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ORIGINAL ARTICLE

Baumann Skin Type in the Korean Male Population

Young Bin Lee, Sung Ku Ahn, Gun Young Ahn[1], Hana Bak[2], Seung Phil Hong, Eun Jung Go[3], Chang Ook Park[4], Sang Eun Lee[5], Weon Ju Lee[6], Hyun-Chang Ko[7], Jee-Bum Lee[8], Hyung Joo Kim[9], Kun Park[10], Sang-Hoon Lee[11], Dong Hoon Song[12], Sun Young Choi[13], Yeol Oh Sung[14], Tae-Hyun Kim[15], Ja Woong Goo[16]

Department of Dermatology, Yonsei University Wonju College of Medicine, Wonju, [1]Chungdam Gowoonsesang, Dr. G Dermatology Clinic, [2]Chungdam Hana Dermatolgic Clinic, [3]Department of Dermatology, National Police Hospital, [4]Department of Dermatology, Yonsei University College of Medicine, [5]Department of Dermatology, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, [6]Department of Dermatology, Kyungpook National University School of Medicine, Daegu, [7]Department of Dermatology, Pusan National University School of Medicine, Busan, [8]Department of Dermatology, Chonnam National University Medical School, Gwangju, [9]Kims Dermatologic Clinic, Busan, [10]Department of Dermatology, Wonkwang University School of Medicine, Iksan, [11]Department of Dermatology, Soonchunhyang University College of Medicine, Seoul, [12]Yonsei Dermatologic Clinic, Jeju, [13]Deparment of Dermatology, Inje University Seoul Paik Hospital, Seoul, [14]Severance Dermatologic Clinic, Daegu, [15]DS Dermatologic Clinic, Daejeon, [16]Jang Dermatologic Clinic, Incheon, Korea

Background: Research into the Baumann skin type (BST) has recently expanded, with growing interest in the development of an efficient and effective skin type classification system for better understanding of this skin condition. **Objective:** We aimed to identify male-specific skin type characteristics with investigation into the distribution of BST by age and region in the Korean male population and to determine the intrinsic and extrinsic factors related to skin type. **Methods:** A questionnaire was administered to collect information about age, region, working behavior, drinking behavior, smoking behavior, usual habit of sun protection, medical history, and the BST which consisted of four parameters; oily (O) or dry (D), sensitive (S) or resistant (R), pigmented (P) or non-pigmented (N), and wrinkled (W) or tight (T). **Results:** We surveyed 1,000 Korean males aged between 20 and 60 years who were divided equally by age and region. Of the total respondents, OSNW type accounted for the largest percentage and ORPW type the lowest. In terms of Baumann parameters, O type was 53.5%, S type was 56.1%, N type was 84.4% and W type was 57.5%. Several behavioral factors were found to have various relationships with the skin type. **Conclusion:** The predominant skin type in the Korean male respondents was OSNW type, and the distribution of skin types with regards to age and region was reported to be distinct. Therefore, skin care should be customized based on detailed skin types considering the various environmental factors. **(Ann Dermatol 31(6) 621～630, 2019)**

-Keywords-
Baumann skin type, Korean men, Questionnaire based study, Sexual dimorphism

INTRODUCTION

Skin type classification has been developed to improve the clinical approach to skin conditions. With the expansion of the cosmetic industry and the field of dermatology, there is a growing need for an intuitive classification system.

The Fitzpatrick skin type, which is subdivided into six categories according to skin color, contributed not only with utility but also provided a systemic view on the difference in anthropology and photodermatology[1]. Other classifica-

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Corresponding author: Sung Ku Ahn, Department of Dermatology, Yonsei University Wonju College of Medicine, 20 Ilsan-ro, Wonju 26426, Korea. Tel: 82-33-741-0621, Fax: 82-33-748-2650, E-mail: ahnsk@yonsei.ac.kr
ORCID: https://orcid.org/0000-0003-0978-9426

tions, including the Japanese skin type, Lancer ethnicity scale, and Robert skin type, have been proposed[2]. However, conventional methods have major shortcomings, with limited numbers of evaluation items and low applicability for general dermatologic conditions.

The Baumann skin type (BST) classification estimates four parameters based on 64 self-reported questionnaires and combines those parameters into a total of 16 skin types[3]. By classifying the individual properties more precisely through these detailed items, this classification can circumvent the existing limitations of other methods. It aids in reliable diagnosis and treatment of skin conditions and effectively bridges communication between doctor and patient[4].

Ahn et al.[5] reported a distribution of BST by age and region in the Korean female population. Inspired by this previous study, we aimed to identify male-specific features and analyze the differences in skin type between males and females by mapping the skin types of Korean males.

MATERIALS AND METHODS

The survey was conducted face-to-face or through a questionnaire at the office, from June 2018 to December 2018 on Korean males (aged 20～60 years). Information on age, region, occupation type, sun-protective behavior, alcohol consumption, smoking, and comorbidities was collected from the respondents with a questionnaire from Baumann[3]. It consisted of 64 items to determine four parameters: oily (O) versus dry (D), sensitive (S) versus resistant (R), pigmented (P) versus non-pigmented (N), and tight (T) versus wrinkled (W). Each parameter was evaluated for 'lipid barrier patency and sebum productivity,' 'tolerability to external product or procedure,' 'skin tone and burning tendency,' and 'wrinkles and lifestyle prone to aging.' Each item was weighted from 0 to 5; If it was difficult for the responder to choose a particular option or the answer was ambiguous, a weight of 2.5 was given. Scores were summed to convert each parameter, and the four parameters were combined to determine the total type. Participants responded to the questionnaire themselves and identified their own skin type.

