

# Correlation between Duration of Sun Exposure and Scalp Seborrheic Dermatitis Severity Score in the Dermatovenereology Clinic, Dr. Cipto Mangunkusumo General Hospital

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**Abstract:** Seborrheic dermatitis is a chronic inflammatory skin condition characterized by scaling and pruritus in seborrheic areas. One of the influencing factors of seborrheic dermatitis severity is sun exposure. However, the role of sun exposure in the pathogenesis of seborrheic dermatitis is still controversial. Several studies showed sunlight can assist the improvement of seborrheic dermatitis, while other studies found sunlight can provoke exacerbation of symptoms. This study aims to investigate the correlation between duration of sun exposure and scalp seborrheic dermatitis severity score. We included 87 subjects with seborrheic dermatitis in the dermatology and venereology outpatient clinic, dr Cipto Mangunkusumo General Hospital, Jakarta, Indonesia. The severity score of seborrheic dermatitis on the scalp was measured using the modified Seborrheic Dermatitis Area Severity Index (SDASI), and data on duration of sun exposure were obtained using questionnaires. The average of sun exposure duration is 120 minutes (0-660), and the average of SDASI score was 2.25 (0.25-21.00). Spearman correlation test revealed a significant ( $p=0.002$ ) yet weak ( $r=0.322$ ) negative correlation between the duration of sun exposure and scalp seborrheic dermatitis severity score.

## 1 INTRODUCTION

Seborrheic dermatitis is a chronic inflammatory skin condition characterized by scaling and pruritus in seborrheic areas, estimated to occur in 1-3% of the world population (Borda et al, 2015). In Indonesia, the prevalence of seborrheic dermatitis in the 12-20 years old population is 26.5% (Cheong et al, 2016). The mildest form of seborrheic dermatitis is commonly called dandruff (Borda et al, 2015). Dandruff is a chronic condition associated with pruritus and scaling of the scalp (Borda et al, 2015) (Mohamed et al, 2014). The prevalence of dandruff is estimated to be 50% worldwide (Borda et al, 2015). Despite its non-life threatening nature, dandruff and seborrheic dermatitis can negatively affect quality of life. Currently, the etiopathogenesis of seborrheic dermatitis is unclear. Three main factors are known to be associated with the disease, which are sebaceous glands secretions, *Malassezia* colonization, and individual susceptibilities such as skin condition, immune responses, neurogenic factors, nutritional

factors, genetic factors, and the presence of other medical conditions (Borda et al, 2015) (Collins et al, 2012).

In addition to the three factors, weather and climate are also known to affect seborrheic dermatitis. In countries with temperate climate and four seasons, seborrheic dermatitis generally worsens in the winter and autumn, and improves in the summer (Mohamed et al, 2014). These changes are believed to be caused by low sun exposure, which is a risk factor of seborrheic dermatitis (Goldberg et al, 2013). On the contrary, several studies reported sun exposure as a non-microbial factor which causes dandruff and exacerbation of seborrheic dermatitis (Cheong et al, 2016) (Mohamed et al, 2014). Ultraviolet radiation is thought to cause hyperplasia of sebaceous glands and changes in the skin surface's lipid composition, leading to disturbances in skin's defenses (Akitomo et al, 2017). Thus, the role of sunlight in the pathogenesis of seborrheic dermatitis is controversial. This study aims to investigate the correlation between duration of sun exposure and

scalp seborrheic dermatitis severity score in dr Cipto Mangunkusumo General Hospital's dermatology and venereology outpatient clinic. The results of this study are hoped to add to the evidence regarding factors associated with seborrheic dermatitis, and can be considered in preventing or treating the disease.

