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WRINKLES PROFILE IN VARIOUS AGE AND GENDER USING VISIA® IMAGING IN INDONESIA: A SINGLE-CENTER STUDY

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Abstract

Introduction: Skin is the most recognizable manifestation of tissue aging, particularly the face, which is sensitive to skin aging due to frequent and extensive exposure to sunlight. Visible signs of facial aging, such as wrinkles, are common concerns among all ages, significantly impacting cosmetic appearance and often leading to negative psychological, emotional, and social consequences. Understanding wrinkle variations across age and gender is crucial for effective dermatological treatment and development of more personalized skincare regimens. This study aimed to describe and analyze wrinkles profile using VISIA® imaging technology across different age groups and genders.
Methods: This analytic quantitative study with a cross-sectional design approach utilized medical records of registered patients at Dermalogia Clinic in Jakarta who underwent VISIA® imaging from 2024-2025. Wrinkles were assessed using VISIA® imaging system, which provides high-resolution, objective skin assessments through an automated quantified software, with depth and density metrics quantified using pixel-based algorithm. Wrinkle severity was quantitatively compared across age groups and genders.
Results: Among 420 patients, wrinkle significantly worsen progressively with age ($p<0.05$), especially under the eyes and at crow's feet. Men aged 30-50 showed more pronounced wrinkles, with the >50 age group having the highest severity. Males exhibited deeper wrinkles than females, likely due to biological, hormonal, and environmental differences.
Conclusion: Age and gender significantly influence facial wrinkle severity. VISIA® imaging provides a reliable objective assessment on skin aging, supporting personalized anti-aging treatments. Further studies are needed to explore lifestyle factors affecting wrinkle formation.

Keywords: *wrinkle, skin aging, VISIA®*

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INTRODUCTION

Ageing is an inevitable biological process that cannot be avoided, which involves several visible changes. Skin is the most recognizable manifestation of tissue aging, particularly in the facial region, which is uniquely vulnerable to skin aging due to its frequent and extensive exposure to environmental factors such as sunlight.(Lowry, 2020; Zargaran et al., 2022) As individuals age, the skin undergoes various physiological changes that manifest as skin aging influenced by a combination of intrinsic (genetic) and extrinsic (environmental) factors.(Shin et al., 2023) Facial aging is characterized by the appearance of wrinkles and folds, fine lines, facial redness, dyspigmentation, poor skin texture, an imbalanced distribution of soft tissue, and skin laxity.(Swift et al., 2021; Walker, 2022) Among these, visible signs of facial aging, such as wrinkles and fine lines, are common concerns among individuals of all ages, which can significantly impact an individual's cosmetic appearance to deleterious psychological, emotional, and social effects because facial aging alters self-perception and how individuals are seen by others, often serving as a source of self-consciousness and affecting interpersonal interactions. (Farage et al., 2015; Walker, 2022) Moreover, older appearing, wrinkled faces were judged as less attractive as well as they were perceived as showing more negative emotions.(Hess et al., 2023; Swift et al., 2021)

Understanding the variations in wrinkle formation across different age groups and genders is crucial for effective dermatological treatment. Research indicates that intrinsic factors such as genetics and hormonal changes, alongside extrinsic factors like sun exposure and lifestyle choices, contribute to the development of wrinkles. Wrinkles, often a result of decreased collagen and elastin production, are typically considered a hallmark of aging.(Swift et al., 2021; Walker, 2022) As the skin ages, it becomes more vulnerable to environmental factors, including sun exposure, which accelerates the process of photoaging.(Vierkötter & Krutmann, 2012; Wong & Chew, 2021) The role of gender and age in influencing facial skin characteristics, such as wrinkles, has been widely studied.(Wong & Chew, 2021) However, there is a lack of objective data regarding how these features vary across different age groups and genders, and often lack comprehensive demographic representation, particularly regarding ethnic diversity.(S. Chan et al., 2022; Vierkötter & Krutmann, 2012) This gap in research limits the ability to develop tailored skincare regimens that address the unique needs of diverse populations.