Additional data were collected to investigate the relationship with BST. Occupation type was divided into "indoor worker," "indoor-outdoor shift worker," and "outdoor worker." Sun-protective behavior included "using a sunscreen" and "wearing a hat or cap." The respondents were asked to answer "Yes" or "No" to the question about the current usage of sunscreen, and to answer as "All the time," "Occasionally," and "Not at all" for the habit of wearing a hat or cap. Answers on alcohol consumption were presented into three categories: "Drink more than 3 times/week," "Drink less than 3 times/week," and "Never drink." Those on smoking were "Smoke more than 1 pack per day," "Smoke less than 1 pack per day," and "Never smoke." The questions relating to the history of hypertension and diabetes mellitus (DM) were included in comorbidities. In each case, respondents were asked to choose from the following: "Taking medication under diagnosis," "Diagnosed but untreated," and "Undiagnosed."

Missing data were not included in the analysis. Descriptive analysis was performed on the distribution of the BST and the Baumann parameters by age and region. A chi-square test was performed, using IBM SPSS Statistics ver. 23.0 (IBM Co., Armonk, NY, USA), to analyze the relationship between the relevant variables and the Baumann parameters. A p-value of <0.05 was considered statistically significant.

The institutional review board (#CR318095) of Wonju Severance Christian Hospital approved the data collection and analysis of information under ethical consideration. Written consent was obtained from all respondents.

RESULTS

Distribution of Baumann skin types

1) National distribution

One thousand Korean males were included in this study (Table 1). The number of people in each region was appropriately secured in proportion to the total populations. Among the total respondents, OSNW type was the most common, followed by the DSNW, DRNT, and ONST types. A sum of the top four types accounted for 47.3%, with 10 of the 16 types having less than 10% each. The least common type was the ORPT type. The DRPT and ORPW types were the second and third from the end respectively (Fig. 1).

2) Regional distribution

The regional distribution of BST was as follows: In Seoul, OSNW accounted for the largest percentage, followed by ORNW, DSNW, and DRNW. In Gyeonggi-do/Incheon, OSNW occupied the largest percentage, followed by OSNT, and DSNW. In Chungcheong-do, ORNT was the most common, followed by OSNT and OSNW. In Gyeongsangbuk-do, DSNW was dominant, followed by ORNW and OSNT. In Gyeongsangnam-do, OSNW was first, followed by OSNT and OSPW. In Jeolla-do, DSNW was the largest proportion, followed by OSNW and DRNT. In Gangwon-do, DRNT was dominant, followed by DRNW, OSNW, and ORNW. In Jeju-do, OSNW ranked first, followed by

Table 1. Demographic data of all respondents (n=1,000)

Category	Value
Region	
Seoul	250 (25.0)
Gyeonggi-do/Incheon	250 (25.0)
Chungcheong-do	100 (10.0)
Gyeongsangnam-do	100 (10.0)
Gyeongsangbuk-do	100 (10.0)
Jeolla-do	100 (10.0)
Gangwon-do	60 (6.0)
Jeju-do	40 (4.0)
Age (yr)	
20~29	251 (25.1)
30~39	253 (25.3)
40~49	247 (24.7)
50~59	249 (24.9)
Use of sunscreen	
Yes	342 (34.2)
No	658 (65.8)
Use of hat or cap	
All the time	65 (6.5)
Occasionally	314 (31.4)
Not at all	621 (62.1)
Working behavior	
Outdoor workers	113 (11.3)
Indoor-outdoor workers	223 (22.3)
Indoor workers	664 (66.4)
Smoking behavior	
More than 1 pack per day	104 (10.4)
Less than 1 pack per day	283 (28.3)
Non-smokers	613 (61.3)
Alcohol drinking behavior	
More than 3 times a week	102 (10.2)
Less than 3 times a week	640 (64.0)
Non-drinkers	258 (25.8)
Diabetes mellitus	
Taking medication under diagnosis	51 (5.1)
Diagnosed but untreated	5 (0.5)
Undiagnosed	944 (94.4)
Hypertension	
Taking medication under diagnosis	115 (11.5)
Diagnosed but untreated	17 (1.7)
Undiagnosed	868 (86.8)

Values are presented as number (%).

ORNT, DRNT, and DRNW. OSNW was the most common type in Seoul, Gyeonggi-do/Incheon, Gyeongsangnam-do and Jeju-do, while DSNW was the most common in Gyeongsangbuk-do and Jeolla-do. In all regions except for Chungcheong-do, there was more than one skin type not reported; this was especially true in Gyeongsangbuk-do, where five skin types were not reported (Fig. 2).

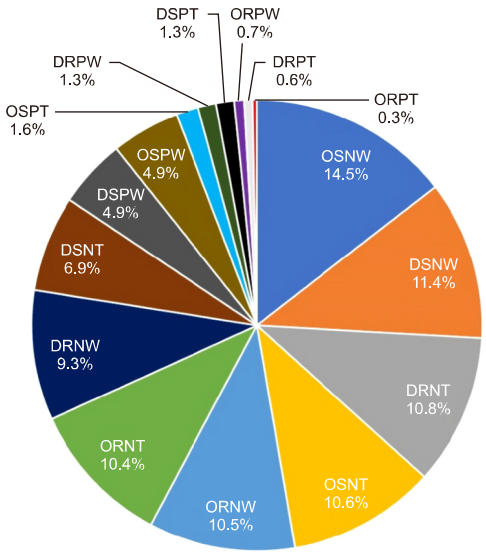

Fig. 1. Nationwide distribution of the Baumann skin type of the 1,000 Korean males included in this study. The proportion of each skin type was described in a clockwise order. The OSNW type was the most common skin type in this study. O: oily, D: dry, S: sensitive, R: resistant, N: non-pigmented, P: pigmented, T: tight, W: wrinkled, ND: not done.

