Risk factors of skin cancer among Indonesian population

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Abstrak

Suatu penelitian kasus kontrol untuk mengkaji faktor risiko kejadian kanker kulit telah dilaksanakan pada populasi Indonesia menggunakan 139 kasus baru kanker kulit dan 242 pasangan kontrol di RS Cipto Mangunkusumo Jakarta. Kriteria pasangan kontrol adalah umur, jenis kelamin, dan status sosial ekonomi. Tujuh belas faktor risiko yang diteliti adalah: indeks masa tubuh, tingkat pendidikan, kerja di lapangan terbuka, alat keamanan diri, faktor genetik, kebiasaan merokok, pajanan pada perokok, penggunaan hormon, dan konsumsi sembilan jenis bahan makanan. Studi ini telah mengidentifikasi 7 faktor penyebab kanker kulit yakni: pendidikan rendah (OR 9.71), kerja di lapangan (OR 5.29), berat badan rendah (OR 2.93), riwayat kanker keluarga (OR 2.82), perokok (OR 2,04), pajanan pada perokok (OR 2.06) dan konsumsi tinggi lemak (OR 4.47). Studi ini juga mengidentifikasi 8 faktor pencegah yakni: penggunaan baju lengan panjang (OR 0.29), konsumsi cukup daging (OR 0.17), konsumsi cukup lemak (OR 0.44), konsumsi tinggi atau cukup telur (OR 0.05 dan 0.19), konsumsi tinggi dan cukup santan (OR 0.44 dan 0.24), konsumsi tinggi buah (OR 0.29), konsumsi tinggi dan cukup sayuran (OR 0.54 dan 0.34), serta konsumsi tinggi bawang putih (OR 0.44). Analisa lanjutan dengan metoda regresi logistik menunjukkan hanya 6 faktor saja yang nyata berkaitan dengan perkembangan kanker kulit, yakni pendidikan, pekerjaan di luar, konsumsi lemak, daging, telur dan buah-buahan.

Abstract

A case-control study to identify risk factors on the development of skin cancer among Indonesian population has been conducted using 139 newly diagnosed skin cancer cases, and 242 matched controls selected among non-cancer patients of the Jakarta General Hospital. The matching variables are age interval, sex, and social-economic status. Seventeen potential determinant factors were assessed: present body mass index, education, working condition, physical protection, genetic trait, smoking habit, exposure to smokers, hormonal drug, and consumption of nine food items. This study has identified seven significant risk factors: low education (OR=9.71), working in the open field (OR=5.29), under weight (OR=2.93), cancer history (OR=2.82), smoking (OR=2.04), exposure to smokers (OR=2.06), and high fat consumption (OR=4.47). This study also has identified eight significant protective factors: using long sleeve (OR=0.29), moderate consumption of meat (OR=0.17), moderate consumption of fat (OR=0.44), high and moderate consumption of egg (OR=0,05 and 0,19 respectively), high and moderate consumption of coconut milk (OR=0,44 and 0,24 respectively), high consumption of fruit (OR=0,29), high and moderate consumption of vegetable (OR= 0,54 and 0,34 respectively), and high consumption of garlic (OR=0.44). Further analysis using logistic regression method revealed those 6 factors, namely education, working outside, fat, meat, egg and fruit consumption have real effect on the development of skin cancer.

Keywords: case-control, skin cancer, and risk factor

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As one of the developing countries with fast economical growth, Indonesia also showed a dramatic improvement of its public health situation. In the last decade there was a significant shift of leading causes of death, from acute communicable diseases in early 1980s to chronic diseases in early 1990s. Coronary heart disease and malignancies ranked number one and two in this statistical figure.[1,2]

Indonesia is located just in the equator with very dense sunlight exposure for almost all of its population. Inspite of recent development of industry, agriculture remained the larger contribution to the

economy of the country. According to demographic statistic, 70% of Indonesian adults still engaged with one type of agricultural works and the exposure with lengthy and direct sunlight was widely common.

The pathology-based cancer registry in 1988-1992 showed that skin cancer ranked the first among male cases and ranked the fourth among female cases.[3] Most of these cases came to the hospital at very late stages and showed poor responses to the available treatments. In contrast, the majority of skin cancer in Japan were in earlier stage.[4]

Besides exposure to direct sunlight, other risk factors could influence the development of skin cancer. The excessive use of cosmetics, hormonal drugs, certain skin types, and genetic trait could increase the risk of skin cancer, while the use of skin protectors could reduce the level of risk. In preparing the proper educational material, a thorough study on such risk factors among the Indonesian population might reveal specific data, both geographical and ethnical one.

