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Risk Factors for Occupational Diseases Due to Exposure to Ultraviolet Rays among Agricultural and Outdoor Workers

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Abstract:
As a country with a tropical climate with high humidity, relatively high air temperature, and hot solar radiation, it can disrupt the psychological and social conditions of field workers such as farmers. Farmers have a higher risk due to their work activities under the hot sun, which has a dangerous UV index. In addition, the lack of understanding of the factors and how to prevent farmers from being exposed to UV light has caused many cases of farmers getting diseases such as heatstroke, cataracts, and skin cancer due to exposure to UV rays. This study aims to know the risk factors for the dangers of UV light and the use of PPE for agricultural workers and workers in outdoor environments. This study used the literature review method. The search was based on three databases, Science Direct, PubMed, and Google Scholar, with the last five years of publication (2019-2023). Workers who do a lot of outdoor activities, such as farmers, have a higher risk of developing skin cancer due to the scorching sun with a harmful UV index. One of the risk factors for skin cancer in agricultural workers is exposure to ultraviolet radiation (UVR) and heat. Exposure to ultraviolet radiation (UVR) is also a risk factor for skin cancer, heatstroke, and cataracts in agricultural and outdoor workers. In addition, hazardous equipment can also be another risk factor for cancer in farm workers. Agricultural workers and workers outside the field must know how to maintain their health by using shade seeking, using PPE, and using sunscreen from the dangers of UV rays so that they do not experience skin cancer, heatstroke, and cataracts.

Keywords:
UV rays; skin cancer; heatstroke; cataracts

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INTRODUCTION

Indonesia is referred to as a country because it is located in a tropical area, and some of the livelihoods of its people are farmers who are active outdoors, so they are exposed to direct sunlight (Jabbar et al., 2019). Outdoor workers, most of whom work in the agricultural, construction, and fishing sectors, are at high risk of being affected by UV rays (Kurniyawan et al., 2023). Direct exposure to sunlight has an impact on several disease risks. This is because sunlight is a polychromatic beam consisting of various electromagnetic waves, one of which is UV light. UV light is a band of sunlight waves with a 100 - 400 nm wavelength. Ultraviolet rays in the 100 - 400 nm wave band are divided into three: UV A, UV B, and UV C. UV C rays will be stuck in the ozone layer when entering the atmosphere, and 90% of UV B will be absorbed by ozone. At the same time, most UV A will be able to reach the earth's surface (BMKG, 2023).

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The depletion of the ozone layer causes global warming, resulting in higher intensity of UVC radiation. This can harm living things. In humans, prolonged exposure to UV rays can cause several disease risks, such as skin cancer, eye damage, and decreased immunity (Jabbar et al., 2019). Exposure to direct sunlight causes hot environmental conditions. The work environment can be influenced by several factors, such as temperature, movement, type of activity, and personal aspects, which, if not appropriate, can result in work-related hazards or illnesses. The sun is a source of heat exposure in the work environment, and it can cause radiation to humans. Exposure to heat causes outdoor workers to experience fatigue, which reduces their ability to think due to the high temperatures in the working climate (Ginting et al., 2022).

Exposure to UV rays can pose several risks for diseases such as skin cancer, heatstroke, and cataracts. Farmers who work outdoors are at greater risk than indoor workers. Exposure to extreme UV rays can cause occupational diseases (Aulia et al., 2023). Heat Stroke is a condition of body heat due to hot weather because the body cannot control the body temperature it receives. The increase in body temperature reaches 41 ° C within 10 to 15 minutes, and the body can no longer sweat. A work environment exposed to the sun affects productivity and can cause health problems, including death (Ginting et al., 2022).

