

# THE STUDY ON THE TOPOGRAPHIC VARIATIONS OF FACIAL SKIN IN KOREAN ADULT FEMALES

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## SYNOPSIS

This study was observed the variations in skin color, hydration, sebum content according to age groups at the forehead, both cheeks, and chin in 154 healthy Korean women subjects with aged 30 to 59. We selected four face sites (forehead, right cheek, left cheek, and chin) and measured with chromameter, corneometer, and sebumeter. All statistical analysis was performed on the computer software package SPSS 8.0.

There was no significant difference of lightness between facial four regions in age groups but lightness showed to tend to age-related decrease on each regions. Redness and yellowness showed the highest values on chin and forehead respectively but there was no tendency to steady changes according to age variation. Both cheeks showed the highest hydration level and the lowest sebum content compared with forehead and chin in all age groups and there was tendency to age-related changes of sebum content on both cheeks.

So we concluded there was decreasing tendency in lightness and sebum content according to the increase of age and there was no age-related change of skin hydration level at least in facial skin.

## KEYWORDS

lightness, redness, yellowness, sebum content, hydration

## INTRODUCTION

Aging of the skin includes both intrinsic (chronologic) and extrinsic (photoaging) aging. Human skin condition shows variations throughout life and many extrinsic and intrinsic

factors influence skin conditional changes such as skin color, skin hydration level, skin sebum content, and so on. Skin elasticity, hydration, skin blood flow and skin surface pattern show age-related changes reflecting the damage of cutaneous structures involved. Avoidance of sun exposure has been clearly recognized as the best way to prevent premature skin aging (e.g., wrinkling and age spots).

The deleterious effects of chronic sun exposure are easily appreciated when one looks at the sun exposed and unexposed skin of people who have worked outdoors for years, such as farmers. Hypo and hypermelanization, senile lentigenes, telangiectasia, dry rough and wrinkled skin are all associated with chronic sun exposure. While these qualitative aspects of chronic sun exposure are well known, few studies have been conducted to quantitatively understand the relationship between chronic sun exposure and premature skin aging. Warren et al. quantified facial wrinkling, skin color, skin elasticity and perceived age in Caucasians and reported no significant difference was noted for skin color in the high vs. low sun exposure group in either older or younger persons. For the purpose of evaluating age-related skin changes according to chronological aging, this study was observed the variations in skin color, hydration, sebum content at the four sites of face and performed to assess the difference of skin states according to age groups in 154 healthy Korean women subjects with aged 30 to 59.

## **MATERIAL AND EXPERIMENT**

### **Subjects**

A total of 154 Korean females self-reporting good health and not pregnant were surveyed. The number of subjects in each age group was as shown in Table I. Subjects in this study lived in area of Seoul and Suwon shi. Thirty minutes prior to skin measurements, subjects cleansed their face to remove all makeup and sebum and they were adjusted to the temperature and humidity controlled room( $22\pm 2^{\circ}\text{C}$ ,  $50\pm 5\%$ ). Skin measurements were performed at four face sites of forehead, right cheek, left cheek, and chin (middle of forehead about 2cm above the eyebrow line, both upper cheeks, middle of chin about 1cm below the lower lip).

### **Skin Color**

The Chromameter CR10(Minolta, Japan) was used to measure skin color ( $L^*, a^*, b^*$ ) on four face sites. Measurements were made in triplicate at each skin site and the average of these three measurements was calculated and used for group statistics.

### **Skin Hydration**

The Corneometer CM825 (Courage-Khazaka) was used to measure the skin electrical capacitance, a measure of skin hydration, on four face sites according to manufacturer's instructions. Measurements were made in triplicate at each skin site and the average of these three measurements was calculated and used for group statistics.

### **Sebum Content**

The Sebumeter SM810 (Courage-Khazaka) was used to measure the skin sebum content on four face sites. Measurements were made in duplicate at each skin site according to manufacturer's instructions and the average of these two measurements was calculated and used for group statistics.

