

# Association between Vitamin-D Levels and Signs of Ageing in Young Adults of Bareilly District, U.P, India

Medhavi Agarwal<sup>1</sup>, Saloni<sup>2</sup>, Rashmi Katyal<sup>3</sup>

## ABSTRACT

**Introduction:** Our skin synthesis Vitamin-D by peak effective UVB-irradiation with wavelength of 295-297nm from sunlight (eUVB) and to a small extent by absorption of food. Vitamin-D along with other vitamins plays a major role in the process of ageing. Vitamin-D deficiency is often severe and significantly more observed in elderly people. Thus this study was planned so as to study does there is any association between vitamin D and ageing of skin. Current research aimed to study the association between Vitamin-D levels and signs of ageing among young adults living in Bareilly district.

**Material and methods:** A Community based cross-sectional study was conducted in Bareilly district from October 2018 till December 2018 after taking ethical clearance from the institute (IEC/40/2018/ OCT) among all the individuals between 18-35 years of age providing their consent for the study and not suffering from any known disease living in Bareilly district.

**Results:** 53.7% study subjects out of the 82 total study subjects were found to have Vitamin-D deficiency and 46.3% study subjects out of the 82 total study subjects were not Vitamin-D deficient. 44.1% study subjects out of total 34 study subjects of mild grade Fitzpatrick's classification were having Vitamin-D deficiency. there is association between the wrinkling of skin and Vitamin D deficiency.

**Conclusion:** In this study, it was establish that there is a significant relationship between Vitamin-D levels and facial wrinkles as well as photoageing using Fitzpatrick's and Glogau classification

**Keywords:** Photo Ageing; Vitamin D; Skin Changes; Contour Changes of Skin

## INTRODUCTION

Thomas Bailey Aldrich once said, "To keep the heart unwrinkled, to be hopeful, kindly, cheerful, reverent that is to triumph own old age" Having said that, ageing is defined as the time-related deterioration of the physiological function necessary for survival and fertility.<sup>1</sup> Our skin synthesis Vitamin-D by peak effective UVB-irradiation with wavelength of 295-297nm from sunlight (eUVB) and to a small extent by absorption of food.<sup>2</sup> Vitamin-D along with other vitamins plays a major role in the process of ageing. It produces two types of effects in our body: classical and non- classical effects.

Classical effects are related to bone and muscle health which includes preventing osteomalacia, muscle weakness and protecting against falls as well as low impact fractures.<sup>3</sup> The non-classical effects of Vitamin-D, depending upon serum 25- hydroxyvitamin-D levels includes increased risk

of sepsis, cardiovascular, metabolic disorders including hyperlipidemia, type 2 diabetes mellitus, acute vascular events, dementia, stroke, heart failure etc.<sup>3</sup> and that of few cancers such as colon<sup>4-6</sup>, prostate<sup>7</sup> and breast cancers<sup>8</sup>; all leading to shorter lifespan. "Healthy levels of Vitamin-D have been demonstrated to prevent skin ageing." as said by Dr. Tsippora Shainhouse.<sup>9</sup>

He further added that "healthy levels of Vitamin-D have been demonstrated to prevent skin ageing, promote healthy bone growth, possibly reduce the risk of certain cancers and even improve mood".<sup>9</sup> According to Dr. Shainhouse, "individuals at highest risk are those who are institutionalized, the elderly, obese, or those with more darkly pigmented skin."<sup>9</sup> It has been reported that more than one- third of human adults have low levels of Vitamin-D.<sup>10</sup> Vitamin-D deficiency is often severe and significantly more observed in elderly people.<sup>11</sup> Thus this study was planned so as to study does there is any association between vitamin D and ageing of skin

Current research aimed to study the association between Vitamin-D levels and signs of ageing among young adults living in Bareilly district.

With objectives to find association between Vitamin-D level and wrinkling of skin, to find association between Vitamin-D level and photo ageing of skin and to find association between Vitamin-D level and contour changes of facial skin.

