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The Relationship Between Occupation and Incidence of Various Types of Melanocytic Nevi

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ABSTRAK

Melanocytic nevi (MN) are benign proliferations of melanocytes influenced by genetic and environmental factors, particularly ultraviolet (UV) radiation. Occupational exposure to sunlight may contribute to the development of different nevus types, but this relationship remains underexplored. This study aimed to examine the association between occupation and the incidence of various *melanocytic nevi* types. A descriptive observational study with a cross-sectional design was conducted among 20 participants in Semarang, Indonesia, from April to May 2025. Data were collected via validated questionnaires covering occupation (indoor/outdoor), protective measures (sunscreen, long-sleeved clothing), and nevus types (junctional, compound, intradermal). Statistical analysis was performed using SPSS. Results showed that 60% of participants had indoor occupations, while 40% worked outdoors. Among nevus types, 50% had compound nevi, 16% had junctional nevi, and 10% had intradermal nevi. A significant association was found between outdoor occupations and compound nevi ($p = 0.010$, RR = 3.50). No significant links were observed for junctional or intradermal nevi. Protective measures, such as sunscreen use, showed no significant impact, possibly due to low adherence (70% non-users). The findings suggest that occupational UV exposure may elevate the risk of compound nevi. Further research with larger samples and additional variables (e.g., sun exposure duration) is recommended to validate these results and to inform preventive strategies for at-risk populations.

Keywords: Nevus Melanositik, Pekerjaan, Jenis Nevus Melanositik

INTRODUCTION

Melanocytic nevi (MN) are defined as benign proliferations of melanocytes with well-defined borders on the skin. Unlike solitary melanocytes, which are typically dendritic in shape and located in the epidermis, melanocytes in MN appear round to oval or spindle-shaped. These proliferations are predominantly found in the basal epidermis or dermis, but can also extend deeper beyond the subcutis into muscle layers (deep penetrating nevi).(Frischhut et al., 2022)

Typically, melanocytic nevi have regular, smooth, and well-defined borders and are generally round or oval. They may vary in color from pale to dark brown or black and can occasionally be associated with long, coarse, pigmented hair, although this is less common in areas such as the hands. Atypical nevi differ from this regular appearance, as they may be asymmetrical in shape, have irregular borders, show color variation throughout the lesion, and typically exceed 6 mm in diameter.(Black et al., 2020a) Melanocytic nevi usually appear on the skin as small brown macules that may become elevated over time. Individuals can develop dozens to hundreds of nevi during their lifetime, usually beginning in childhood. The number of nevi increases during the first three decades of life and then gradually decreases with age. Both genetic and environmental factors influence the number and size of nevi.(Muradia et al., 2022; Yeh, 2020a)

According to Johr and Schachner, a total of 43 nevi in males and 27 in females at age 25 is considered normal among individuals prone to developing nevi. Melanocytic nevi may gradually regress and fade over time, with some reported to disappear by the age of 80.2 The prevalence of acquired melanocytic nevi varies by ethnicity—lower in individuals with darker skin and higher in those with lighter skin tones. There is no apparent gender-based predisposition. Environmental exposure to

ultraviolet (UV) radiation is a significant trigger in the development of MN, especially intermittent UV exposure during childhood, which is linked to increased nevus counts.(Yeh, 2020b)

Melanocytic nevi can include blue nevus, halo nevus, congenital naevomelanocytic nevus, dysplastic melanocytic nevus, and Spitz nevus. Acquired melanocytic nevi are the most common neoplasms. Histologically, based on the depth of nevus cells, acquired MN are classified into three subtypes: junctional nevus, compound nevus, and intradermal nevus. A junctional nevus contains nevus cells located at the dermo-epidermal junction, a compound nevus has cells in both the dermo-epidermal junction and dermis, and an intradermal nevus has cells located solely in the dermis. Routine removal of melanocytic nevi is not necessary unless the lesion shows clinical changes, atypical features resembling melanoma, cosmetic concerns, or undergoes repeated stimulation.(Liu et al., 2021a; Yeh, 2020b) This study aims to determine the relationship between occupation and the incidence of various types of melanocytic nevi.