The importance of environmental and constitutional risk factors has been studied mostly in populations living in cooler climates.[4-9] This study was intended to identify significant risk factors and lifestyles influencing the development of skin cancer in tropical area.

MATERIALS AND METHODS

A case-control study design[11, 12] with 1:2 ratio was implemented in the assessment of skin cancer's risk factors. The case group was defined as all new diagnosed skin cancer patients who came to Dr. Cipto Mangunkusumo National Central General Hospital, Jakarta during the study period of 1996 to 1999. Almost all of skin cancer patients in the Jakarta area, especially those from middle to lower social economic level, were referred to this hospital. The diagnosis of skin cancer was performed histopathologically. Standard coding system[10] was used throughout the study period. The controls were defined as non-malignancy patients who came for medical assistance to the dermatology or surgery departments of the General Hospital in similar (within 3 months) to the cases. For every skin cancer patient, two hospital controls matched for age (ca. 3 yrs) and gender were used to increase its statistical power. Demographic characteristics of the respondents were gathered through a structured interview, while medical data were collected through physical

examination. Standard questionnaire and its manual are given in Appendix.

The seventeen risk factors included in this study were present body mass index, education, working condition, physical protection, genetic trait, smoking habit, hormonal drug, and consumption of nine food items. Each potential risk factor was assessed through bivariate analysis and was measured its estimated Relative Risk and the 95% confidence intervals. For all significant risk factors, a further analysis has been applied to assess the strength of association for each determinant factor given that all other factors retained as constant. Logistic regression method was selected for this multivariate analysis.

Nutritional factors were adjusted to the Indonesian diet.[13] High food consumption was defined if the subject consumed more than twice per week, moderate consumption was twice or less per week. Low educational level was defined for those who only had elementary education, middle education was junior high school. Physical protection was defined for subject who regularly wore long sleeve shirt. Smoking risk was defined as those who currently smoking cigarettes. Genetic trait was defined for those who had relative suffering from any type of malignancy.

RESULTS

So far, until March 1999, data of 139 cases of skin cancer and 242 controls could be analyzed. Female subjects are a little bit more than male subjects; almost 57% of cases are female skin cancer patients. As expected earlier, the majority of cases were rather older. Almost 44% were older than 60 years, followed by around 30% of cases between 51 and 60 years of age. There were almost 9% of skin cancer cases aged less than 40 years. The details are given in Table 1.

Table 1. Age distribution of cases and controls

Variables	Cases		Controls	
	N	%	N	%
Gender Distribution				
Male	60	43.2	97	40.1
Female	79	56.8	145	59.9
Age Distribution				
Less than 40 years	12	8.6	24	9.9
Between 40 – 50 years	25	18.0	41	17.0
Between 51 – 60 years	41	29.5	84	34.7
More than 60 years	61	43.9	93	38.4

The selection of controls did not interfere with the possible determinant factors. No control subject was diagnosed of having any disease that has confirmed causal association with any potential factor, whether increasing or decreasing association. The majority of control group were women who visit the hospital for consultation. Eighty-four percents of control visited dermatology department seeking for medical assistance for ordinary medical problems. See Figure 1 for their clinical diagnosis.
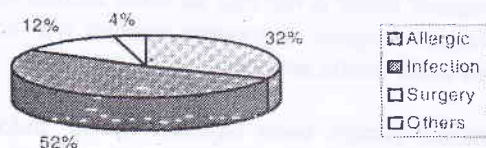

Figure 1. Clinical diagnosis of controls

Univariate analysis of determinant factors showed that fourteen of them had significant role on the development of skin cancer. The results of the analysis of social, demographical and environmental factors are given in Table 2. Lower educational level significantly (OR=9.7) increased the risk of contracting skin cancer, working outside at the open area also significantly (OR=5.3) caused the malignancy. Under weight, having relative with cancer, smoking, and exposure to active smokers also showed significant risk, though not too strong (OR between 2.04 and 2.93) in the skin cancer development. On the other hand, the use of long sleeve can significantly reduced (OR=0.29) the risk of skin cancer. The use of hormonal drugs such as contraceptive methods and other hormonal medicines did not give any significant effect in the development of skin cancer.