## MATERIAL AND METHODS

A Community based cross-sectional study was conducted in Bareilly district from October 2018 till December 2018 after taking ethical clearance from the institute (IEC/40/2018/ OCT) among all the individuals between 18-35 years of age providing their consent for the study and not suffering from any known disease living in Bareilly district. For sample size calculation a pilot study was conducted from which, prevalence was calculated to be 55.2%. Now, applying the sample size calculator and allowable error of 20%, sample size came to be 82. A multi-stage sampling technique for district by using 10% of selection was used to collect the

<sup>1</sup>Associate Professor, Department of Community Medicine, RMCH, Bareilly, <sup>2</sup>Final Year MBBS Student, RMCH, Bareilly, <sup>3</sup>Professor, Department of Community Medicine, RMCH, Bareilly, India

**Corresponding author:** Dr. Medhavi Agarwal, Shanti Nikunj, 15 New Civil Lines, Bareilly, UP, India

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appropriate sample size

Data collection was done using a questionnaire which was validated by pilot study and Immunoassay analyzer (EBRA LISA SCAN –II) was used for the assessment of Vitamin-D level.

We used a questionnaire for assessment of the signs of ageing as per various grading systems including Fitzpatrick classification of facial wrinkles, Glogau classification for photo ageing and Hamilton’s classification of contour changes of facial skin. Immunoassay analyzer (EBRA LISA SCAN –II) was used for the assessment of Vitamin-D level. Vitamin-D level and signs of ageing were compared as per the above-mentioned grading systems and an association between them was established. All the other confounding factors were taken care of using appropriate statistical methods. SPSS version 24.0 (Statistical Package for Social Studies) was used to analyze data. For calculating the association chi-square test was applied.

**RESULTS**

53.7% study subjects out of the 82 total study subjects were found to have Vitamin-D deficiency and 46.3% study subjects out of the 82 total study subjects were not Vitamin-D deficient.

15.9% study subjects out of total 44 Vitamin-D deficient subjects were males and 84.1% study subjects out of total 44 Vitamin-D deficient subjects were females. 34.2% study subjects out of total 38 subjects who were not Vitamin-D deficient were males and 65.8% study subjects out of total 38 subjects who were not Vitamin-D deficient were females. 35% of the study subjects out of 20 male study subjects were having Vitamin-D deficiency and 65% study subjects out of total 20 male study subjects were not Vitamin-D deficient. 59.7% study subjects out of total 62 female study subjects were having Vitamin-D deficiency and 40.3% study subjects out of 62 female study subjects were not Vitamin-D deficient. As depicted in table 1: 44.1% study subjects out of total 34 study subjects of mild grade Fitzpatrick’s classification were having Vitamin-D deficiency and 55.9% study subjects out of total 34 study subjects of mild grade Fitzpatrick’s classification were not having Vitamin-D deficiency. 53.7% study subjects out of total 41 study subjects of moderate grade Fitzpatrick’s classification were having Vitamin-D deficiency and 46.3% study subjects out of total 41 study subjects of moderate grade Fitzpatrick’s classification were

not having Vitamin-D deficiency. 100% study subjects out of total 7 study subjects of severe grade Fitzpatrick’s classification were having Vitamin-D deficiency. 34.1% study subjects out of total 44 Vitamin-D deficient study subjects fall under mild grade of Fitzpatrick’s classification and 50% study subjects out of total 44 Vitamin-D deficient study subjects fall under moderate grade of Fitzpatrick’s classification and 15.9% study subjects out of total 44 Vitamin-D deficient study subjects fall under severe grade of Fitzpatrick’s classification. There is an equal distribution of 50% study subjects out of total 38 non- vitamin-D deficient study subjects falling under mild and moderate grade of Fitzpatrick’s classification. On applying chi square test between the Fitzpatrick’s classification of facial wrinkles and presence of Vitamin-D deficiency, it was found that there is a significant relationship between the two (p<0.05) thus it states there is association between the wrinkling of skin and Vitamin D deficiency.

