

# Determination of Serum 25-Hydroxyvitamin D Levels in Patients with Alopecia Areata

Manisha Singh Basukala,<sup>1</sup> Ayush Jha,<sup>2</sup> Roji Dawadi,<sup>2</sup> Rima Shrestha<sup>2</sup>

<sup>1</sup>Department of Dermatology, Dhulikhel Hospital Kathmandu University Hospital, <sup>2</sup>Department of Dermatology, KIST medical College and Teaching Hospital.

## ABSTRACT

**Background:** Alopecia Areata is a common non scarring alopecia with autoimmune etiology. In several previous studies, an insufficient level of 25 hydroxyvitamin D had been correlated with various autoimmune diseases. The current study aimed to determine the level of serum 25 hydroxyvitamin D in patients with alopecia areata.

**Methods:** A cross-sectional study was conducted on 35 patients with alopecia areata who visited the outpatient department of Dermatology of KIST Medical College and Teaching Hospital, Nepal. A prior approval of the institute review committee was taken. Convenience sampling technique period for 3 months (March 2022-May 2022) was used to include the participants (informed consent was taken; in minors parental consent was prepared). The serum levels of 25 hydroxyvitamin D was estimated using Abbott Architect i1000 SR analyser.

**Result:** In this study, Alopecia Areata was common in the age group of 16–30 years (Mean age:  $31.65 \pm 11.92$  Years). The average duration of the disease in Alopecia Areata patients was close to 1 year. This study indicated a lower concentration of 25 hydroxyvitamin D in half of the studied AA patients (51.4%). The number of patches, Severity of Alopecia Tool scoring, serum 25 hydroxyvitamin D level, and age were found to be statistically insignificant with the disease activity. However, a significant positive correlation was found between the Severity of Alopecia Tool score and the number of patches.

**Conclusions:** Although low levels of serum 25 hydroxyvitamin D may be seen among subjects with alopecia areata; No statistical correlation was observed. Hence, a larger study of similar nature is needed in the future to elucidate the exact correlation.

**Keywords:** Alopecia areata; autoimmune; 25 hydroxyvitamin d.

## INTRODUCTION

Alopecia Areata (AA) is a common, non-scarring form of hair loss mediated primarily by leukocytes.<sup>1-3</sup> Genetic predisposition and environmental factors trigger the instigation of the disease. However, the precise reason is still unknown.<sup>4,5</sup>

The prevalence of alopecia areata is 0.1 to 0.25%, with a lifetime risk of 2% worldwide.<sup>6</sup> In Singapore, Tan et. al. reported the incidence rate of AA to be 3.8%.<sup>7</sup> The age of onset appears to be between 25 and 36 years.<sup>8</sup> Recent studies have highlighted role of 25 hydroxyvitamin D deficiency in autoimmune diseases including AA.<sup>9</sup> Also it has been accepted that 25 hydroxyvitamin D receptors

initiate anagen in the outer root sheath and mesodermal papilla of the hair follicle.<sup>10,11</sup> However, there are conflicting results.<sup>12</sup>

There are limited studies correlating relation between vitamin D levels and alopecia areata. Hence, this study investigated the level of serum 25-hydroxyvitamin D in patients with AA in a tertiary care center.

## METHODS

This cross-sectional study was conducted among the patients attending the dermatology outpatient department of Kist Medical College Hospital, Nepal. The study was carried out with the prior approval of

**Correspondence:** Dr Manisha Singh Basukala, Department of Dermatology, Dhulikhel Hospital Kathmandu University Hospital. Email: drmanishasingh@kusms.edu.np, Phone: +9779802005666.

the institute review committee of Kist Medical College, Nepal. The study was conducted over the duration of three months (March 2022-May 2022).

The studied population included patients of all ages who were present with alopecia areata at the OPD of KIST medical college and teaching hospital. Participants meeting the inclusion criteria were recruited for the study by using a convenience sampling technique. Sample size was calculated using 2% population prevalence and considering 80% power and 5% alpha error. The minimum sample size calculated was 50. A total of 50 patients were recruited in the study, however 15 patients didn't come for follow up with the blood test report. Therefore there were 35 study participants.