3) Age-specific distribution

The distribution of BST by age was as follows: In the 20s, DRNT was the most common, followed by OSNW and OSNT. In the 30s, ORNW accounted for the largest percentage, followed by OSNW and DSNW. In the 40s, OSNW took the largest share, followed by DSNW and DRNW. In the 50s, DSNW was the most common, followed by DRNW and ORNT. The OSNW type was included in the top three ranks in the 20s, 30s, and 40s, but ranked fifth in the 50s. The DSNW ranked seventh in the 20s, but it was included in the top three ranks in the 30s, 40s, and 50s. There was a difference in terms of unreported skin type by age as ORPW in 20s, ORPT in 30s, DRPT in 40s and DSPT in 50s (Fig. 3).

Distribution of Baumann parameters

1) National distribution

In terms of the distribution of the four Baumann parameters, the oily, sensitive, pigmented, and wrinkled types were 53.5%, 56.1%, 15.6%, and 57.5%, respectively (Fig. 4).

2) Regional distribution

The distribution by region was as follows: The oily type was the highest in Gyeongsangnam-do at 63.0% and the lowest in Gangwon-do at 43.3%. For the sensitive type, Gyengsangnam-do accounted for the highest percentage

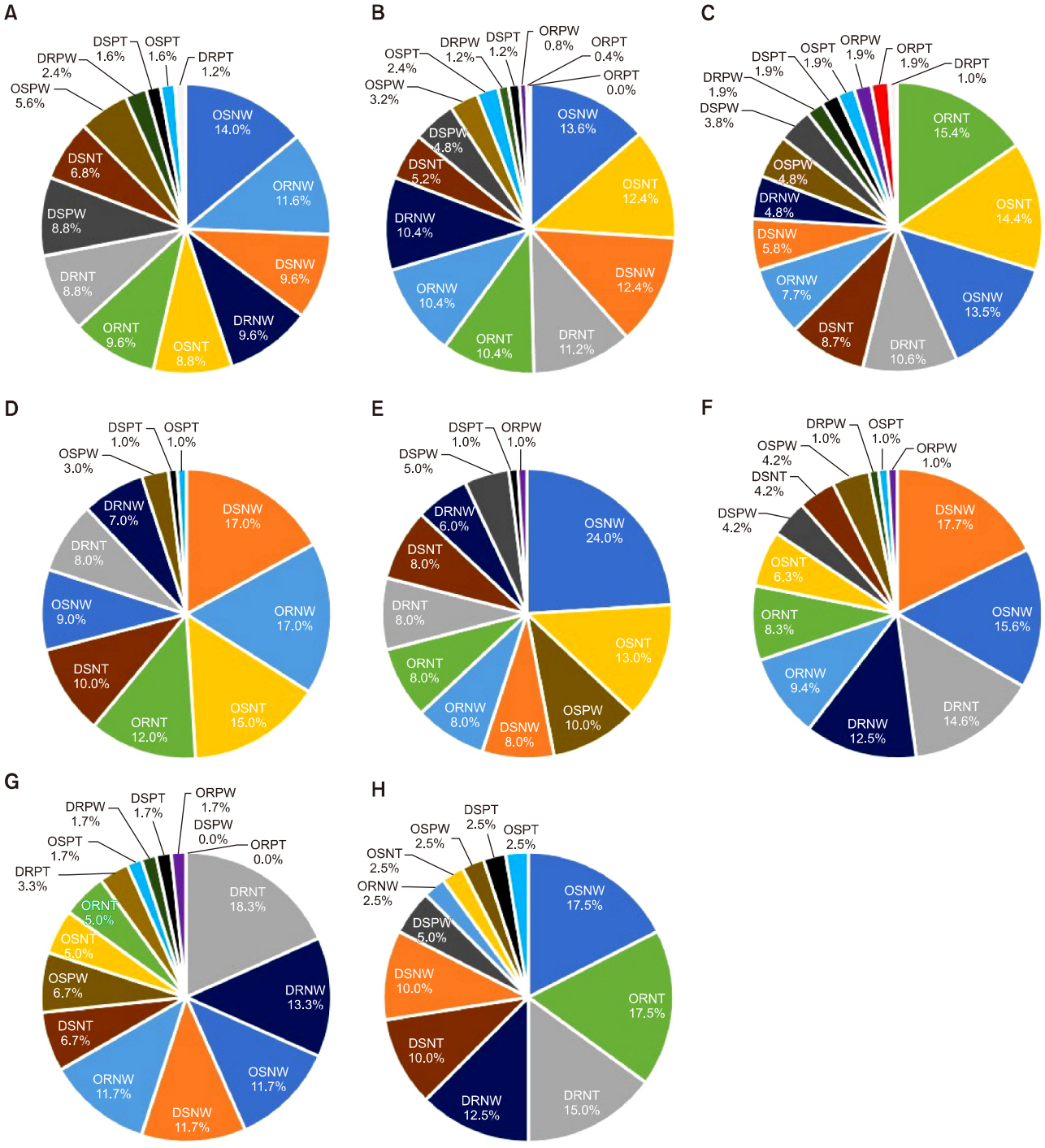

Fig. 2. Distribution of the Baumann skin type by region. There was a difference in not only the order of Baumann skin types by region, but also the diversity of reported types in each region. (A) Seoul, (B) Gyeonggi-do/Incheon, (C) Chungcheong-do, (D) Gyeongsangbuk-do, (E) Gyeongsangnam-do, (F) Jeolla-do, (G) Gangwon-do, and (H) Jeju-do. O: oily, D: dry, S: sensitive, R: resistant, N: non-pigmented, P: pigmented, T: tight, W: wrinkled.

of 68.0%, while Gangwon-do accounted for the lowest of 45.0%. The pigmented type was the highest in Seoul at 21.2%, and the lowest in Gyeongsangbuk-do at 5.0%. Jeolla-do showed the highest percentage of the wrinkled type at 65.6%, and Chungcheong-do reported the lowest at 44.2% (Supplementary Fig. 1).