In Indonesia, a country characterized by its rich tapestry of ethnic backgrounds and varying cultural practices, there is a pressing need to investigate how these factors influence skin aging. Advanced skin imaging technologies such as VISIA® have revolutionized dermatological assessments, allowing for non-invasive, high-resolution analysis of detailed facial skin conditions—including wrinkles. VISIA utilizes UV, visible, and polarized light to capture detailed images of skin texture, pigmentation, and vascularity, providing precise measurements of facial wrinkles, textures, and many more. Researchers can gain valuable insights into the prevalence and severity of these concerns across different demographics. VISIA® imaging employs sophisticated algorithms to analyze skin characteristics objectively, offering a reliable method for quantifying facial aging.

This study aims to describe and analyze wrinkle profiles using VISIA® imaging technology across various age groups and genders. By focusing on a diverse population, this research seeks to provide a deeper understanding of how demographic factors (ages and gender) influence skin aging and facial skin appearance. Ultimately, findings from this study are crucial to contribute to the development of effective anti-aging treatment protocol tailored to meet the specific needs of individuals based on their age and gender, and more personalized skincare regimens. Through this exploration, we hope to pave the way for improved patient outcomes in dermatology by fostering a more inclusive approach to skincare research and treatment.(McKnight et al., 2022; Shin et al., 2023)

METHODS

This study employed a cross-sectional, analytic quantitative design conducted at Dermalogia Clinic, Jakarta, from January 2024 to March 2025. Data were collected using medical records of patients who underwent VISIA®

imaging during the study period. Exposures, including age, gender, and ethnicity, as well as the outcome variable, wrinkle severity, were measured simultaneously.

Inclusion criteria were as follow: individuals aged 15 years or older who had completed VISIA® imaging between January 2024 and March 2025, along with complete demographic and imaging data. Participants were excluded if they had active skin infections or inflammatory skin conditions, or if they had undergone any cosmetic procedures within the previous six months.

Data Collection

(1) VISIA® Imaging

Participants were instructed to cleanse their face and avoid wearing makeup for at least 24 hours prior to imaging. Facial images were captured using the VISIA® system under three standardized lighting conditions: visible light to assess surface features such as wrinkles, cross-polarized light to evaluate sub-surface features including pigmentation and vascular characteristics, and UV light to detect UV-induced damage such as porphyrins and sun spots. Standardized photographs were taken from three angles: front, left, and right profiles.

(2) Wrinkle Analysis

Automated, quantified software was used to analyze the VISIA® images. Depth and density of wrinkles were measured using pixel-based algorithms, and results were expressed as percentile scores by comparing each subject's data to age- and gender-matched reference databases. The analysis focused on key facial regions commonly affected by wrinkles, including the periorbital area (crow's feet), the sides of the face, and the forehead and glabellar regions.

Outcome

Outcome in this study was wrinkle severity, quantified using VISIA® percentile scores. Independent variables included age group (categorized into 15–30 years, 30–50 years, and over 50 years), gender (male and female), and ethnicity. Ethnicity was classified into five categories: Native-Indonesian, Chinese-Indonesian, Papuan, Arab-Indonesian, and Caucasian-Indonesian.

Statistical Analysis

Normality of the data (n = 420) was assessed using the Kolmogorov-Smirnov test with Lilliefors correction. As the data were found to be non-normally distributed, descriptive statistics were presented using median values along with minimum and maximum ranges for wrinkle severity scores.

Inferential statistical analysis included the Kruskal-Wallis H test to compare wrinkle severity across different age groups, and the Mann-Whitney U test for pairwise comparisons between age groups and gender. Spearman's rank correlation was used to evaluate the relationship between age or gender and wrinkle severity. All analyses were conducted using SPSS version 28.0.