Table 2 depicts: 44.1% study subjects out of total 34 study subjects having folds in Hamilton’s classification were having Vitamin-D deficiency and 55.9% study subjects out of total 34 study subjects having folds in Hamilton’s classification were not having Vitamin-D deficiency. 60.4% study subjects out of total 48 study subjects having combination of folds, furrows and wrinkles in Hamilton’s classification were having Vitamin-D deficiency and 39.6% study subjects out of total 34 study subjects having combination of folds, furrows and wrinkles in Hamilton’s classification were not having Vitamin-D deficiency. 34.1% study subjects out of total 44 Vitamin-D deficient subjects were having folds in Hamilton’s classification and 65.9% study subjects out of total 44 Vitamin-D deficient subjects were having combination of folds, furrows and wrinkles in Hamilton’s classification. An equal distribution of 50% study subjects out of total 38 non- vitamin-D deficient study subjects was found to have folds and combination of folds, furrows and wrinkles in Hamilton’s classification. On applying chi square test between the Hamilton’s classification of contour changes of facial skin and presence of Vitamin-D deficiency, it was found that there is not a significant relationship between the two (p>0.05).

Table 3 states that 100% study subjects out of total 6 study subjects of mild grade Glogau classification were not having Vitamin-D deficiency. 57.9% study subjects out of total

|   | Vitamin D deficiency present | Vitamin d deficiency absent | Total               |
|---|------------------------------|-----------------------------|---------------------|
| fitzpatrick’s classification of facial wrinkles- MILD     | 15(44.1%)<br>(34.1%)         | 19(55.9%)<br>(50%)          | 34(100%)<br>(41.5%) |
| fitzpatrick’s classification of facial wrinkles- MODERATE | 22(53.7%)<br>(50%)           | 19(46.3%)<br>(50%)          | 41(100%)<br>(50%)   |
| fitzpatrick’s classification of facial wrinkles- SEVERE   | 7(100%)<br>(15.9%)           | 0                           | 7(100%)<br>(8.5%)   |
| Total   | 44(53.7%)<br>(100%)          | 38(46.3%)<br>(100%)         | 82(100%)<br>(100%)  |

x<sup>2</sup> = 7.29; df = 2; p<0.05

**Table-1:** Association of study subjects on the basis of Fitzpatrick’s classification of facial wrinkles and Vitamin-D levels

|  | Vitamin D deficiency present | Vitamin d deficiency absent | Total               |
|--|------------------------------|-----------------------------|---------------------|
| Folds                                      | 15(44.1%)<br>(34.1%)         | 19(55.9%)<br>(50%)          | 34(100%)<br>(41.5%) |
| Combination of folds, furrows and wrinkles | 29(60.4%)<br>(65.9%)         | 19(39.6%)<br>(50%)          | 48(100%)<br>(58.5%) |
| Total                                      | 44(53.7%)<br>(100%)          | 38(46.3%)<br>(100%)         | 82(100%)<br>(100%)  |

$\chi^2 = 2.126$ ;  $df = 1$ ;  $p > 0.05$

**Table-2:** Association of study subjects on the basis of Hamilton’s classification of contour changes of facial skin and Vitamin-D levels

|                                  | Vitamin D deficiency present | Vitamin d deficiency absent | Total               |
|----------------------------------|------------------------------|-----------------------------|---------------------|
| Glogau classification - mild     | 0                            | 6(100%)<br>(15.8%)          | 6(100%)<br>(15.8%)  |
| Glogau classification - moderate | 44(57.9%)<br>(100%)          | 32(42.1%)<br>(84.2%)        | 76(100%)<br>(92.7%) |
| Total                            | 44(53.7%)<br>(100%)          | 38(46.3%)<br>(100%)         | 82(100%)<br>(100%)  |

$\chi^2 = 7.49$ ;  $df = 1$ ;  $p < 0.05$

**Table-3:** Association of study subjects on the basis of Glogau classification for photo ageing and Vitamin-D levels:

76 study subjects of moderate grade Glogau classification were having Vitamin-D deficiency and 42.1% study subjects out of total 76 study subjects of moderate grade Glogau classification were not having Vitamin-D deficiency. 0% study subjects out of total 44 Vitamin-D deficient study subjects fall under mild grade of Glogau classification and 100% study subjects out of total 44 Vitamin-D deficient study subjects fall under moderate grade of Glogau classification. 15.8% study subjects out of total 38 non- vitamin-D deficient study subjects fall under mild grade of Glogau classification and 84.2% study subjects out of total 38 nonvitamin- D deficient study subjects fall under moderate grade of Glogau classification. On applying chi square test between the Glogau classification for photo ageing and presence of Vitamin-D deficiency, it was found that there is a significant relationship between the two ( $p < 0.05$ ).