### **Statistical Analysis**

For each data from the skin measurements, the differences between 3 age groups(30~39, 40~49, 50~59) and between four face sites were compared using a one-way ANOVA of SPSS 8.0 software.

## **RESULTS**

### **Difference of facial skin color**

There was no significant differences of lightness between four measuring sites in each age groups but there was tendency to decrease of lightness according to increase of age on each measuring site. In right cheek and chin, there was significant decrease of lightness in forties and fifties compared with thirties respectively ( $p < 0.01$ ) (Table II and Fig. 1).

Chin showed the highest values of redness in all age groups compared with other regions and there was significant differences of redness in thirties, forties and all ages ( $p < 0.01$ ) (Table III and Fig. 2). But there was no tendency to steady changes of redness according to age variation on all regions.

Forehead showed the highest values of yellowness and there was significant differences of yellowness compared with other regions in thirties, forties and all age groups ( $p < 0.01$ ) (Table IV and Fig. 3). But there was no tendency to steady changes of yellowness according to age variation on all regions.

#### **Differences of hydration level and sebum content in facial skin**

Both cheeks showed the highest hydration level and there was significant differences compared with forehead and chin in all age groups ( $p < 0.01$ ) (Table V and Fig. 4). But there was no tendency to steady changes of hydration level according to age variation on all regions.

The lowest sebum content was measured at both cheeks and there was significant differences of sebum content compared with forehead and chin in all age groups ( $p < 0.01$ ) (Table VI and Fig. 5). And there was tendency to decrease of sebum content according to the increase of age in both cheeks. Especially there was significant decrease of sebum content between thirties and fifties in both cheeks ( $p < 0.05$ ).

#### **DISCUSSION**

Noninvasive technology is an important tool in investigating and assessing physical properties of the skin and may provide a precise functional estimate of cutaneous aging. By utilizing easy-to-use equipment we could investigate facial skin color, skin hydration, and sebum content in a large number of female subjects to quantitatively measure the difference in facial skin associated with age.

Skin color is classified as either constitutive or facultative skin color. The facultative skin color varies in an individual and is affected by various factors including endocrine changes, UV radiation and disorders of melanin pigmentation. Since previous reports have given the

relationship between skin color and UV sensitivity and the differences of skin color according to anatomic regions and seasonal changes, we tried to survey the differences of facial skin color on four measuring sites (forehead, both cheeks and chin) according to age groups. In this study, we found an inverse relationship between the value of lightness and the increase of age, but no differences of lightness between the anatomic regions. Redness and yellowness showed the highest values on chin and forehead respectively, but there was no tendency to age-related changes on all regions.

It is generally accepted that skin water content and sebum content, which are important indicators in the function of stratum corneum, decrease with age and dry skin increases with age. In this study, we found both cheeks showed the highest hydration level and the lowest sebum content compared to forehead and chin in all age groups. We confirmed again sebum content showed decrease with age on both cheeks. But we found there was no tendency to steady changes of hydration level according to age variation on all regions. From this controversial result, we can conclude that there was no age-related changes of skin hydration level at least in facial skin.

## **CONCLUSION**

This study was observed the variations in skin color, hydration, sebum content according to age groups at the forehead, both cheeks, and chin in 154 healthy Korean women subjects with aged 30 to 59. From the study, the following conclusions were obtained.

- 1) There was no significant difference of lightness between facial 4 regions in age groups but lightness showed to tend to age-related decrease on each regions.
- 2) Redness and yellowness showed the highest values on chin and forehead respectively but there was no tendency to steady changes according to age variation.
- 3) Both cheeks showed the highest hydration level and the lowest sebum content compared with forehead and chin in all age groups and there was tendency to age-related decrease of sebum content on both cheeks. But there was no age-related changes of skin hydration level at least in facial skin.

