Comparison of serum levels of calcium, vitamin-D, phosphorous and C-reactive protein in acne patients versus healthy subjects

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INTRODUCTION

Acne vulgaris is considered a common skin disease in which sebaceous glands’ inflammation and obstruction lead to involvement of chest, back, and face 1-3. The genetic has been regarded as one of the main contributing factors to acne 4. Four related mechanisms include follicular proliferation and ruptures, sebum production, inflammation, and coryne-bacterium presence 5,6. Acne is usually observed in adolescence due to sex hormone role in the middle of the second decade of life 6-8. Androgens level, genetic, corticosteroids, chemical agents, and psychiatric factors are among the aggravating factors for acne 9-11. Antibiotics such as tetracycline 12-14 and retinoid 15 are the main therapeutic options. Although, these modalities are effective in the treatment of the patients, the...
therapeutic outcomes are not favorable in some cases. In these cases, other etiologies such as mineral and vitamin deficiencies are proposed to be important. Some micronutrients or inflammation-related factors such as zinc, calcium, vitamin D, phosphorous, and C reactive protein (CRP) are among suggested markers. Regarding some controversies or few studies in this area, this study was conducted to determine and compare the serum levels of calcium, vitamin D, phosphorous, and CRP in acne patients and healthy subjects.

PARTICIPANTS AND METHODS

Participants and study design

In this case-control study, 144 consecutive subjects with and without acne (72 cases and 72 controls), referred to Rasoul Akram Hospital in 2016 were enrolled. Additionally, the serum calcium, phosphorous, CRP and vitamin D were determined in the subjects by the ELISA method, and compared between the groups, based on acne severity. The control group was selected from healthy personnel without acne through clinical examination. The severity was determined according to the following items:

- Mild acne: fewer than 20 comedones, or fewer than 15 inflammatory lesions, or a total lesion count more than 30;
- Moderate acne: 20-100 comedones, or 15-50 inflammatory lesions, or a total lesion count of 30-125;
- Severe acne: more than 5 cysts, or comedone count more than 100, or a total inflammatory count more than 50, or a total lesion count more than 125.

Statistical methods

Data of the 144 patients (72 subjects in each group) were analyzed using the SPSS software (version 24.0). The tests used for comparisons included Independent-Sample-T, Mann-Whitney-U, ANOVA, Kruskal-Wallis, and Pearson tests. The significance level was considered 0.05.

Ethical considerations

The written informed consent was obtained from all participants.

RESULTS

The mean age was 25.5 ± 7.9 and 26.4 ± 8.8 years in both case and control groups, respectively (P > 0.05); in each group, 50% were male. Table 1 shows the acne severity. Duration was less than one year, 1-5 years, 5-10 years, and more than 10 years in 34.7%, 23.6%, 16.7%, and 25%, respectively.

As Table 2 shows, dairy intake (dairy product usage divided based on frequency of use and considered as multiple times in a day (very much), daily (much), most days in a week (medium), 2-3 times in week in a week (few), less than 2 days in a week or even no use (very few)) was higher...
in the case group \( (P = 0.0001) \). In case and control groups, sun exposure longer than three hours was 48.6\% and 27.8\%, respectively, with a significant difference \( (P = 0.010) \). Calcium, phosphorus and CRP levels were not significantly different between the two groups. The only serum marker differed between the groups was vitamin D \( (P = 0.001) \) (Table 3).

The age was not related to vitamin D, CRP, calcium and phosphorous \( (P > 0.05) \). The gender was not associated with determined serum markers except calcium that was higher in males in both case and control groups. \( (P = 0.0001 \text{ and } P = 0.003, \text{ respectively}) \). Although, the CRP level was not different between the case and control groups, it was positively associated with acne severity or its grade \( (P = 0.034) \). Other serum factors were not related to acne severity \( (P > 0.05) \). The only factor relevant to sun exposure in both groups was the serum vitamin D level \( (P = 0.0001) \). Furthermore, calcium \( (P = 0.0001) \) and phosphorous \( (P = 0.042) \) were associated with the diary intake in the two groups. Duration of acne was not associated with serum markers levels \( (P > 0.05) \).

The determined serum levels were not relevant to acne severity, except CRP \( (P = 0.034) \) (Tables 4 and 5).

### DISCUSSION

Acne is a common dermatological disease worldwide, particularly in adolescents. Determination of the related factors can help to plan a better program to reduce the burden of acne. According to our findings, between calcium, phosphorous, CRP, and vitamin D indices, only the serum vitamin D level was related to acne. Interestingly, the patients with acne had higher serum levels of vitamin D. In other words, vitamin D can reduce the acne rate, being inconsistent with previous studies.