Ethical Considerations

The study protocol was approved by the clinic's institutional review board. A waiver of informed consent was granted due to the use of anonymized, retrospective data. All data were stored securely, with personal identifiers removed to ensure participant confidentiality and privacy.

RESULTS

Table 1. Actual Age, Wrinkles, and True VISIA® Age Descriptive Statistics using VISIA®

Statistics	Actual Age	Wrinkle Percentile Scores Based on Location in VISIA®			True VISIA® Age (years)	
	(years)	Left Face	Right Face	Front Face	Right Face	Left Face
Median	33	37	43	44	31	31
Range	60	90	90	90	59	61
Minimum	11	9	9	9	12	10
Maximum	71	99	99	99	71	71
Total Samples	**420**	**420**	**420**	**420**	**420**	**420**

These scores are percentiles — **lower scores means higher wrinkles** compared to age-matched peers in the VISIA® database.

The study included a broad age range of participants, from 11 to 71 years old, representing a wide population spectrum from adolescents to the elderly. Wrinkle assessments were based on specific facial regions: the left and right face (targeting the under-eye area and crow's feet), and the front face (covering the forehead and glabella).

Based on VISIA® percentile scores, most participants had scores above 30, indicating a generally better-than-average wrinkle condition when compared to age-matched peers in the database. However, more wrinkles were observed in the under-eye and crow's feet regions (lower percentile scores) than in the forehead and glabella areas. This pattern may be attributed to habitual facial movements or greater exposure to sunlight in those regions.

Table 2. Age Group and Gender Frequencies

Statistics	Age Group (years)				Gender		
	15-30	30-50	> 50	Total	Female	Male	Total
Frequency	173	221	26	420	372	48	420
Percentage	41.2	52.6	6.2	100	88.6	11.4	100

The study population consisted of 420 participants, with the majority falling within the 30–50 year age group (52.6%), followed by the 15–30 year group (41.2%), and a smaller proportion aged over 50 years (6.2%). This distribution indicates that most participants were middle-aged adults—a demographic where wrinkles typically become more noticeable.

In terms of gender, the sample showed a strong predominance of female participants (88.6%), with males comprising only 11.4% of the total. This likely reflects greater female interest in skincare and aesthetic assessments. However, the small male sample size restricts the robustness of gender-based comparisons.

Table 3. Wrinkles with Age Correlation Using VISIA®

		Wrinkle Left Face	Wrinkle Right Face	Wrinkle Front Face
Age (Spearman's rho)	Correlation coefficient	-0.166**	-0.225**	0.022
	Sig. (2-tailed)	0.001	0.000	0.323
	N	420	420	420

**Correlation is significant at the 0.01 level (2 -tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Results of study examining correlation between age and wrinkle percentile scores using VISIA reveal distinct patterns across different areas of the face. Specifically, there was a weak but statistically significant negative correlation between age and wrinkle percentiles on the left side of the face (Spearman's rho = -0.166, $p < 0.001$), and a stronger negative correlation on the right side of the face (Spearman's rho = -0.225, $p < 0.001$). This indicates that wrinkle severity tends to increase with age, as lower percentile scores represent more wrinkles. Notably, the stronger effect on the right side of the face may suggest the presence of asymmetrical aging patterns. In contrast, no significant correlation was found between age and wrinkles on the front of the face (Spearman's rho = 0.022, $p = 0.323$). This lack of association suggests that wrinkle development in this area may be influenced more by factors such as expression lines, sun exposure, or skin hydration rather than by age itself.