So we concluded there was decreasing tendency in lightness and sebum content according to the increase of age and there was no age-related change in facial skin hydration level. It will be helpful to develop the antiaging products, which were considered to prevent skin pigmentation and support skin barrier function.

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**Table I . The number of subjects in each age group**

Ages	30~39	40~49	50~59
Number	77	54	23

**Table II . The skin color of L\* value**

Lightness	Forehead	Right cheek	Left cheek	Chin
Thirties	59.4±2.6	60.3±2.3	59.5±5.4	60.1±3.0
Forties	59.0±1.8	58.6±2.5	58.8±2.7	58.4±2.5
Fifties	58.4±2.5	58.7±3.2	58.4±3.4	57.8±2.8
All ages	59.1±2.3	59.5±2.7	59.1±4.3	59.1±3.0

Mean±S.D. (thirties: n=77, forties: n=54, fifties: n=23) L : lightness, a : redness, b : yellowness

**Table III. The skin color of a\* value**

Redness	Forehead	Right cheek	Left cheek	Chin
Thirties	17.5±5.0	17.0±3.1	17.5±3.9	19.8±4.6
Forties	17.1±2.9	17.8±2.2	18.2±3.3	20.4±2.9
Fifties	17.6±4.6	17.2±3.5	17.6±3.4	20.8±3.5
All ages	17.4±4.3	17.3±2.9	17.8±3.6	20.1±3.9

Mean±S.D. (thirties: n=77, forties: n=54, fifties: n=23) L : lightness, a : redness, b : yellowness

**Table IV. The skin color of b\* value**

Yellowness	Forehead	Right cheek	Left cheek	Chin
Thirties	18.5±2.1	16.8±2.0	16.7±2.4	16.8±2.4
Forties	18.2±1.5	16.7±1.9	16.3±2.1	16.2±2.9
Fifties	17.5±2.1	17.2±1.8	17.0±1.9	16.6±1.6
All ages	18.3±1.9	16.9±1.9	16.6±2.2	16.9±4.3

Mean±S.D. (thirties: n=77, forties: n=54, fifties: n=23) L : lightness, a : redness, b : yellowness

**Table V. The skin hydration**

Hydration	Forehead	Right cheek	Left cheek	Chin
Thirties	67.5±10.5	76.0±8.8	76.8±9.2	65.5±10.2
Forties	68.6±11.1	77.6±8.0	78.5±7.8	64.9±12.4
Fifties	68.3±13.5	77.4±7.8	78.1±7.8	68.2±10.1
All ages	68.0±11.1	76.8±8.4	77.6±8.5	65.7±11.0

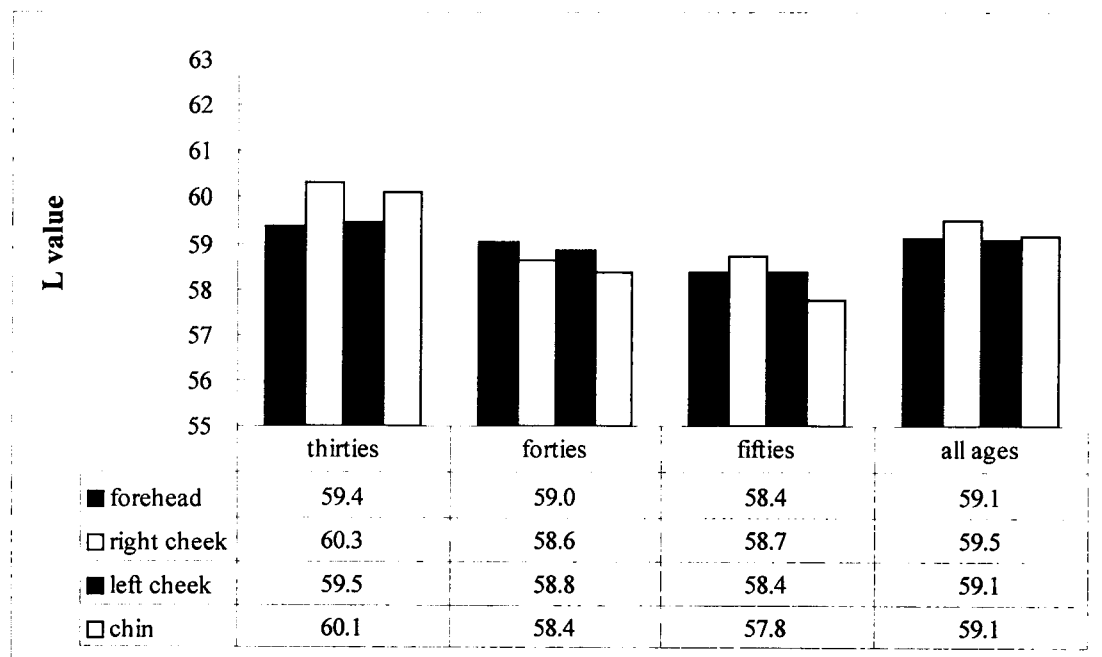
Mean±S.D. (thirties: n=77, forties: n=54, fifties: n=23)