Farmers who work outdoors have a high risk of developing skin cancer. This is because solar radiation is carcinogenic to humans. Ultraviolet radiation can damage all skin types and is permanent and irreversible. An increase in the frequency of exposure to UV light increases the risk of developing skin cancer (Sumirate et al., 2022). Ultraviolet light causes photochemical reactions to form free radicals, which can affect the protein structure of the eye lens and cause the eye lens, which was initially clear to become cloudy. Exposure to UV rays is a causal link between occupational diseases and cataracts. The prevalence of cataracts in outdoor workers is 1.3 times greater than that of indoor workers. Outdoor workers, such as farm workers, are more likely to be exposed to sunlight, so they have a greater chance of developing cataracts (Sudrajat et al., 2021).

Cataracts are an eye disorder caused by a change in the lens, which was initially clear and translucent to become cloudy; this condition causes human vision to become blurred. This visual disturbance is caused slowly and, over time, can cause blindness (Sugiharto et al., 2022). Cataracts can occur due to several factors, such as age, gender, occupation, genetics, systemic diseases (such as diabetes), smoking, trauma, drugs, and exposure to UV light (Wati et al., 2022). Patients with cataracts can experience psychological and physiological impacts. The physiological impact is caused by discomfort in the eyesight, while the psychological impact on the patient is a feeling of anxiety due to eye surgery (Kurniyawan et al., 2023).

Agronursing is the implementation of nursing care and management of nursing services that focus on clients (individuals, families, groups, and communities) that are holistic (biological, psychological, social, spiritual, and cultural) and comprehensive (promotive, preventive, curative and rehabilitative) in agricultural scope (agriculture, plantations, fisheries, animal husbandry, and agro-industry) (Kurniyawan et al., 2023). Agronursing is comprehensive and holistic client-oriented nursing care and management in the agricultural sector. Agronursing is very suitable for implementation in Indonesia, an agricultural country because most of Indonesia's population works in the agricultural sector (Kurniawan et al., 2023). About 60% of Indonesia's population lives in rural areas, most of which work in agriculture. Many rural workers in Indonesia work in the agricultural sector and are at risk of experiencing health problems related to the interaction of farmers and the environment (Nur et al., 2023).

Volume 02 Number 02
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METHOD

This type of research uses a literature review. The literature search process in this literature review uses three databases, namely ScienceDirect, PubMed, and Google Scholar, with a publication year range of 2019 to 2023. The literature search was carried out using several keywords in Indonesian and English. Some of the keywords used are "UV Rays," " Skin Cancer," " Heatstroke," or "cataracts." The article search begins by identifying the keywords found, and approximately 8,876 articles that match the keywords are obtained. The next stage is screening by selecting the title of the article and the year of publication according to the research criteria. At this stage, 874 articles fit the research criteria.

Furthermore, articles were filtered according to the inclusion and exclusion research criteria. In this screening, 749 articles met the inclusion and exclusion research criteria. The next stage is to filter articles against abstracts to focus articles according to research criteria. From this stage, 20 articles fit the research criteria. The 20 articles were re-selected based on the language, research design, outcomes, and other predetermined criteria. Finally, ten articles were determined that matched the research criteria and could proceed to the analysis stage.