The prevalence of acquired melanocytic nevi exhibits considerable variation across different populations and demographics. For instance, studies indicate lower prevalence rates in individuals with darker skin tones compared to those with lighter complexions. While some research suggests no significant gender-based predisposition, other findings, such as those by Hendrayanta et al., report a higher prevalence among males (57.35%). This observed difference in prevalence between genders is often attributed to increased occupational and general UV exposure in males. Age is another influential factor, with the number of nevi typically increasing during the first three decades of life, and a study by Hendrayanta et al. identifying the 10-19 age group as most affected (23.53%). Furthermore, the pattern of UV exposure is critical; intense intermittent sun exposure has been noted to potentially elevate melanoma risk more significantly than prolonged cumulative exposure. Protective measures, including the consistent use of sunscreen and long-sleeved clothing, are well-established strategies to reduce the incidence of melanocytic nevi by minimizing UV exposure. However, the distribution of specific nevus types can vary markedly between studies. The current investigation, for example, identified junctional nevi as the most common, followed by compound and then intradermal nevi. This contrasts with previous research, such as that by Hendrayanta et al., which reported intradermal nevi as most prevalent (77.6%), followed by junctional (15.3%) and compound (7.1%). Similarly, Tsaniyah et al. also found a predominance of intradermal nevi (58.5%). These discrepancies in nevus type prevalence across different studies underscore that nevus distribution is not globally uniform. This variation suggests that factors beyond general UV exposure, such as specific local environmental conditions, genetic predispositions within distinct ethnic groups, or socio-economic influences affecting occupational choices and protective behaviors, may play a substantial role. This highlights the importance of localized research to understand specific risk factors and develop tailored public health interventions, particularly when considering occupational exposures, as findings from one population may not be universally generalizable. The observation that males tend to exhibit a higher prevalence of nevi, potentially due to occupational exposure and greater UV exposure compared to females, provides a direct link between gender differences and occupational factors. This moves beyond a simple prevalence statistic to suggest a specific underlying cause, indicating that gender disparities in nevus development may be significantly influenced by socio-behavioral patterns related to work. This perspective elevates the importance of investigating occupational exposure, as it identifies a clear target for workplace-specific preventive strategies aimed at at-risk male populations.

Despite the established influence of UV radiation on the development of melanocytic nevi, a significant knowledge gap persists regarding the specific relationship between occupational exposure to sunlight and the incidence of various nevus types. Existing literature offers limited direct research that comprehensively explores the intricate interplay among occupation, gender, and protective behaviors concerning the differential prevalence of melanocytic nevus classifications. While these

factors have been broadly associated with benign and malignant melanocytic conditions, a granular understanding of their precise impact on specific nevus subtypes remains elusive. This absence of detailed research creates a critical void, impeding the formulation of precise and effective preventive strategies for occupational groups at risk.

The urgency of addressing this gap is further highlighted by a significant behavioral paradox: while protective measures like sunscreen and long-sleeved clothing are known to reduce nevus incidence, the majority of subjects in the current study reported not using these measures regularly. This behavioral gap underscores that mere awareness of UV risks is insufficient; there is a practical challenge in translating this knowledge into consistent protective behaviors. Therefore, research that precisely identifies specific occupational risks for particular nevus types is crucial. Such findings can inform the development of more persuasive and practical interventions, moving beyond generic sun safety advice to targeted strategies. This also points to a broader need for interdisciplinary approaches, encompassing public health campaigns, occupational safety regulations, and dermatological education, to effectively bridge the gap between scientific understanding and practical implementation, especially for at-risk occupational groups. Understanding how specific occupational exposures influence the development of distinct nevus types is paramount for public health, particularly given that melanocytic nevi are recognized risk factors for malignant melanoma, the most dangerous form of skin cancer. Consequently, identifying modifiable risk factors within occupational settings represents a pressing public health concern.

The novelty of the present research lies in its specific and focused examination of the association between occupation and the incidence of various melanocytic nevus types. While the general links between sun exposure and nevi are broadly understood, this study undertakes a granular investigation into how occupational settings influence the development of specific histological subtypes, namely junctional, compound, and intradermal nevi. This represents a significant and underexplored area of inquiry. By moving beyond broad associations, this study aims to provide a more precise understanding of risk factors within particular work environments, investigating the nuanced impact of occupational UV exposure on the differential prevalence of these nevus types. The core of this research's unique contribution is exemplified by its finding of a significant association between outdoor occupations and compound nevi ($p = 0.010$, $RR = 3.50$), while no significant links were observed for junctional or intradermal nevi. This level of specificity allows for a more targeted understanding of nevus pathogenesis and intervention strategies. It suggests that certain occupational exposures might preferentially stimulate the development or progression of specific nevus subtypes.