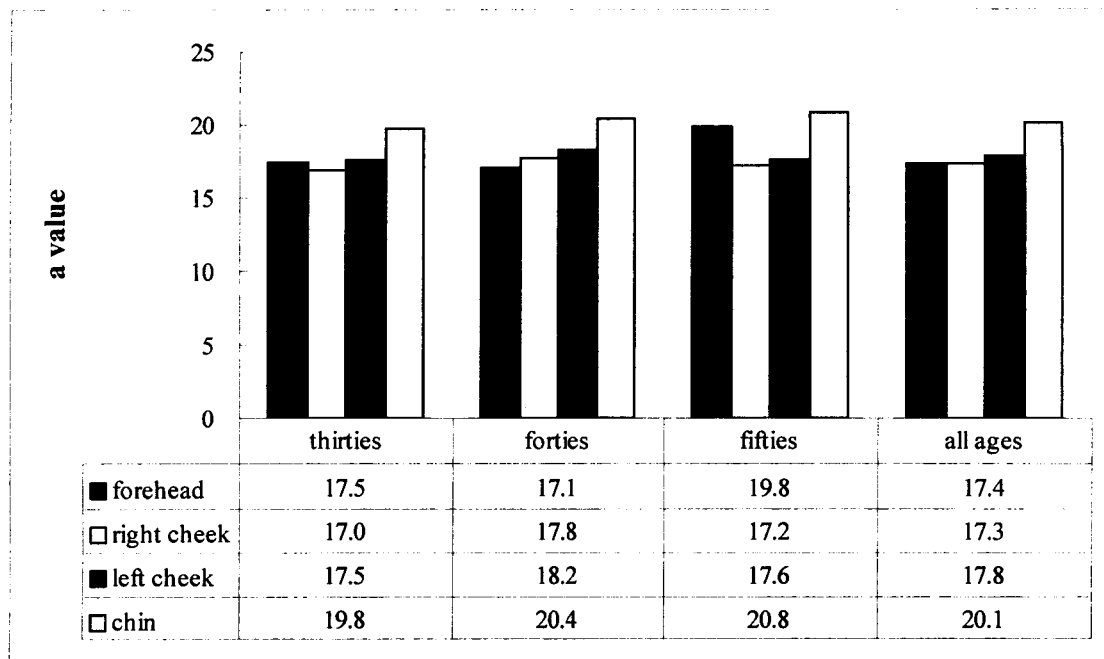
**Table VI. The skin sebum content**

Yellowness	Forehead	Right cheek	Left cheek	Chin
Thirties	50.0±46.2	16.7±25.0	16.4±23.7	43.4±44.5
Forties	48.9±39.5	15.3±16.1	14.6±13.4	47.5±33.4
Fifties	30.8±31.6	6.7±11.2	6.3±10.4	36.1±32.2
All ages	46.8±42.3	14.7±20.8	14.2±19.2	43.7±39.1