The inclusion criteria included clinically diagnosed patients of any age and gender with alopecia areata. The exclusion criteria were concurrent history of autoimmune diseases like vitiligo, rheumatoid arthritis, diabetes, thyroid disorder, or lupus erythematosus, and patients who recently received vitamin D supplementation, pregnancy or lactation, obesity, defined by body mass index (BMI)  $\geq 25$ . Informed consent was obtained from participants aged 18 and above and for age less than 18 informed consent from parents of participant and informed assent from the participant was obtained.

The data were collected using a preformed proforma. Proforma included demographic information, disease duration, clinical subtypes, and disease activity were included in the self-designed proforma for data collection. The Severity of Alopecia Tool (SALT) scoring was used to determine the severity of alopecia areata by evaluating the percentage of scalp hair loss (0-100%). Patients presenting with alopecia areata were subjected to the biochemical assessment of serum 25-hydroxyvitamin D level. The serum levels of 25 hydroxyvitamin D was estimated using Abbott Architect i1000 SR analyser. Vitamin D deficiency was defined as deficient if  $< 20$ ng/ml.

Data were analysed and managed using Microsoft Excel and social science statistical software for Windows (SPSS Inc. version 20, Chicago, IL). Regression analysis was applied to understand the correlation between two variables.

## RESULTS

In the present study, 35 people with alopecia areata were evaluated. Patients' average age was found to be

$31.65 \pm 11.92$  Years (Range: 13-57 years). The average disease duration for patients was 13.63 months.

Low levels of serum 25 hydroxyvitamin D ( $< 20$  ng/ml) was seen among 18 patients (51.42%). In addition, statistical analyses was also conducted to find the statistical significance between the factors influencing alopecia areata including number of alopecia patches, salt scoring, serum vitamin D level, and age. Here, number of patches referred to the hair loss area on the scalp and salt scoring refers to the Severity of Alopecia Tool (SALT), which was calculated by measuring the percentage of hair loss in each of four areas of the scalp— left profile (18%), right profile (18 %), posterior (24%), and vertex (40 %), and adding the total to achieve a composite score.<sup>6</sup>

**Table 1. Demographic and laboratory findings in patients with alopecia areata.**

| Categories                           | Parameter | Count (Percentage)    |
|--------------------------------------|-----------|-----------------------|
| <b>Total Number of Patients = 35</b> |           |                       |
| <b>Age</b>                           | 0-15      | 1 (2.85)              |
|                                      | 16-30     | 17 (48.57)            |
|                                      | 31-45     | 14 (40)               |
|                                      | 46-60     | 3 (8.57)              |
| <b>Gender</b>                        | Female    | 20 (57.14)            |
|                                      | Male      | 15 (42.85)            |
| <b>Average duration of Illness</b>   | Total     | 13.63 months          |
| <b>Average Serum Vitamin D Level</b> | Total     | $21.82 \pm 8.1$ ng/ml |
|                                      | Female    | 20.89 ng/ml           |
|                                      | Male      | 23.07 ng/ml           |
| <b>Vitamin-D deficient</b>           | Total     | 18 (51.42)            |
|                                      | Female    | 11 (31.42)            |
|                                      | Male      | 7 (20)                |

As shown in Table1, this study documented the observations of 35 individuals with alopecia areata. Patients' age was categorised into four groups, ranging from 0 to 60 (0-15, 16-30, 31-45, and 46-60), with the youngest patient was 13 years old and the oldest 57 years old. The age group 16 to 30 had the most common incidence (n=17) that accounted for 48.57%. The second most populated age group among the patient was 31 to 45, that had 14 patients and accounted for 40% of the total, while the other two age groups 0-15 and 46-60

had very few patients that are 1 and 3 respectively.

Regarding gender variance, a female predominance over males was observed with a female count of 20 (57%) and a male count of 15 (43%). Gender distribution showed that alopecia areata is more prevalent in women in the present study. However a similar study with larger sample size could elucidate the exact scenario. The average duration of illness was 13.63 months, which was slightly more than a year.

**Table 2. Gender distribution according to age group**

| Gender | Total | 0-15 | 16-30 | 31-45 | 46-60 |
|--------|-------|------|-------|-------|-------|
| Female | 20    | 1    | 9     | 9     | 1     |
| Male   | 14    | 0    | 8     | 5     | 2     |

Table 2 shows the distribution of alopecia areata according to the gender and age groups. A diverse presentation was noted. This could have been because of small sample size.