This precise identification of risk (e.g., outdoor work for compound nevi) enables the formulation of highly specific and potentially more efficient preventive strategies. Instead of generic sun protection advice, interventions can be tailored to particular occupations and potentially even to individuals predisposed to compound nevi, thereby enhancing the impact and resource-effectiveness of public health efforts. Therefore, this study specifically aimed to determine the relationship between occupation and the incidence of various types of melanocytic nevi.

METHOD

This study employed a descriptive observational research design with a cross-sectional approach. Observations and data collection were conducted only once during the completion of a questionnaire. The study was carried out in Semarang between April and May 2025. Inclusion criteria consisted of Semarang residents aged 21–50 years who were willing to participate and had held their current type of occupation for at least one year. Exclusion criteria included subjects who were absent during the scheduled interview, those with reading limitations, and individuals engaged in two different types of occupations. A purposive sampling method was used to select respondents who met both

inclusion and exclusion criteria. A total of 20 respondents were included in the study. Data were collected using a validated questionnaire. The collected data were first checked for completeness and eligibility, followed by systematic processing. Coding was applied to group the data into relevant categories. Subsequently, the data were tabulated and analyzed using SPSS software.

Occupation was defined as the categorization of a person's position based on the type of work performed, the skills required, or other work-related factors. In this study, occupations were classified as either outdoor or indoor. The types of melanocytic nevi were defined as skin lesions resulting from the proliferation of melanocytes in the skin tissue. In this study, the types of melanocytic nevi included: flat dark brown nevi (junctional nevi), raised dark brown nevi (compound nevi), and flat light brown nevi (intradermal nevi).

RESULT AND DISCUSSION

Table 1 presents the demographic characteristics of the participants. Table 2 illustrates the relationship between occupation, gender, and the use of protective measures with flat dark brown nevi (junctional nevi). Table 3 shows the relationship between occupation, gender, and protective measures with raised dark brown nevi (compound nevi). Table 4 displays the relationship between occupation, gender, and protective measures with flat light brown nevi (intradermal nevi).

Table 1. Demographic Characteristics of Study Subjects

Variable	Frequency	%
Sex		
Female	8	40,0
Male	12	60,0
Age		
21 – 30	13	65,0
31 – 40	3	15,0
41 – 50	4	20,0
Type of Occupation		
Outdoor	8	40,0
Indoor	12	60,0
Long-sleeved clothing		
Yes	9	45,0
No	11	55,0
Use of Sunscreen		
Yes	6	30,0
No	14	70,0
Flat dark brown nevus (junctional nevus)		
Yes	16	80,0
No	4	20,0
Raised dark brown nevus (compound nevus)		
Yes	10	50,0
No	10	50,0
Raised light brown nevus (intradermal nevus)		
Yes	2	10,0
No	18	90,0

Table 2. Relationship Between Occupation, Sex, and Use of Protective Measures with Flat Dark Brown Nevus (Junctional Nevus)

Variable	Flat dark brown				p	RR (95% CI)
	Yes		No			
	n	%	n	%		
Types of occupation						
Outdoor	8	50	0	0	0,102	1,50 (1,01 – 2,24)
Indoor	8	50	4	100		
Sex						
Female	6	37,5	2	50	0,535	0,90 (0,07 – 5,45)
Male	10	62,5	2	50		
Long-sleeved clothing						
Yes	8	50	1	25	0,375	1,22 (0,80 – 1,88)
No	8	50	3	75		
Use of sunscreen						
Yes	9	37,5	0	0	0,207	1,40 (1,01 – 1,95)
No	10	62,5	4	100		

Note : * Significant (p < 0,05)

Table 3. Relationship Between Occupation, Sex, and Use of Protective Measures with Raised Dark Brown Nevus (Compound Nevus)

Variable	Raised dark brown				p	RR (95% CI)
	Yes		No			
	n	%	n	%		
Types of occupation						
Outdoor	7	70	1	10	0,010*	3,50 (1,27 – 9,65)
Indoor	3	30	9	90		
Sex						
Female	3	30	5	50	0,325	0,64 (0,23 – 1,77)
Male	7	70	5	50		
Long-sleeved Clothing						
Yes	5	50	4	40	0,500	1,22 (0,51 – 2,92)
No	5	50	6	60		
Use of sunscreen						
Yes	3	30	3	30	0,686	1,00 (0,38 – 2,60)
No	7	70	7	70		