Table 4. Wrinkles with Gender Correlation Using VISIA®

		Wrinkle Left Face	Wrinkle Right Face	Wrinkle Front Face
Gender (Spearman's rho)	Correlation coefficient	-0.121*	-0.80	-0.289**
	Sig. (2-tailed)	0.007	0.099	0.000
	N	420	420	420

**Correlation is significant at the 0.01 level (2 -tailed).
*Correlation is significant at the 0.05 level (2-tailed).

This study also explored the relationship between gender and wrinkle percentile scores using VISIA, revealing notable patterns across different facial areas. A weak but statistically significant negative correlation was found between gender and wrinkle scores on the left side of the face (Spearman's rho = -0.121, p = 0.007), indicating that men tend to exhibit worse wrinkle severity than women in this area. A weaker negative correlation was observed on the right side of the face (Spearman's rho = -0.080, p = 0.099), which only barely reached statistical significance, suggesting this result may be less reliable and potentially influenced by other factors such as sun exposure or lifestyle. The most pronounced association emerged in the front face region, where a moderate and highly significant negative correlation was identified (Spearman's rho = -0.289, p < 0.001). Overall, these findings suggest that gender plays a significant role in wrinkle severity, particularly in the front and left facial areas, with men generally showing greater wrinkle severity than women, while the right side of the face displays only a marginal gender effect.

Table 5. Differences in Wrinkle Percentile Score Profiles by Age Group Using VISIA®

Wrinkle Location in VISIA®	Age Group	N	Median Wrinkle Percentiles Severity Score (min-max)	Significance (p-value)	Post-hoc
Left Face	15-30 years old	173	39 (9-98)	**0.034***	30-50: p = 0.192
	30-50 years old	221	38 (9-99)		> 50: p = 0.053
	> 50 years old	26	29.5 (9-86)		**15-30: p = 0.012****
	Total	**420**			
Right Face	15-30 years old	173	52 (9-99)	**0.000***	**30-50: p = 0.005****
	30-50 years old	221	39 (9-99)		**> 50: p = 0.027****
	> 50 years old	26	19.5 (9-76)		**15-30: p = 0.000****
	Total	**420**			
Front Face	15-30 years old	173	40 (9-99)	0.158	
	30-50 years old	221	49 (9-99)		
	> 50 years old	26	34.5 (9-99)		
	Total	**420**			

N: total samples. *Kruskal-Wallis test. **Mann-Whitney test. Differences is significant at the 0.05 level.

The analysis of wrinkle percentile score profiles by age group revealed that wrinkle severity tends to worsen progressively with age, though not uniformly across all facial areas. The right side of the face showed the clearest age-related pattern, with a significant decline in wrinkle percentile scores from the 15–30 year group (median = 52) to those aged 30–50 (median = 39), and a further drop in individuals over 50 years old (median = 19.5). These differences were statistically significant ($p < 0.001$), with post-hoc tests confirming significant differences between all age groups.

The left side of the face also exhibited an age-related decline in wrinkle scores, though less pronounced. Median scores decreased from 39 in the 15–30 year group to 29.5 in those over 50 years, with a significant overall effect ($p = 0.034$) and post-hoc differences mainly between the youngest and oldest groups.

In contrast, the front of the face did not show a statistically significant difference in wrinkle scores across age groups ($p = 0.158$), suggesting no clear age-related pattern. This implies that wrinkle formation in this area might be more influenced by factors such as genetics, skin hydration, sun exposure, or habitual facial expressions, rather than age alone.

Overall, the findings indicate that wrinkles worsen with age, particularly after 50, and most markedly on the right side of the face. The best wrinkle percentile scores were consistently observed in the 15–30 year age group across all facial areas.

Table 6. Differences in Wrinkle Profiles by Gender Using VISIA®

Wrinkle Location in VISIA®	Gender	N	Median Wrinkle Percentiles Severity Score (min-max)	Significance (p-value)
Left Face	**Female**	372	39 (9-99)	
	Male	48	21.5 (9-93)	**0.013***
	Total	**420**		
Right Face	**Female**	372	44.5 (9-99)	
	Male	48	36.5 (9-93)	0.099
	Total	**420**		
Front Face	**Female**	372	49.5 (9-99)	
	Male	48	18 (9-79)	**0.000***
	Total	**420**		

N: total samples. *Mann-Whitney test. Differences is significant at the 0.05 level

The analysis of wrinkle profiles by gender revealed significant differences in wrinkle severity scores between men and women, particularly on specific areas of the face. Women were found to have significantly fewer wrinkles (indicated by higher percentile scores) than men on the left side of the face, with this difference reaching statistical significance ($p = 0.013$).