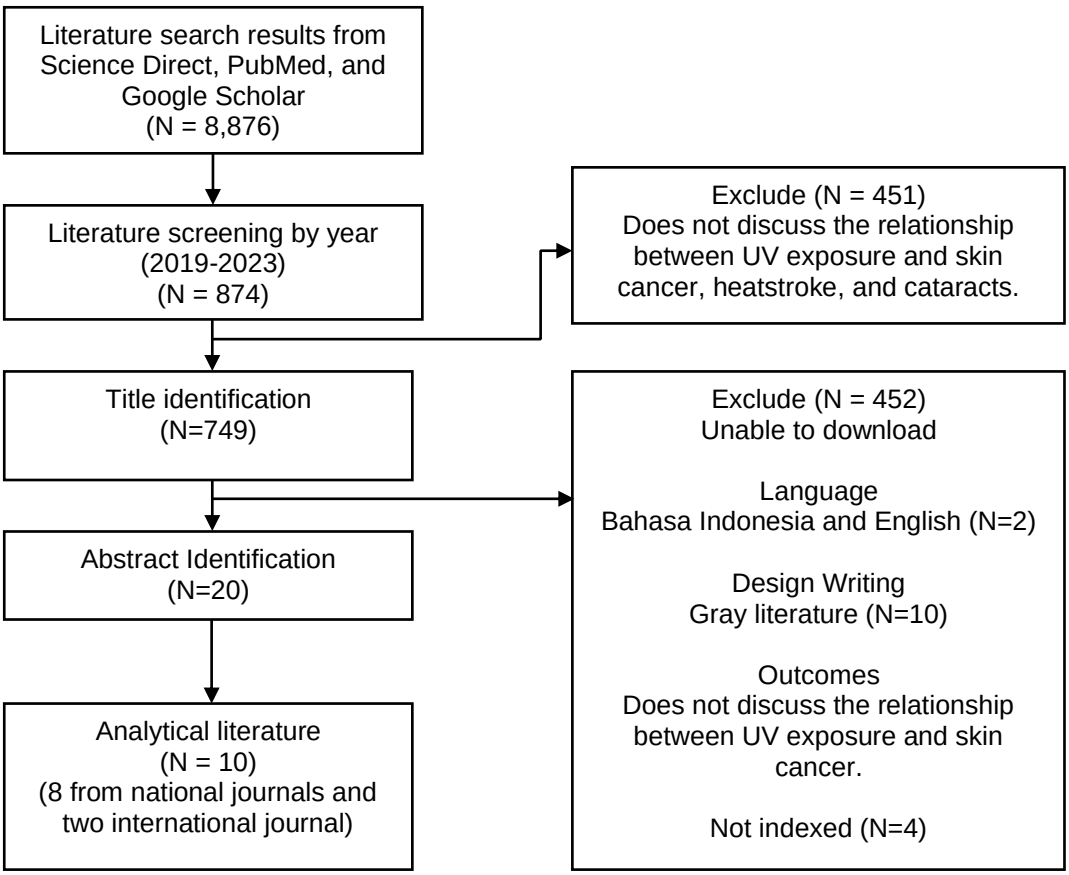

Figure 1. Flowchart of Literature Search Process

RESULT

Radiation with a harmful index is one of the factors causing occupational diseases (PAK) in outdoor workers. Some examples of diseases that can be caused by UV radiation include skin cancer, cataracts, and heatstroke. Workers who do a lot of outdoor activities, such as farmers, have a higher risk of developing skin cancer due to the sun's harmful UV index. In addition, the lack of a better understanding of occupational skin cancer, as well as ways to prevent it, also has an impact on increasing the risk of developing skin cancer among outdoor workers. The cause of skin cancer that is often found in farmers is UV exposure (Jabbar et al., 2019).

From the results of the journal analysis, it was concluded that one of the risk factors for skin cancer in agricultural workers is exposure to ultraviolet radiation (UVR) and heat. Exposure to ultraviolet radiation (UVR) is also a risk factor for skin cancer, heatstroke, and cataracts in agricultural and outdoor workers. Exposure to other carcinogens (for example, zoonotic pathogens, pesticides, endotoxins, solvents, metals, welding fumes, crystalline silica, and diesel exhaust fumes) and hazardous equipment can also be another risk factor for cancer in agricultural workers but still requires further research (Togawa et al., 2021).

The usual attitudes of agricultural and out-of-the-field workers in addressing exposure to ultraviolet radiation (UVR) and heat as risk factors for skin cancer are shade seeking, use of PPE, and use of sunscreen. The knowledge level of most out-of-field workers has sufficient value regarding the dangers of UV light, its prevention, and the use of PPE as a K3 facility. This level of knowledge influences out-of-field workers' attitudes toward using PPE (Winaya et al., 2022).