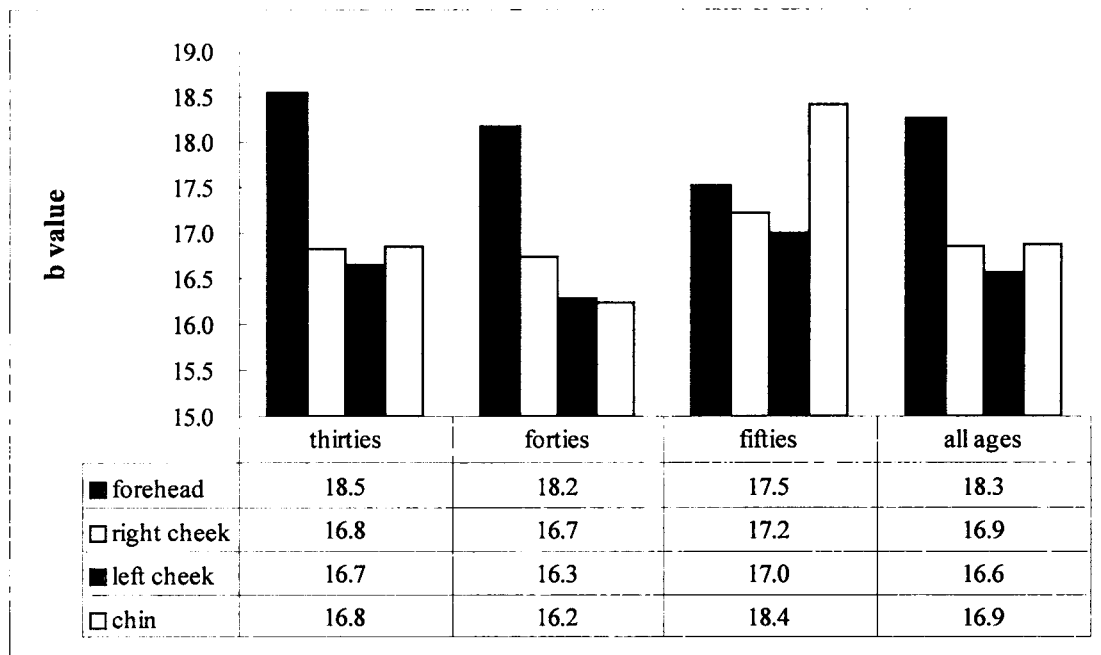
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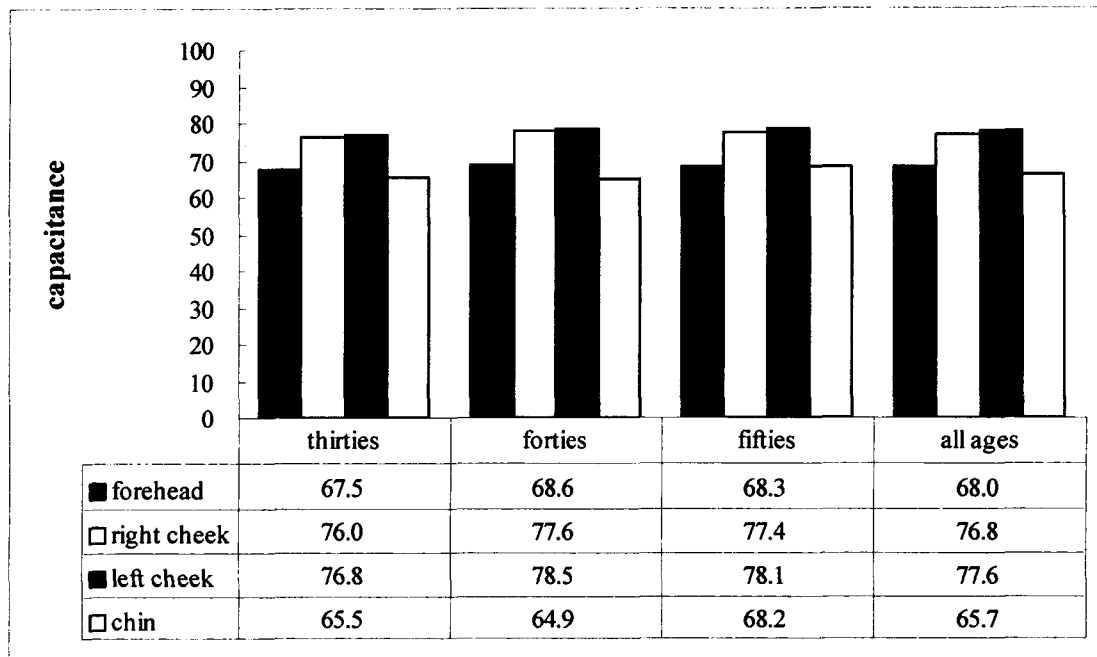
**Figure 1. The facial skin color of L\* values according to age.**