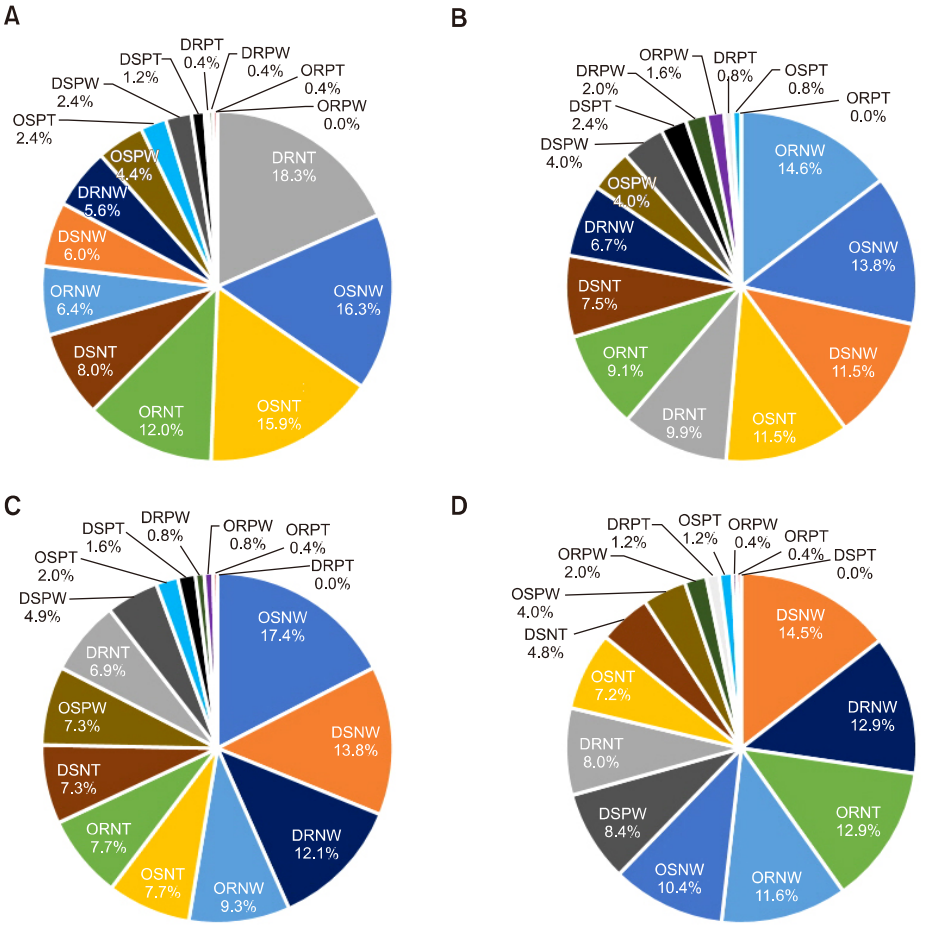

Fig. 3. Distribution of the Baumann skin type by age. There was no obvious regular pattern in the rankings of skin type for each age group. (A) Twenties, (B) thirties, (C) forties, and (D) fifties. O: oily, D: dry, S: sensitive, R: resistant, N: non-pigmented, P: pigmented, T: tight, W: wrinkled.

3) Age-specific distribution

The distribution of each parameter by age was as follows: The oily type was 57.0%, 54.9%, 52.6%, and 48.2% in the 20s, 30s, 40s, and 50s, respectively; there was no statistical significance between the ages. The sensitive type was 55.8%, 55.3%, 61.9%, and 50.6% in the 20s, 30s, 40s, and 50s, respectively; statistical significance was shown between the 40s and 50s. The pigmented type was 11.6%, 15.4%, 17.8%, and 17.7% in the 20s, 30s, 40s, and 50s, respectively; there was no statistical significance between the ages. The wrinkled type was 40.6%, 57.7%, 66.4%, and 64.3% in the 20s, 30s, 40s, and 50s, respectively; statistical significances was reported between the 20s and remaining age groups (Supplementary Fig. 2).

4) Relationship with behavioral factors and comorbidities

Factors with the potential to influence skin type, including sun protective behaviors, smoking, drinking, working behavior, and presence of comorbidities, were included in the questionnaire and analyzed using the Baumann parameters (Fig. 5).

Overall, 34.2% of respondents reported using sunscreen; in the group using sunscreen, sensitive type accounted for 60.1%, and in the group with no sunscreen, it accounted for 54.0%. There was a statistically significant difference between the groups. For the wrinkled type, 53.4% used sunscreen and 59.5% did not; this was statistically significant.