#### Table 3. Serum levels of vitamin and minerals in the two groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca (mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>9.59</td>
<td>.64</td>
</tr>
<tr>
<td>Control</td>
<td>9.40</td>
<td>.61</td>
</tr>
<tr>
<td>Phosphorous (mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>3.19</td>
<td>.96</td>
</tr>
<tr>
<td>Control</td>
<td>3.31</td>
<td>.53</td>
</tr>
<tr>
<td>VitD (ng/ml)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>29.30</td>
<td>16.21</td>
</tr>
<tr>
<td>Control</td>
<td>20.39</td>
<td>14.89</td>
</tr>
<tr>
<td>CRP (mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>6.95</td>
<td>3.11</td>
</tr>
<tr>
<td>Control</td>
<td>6.36</td>
<td>2.23</td>
</tr>
</tbody>
</table>

#### Table 4. Association of gender with serum parameters

<table>
<thead>
<tr>
<th>Group</th>
<th>Gender</th>
<th>Ca (mg/dl)</th>
<th>Phosphorous (mg/dl)</th>
<th>VitD (ng/ml)</th>
<th>CRP (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Female</td>
<td>Mean</td>
<td>9.31</td>
<td>3.39</td>
<td>31.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Std. Deviation</td>
<td>.41</td>
<td>1.18</td>
<td>17.57</td>
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<tr>
<td></td>
<td>Male</td>
<td>Mean</td>
<td>9.88</td>
<td>3.00</td>
<td>27.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Std. Deviation</td>
<td>.71</td>
<td>.63</td>
<td>14.64</td>
</tr>
<tr>
<td>Control</td>
<td>Female</td>
<td>Mean</td>
<td>9.20</td>
<td>3.33</td>
<td>23.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Std. Deviation</td>
<td>.52</td>
<td>.57</td>
<td>16.08</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Mean</td>
<td>9.61</td>
<td>3.29</td>
<td>17.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Std. Deviation</td>
<td>.62</td>
<td>.49</td>
<td>13.11</td>
</tr>
</tbody>
</table>

#### Table 5. Association of acne severity with serum parameters

<table>
<thead>
<tr>
<th>Group</th>
<th>Grade</th>
<th>Ca (mg/dl)</th>
<th>Phosphorous (mg/dl)</th>
<th>VitD (ng/ml)</th>
<th>CRP (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Moderate/Severe</td>
<td>Mean</td>
<td>9.58</td>
<td>3.18</td>
<td>26.67</td>
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<tr>
<td></td>
<td>Std. Deviation</td>
<td>0.60</td>
<td>0.51</td>
<td>15.83</td>
<td>1.82</td>
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<tr>
<td></td>
<td>Very Severe</td>
<td>Mean</td>
<td>9.62</td>
<td>3.21</td>
<td>32.97</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>0.70</td>
<td>1.37</td>
<td>16.27</td>
<td>4.19</td>
</tr>
</tbody>
</table>
Serum parameters in acne patients

Our study showed that patients with acne had higher exposure to the sun or higher intake of dairy products that may explain the higher levels of vitamin D in the case group. Contrary to the study conducted by Toosi et al., our results indicated that the control group had significantly lower vitamin D levels. Moreover, we did not find any correlation between vitamin D and demographic characteristics of the patients, as well as between vitamin D and acne severity. Two related studies in Turkey and Korea demonstrated that patients with acne had lower levels of vitamin D; the latter study reported an inverse correlation between the acne severity and serum levels of vitamin D, being inconsistent with our results; this result is justified by the above-mentioned probable confounders.

In conclusion, to the best of our knowledge, calcium, phosphorous, and CRP levels are not associated with acne severity. Calcium level is higher in males with higher exposure to the sun, based on cultural or occupational condition in our country that may differ in other countries with different nutritional habits and different sun exposure. Owing to the high prevalence of acne, it is recommended that the probable related factors be focused to better manage or prevent acne vulgaris, since there are many related articles in this regard.

However, more comprehensive matched studies with a larger sample size are required to obtain more definite results particularly with consideration of confounding factors.

Considering the high prevalence and great burden of acne vulgaris, there are many articles emphasizing on acne associations, treatments, and management of its complications, especially scars. In this study, one of the controversial associations of acne vulgaris is studied and discussed.

Acknowledgements

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Conflict of Interest: None declared.

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