**DISCUSSION**

Ageing is a complex process that is influenced by many genetic as well as environmental factors.<sup>23</sup> In this study, we tried to study the association between Vitamin-D levels and signs of ageing in young adults living in Bareilly district. We were able to establish a significant relationship between Vitamin-D levels and facial wrinkles as well as photoageing using Fitzpatrick’s and Glogau classification respectively whereas no significant relationship was established between Vitamin-D levels and contour changes of facial skin using Hamilton’s classification. Anne Lynn S. Chang et al published a study on ‘association of facial skin aging and Vitamin-D levels in middle-aged white women’. The relationship between UV- induced skin photodamage and Vitamin-D levels was investigated and their results suggested a significant association between skin ageing and Vitamin-D levels. However, they were unable to establish causality or determine the direction of the observed association. But, in

this study a significant relationship was established between Vitamin-D deficiency and photoageing. They further hypothesized that less facial photodamage due to avoidance of UVR would predispose women to Vitamin-D deficiency. This may be because of underlying genetic differences in Vitamin-D synthesis. This may also be because this study was conducted upon white women whereas this study was conducted upon the population of Bareilly, India who are more prone to develop Vitamin-D deficiency because of darker skin tone. They further added that even among the high photodamage group, the levels of Vitamin-D were slightly above the threshold for Vitamin-D sufficiency only. Thus, patients with pronounced photodamage do not necessarily have high Vitamin-D levels and hence, should not be excluded from Vitamin-D testing.<sup>22</sup> Dawoud N. M. et al published a study with the title “Serum Vitamin-D and facial aging: Is there a link?” A high prevalence of Vitamin-D deficiency was detected in the subjects who were studied irrespective of gender and age whereas in this study, Vitamin-D deficiency was found to be more prevalent in females as compared to males. It may be because of the difference in the population studied. Also, in this study, Vitamin-D levels were not correlated with photodamage scores and were not affected by the Fitzpatrick skin phototype, duration of sun exposure per day or the use of sunscreens ( $p > 0.05$  for all). Hence, they concluded that facial ageing is not correlated with Vitamin-D levels, and clinical trials using oral or topical vitamin-D to combat ageing are better predictors of its effects rather than in vivo studies.<sup>23</sup> Whereas, in this study a significant relationship was established between Vitamin-D levels and facial wrinkles as well as photoageing. Hence, in this study a relationship was established between Vitamin-D levels and facial ageing. This may be because of underlying genetic differences in



Vitamin-D synthesis. This may also be because this study was conducted upon the population of Egypt which lies in the northern African belt whereas this study was conducted upon population of Bareilly, India which lies between tropical and temperate region making population of India less prone to sunlight and low Vitamin-D levels as compared to the population of Egypt.

As far as we could access the freely available data, no more comparable study could be traced. But, on these results, a significant relationship between Vitamin-D levels and facial wrinkles as well as photoageing was established using Fitzpatrick's and Glogau classification respectively whereas no significant relationship was established between Vitamin-D levels and contour changes of facial skin using Hamilton's classification.

## CONCLUSION

In this study it was found that the majority of the study subjects were Vitamin-D deficient. It was also found that people having Vitamin-D deficiency have more chances of being placed under moderate grade of facial wrinkles followed by mild and severe grade facial wrinkles in Fitzpatrick's classification while people not having Vitamin-D deficiency had equal chances of being placed under mild and moderate grade facial wrinkles with no chance of being placed under severe grade facial wrinkles in Fitzpatrick's classification of facial wrinkles.

It was also found that people having Vitamin-D deficiency are more prone to have combination of folds, furrows and wrinkles rather than having only folds in Hamilton's classification of contour changes of facial skin while people not having Vitamin-D deficiency are equally prone to develop only folds or combination of folds, furrows and wrinkles in Hamilton's classification of contour changes of facial skin.

In this study, it was also able to establish a significant relationship between Vitamin-D levels and facial wrinkles as well as photoageing using Fitzpatrick's and Glogau classification respectively whereas no significant relationship was established between Vitamin-D levels and contour changes of facial skin using Hamilton's classification.

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