Overall, 6.5% of respondents reported wearing a hat or cap all the time and 31.4% did occasionally. The pigmented type accounted for 24.6% of the group wearing a hat or cap all the time, 18.9% wearing them occasionally, and 12.9% never wearing them. There were statistical significances between the groups. The wrinkled type accounted for 67.7% of the group wearing a hat or cap all the time, 66.0% wearing them occasionally, and 51.9% never wearing them; statistical significances were observed between the groups. The proportion of sensitive type was significantly higher in the group wearing a hat or cap occasionally than in the group never wearing them.

Overall, 11.3% of outdoor workers, 22.3% of indoor-outdoor shift workers, and 66.4% of indoor workers were included. The sensitive type accounted for 68.1%, 53.2%,

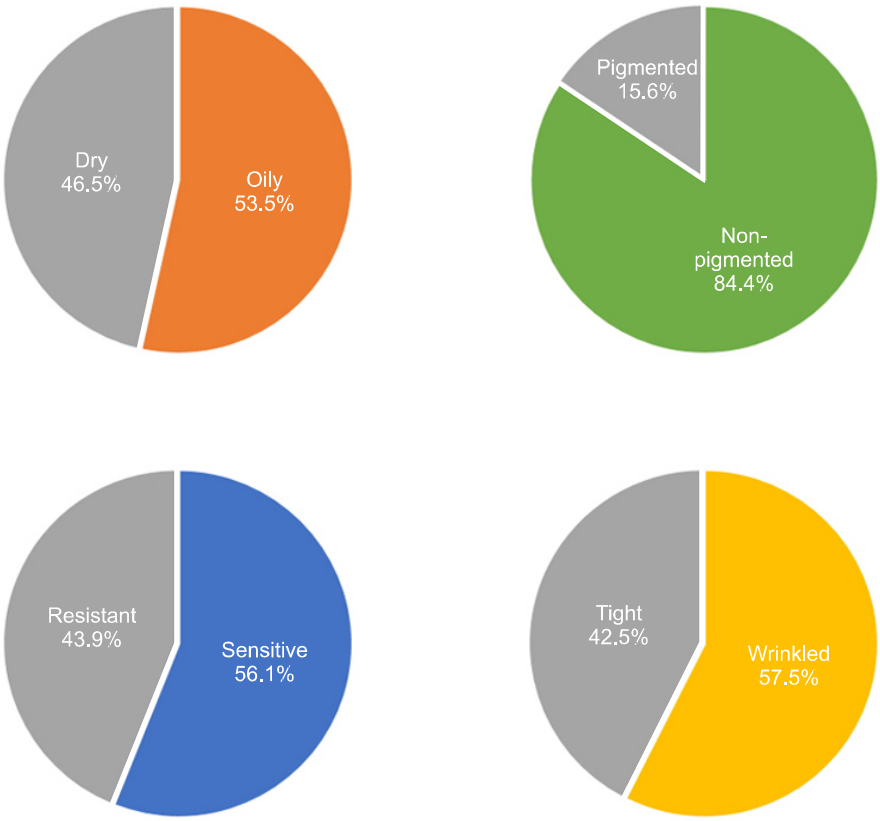

Fig. 4. Distribution of the Baumann parameters. The proportion of individuals with oily, sensitive, non-pigmented, and wrinkled types were higher than that of individuals with dry, resistant, pigmented, and tight types, respectively.

and 55.1% of the group of outdoor, indoor-outdoor, and indoor workers, with statistical significance observed between groups. The pigmented type was significantly higher in outdoor workers than indoor workers, and the wrinkled type was significantly higher in indoor-outdoor shift workers than indoor workers.

Considering alcohol consumption, 10.2% of the total respondents reported drinking more than three times/week, 64.0% did so less than three times/week, and 25.8% were non-drinkers. The pigmented type was significantly higher in the group drinking more than three times/week than in the group drinking less than three times/week. The wrinkled type was significantly higher in the group drinking more than three times/week compared to non-drinkers.

Considering smoking, 10.4% of the total respondents reported smoking more than one pack per day, 28.3% smoked less than one pack per day, and 61.3% were non-smokers. The wrinkled type accounted for 77.7% of the group smoking more than one pack per day, 78.7% of the group smoking less than one pack per day, and 44.1% of non-smokers; statistical significance was found between groups.

Overall, 5.1% of respondents reported taking medication for a diagnosis of DM, 0.5% were diagnosed but untreated, and 94.4% were undiagnosed; there were no parameters showing statistical significance between groups. The percentage of respondents taking medication for hypertension was 11.5%, that of untreated was 1.7%, and that of undiagnosed was 86.8%; the sensitive and wrinkled types showed statistical significance between groups.

DISCUSSION

It is important to understand the vitality of the skin to discern the main factor penetrating all parameters instead of regarding BST as a dichotomous combination of parameters. Lipid composition of the stratum corneum, sebum, bacterial diversity, and natural moisturizing factors exert influence on deciding oily/dry types in complex way[4,6,7]. Sensitive/resistant types arise as a result of increased sensitivity to external antigens, reactivity to stress or hormonal changes, and the permeability of underlying vessels[8,9]. Wrinkle/tight types, indicators of skin aging, represent the collapse of the dermal matrix component due to improper processing of reactive oxygen species[10].