On the right side of the face, no strong evidence of a gender difference was observed ($p = 0.099$), suggesting that wrinkle severity in this region may be similarly influenced for both men and women, or potentially affected by other factors such as sun exposure or lifestyle.

The front of the face showed the most pronounced gender-based difference, where women had considerably fewer wrinkles than men, as evidenced by a highly significant result ($p < 0.001$). This finding highlights the front facial region as the area where gender differences in wrinkle severity are most apparent, possibly due to differing skincare habits, hormonal influences, or genetic factors between men and women. Overall, these results indicate that women tend to experience lower wrinkle severity than men, with the largest disparities seen on the front of the face.

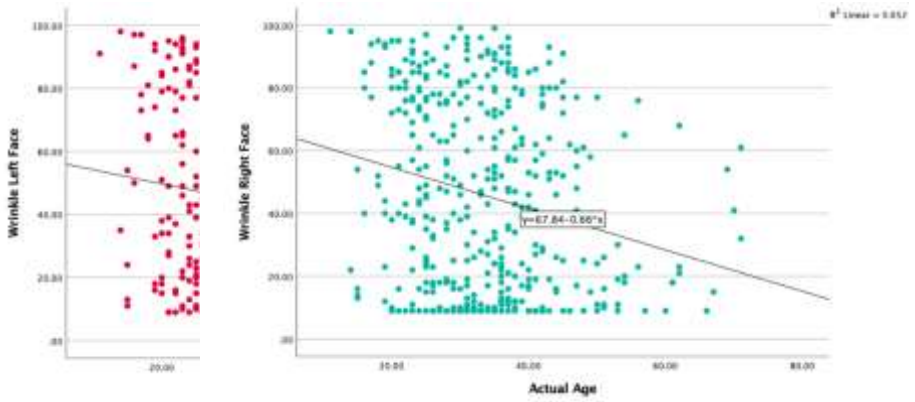

Figure 1. Both images show that the younger the age, the higher the percentile of wrinkles on the right and left face with VISIA®. A higher number indicates better wrinkle severity than the same age and skin type group in VISIA® imaging.

Table 7. Ethnicity Frequencies

Ethnicity	Frequency	Percentage
(1) Native-Indonesian	261	62.1
(2) Chinese-Indonesian	140	33.3
(3) Papuan	5	1.2
(4) Arab-Indonesian	8	1.9
(5) Caucasian-Indonesian	6	1.4
Total	**420**	**100.0**

The table presents the distribution of ethnicities within the study sample, revealing that the majority of participants were Native-Indonesian (62.1%) and Chinese-Indonesian (33.3%), while the remaining ethnic groups — Papuan, Arab-Indonesian, and Caucasian-Indonesian — accounted for very small proportions of the total sample. Due to these small subgroup sizes, particularly in the Papuan, Arab-Indonesian, and Caucasian-Indonesian groups, no formal statistical tests such as correlations or group comparisons were conducted for ethnicity-related differences. Instead, a descriptive analysis using median scores was applied to explore trends in wrinkle and redness percentiles across these ethnic groups. It is important to note that these findings are exploratory in nature and not intended for statistical inference. The authors emphasize that these observations are preliminary and primarily intended to guide future research, which should aim to include larger, more balanced subgroup samples to allow for reliable and meaningful statistical comparisons across ethnic groups.