Table 1. Results of Literature Analysis

No	Author and Journal Identity	Journal Title	Population and Sample	Results Summary
1	Author : Wati. L et al. Identity Journal : Journal of Nursing Media Research Vol. 5 No. December 2, 2022: 89-97	Relationship of Sun Exposure, Smoking, and Alcohol with Cataracts in Coastal Fishermen	Population: 827 people sample: 20 people	The results of the study proved that smoking habits (p-value = 0.10) and consuming alcohol (p-value = 0.10) did not have a significant relationship with the incidence of cataracts. UV light exposure variable (p-value = 0.057) has the lowest significant relationship with the incidence of cataracts.
2	Author : Dewi, F.S Identity Journal : Indonesian Community Service Journal Vol. 2, No. 1, January 2023, p. 1-240	Education on Increasing Knowledge and Behavior of Fishermen's Occupational Safety Against Personal Protective Equipment	Sample: 60 fishermen	The study results prove that many fishermen still do not use Personal Protective Equipment (PPE); as many as 53% of fishermen and only 27% of fishermen have their health checked. The lack of OSH behavior among fishermen is due to the average level of education in elementary and junior high schools, so fishermen need to learn more about PPE.
3.	Author : Aulia R et al. Identity Journal : Journal of Medula, Volume 13, Number 3	The Impact of Heat Exposure in the Work Environment on Workers' Health	343 workers exposed to heat exposure	Based on the results of the study, it was shown that the impact of exposure to heat in the work environment was characterized by the most frequent symptoms, including excessive sweating (70.71%), reddish rashes or prickly heat (54.55%), and easy fatigue (52.02%).

No	Author and Journal Identity	Journal Title	Population and Sample	Results Summary
4.	Author : Jabbar, JM et al. Identity Journal : Journal of Health Research STIKes Dharma Husada Bandung	Farmer's Knowledge Level About UV Rays on Eye Health	390 farmers in East Cikaum Village Subang regency	It can be seen that the level of knowledge of UV light sources from the five questions asked to respondents resulted in a total score of 302, so the level of respondents' knowledge about UV light sources was included in the good category. For the level of knowledge of the dangers of UV rays, the five questions asked to respondents resulted in a total score of 192, so the level of knowledge of respondents about the dangers of UV rays was included in the poor category with a score of (49.2). %). For the level of farmers' knowledge about eye protection from UV rays, the five questions asked to respondents resulted in a total score of 276, so the level of knowledge of respondents about eye protection from UV rays was included in the sufficient category with a score (of 70.8%). For farmers' knowledge about UV rays, including sources, hazards, and eye protection equipment from UV rays, it is included in the sufficient category with a value (65.8%).
5.	Author : Sugiharto et al Identity Journal : J Indon Med Assoe, Vol. 72 No.4: 188-195.	Case Report: Occupational Cataracts in Oil Palm Plantation Workers	The case study sample used was a 38-year-old man who was an oil palm plantation worker complaining of blurred eyes since 1.5 years ago; his eyes bulged when he saw a bright light, and he seemed to see fog.	From the results obtained from the case study, it can be concluded that the palm oil worker suffered from work-related cataracts.
6.	Author : Sumirate, RN et al. Identity Journal : Indonesian Scientific Journal Vol. 2 No.8: 699-715	Basal Cell Carcinoma in Traditional Rubber Farmers	A 70-year-old woman with the initials M with Basal Cell Carcinoma	Basal Cell Carcinoma is often found in workers exposed to sunlight for a long time because solar radiation is carcinogenic to humans. Through the seven stages of working diagnosis, the diagnosis of Basal Cell Carcinoma in the patient is related to his work as a traditional rubber farmer. Appropriate definitive and non-medical management and patient compliance can restore the patient's health condition with a good prognosis.