When discussing the vitamin D levels in patients with alopecia areata and considering the normal range between 20-40 ng/ml, it was observed that the average vitamin D level for all patients was 21.82 ng/ml. Also, the average vitamin D level separately for females and males was 20.89 ng/ml and 23.07 ng/ml respectively.

**Table 3. Statistical analysis between clinical and laboratory parameters in patients with alopecia areata.**

| Parameter 1           | Parameter 2           | R (Regression) | p-Value                |
|-----------------------|-----------------------|----------------|------------------------|
| Number Of Patches     | Duration of illness   | 0.01           | 0.54                   |
| Salt Scoring          | Duration of illness   | 0.01           | 0.55                   |
| Serum Vitamin D Level | Duration of illness   | 0.0            | 0.72                   |
| Age                   | Duration of illness   | 0.1            | 0.06                   |
| Number Of Patches     | Serum Vitamin D Level | 0              | 0.8                    |
| Salt Scoring          | Serum Vitamin D Level | 0              | 0.9                    |
| Age                   | Serum Vitamin D Level | 0.02           | 0.39                   |
| SALT Scoring          | Number Of Patches     | 0.85           | 3.47X10 <sup>-15</sup> |
| Age                   | Number Of Patches     | 0              | 0.65                   |
| Age                   | SALT Scoring          | 0.01           | 0.56                   |

Table 3 shows the statistical analysis performed between the factors associated with alopecia areata

patients. Here, a regression analysis was performed between parameters including number of patches, SALT scoring, serum vitamin D level, and age. It was aimed to find the relation between any of these two parameters by calculating the correlation and the margin of error. As a result, it was found that there was no correlation of duration of illness and vitamin D level with any other parameters recorded in this study, which suggests the statistical independence of these parameters. However, SALT scoring and number of patches showed a higher correlation with 0.85 regression coefficient with corresponding 3.47X10<sup>-15</sup> p-value. This was close to correlation value of 1 that signifies both variables move in the same direction and its p value was also below 0.05 confidence level which indicates the statistical dependence between these parameters.

## DISCUSSION

Alopecia areata is a form of non-scarring alopecia characterized by patchy balding on the hairy skin. It is a common autoimmune disease that results in hair loss on the scalp and other areas of the body. The estimated prevalence and incidence rate is 1-2% of the population.<sup>3,4</sup> Alopecia areata is believed to be caused by a combination of genetic and environmental factors. The disease is generally managed by several drugs that include corticosteroids and topical minoxidil, and immunosuppressive drugs.

The findings of the present study indicate that patients tend to develop AA generally from teen till young adult. In the present study, individuals aged 16-30 were the most affected in contrast with the studies published by Furue et al and Al-ajlan et. al.; who reported common age groups being 31-40 and 11-20 respectively.<sup>13,14</sup> This could be partially because of the limited sample size in the present study.

The present study observed that females are more affected by AA out of 35 patients, where 20 (57%) were female and 15 (43%) were male. The average duration of illness was 13.63 months. The average duration of illness was 13.63 months.

This study also found that the overall average vitamin D level in AA patients was 21.82 ng/ml. Also the average vitamin D level in female patients was 20.89 ng/ml and the average vitamin D level in male patients was 23.7 ng/ml. The amount of vitamin D was not strictly linked to severity of alopecia areata. Furthermore, it was seen that 18 (51.42%) patients with AA had a lower range of vitamin D levels. No statistically significant

correlation was established between vitamin D and AA in the present study. Moreover, some studies have shown a relation between vitamin D insufficiency and alopecia areata. A systematic meta-analysis published in the year 2018 has supported lower levels of serum Vitamin D levels in patients with AA.<sup>15</sup> There are varying studies with diverse data. A study published by Erpolat et. al. and by Daroach M et. Al. revealed that majority (85.3% and 96.7% respectively) of AA patients were vitamin D deficient.<sup>11, 16</sup> Regarding the present study, although more than 50% of the AA cases had lower levels of serum vitamin D levels, a statistically significant correlation between vitamin D deficiency and AA could not be determined. However, it was found that SALT score and number of patches were correlated as the SALT score directly depends on the number of patches. Similarly, in a study published from Nepal by Suchana et al., no correlation was detected between salt score and vitamin D level ( $p = 0.89$ ).<sup>17</sup>

Certain limitations of the present study could be that long term follow up was not done, limited sample size, levels of parathyroid hormone not measured vitamin D was not given as a therapeutic trial.