Table 8. VISIA® Trends across Different Ethnicity

Ethnicity	N	Median Scores (min-max)		
		Wrinkle Percentiles in VISIA®		
		Left Face	Right Face	Front Face
(1) Native-Indonesian	261	33 (9-96)	42 (9-99)	40 (9-99)

(2) Chinese-Indonesian	140	44.5 (9-99)	44.5 (9-96)	55.5 (9-99)
(3) Papuan	5	19 (9-79)	23 (9-72)	67 (19-99)
(4) Arab-Indonesian	8	60 (19-95)	57 (18-95)	58.5 (9-80)
(5) Caucasian-Indonesian	6	78 (26-98)	78 (60-98)	46 (9-81)

N: Frequency

The table illustrates trends in wrinkle percentiles across different ethnic groups based on VISIA® analysis. In this study, lower percentile scores indicate higher levels of wrinkles compared to age-matched peers in the VISIA® database. Among groups, Caucasian-Indonesians exhibited the highest wrinkle percentiles, suggesting they had fewest wrinkles. Conversely, Papuan participants displayed lowest wrinkle percentiles, indicating highest wrinkle severity; however, this finding is limited by their very small sample size. Native-Indonesians showed moderate wrinkle levels. Chinese-Indonesians demonstrated slightly fewer wrinkles compared to Native-Indonesians Arab-Indonesians exhibited relatively fewer wrinkles. These trends provide insight into how wrinkle profiles may differ by ethnicity in this sample, though findings, especially in smaller subgroups, should be interpreted cautiously.