## 2 METHODS

This study is a cross-sectional study conducted in the dermatology and venereology outpatient clinic in dr Cipto Mangunkusumo General Hospital, Jakarta, Indonesia, from April to July 2017. Through consecutive sampling, 87 subjects were recruited according to the inclusion and exclusion criteria. We investigated two variables, which are the duration of sun exposure and the severity score of scalp seborrheic dermatitis. Duration of sun exposure was defined as the average duration of sun exposure experienced by the subjects on a daily basis; the data was obtained from the patient profile and characteristics questionnaire in the clinic. The severity score of scalp seborrheic dermatitis is a measurement of scalp seborrheic dermatitis through clinical observation by a dermatovenereologist, using a modified seborrheic dermatitis area severity index (SDASI). The measurement was performed by dividing the scalp area into four quadrants. Erythema, scaling, and papules were measured, and scored with 0 (absent), 1 (mild), 2 (moderate), and 3 (severe). The size of lesions in each quadrant was scored 1-4 (1: 1-25%, 2: 26-50%, 3: 51-75%, 4: 76-100%). The score of each quadrant was added and divided by 4 to obtain the final severity score of scalp seborrheic dermatitis. The final score was classified as mild (1-9), moderate (10-26), and severe ( $\geq 27$ ). The data collected were analyzed using SPSS 20.0 with univariate and bivariate analysis to investigate inter-variable correlation. The collected data had abnormal distribution, and the Spearman correlation was used.

## 3 RESULTS

The median age of the subjects was 29.25 years old. The majority of the subjects were female (61.4%), work as office workers (48.2%), and had mild seborrheic dermatitis (89.7%). Univariate analysis showed both variables had abnormal distribution on the Kolmogorov-Smirnov test. The median sun exposure duration was 120 minutes with a minimum value of 0 minutes and a maximum value of 660

minutes. For the seborrheic dermatitis severity score variable, the median was 2.25 with a minimum of 0.35 and a maximum of 21. Bivariate analysis using the Spearman test revealed  $p=0.002$  and  $r=-0.322$ , which showed a weak negative correlation between the two variables.

## 4 DISCUSSION

Our study found the median of sun exposure duration in the subjects was 120 minutes. This finding is in line with a study conducted by W&S Market in Southeast Asian countries, which found Indonesians spend an average of 1-2 hours outdoors, exposed to direct sunlight. Vietnamese people spend 1-2 hours outdoors as well, while Thai people only spend 30 minutes to an hour (W&S Market Research, 2016). Sunlight contains ultraviolet rays, which can have both positive and negative effects on human health. A study by Setiati reported the intensity of ultraviolet rays in Jakarta and Bekasi, Indonesia, reach their peak at 11 a.m. to 2 p.m., and decrease until 4 p.m. (Setiati, 2016). Most of humans' ultraviolet exposure is from sunlight, which can vary depending on someone's outdoor activities such as sunbathing, recreational activities, or outdoor work. The majority of our study subjects were office workers who mostly spend their time indoors.

The median of sun exposure duration in our study is the same in both male and female subjects (120 minutes). According to Koster and Al-Ghamdi, sun exposure in males was generally higher compared to females (Koster et al, 2017). A study in Sweden reported duration of sun exposure may be affected by age, level of education, and skin type. Furthermore, a study by Haluza identified the factors that affect levels of sun exposure, which include age, social and professional factors, routine exercise, skin type, sunscreen use, sunburn occurrence, and motivation to tan the skin (Haluza et al 2016).

The seborrheic dermatitis severity score measured using modified SDASI can be classified as mild (1-9), moderate (10-26), and severe ( $\geq 27$ ). From the collected data, we found the average seborrheic dermatitis severity score in this study was 2.25. Most of the subjects were categorized as mild (89.7%), 10.3% was categorized as moderate, and none of the subjects was categorized as severe. Based on sex, no significant difference was found between the average severity score in male subjects (2.25) and female subjects (2.375). Our findings are consistent with findings from a study by Olina, which reported no significant relationship between sex and seborrheic

dermatitis severity score measured with Seborrheic Area Severity Index (SASI) (Olina et al, 2015). In contrast, Park's study observed male sex, duration of disease of more than 7 years, and history of acne vulgaris as the influencing factors of scalp seborrheic dermatitis occurrence (Park et al, 2016).