Table 2. Statistical analysis of social demography and environmental factors

Variables	Case	Control	OR	95% CI Min	95% CI Max
Educational Level					
Low (Elementary) *	109	72	9.71	5.19	18.36
Middle (Junior High)	13	61	1.37	0.58	3.21
High (Senior High up)	17	109	1		
Working Outside					
Yes	69	38	5.29	3.19	8.81
No	70	204	1		
Body Type					
Under weight (BMI < 17) *	85	97	2.93	1.71	5.03
Normal weight (BMI 17 – 22)	29	97	1		
Over weight (BMI > 22)	25	48	1.74	0.88	3.46
Cancer History**					
Yes *	6	0	2.82	2.46	3.23
No	133	242	1		
Hormonal Use					
Ever use	3	12	0.42	0.09	1.65
Never	136	230	1		
Smoking Habit					
Smoker *	32	33	2.04	1.14	3.67
Ex smoker	22	30	1.54	0.80	2.96
Non smoker	85	179	1		
Exposure to Smokers					
Yes *	62	68	2.06	1.30	3.26
No	77	174	1		
Use of Long sleeves					
Yes *	59	174	0.29	0.18	0.46
No	80	68	1		

*   Significant risk assessed based on 95 % Confidence Interval; OR = Odds Ratio;   95 % CI = 95 % Confidence Interval
** Calculated using Relative Risk Formula

The results of the analysis of nutritional factors are given in Table 3. From nine types of food, only seven influenced the development of skin cancer. Protection from the development of skin was shown by moderate consumption of lean meat (OR=0.17), egg frequently or moderately (OR=0.05 and 0.19 respectively), food or drink with coconut milk either daily or moderately with OR=0.44 and 0.24 respectively. Consumption of fresh fruit and vegetables as expected also to provide protection against skin cancer. Fresh fruit consumed almost every day showed significant (OR=0.29) protection against skin cancer, similarly for fresh vegetable consumed moderately or every day with OR=0.34 and 0.54, respectively. The use of garlic in

every day recipe could also be a protective factor (OR=0.44) for skin cancer.

Fat consumption showed a very interesting impact in the development of skin cancer. Subjects who consumed high fat showed significantly higher risk (OR=4.47) of developing skin cancer. On the contrary, those who consumed moderate portion of fatty food showed reduce risk with an OR=0.44.

Milk consumption and tea consumption did not have any significant impact to the development of skin cancer. The majority of cases and controls did not consume much of milk but almost all of them consumed tea frequently.

Table 3. Statistical analysis of nutritional factors

Variables	Case	Control	OR	95% CI	
				Min	Max
Milk Consumption					
Always (> 2 times per week)	6	17	0.56	0.19	1.58
Rarely (twice or less per week)	13	36	0.58	0.28	1.18
Almost never	120	192	1		
Tea Consumption					
Always (> 2 times per week)	109	181	1.43	0.73	2.82
Rarely (twice or less per week)	14	23	1.45	0.54	3.84
Almost never	16	38	1		
Meat Consumption					
Always (> 2 times per week)	16	23	0.50	0.23	1.09
Rarely (twice / less per week) *	37	157	0.17	0.10	0.28
Almost never	86	62	1		
Fat Consumption					
Always (> 2 times per week) *	18	6	4.47	1.59	13.13
Rarely (twice / less per week) *	29	99	0.44	0.26	0.73
Almost never	92	137	1		
Egg Consumption					
Always (> 2 times per week) *	14	99	0.05	0.02	0.11
Rarely (twice / less per week) *	78	128	0.19	0.10	0.39
Almost never	47	15	1		
Coconut Milk Consumption					
Always (> 2 times per week) *	19	30	0.44	0.20	0.92
Rarely (twice / less per week) *	59	170	0.24	0.14	0.40
Almost never	61	42	1		
Fruit Consumption					
Always (> 2 times per week) *	45	132	0.29	0.14	0.58
Rarely (twice or less per week)	67	87	0.66	0.33	1.31
Almost never	27	23	1		
Vegetable Consumption					
Always (> 2 times per week) *	34	62	0.54	0.30	0.96
Rarely (twice or less per week) *	41	117	0.34	0.20	0.58
Almost never	64	63	1		
Garlic Consuption					
Always (> 2 times per week)*	54	143	0.44	0.22	0.88
Rarely (twice or less per week)	62	72	1.01	0.50	2.04
Almost never	23	27	1		

* Significant risk assessed based on 95 % Confidence Interval;   OR = Odds Ratio;   95 % CI = 95 % Confidence Interval

When logistic regression analysis method was applied for the fourteen significant risk factors, seven of them did not show real impact on skin cancer. By keeping other risk factors constant, the causal relationship of body type, cancer history, smoking, exposure to smokers, use of long sleeve, coconut milk, vegetable and garlic consumption diminished. Low education, working outside, and high fat consumption remained as significant risk factors for the development of skin cancer, while meat, egg, and fruit consumption also remained as significant protector against skin cancer. See details in Table 4.