Firstly, the overall characteristics of the Korean male skin

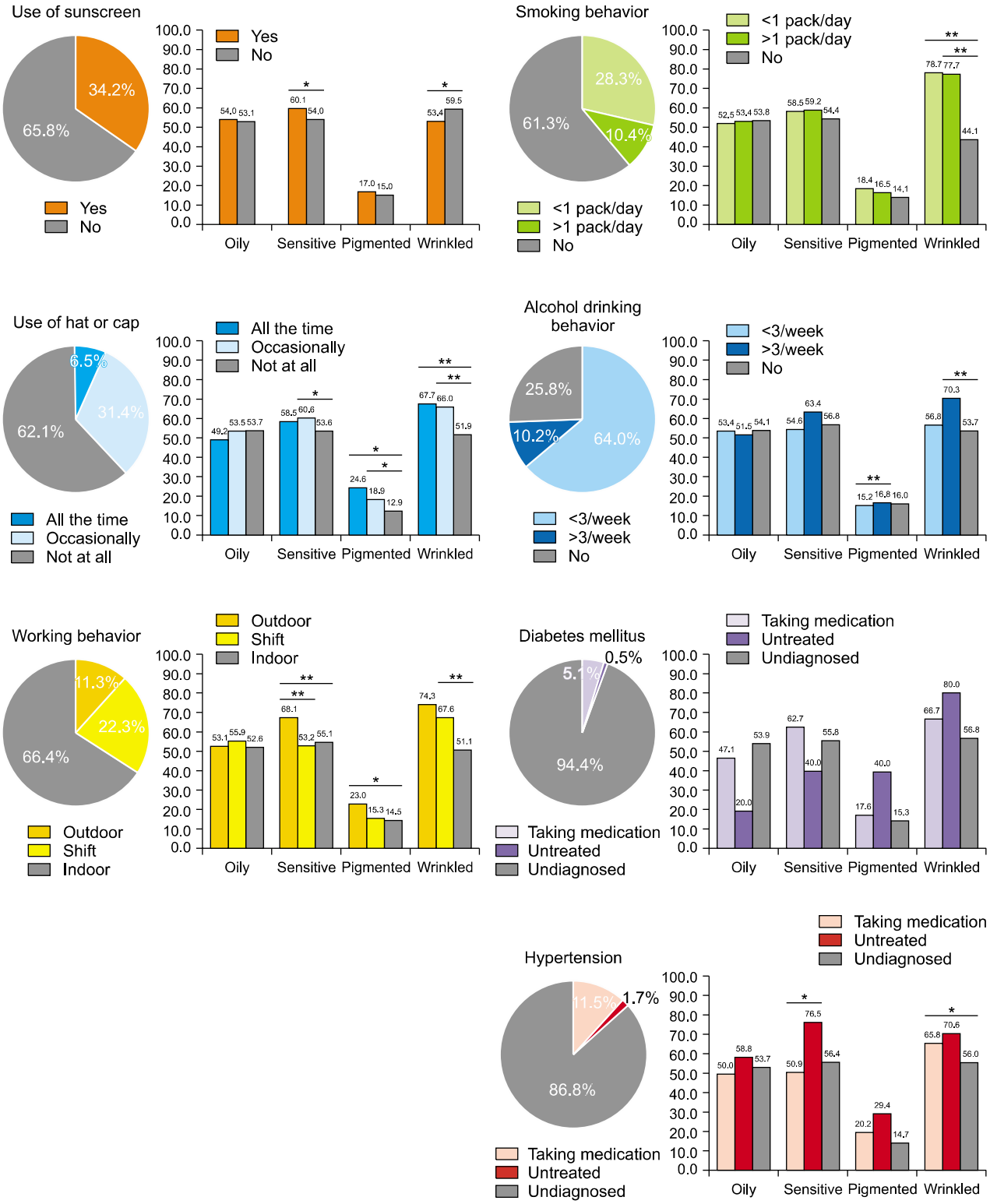

Fig. 5. Schematic diagrams illustrating the relationship between each intrinsic/extrinsic factor and the Baumann parameters. The crude analysis revealed that the parameters had different relationships with each environmental and behavioral factor (*$p<0.05$, **$p<0.01$).

type was observed in this descriptive analysis using BST. The proportion of dry type increased with age and was the highest (51.2%) in the 50s; this proportion was similar to that seen in other epidemiological studies that reported the prevalence of dry skin in elderly individuals (40.6% ~ 80.7%)[11-13]. The proportion of sensitive type was higher

than that of resistant type in all age groups. Although the definition of sensitive skin was not strictly identical to that of the present study, a theoretical concept based on skin reactivity to extrinsic factor reported a similar prevalence (38.2%～51.9% of males)[9,14]. The percentages of pigmented type in all ages were reported to be less than 20%, which was much lower than those of previous studies on BST of Caucasian populations (39%～53%)[15]. This may be due to the ethnic differences relating to genes involved in melanin and tyrosinase since the questions regarding pigmented traits in this survey were weighted towards the genetic background[16,17]. It might also be due to a high threshold for males to consider themselves with pigmented skin. The wrinkled type increased with age and was found to be surprisingly higher than the tight type after the age of 30. This is in line with the redesign of the collagen structure induced by a reduction of testosterone after the age of 30[18,19].

Aside from the Baumann parameters, the male skin type was characterized by regional BST variations. It is necessary to consider underlying environmental factors including temperature, humidity, possible sunshine, and air pollution depending on the region. A more substantive interpretation on regional distribution of BST can be sought based on the regional data provided by the Korean Meteorological Administration (Supplementary Fig. 3). Considering that there is a large difference in the average temperature of cold seasons and possible sunshine between regions, it is necessary to pay attention to the complexity of the relevant factors in the real world and should not be interpreted only by a difference of latitude or longitude.