Bivariate analysis showed a significant relationship between duration of sun exposure to seborrheic dermatitis severity score ( $p < 0.05$ ), with a correlation coefficient of  $-0.322$ , showing an inversely proportional relationship where longer duration of sun exposure is related to lower seborrheic dermatitis severity score. Nevertheless, a coefficient of  $0.322$  shows a weak correlation. The role of sunlight, including ultraviolet rays, in seborrheic dermatitis is still controversial. Currently, no other studies have investigated the direct relationship between duration of sun exposure and seborrheic dermatitis severity score. The factors associated with seborrheic dermatitis which have been extensively studied include *Malassezia*, sebaceous glands activity, and skin defenses.

The findings of this study are corroborated by previous studies on the effect of ultraviolet irradiation on *Malassezia* or *Pityrosporum ovale* fungi. Mayser and Pape's study showed UVA and UVB irradiation had significant inhibitive effects on *Malassezia* growth (Masyer et al, 1998). Their findings became the foundation of using UVB phototherapy as a treatment method for seborrheic dermatitis, especially for patients with large or recalcitrant lesions, although this modality has not been proven by randomized trials (Naldi, 2009). Moreover, Mayser and Pape's findings on sun exposure's effect on sebaceous glands, skin condition, skin temperature changes, and sweat production were not consistent with the results of other previous works. The effects of ultraviolet irradiation on sebaceous glands and sebum production have been extensively studied. Akimoto conducted a study on the sebocytes of guinea pigs, and found increased cell proliferation and sebum production after UVB irradiation (Setiati, 2006). On the contrary, Lee's study on human sebocytes found irradiation with UVB, UVA, and other components of sunlight did not cause significant increase nor decrease in sebum production (Lee et al, 2015). Although seborrheic dermatitis occurrence is strongly associated with sebaceous glands activity, excessive sebum production is not an independent etiological factor of seborrheic dermatitis (Collins et al, 2012) (Goldberg et al, 2013). In general, seborrheic dermatitis develops due to changes in lipid compositions on the skin surface, providing favorable conditions for the colonization of certain

microorganisms. Excessive sun exposure and ultraviolet irradiation are believed to disturb the skin's defenses, supporting the development of seborrheic dermatitis (Akitomo et al, 2003). Akimoto's study highlighted how ultraviolet rays can oxidize squalane, a form of lipid found on the skin surface, to squalane peroxidase which can irritate the skin and disturb its defenses (W&S Market Research, 2016).

A few limitations may influence the results of our study, such as the use of sun exposure duration as the sole indicator of sun exposure. According to Koster, in order to measure sun exposure, thorough observation of objective and subjective factors is needed. In addition to duration, observations of the time of exposure, ultraviolet ray intensity, exposed body parts, and sun protection habits should be made.<sup>9</sup> Furthermore, the subjects in our study mostly had mild seborrheic dermatitis, and none of the subjects had severe seborrheic dermatitis, thus the conclusion on the relationship between sunlight and seborrheic dermatitis based on the findings of this study should be interpreted with caution. Thus, an important component to include in future investigations is an equal distribution of different levels of seborrheic dermatitis severity. Our study did not include other factors aside from the duration of sun exposure as variables, which lead to the possibility of our results being affected by other confounding factors, due to seborrheic dermatitis' multifactorial nature. This limitation suggests an opportunity for future multivariate research to study the various factors that can influence the severity of scalp seborrheic dermatitis.

## 5 CONCLUSION

The evidence from the current study suggests a significant negative correlation, albeit weak, between the duration of sun exposure and scalp seborrheic dermatitis severity score. Our study was limited by the large amount of subjects (89.7%) with mild seborrheic dermatitis, thus further investigations including all levels of seborrheic dermatitis severity are needed.

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