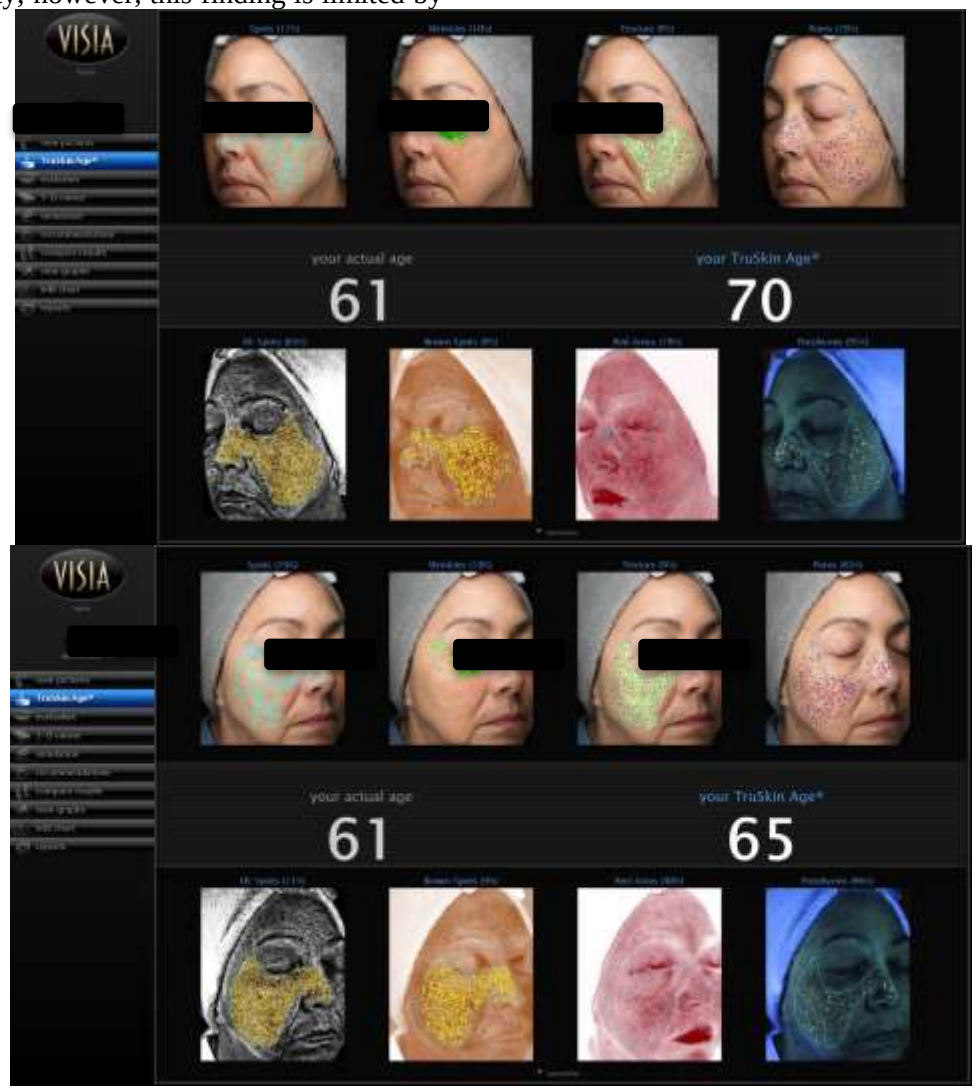

Figure 2. Example of VISIA® imaging and its parameters.

DISCUSSION

In this research, the VISIA® reflected a generally youthful skin profile among participants, indicating a better-than-average overall wrinkle condition.(Henseler, 2022, 2023; Wang et al., 2018) It is suggested that Indonesian participants may experience delayed visible aging, with several contributing factors potentially playing a role. Genetically, higher melanin content in Indonesian skin provides natural protection against UV damage, which is a primary cause of premature wrinkles.(Brenner & Hearing, 2008; Solano, 2020) Additionally, ethnic differences in collagen and elastin structure may offer greater genetic resilience against aging signs.(T.-F. Chan et al., 2008; Fantasia et al., 2013) Beyond genetics, strong sun protection and skincare habits, shaped by Indonesia's climate and prevailing beauty standards, contribute to healthier skin.(Alvina et al., 2025; Winaya et al., 2024) Furthermore, environmental, lifestyle, and cultural influences, such as the widespread use of the hijab, offer added protection from sun exposure and pollution. Cultural beauty ideals that prioritize even-toned, bright skin also encourage early adoption of skincare practices, collectively contributing to delayed visible aging among Indonesian individuals.(Winaya et al., 2024)

In this study, it was observed that the under-eye area and crow's feet exhibited more wrinkles than the forehead or glabella region. Several factors may explain this pattern. Anatomically, the skin around the eyes is thinner and has fewer oil glands, making it more susceptible to dryness and wrinkling. Additionally, repetitive muscle movements contribute significantly; frequent blinking and facial expressions such as smiling and squinting repeatedly pull at the delicate eye area, creating dynamic wrinkles that eventually become permanent.(Coban et al., 2025) Environmental exposure patterns also play a role, with Indonesia's high UV exposure and bright sunlight prompting squinting and affecting the eye region most.(Alvina et al., 2025; Solano, 2020) Combined with exposure to sunlight and pollution, these factors accelerate skin aging around the eyes. Moreover, the number of wrinkles tends to correlate with lifetime sun exposure.

These findings align with global patterns observed in skin aging studies. The study also found that one side of the face tends to show more wrinkles than the other.(Verhoeven et al., 2024) This could be attributed to environmental and anatomical asymmetry, where uneven exposure to pollution, smoking, fans, air conditioning, and natural anatomical differences might cause one side of the face to age faster. Additionally, the natural aging process is not perfectly symmetrical, meaning minor differences between the two sides of the face can become more noticeable with time.(Linden et al., 2018).

Men were found to have more severe wrinkles than women, particularly on the forehead. This difference is likely influenced by several factors. Biologically, men's skin tends to be thicker, less hydrated, and their forehead muscles are more active, which results in deeper creasing over time.(Gerasymchuk et al., 2023) Additionally, men typically experience more sun and outdoor exposure, which increases their risk of developing wrinkles. In contrast, women benefit from the protective effects of estrogen, which helps to guard against wrinkle formation — although this protection diminishes after menopause. (Ingold et al., 2024)

CONCLUSION

Age and gender significantly influence facial wrinkle severity. VISIA® imaging provides a reliable objective assessment on skin aging, supporting personalized anti-aging treatments. Further studies are needed to explore lifestyle factors affecting wrinkle formation.

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