No	Author and Journal Identity	Journal Title	Population and Sample	Results Summary
7.	Author : Togawa, K et al. Identity Journal : International Environment. Vol. 157:1-11.	Incidence of Cancer in Agricultural Workers: Findings from the International Consortium of Agricultural COHORT Studies (AGRICOH)	The analytical study used 8 COHORTs from 6 countries involving >248,000 male and female agricultural workers aged ≥ 15 years, active and retired.	The study results showed that the incidence of cancer that occurs in agricultural workers' scope is lower compared to the general population. It found that there is an increased risk of skin melanoma, myeloma in women, and prostate cancer in men compared to the general population. In contrast, data show that the overall incidence of cancers (such as bladder, breast, colorectal, esophageal, larynx, lung, and pancreatic cancer) is lower than in the general population.
8.	Author : Ragan, KR et al. Journal of Identity : Preventing Chronic Disease: Public Health Research, Practice, and Policy. Vol. 16 E15:1-14	Skin Cancer Prevention Behaviors Among Agricultural and Construction Workers in the United States, 2015	The sample data used is from the 2015 National Health Survey (NHIS) Cancer Control Supplement found in the Adult Section, namely respondents aged 18 years and over with current or recent main employment status in agriculture or construction (n = 2.747).	The results of the study were that most of the agricultural and construction workers (out of 2,298) analyzed were male (based on industry: 72.4% agricultural and 89.3% construction; based on occupation: 66.1% agriculture and 95.6% construction) and non-white people -Hispanic. About ⅓ of workers have had at least one sunburn in the past year. The prevalence of sunscreen and shade use was low, and there were no significant differences between groups (15.1%-21.4% for sunscreen use and 24.5%-29.1% for shade). The prevalence of using protective clothing is higher among agricultural workers than construction workers.
9.	Author : Winaya et al Identity Journal : Udayana Journal of Medicine, Vol. 11, no. 12, p. 91-95	Level of Knowledge and Attitudes of Farmers in Subak Semidi about Sunlight as a Risk Factor for Skin Cancer	The total number of respondents taken by the total sampling amounted to 64. Questionnaires totaled 20 score for level of knowledge and score 20 for attitude.	The level of good knowledge about sunlight as a risk factor for skin cancer was 45 people (70.31%), 17 people (26.56%) had sufficient knowledge, two people (3.13%) lacked knowledge. A good attitude regarding sunlight as a risk factor for skin cancer was 38 people (59.38%), enough attitude was 23 people (35.94%), and a poor attitude was three people (4.68%).
10.	Author : Sudrajat . A et al Identity Journal : Scientific Journal of Midwifery Vol 4 No.2	The Effect of Cataract Risk Factors on Senile Cataracts in Farmers in the Working Area of the Tempurejo Health Center, Jember Regency	Population: 98 farmers Sample: 48 farmers	The results of the study proved that there was an effect of gender on senile cataracts, there was an effect on education level and level of knowledge on senile cataracts, there was a socioeconomic effect on senile cataracts, there was no effect on disease history. Hypertension in senile cataracts, there is no effect of smoking on senile cataracts, and there is an influence of work outside the building on senile cataracts. Women farmers are advised to reduce the intensity of ultraviolet light exposure. In addition, farmers must prioritize the use of PPE when working.

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DISCUSSION

Of the many studies conducted, it was found that the habits of farmers smoking and consuming alcohol did not have a significant relationship with the incidence of cataracts. However, there is a very significant relationship between exposure to UV light for more than four hours and the incidence of cataracts (Wati et al., 2022). Other studies found that many fishermen still did not use personal protective equipment (PPE). This is because the average fisherman's education level only ends in elementary and junior high school, so fishermen need to learn more about the PPE that should be used (Dewi, 2023).

The work environment can affect a person's productivity in doing his job. In terms of the Impact of Heat Exposure in the Work Environment on Workers' Health, Aulia et al. (2023) describe the impact and influence of the work environment that can cause risk factors for work-related diseases. One of them is heat stroke or exposure to heat, which can cause several symptoms of health problems. Meanwhile, other studies found that the level of knowledge regarding preventing exposure to UV rays was sufficient while working. This journal provides the level of knowledge of farmers regarding the use of personal protective equipment against exposure to UV light in the village (Jabbar et al., 2019). Thus, from the two journals, it can be concluded that there is a role for nurses who can provide preventive and promotive services to create a comfortable and safe work environment and minimize the risk of occupational diseases.