DISCUSSION

The development of skin cancer is influenced by multi factors consisting of intrinsic and extrinsic components. The intrinsic factor of cancer history among family member was detected as significant risk factor in the univariate analysis, but diminished after being adjusted with other risk factors. Consumption of various food items also showed unique phenomenon in the development of skin cancer. Protein rich food consumption such as meat and egg proved to be effective in preventing skin cancer both in uni- and multivariate analyses. This important food component might play a role in prevention or in the recovery process of any skin cell damage due to exposure to extrinsic factors such as sunlight.

Other food related protective factors such as vegetable, garlic and coconut milk only showed significant protection in the univariate analysis and diminished in the multivariate analysis. Fruit consumption that provides abundant mineral needed for assisting the metabolism of other micro-nutrient in the skin repair remained significant in the adjustment process. Fat consumption showed different effect depending on its level of consumption. High fat consumption increased significantly the development of skin cancer as in other types of malignancies. However, moderate consumption of fat showed protective defect.

The extrinsic factors of active and passive smokers tend to be significant only after interacting with other determinant factors. These cigarette-related determinant factors loss their influences after adjustment. Low body mass index role in the development of skin cancer was also diminished in the logistic regression analysis. Low education showed very strong relationship with the development of skin cancer. Persons with low education tended to have occupation types that give higher sunlight exposure outside the buildings. Both determinant factors, low education and working outdoors, persistently showed significant increased risk for the development of skin cancer. On the other hand, the use of long sleeve shirt as protector for excessive sunlight only significantly prevents skin cancer before adjustment with other determinant factors. The data confirmed the other studies.[7-9, 14-17]

Table 4. Estimated Relative Risk of determinant factors

Determinant Factors	Bivariate			Multivariate		
	OR	95 % CI		OR	95 % CI	
Education (low level)	9.71 *	5.19	18.36	9.56 *	5.45	19.21
Working outside	5.29 *	3.19	8.81	7.45 *	2.98	9.43
Body type (Under weight)	2.93 *	1.71	5.03	1.98	0.99	4.35
Having cancer history	2.82 *	2.46	3.23	1.87	0.96	4.12
Smoking (active smoker)	2.04 *	1.14	3.67	1.99	0.99	3.88
Exposure to smokers	2.06 *	1.30	3.26	1.65	0.95	3.43
Use of long sleeve	0.29 *	0.18	0.46	0.56	0.36	1.02
Meat consumption (moderate)	0.17 *	0.10	0.28	0.24 *	0.17	0.56
Fat consumption (high)	4.47 *	1.59	13.13	5.12 *	1.43	15.32
(moderate)	0.44 *	0.26	0.73			
Egg consumption (high)	0.05 *	0.02	0.11	0.11 *	0.09	0.34
(moderate)	0.19 *	0.10	0.39			
Coconut milk cons. (high)	0.44 *	0.20	0.92	0.53	0.23	1.03
(moderate)	0.24 *	0.14	0.40			
Fruit consumption (high)	0.29 *	0.14	0.58	0.32 *	0.18	0.59
Vegetable consumption (high)	0.54 *	0.30	0.96	0.67	0.46	1.12
(moderate)	0.34 *	0.20	0.58			
Garlic consumption (high)	0.44 *	0.22	0.88	0.55	0.38	1.06

* Significant risk assessed based on 95 % Confidence Interval;   OR = Odds Ratio;   95 % CI = 95 % Confidence Interval

This study has identified that excessive exposure to sunlight was the main risk factor in the development of skin cancer among the Indonesian population. This excessive exposure to sunlight is reflected by low education level and working outside the buildings. High fat consumption was also identified as important risk factor for skin cancer, while the consumption of fruit could prevent its development. Relative to increasing trend in the morbidity and mortality of cancer in Indonesia,[18-21] the findings could be accounted for further planning of cancer control program.

Acknowledgement

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