Secondly, these features were distinctively different from the previously reported BST distribution of Korean females. The notable differences between males and females were as follows (Table 2)[5]. In males, the ratio was higher in the order of OSNW, DSNW, DRNT, and ONST, which was fourth, sixth, third, and first in females, respectively. There was a large heterogeneity among the ranks of skin types between the age groups, and a specific regularity with regards to age was not observed in males. However, there was a modest homogeneous pattern in the ranking between ages in females and the distribution of the top three skin types showed little or no change with age. Contrary to females, the proportions of wrinkled and oily types were higher than tight and dry types in males, respectively. Additionally, the gap between the proportions of each parameter was clearly different between the sexes: sensitive type (56.1% of males vs. 68.8% of females) and pigmented type (15.6% of males vs. 23.2% of females). With regards to sunscreen usage, drinking, and smoking, there were differences in the skin type showing a significant relationship with each sex.

Table 2. Comparison of the skin type characteristics between males noted in the present study and females described in the study by Ahn et al.[5]

Characteristic	Male	Female
Baumann skin type		
Distribution	OSNW＞DSNW＞DRNT＞OSNT	OSNT＞DSNT＞DRNT＞OSNW
Age-related change	Heterogenous pattern (dramatic changes of ranking by age)	Homogenous pattern (no or little change of ranking by age)
Baumann parameter		
Distribution (%)	O (53.5)＞D (46.5) S (56.1)＞R (43.9) N (84.4)＞P (15.6) T (42.5)＜W (57.5)	O (46.6)＜D (53.4) S (68.8)＞R (31.2) N (76.8)＞P (23.2) T (68.1)＞W (31.9)
Age-related change	Increased tendency of P, W Decreased tendency of O	
Relationship with other factors*		
Use of sunscreen	S/R, T/W	None
Use of hat or cap	S/R, N/P, T/W	ND
Working behavior	S/R, N/P, T/W	None
Smoking behavior	T/W	O/D, T/W
Alcohol drinking behavior	N/P, T/W	O/D
Diabetes mellitus	None	ND
Hypertension	S/R, T/W	ND
Blood type	ND	None

O: oily, D: dry, S: sensitive, R: resistant, N: non-pigmented, P: pigmented, T: tight, W: wrinkled, ND: not done. *The parameters showing significant association were described.

The differences in sexual dimorphism of skin type are primarily derived from the differences in the intrinsic properties of the skin. Several clinical studies have demonstrated differences in skin parameters such as hydration, sebum production, skin color, hair follicle density, and facial topography between sexes[20-22]. Generally, male skin appears to be thicker with a higher amount of collagen and a lower amount of subcutaneous fat than female skin[22,23].

In addition to biophysiological differences, it is necessary to consider the effect of geographic, and sociocultural predilections. As shown in this study, the difference in behavior in terms of sun-protection, smoking, and drinking were remarkable between sexes. Additionally, inequalities in the prevalence of skin disease, differences in self-reported skin complaints, intensity of self-awareness, and illness behavior between the sexes have been previously reported[23-25]. Therefore, it could be presumed that the difference in lifestyle factors may enhance the difference of inherent characteristics, making the gap between sexes more prominent.

Lastly, the relationship between skin type and lifestyle factors could be described from a macroscopic point of view. In this study, behaviors belonging to the same sun-protective behavior category showed different relationships with the Baumann parameters. For example, the wrinkled type was higher in the group who did not use sunscreen compared to the group who did, while this type was lower in the group wearing no hat or cap compared to the group that did. Furthermore, outdoor workers were associated with having more sensitive, pigmented, and wrinkled types than indoor workers. An outdoor worker was known to be associated not only with high cumulative sun exposure but also a low acknowledgement of photocarcinogenic potential[26]. Consequently, the results of this study should be interpreted in terms of a mixture of multiple behavioral factors, including compensation behavior (people using sunscreen are more likely to be exposed to the outdoors) and uncertainty of temporal relationship (people with a vulnerable nature to pigmented or wrinkled skin are more likely to seek sun-protective behavior)[27].

There were few structural and analytical limitations in this study. Since the data were derived from a participant's subjective description and recall of a specific point in time, there is a possibility of recall bias. Since these conditions were not diagnosed by a doctor, there was also a possibility that the objectivity of identification for skin condition could be reduced. For example, the respondents might be misclassified to pigmented type by judging non-pigmented skin lesions, including seborrheic keratosis or non-melanoma skin cancer, as true pigmentary conditions[4].

Another drawback was the representativeness of collected cases. Although we analyzed the data by region, it should be considered that there was both a high rate of migration between regions and a difference between the working and residential areas. There was also a limitation that the distribution of skin type could be influenced and biased depending on the characteristics of collected subjects. However, given that the proportions of each demographic variable including smoking, drinking, and comorbidities in this study were similar to the national data reported by Statistics Korea, validation of this survey-based study can be established.

In conclusion, we report differences in BST according to age and region in the Korean male population. By comparing the differences in skin type between sexes, we provide insights into the perception of illness and the underlying pathophysiology of skin conditions. The role of dermatologist will become much more important for the interpretation and application of this data. The development of customized diagnosis and treatment should be pursued based on a systemic and practical skin type classification.