In addition, research results obtained from Sugiarto et al. (2022) showed that oil palm plantation workers who are often exposed to sunlight have a risk of cataracts. This research is comparable to other studies discussing Basal Cell Carcinoma, often found in workers exposed to sunlight for a long time because solar radiation is carcinogenic to humans (Sumirat et al., 2022).

Research by Togawa et al. (2021) regarding the incidence of cancer in agricultural workers found that the incidence of cancer that occurs within the scope of agricultural workers is lower when compared to the general population. It was found that there is an increased risk of skin melanoma, myeloma in women, and prostate cancer in men compared to the general population. In contrast, data show that the overall incidence of cancer (such as bladder, breast, colorectal, esophagus, larynx, lung, and pancreatic cancer) is lower compared to the general population. This difference may occur due to differences in risk factors that need further research. Risk factors that may be the cause of cancer incidence in agricultural workers are ultraviolet radiation (UVR) and heat, hazardous equipment, and exposure to hazardous agents, such as zoonotic pathogens, pesticides, endotoxins, solvents, metals, welding fumes, crystalline silica, and diesel exhaust fumes (Togawa et al., 2021).

Whereas in a study by Ragan et al. (2019) which discussed skin cancer prevention attitudes among agricultural and construction workers in the US, it was found that the majority of agricultural and construction workers (out of 2,298) analyzed were male (based on industry: 72.4% agricultural and 89.3% construction; by occupation: 66.1% agricultural and 95.6% construction) and non-Hispanic whites. About ⅓ of workers have had at least one sunburn in the past year. The prevalence of sunscreen and shade use was low, and there were no significant differences between groups (15.1%-21.4% for sunscreen use and 24.5%-29.1% for shade). The prevalence of using protective clothing is higher among agricultural workers than construction workers. From the two journals above, it was concluded that one of the risk factors for skin cancer in agricultural workers is exposure to ultraviolet radiation (UVR) and heat. Exposure to other carcinogens (for example, zoonotic pathogens, pesticides, endotoxins, solvents, metals, welding fumes, crystalline silica, and diesel exhaust fumes) and hazardous equipment can also be another risk factor for cancer in agricultural workers but still requires further research. The usual attitudes of agricultural

and out-of-the-field workers in addressing exposure to ultraviolet radiation (UVR) and heat as risk factors for skin cancer are shade seeking, use of PPE, and use of sunscreen.

Geographically, Indonesia is located in a tropical area that is exposed to sunlight throughout the season. This geographical location is an advantage in the agricultural sector, so one of the livelihoods often found in Indonesia is agriculture. As a farmer who requires outdoor activities so that he is exposed to direct sunlight with excessive intensity, he is very susceptible to skin cancer; the leading risk factor is sunlight. The large number of outdoor activities with sufficient intensity for a long time, coupled with a lack of knowledge and the correct attitude to protect oneself from the sun, causes a higher risk of developing skin cancer (Richard et al., 2022). Other studies found that education level and knowledge significantly influenced the incidence of senile cataracts. In addition, work outside the building significantly affects the incidence of senile cataracts (Sudrajat et al., 2021).

CONCLUSION

Agricultural workers, such as farmers, have a higher risk due to their work activities under the hot sun, which has a harmful UV light index. One of the risk factors for skin cancer in agricultural workers is exposure to ultraviolet radiation (UVR) and heat. Exposure to ultraviolet radiation (UVR) is also a risk factor for skin cancer, heatstroke, and cataracts. Agricultural workers and workers outside the field must know how to maintain their health by using shade-seeking, PPE, and sunscreen to protect themselves from UV rays. This level of knowledge influences out-of-field workers' attitudes toward using PPE. In this case, the role of the nurse is to provide health services, which are divided into four stages, namely promotive, preventive, curative, and rehabilitative, to prevent farmers from getting diseases caused by exposure to UV rays such as heatstroke, cataracts, and skin cancer.

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Volume 02 Number 02
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