## CONCLUSIONS

In the present study we found lower serum vitamin D levels in 51.42 % of alopecia areata patients. Based on the statistical analysis, SALT score and number of patches had positive correlation with the p value less than 0.05; while other clinical parameters including duration of illness, serum vitamin D and SALT scoring had minimal or no correlation. Overall, it can be concluded that the patients parameters collected from this single center study showed non-significant correlation of vitamin D with the AA condition.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## REFERENCES

- Hordinsky MK. Overview of alopecia areata. *J Invest Dermatol Symp Proc*. 2013 Dec;16(1):S13-5. [Article]
- Wasserman D, Guzman-Sanchez DA, Scott K, McMichael A. Alopecia areata. *Int J Dermatol*. 2007 Feb;46(2):121-31. [Article]
- Pratt CH, King LE Jr, Messenger AG, Christiano AM, Sundberg JP. Alopecia areata. *Nat Rev Dis Primers*. 2017 Mar 16;3:17011. [Article]
- Lin X, Meng X, Song Z. Vitamin D and alopecia areata: possible roles in pathogenesis and potential implications for therapy. *Am J Transl Res*. 2019 Sep 15;11(9):5285-5300. [Article]
- Madani S, Shapiro J. Alopecia areata update. *J Am Acad Dermatol*. 2000 Apr;42(4):549-66; quiz 567-70. [Article]
- Villasante Fricke AC, Miteva M. Epidemiology and burden of alopecia areata: a systematic review. *Clin Cosmet Investig Dermatol*. 2015 Jul 24;8:397-403. [Article]
- Tan E, Tay YK, Goh CL, Chin Giam Y. The pattern and profile of alopecia areata in Singapore--a study of 219 Asians. *Int J Dermatol*. 2002 Nov;41(11):748-53. [Article]
- Gilhar A, Etzioni A, Paus R. Alopecia areata. *N Engl J Med*. 2012 Apr 19;366(16):1515-25. [Article]
- Gade VKV, Mony A, Munisamy M, Chandrashekar L, Rajappa M. An investigation of vitamin D status in alopecia areata. *Clin Exp Med*. 2018 Nov;18(4):577-584. [Article]
- Amor KT, Rashid RM, Mirmirani P. Does D matter? The role of vitamin D in hair disorders and hair follicle cycling. *Dermatol Online J*. 2010 Feb 15;16(2):3. [Article]
- Erpolat S, Sarifakioglu E, Ayyildiz A. 25-hydroxyvitamin D status in patients with alopecia areata. *Postepy Dermatol Alergol*. 2017 Jun;34(3):248-252. [Article]
- d'Ovidio R, Vessio M, d'Ovidio FD. Reduced level of 25-hydroxyvitamin D in chronic/relapsing Alopecia Areata. *Dermatoendocrinol*. 2013 Apr 1;5(2):271-3. [Article]
- Al-Ajlan A, Alqahtani ME, Alsuwaidan S, Alsalhi A. Prevalence of Alopecia Areata in Saudi Arabia: Cross-Sectional Descriptive Study. *Cureus*. 2020 Sep 10;12(9):e10347. [Article]
- Furue M, Yamazaki S, Jimbow K, Tsuchida T, Amagai M, Tanaka T, et. al. Prevalence of dermatological disorders in Japan: a nationwide, cross-sectional, seasonal, multicenter, hospital-based study. *J Dermatol*. 2011 Apr;38(4):310-20. [Article]
- Lee S, Kim BJ, Lee CH, Lee WS. Increased prevalence of vitamin D deficiency in patients with alopecia areata: a systematic review and meta-analysis. *J Eur Acad Dermatol Venereol*. 2018 Jul;32(7):1214-1221. [Article]
- Daroach M, Narang T, Saikia UN, Sachdeva N, Sendhil Kumaran M. Correlation of vitamin D and vitamin D receptor expression in patients with alopecia areata: a clinical paradigm. *Int J Dermatol*. 2018;57:217-222. [Article]
- Marahatta S, Agrawal S, Khan S. Study on Serum Vitamin D in Alopecia Areata Patients. *J Nepal Health Res Council*. 2019 Apr 28;17(1):21-25. [Article]