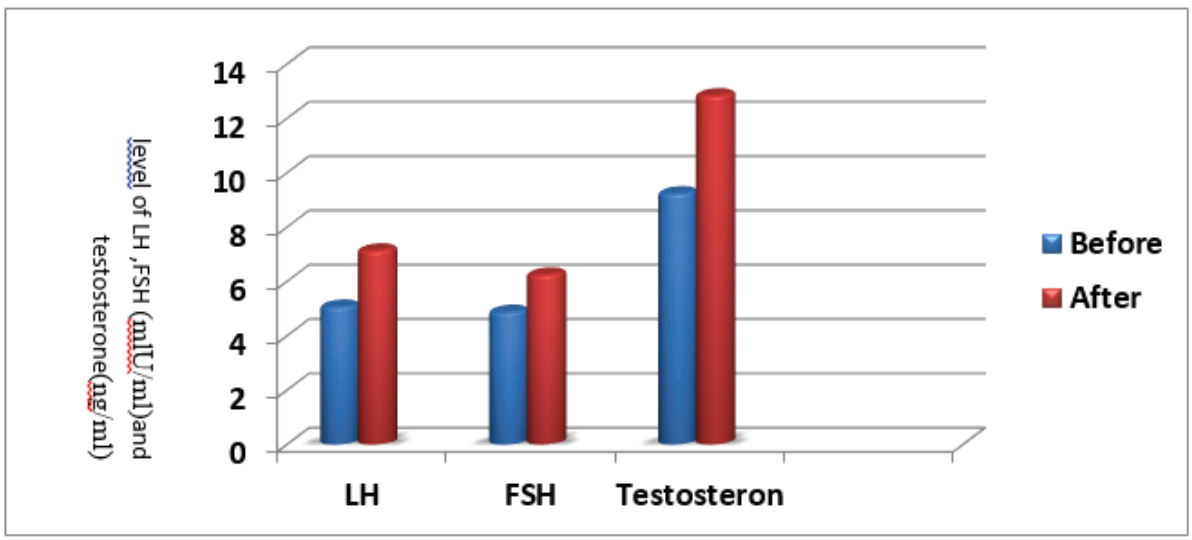


Figure2: Show the level of LH ,FSH ,and testosterone hormones before and after exposure to sunlight

Table 2: Mean and standard-deviation of sperm parameters before and after exposure to sunshine

Parameters	Before sunlight exposure	After sunlight exposure	P value
Sperm count (Million/ml)	28.72 ± 23.48	42.23 ± 29.8	0.01*
Sperm active motility (%)	12.93 ±11.92	29.07 ±20.2	0.0001*
Sperm viability (%)	28.33 ±18.6	45.26 ± 27.4	0.0001*
Normal Sperm morphology (%)	39.5 ± 16.49	58± 11.54	0.0001*

P value ≤ 0.01 were expressed as significant values*

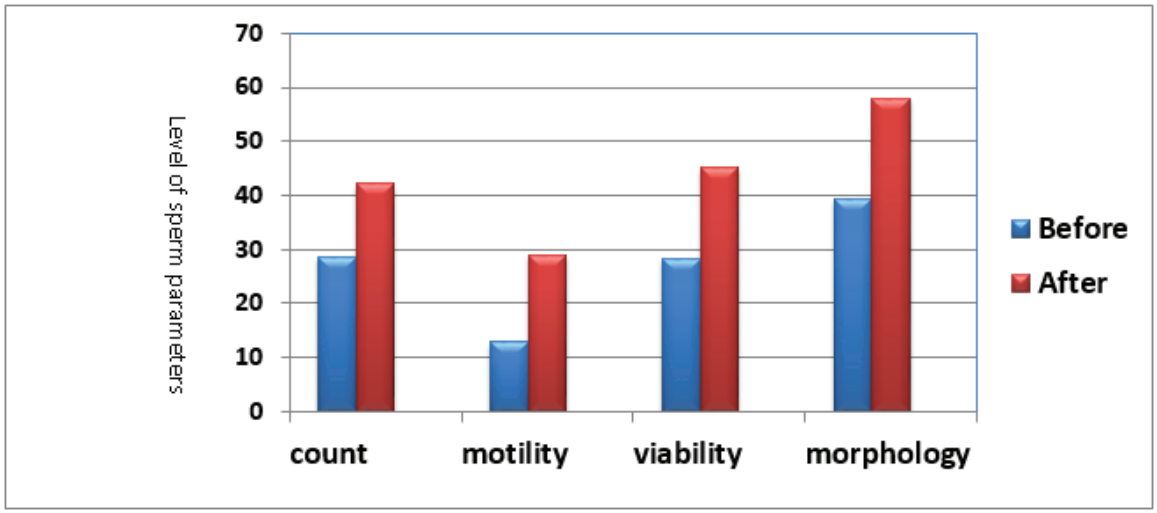


Figure 3:- Show count, motility, viability and morphology of sperm before and after exposure to sunlight

Discussion

The present study showed that there is a significance increase in the level of vitamin D3 that formed after the skin is exposed to direct UVB sunshine 10 min daily for 3 months and this elevation has a direct effect on reproductive testosterone hormone and increases the level of testosterone and vitamin D, which in turn, causes increased release of LH and FSH hormone. Eventually, this leads to increase count, motility, viability, and morphology of sperm. Also, it increases the level of vitamin D3 when the skin exposed to direct sunlight.

This is conformity with many earlier studies shown the association between sunlight and vitamin D3 where skin exposure to the direct UVB sunlight 7-dehydrocholesterol in the skin changed to pre-vitamin D3 which is changed in the liver to vitamin D3 [21]. The study also showed that there is a noticeable increase in the level of reproductive hormones LH, FSH, testosterone after exposure to direct sunlight and this is due to the effect of the increase in the level of vitamin D3 and this is consistent with previous research [22].

Some studies have confirmed the relation between the presence of vitamin D receptors(VDR) on the body of sperm and sperm activity and any deficiency in the level of vitamin negatively affects the activity of sperm and also through the future [23], vitamin D regulates the level of calcium necessary for the reproductive system and sperm activity[24].

Conclusion

Sunlight causes increase vitamin D3 level by action of UVB ray this lead to increase in the level of the reproductive hormones testosterone, LH and FSH, increase this parameter improve fertility by increase seminal fluid total count, actively motile, viability and normal morphology.

Recommendation

Expose to sunlight at least 10 min daily from 10.0 am to 3.0 pm o'clock to improve the fertility of infertile men before taking any drug for this purpose.

Conflict of Interest: Non

Source of Findings: Self findings.

Ethical Clearance: Non

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