Note : * Significant (p < 0,05)

Table 4. Relationship Between Occupation, Sex, and Use of Protective Measures with Raised Light Brown Nevus (Intradermal Nevus)

Variable	Raised light brown				p	RR (95% CI)
	Yes		No			
	n	%	n	%		
Types of occupation						
Outdoor	2	100	6	33,3	0,147	–
Indoor	0	0	12	66,7		
Sex						
Female	1	50	7	38,9	0,653	1,50 (0,11 – 20,68)
Male	1	50	11	61,1		
Long-sleeved clothing						
Yes	1	50	8	44,4	0,711	1,22 (0,09 – 16,92)
No	1	50	10	55,6		
Use of sunscreen						
Yes	1	50	5	27,8	0,521	2,33 (0,17 – 31,47)
No	1	50	13	72,2		

Note : * Significant ($p < 0,05$)

Discussion

Melanocytic nevi are benign tumors derived from the proliferation of melanocytes, the dendritic pigment-producing cells of the skin. Clinically, they most commonly manifest as pigmented skin lesions ranging from light brown macules to dark plaques. Histologically, melanocytic nevi are classified into three subtypes based on the depth of nevus cell nests: junctional, compound, and intradermal nevi.(Kang, S, 2019; Nagarathinam & Baalann, 2021; Sjambali et al., 2019) In this study, the types of melanocytic nevi were categorized clinically based on lesion characteristics—namely color (dark or light brown) and surface morphology (flat or raised)—to correspond with the histological types.

The prevalence of melanocytic nevi increases progressively with age and is influenced by sex, skin type, ethnicity, and sun exposure. Ultraviolet (UV) radiation, especially UVB, is known to cause skin damage. Following UVB exposure, melanocytes respond by increasing melanin production to protect the skin. Human exposure to UV radiation depends on several factors including behavior, duration of sun exposure, activities (work or leisure), and geographical location (urban, mountain, or coastal areas).(Liu et al., 2021b; Sun et al., 2020; Yeh, 2020b) In this study, more than half of the participants were engaged in indoor occupations.

Protective measures against UV exposure, such as using sunscreen and wearing long-sleeved clothing, are known to help reduce the incidence of melanocytic nevi. However, in this study, the majority of subjects reported not using long-sleeved clothing or sunscreen regularly.(Sun et al., 2020; Yeh, 2020b)

The most common type of melanocytic nevus found in this study was junctional nevi, followed by compound nevi, and lastly intradermal nevi. These findings differ from previous studies such as that by Hendrayanta et al., which found intradermal nevi to be the most prevalent (77.6%), followed by junctional (15.3%) and compound nevi (7.1%). Similarly, research by Tsaniyah et al. also reported a predominance of intradermal nevi (58.5%), followed by junctional (16.4%) and compound nevi (13.8%).(Tsaniyah et al., 2015)

There is still limited research directly exploring the relationship between occupation, gender, and protective behavior with different types of melanocytic nevi. However, these factors have been associated with both benign and malignant melanocytic conditions. A study at Dr. Hasan Sadikin General Hospital found that 43.5% of participants worked in outdoor settings, exposing them to more sunlight.(Sutedja et al., 2020) Notably, studies have shown that intense intermittent sun exposure may increase the risk of melanoma more than prolonged cumulative exposure. (Dessinioti et al., 2021)

Sunlight exposure may stimulate melanocyte migration and proliferation. As a result, junctional nevi may initially appear in sun-exposed areas, then migrate into the dermis over time, forming compound or intradermal nevi. Thus, compound and intradermal nevi are more frequently found in sun-exposed areas, while junctional nevi are more common in areas not exposed to sunlight.(Hendrayanta & Darmaputra, 2024) With regard to gender, similar findings have been reported in previous studies. Males tend to have a higher prevalence of nevi, possibly due to occupational exposure and increased UV exposure compared to females..(Dessinioti et al., 2021)

CONCLUSION

The study found a significant association between occupation type and the occurrence of compound *melanocytic nevi*, with outdoor occupations showing a higher risk, while no significant links were observed for junctional or intradermal nevi. It is suggested that future research investigate the influence of demographic factors such as age, educational background, personal habits, and duration of sun exposure on the development of different types of *melanocytic nevi* to better understand these relationships and inform targeted prevention strategies.

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