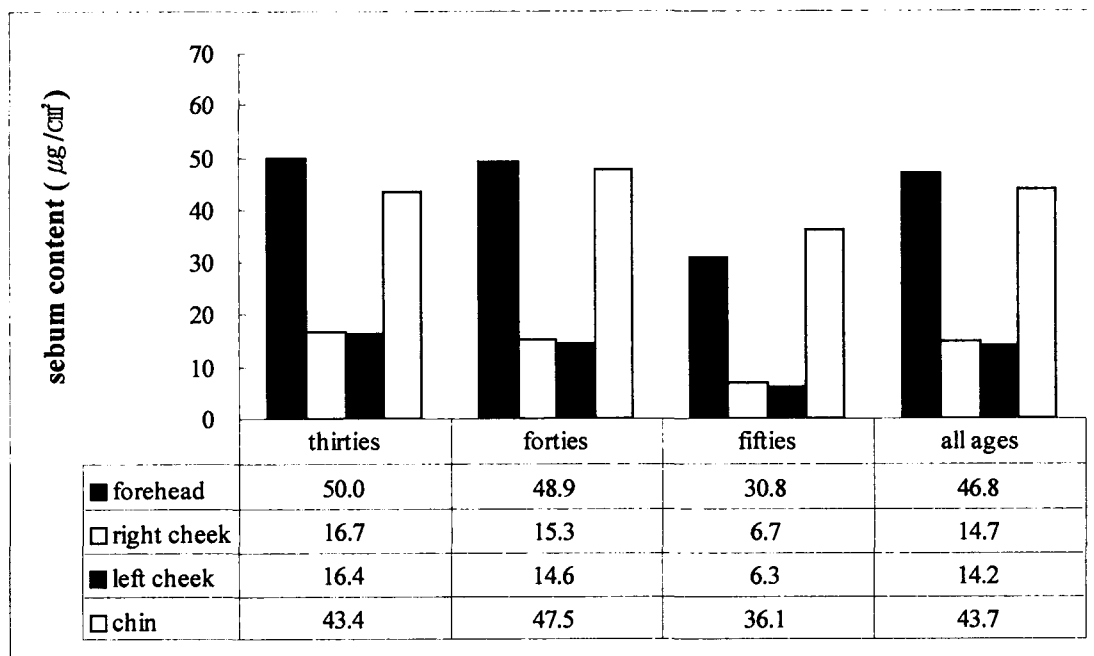
**Figure 2. The facial skin color of a\* values according to age.**



**Figure 3. The facial skin color of b\* values according to age.**



**Figure 4. The hydration level of facial skin according to age.**



**Figure 5. The sebum contents of facial skin according to age.**