SUPPLEMENTARY MATERIALS

Supplementary data can be found via http://anndermatol.org/src/sm/ad-31-621-s001.pdf.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

ORCID

Young Bin Lee, https://orcid.org/0000-0001-5548-627X
Sung Ku Ahn, https://orcid.org/0000-0003-0978-9426
Gun Young Ahn, https://orcid.org/0000-0002-3661-2151
Hana Bak, https://orcid.org/0000-0002-7901-8080
Seung Phil Hong, https://orcid.org/0000-0002-0684-498X
Eun Jung Go, https://orcid.org/0000-0003-4402-3231
Chang Ook Park, https://orcid.org/0000-0003-3856-1201
Sang Eun Lee, https://orcid.org/0000-0003-4720-9955
Weon Ju Lee, https://orcid.org/0000-0001-5708-1305
Hyun-Chang Ko, https://orcid.org/0000-0002-3459-5474
Jee-Bum Lee, https://orcid.org/0000-0002-1477-4037
Hyung Joo Kim, https://orcid.org/0000-0002-1634-0136
Kun Park, https://orcid.org/0000-0001-9773-6118
Sang-Hoon Lee, https://orcid.org/0000-0002-7146-3702
Dong Hoon Song, https://orcid.org/0000-0002-6178-2312
Sun Young Choi, https://orcid.org/0000-0003-0248-7708
Yeol Oh Sung, https://orcid.org/0000-0003-2366-0987
Tae-Hyun Kim, https://orcid.org/0000-0003-0041-2980

Ja Woong Goo, https://orcid.org/0000-0003-2137-539X

REFERENCES

1. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. Arch Dermatol 1988;124:869-871.
2. Roberts WE. Skin type classification systems old and new. Dermatol Clin 2009;27:529-533, viii.
3. Baumann L. The skin type solution: a revolutionary guide to your best skin ever. New York: Bantam Books, 2006:4-26.
4. Baumann L. Understanding and treating various skin types: the Baumann Skin Type Indicator. Dermatol Clin 2008;26: 359-373, vi.
5. Ahn SK, Jun M, Bak H, Park BD, Hong SP, Lee SH, et al. Baumann skin type in the Korean female population. Ann Dermatol 2017;29:586-596.
6. Jia Y, Gan Y, He C, Chen Z, Zhou C. The mechanism of skin lipids influencing skin status. J Dermatol Sci 2018;89: 112-119.
7. Tončić RJ, Kezić S, Hadžavdić SL, Marinović B. Skin barrier and dry skin in the mature patient. Clin Dermatol 2018;36: 109-115.
8. Li Z, Hu L, Elias PM, Man MQ. Skin care products can aggravate epidermal function: studies in a murine model suggest a pathogenic role in sensitive skin. Contact Dermatitis 2018;78:151-158.
9. Berardesca E, Farage M, Maibach H. Sensitive skin: an overview. Int J Cosmet Sci 2013;35:2-8.
10. Kammeyer A, Luiten RM. Oxidation events and skin aging. Ageing Res Rev 2015;21:16-29.
11. Augustin M, Kirsten N, Körber A, Wilsmann-Theis D, Itschert G, Staubach-Renz P, et al. Prevalence, predictors and comorbidity of dry skin in the general population. J Eur Acad Dermatol Venereol 2019;33:147-150.
12. Cowdell F, Dyson J, Long J, Macleod U. Self-reported skin concerns: an epidemiological study of community-dwelling older people. Int J Older People Nurs 2018;13:e12195.
13. Caretti KL, Mehregan DR, Mehregan DA. A survey of self-reported skin disease in the elderly African-American population. Int J Dermatol 2015;54:1034-1038.
14. Misery L, Jourdan E, Huet F, Brenaut E, Cadars B, Virassamynaïk S, et al. Sensitive skin in France: a study on prevalence, relationship with age and skin type and impact on quality of life. J Eur Acad Dermatol Venereol 2018;32: 791-795.
15. Baumann L. Validation of a questionnaire to diagnose the Baumann skin type in all ethnicities and in various geographic locations. J Cosmet Dermatol Sci Appl 2016;6:34-40.
16. Hudjashov G, Villems R, Kivisild T. Global patterns of diversity and selection in human tyrosinase gene. PLoS One 2013;8:e74307.
17. Yin L, Coelho SG, Ebsen D, Smuda C, Mahns A, Miller SA, et al. Epidermal gene expression and ethnic pigmentation variations among individuals of Asian, European and African ancestry. Exp Dermatol 2014;23:731-735.
18. Hamer MA, Pardo LM, Jacobs LC, Ikram MA, Laven JS, Kayser M, et al. Lifestyle and physiological factors associated with facial wrinkling in men and women. J Invest Dermatol 2017;137:1692-1699.
19. Sadick NS. The pathophysiology of the male aging face and body. Dermatol Clin 2018;36:1-4.
20. Keaney TC. Aging in the male face: intrinsic and extrinsic factors. Dermatol Surg 2016;42:797-803.
21. Rahrovan S, Fanian F, Mehryan P, Humbert P, Firooz A. Male versus female skin: what dermatologists and cosmeticians should know. Int J Womens Dermatol 2018;4:122-130.
22. Kim BY, Choi JW, Park KC, Youn SW. Sebum, acne, skin elasticity, and gender difference - which is the major influencing factor for facial pores? Skin Res Technol 2013;19: e45-e53.
23. Draelos ZD. Cosmeceuticals for male skin. Dermatol Clin 2018;36:17-20.
24. Andersen LK, Davis MD. Sex differences in the incidence of skin and skin-related diseases in Olmsted County, Minnesota, United States, and a comparison with other rates published worldwide. Int J Dermatol 2016;55:939-955.
25. Miller IM, Zarchi K, Ellervik C, Jemec GB. Self-reported skin morbidity in Denmark: a population-based cross-sectional study. Eur J Dermatol 2016;26:281-286.
26. Grandahl K, Ibler KS, Laier GH, Mortensen OS. Skin cancer risk perception and sun protection behavior at work, at leisure, and on sun holidays: a survey for Danish outdoor and indoor workers. Environ Health Prev Med 2018;23:47.
27. Bleakley A, Lazovich D, B Jordan A, Glanz K. Compensation behaviors and skin cancer prevention. Am J Prev Med 2018;55:848-855.