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Association between premature canities and quality of life at Medan, Indonesia 2017



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ABSTRACT

Introduction: Premature canities is a terminology to describe a premature condition graying of hair before the age of 20 in Caucasians, 25 in Asians, and 30 in Africans, involving complex processes such as genetic, hormonal and environmental factors. Quality of life is generally measured using a validated questionnaire. Body Image Questionnaires (BIQ) is a questionnaire that specifically assesses the impact of self-appearance, especially in the hair appearance, on the individual self-esteem and the influences in life. In clinical practice, measuring the association of premature canities to the quality of life and understanding how a patient's life is affected by premature canities can be helpful in determining the most appropriate and better management for the patients.

Aim: To evaluate the association between premature canities and quality of life

Methods: This is a cross-sectional analytic method, with BIQ to assess the quality of life. Diagnosis of premature canities was made based on clinical examination. This study involving 63 subjects with premature canities and 114 normal subjects. Statistical analysis was done using descriptive method and chi-square test to assess the association between premature canities and quality of life.

Results: There is a significant association between premature canities and quality of life ($P < 0.05$). There is no significant association between age, sex, and severity degree of premature canities with quality of life ($P > 0.05$).

Conclusion: There is a significant association between premature canities and quality of life, but there is no association between age, sex and severity degree of premature canities with quality of life.

Keywords: premature canities, quality of life, Body Image Questionnaires

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INTRODUCTION

Hair is a complex structure of keratinized epithelial cells and acts as the most effective protector of scalp from sunlight exposure.¹ The appearance of hair plays an important role in the physical appearance of a person and self-perception as a whole.² Considering an important role of hair in social communication, premature graying of hair gives a huge impact on physical appearance, self-esteem, and social acceptance in an individual.^{3,4}

Graying hair that occurs at an earlier age is referred to as premature canities. It is primarily thought to be caused by genetic with interactions of various environmental factors.⁵⁻⁷ Premature canities may also appear alone without underlying pathology as an autosomal dominant condition.⁸ Premature canities is diagnosed if graying hair appears before the age of 20 in Caucasians, 25 in Asians, and 30 in Africans. In addition, it is mentioned that premature canities conditions may be associated with various diseases such as pernicious anemia, hyperthyroidism, and certain autoimmune diseases and even early cardiovascular disease.⁸⁻¹² Although graying hair is understood as a loss of pigment in the hair shaft, to date, the exact cause of premature canities not fully understood.⁵

Most patients experience psychological problems associated with physical appearance due to gray hair that arises earlier so that the patient feel embarrassed by his own physical appearance. The existence of a stigma that develops in society, causing rejection and withdrawal of patients from the social environment in which this can affect the patients quality of life.^{14,15} Body Image Questionnaires (BIQ) is one of the questionnaires that specifically assess the impact of self-appearance, especially in the hair appearance, on individuals towards self-esteem and its influence in everyday life where this will ultimately affect the patients quality of life. The questionnaire aims to assess the dimensions of individuals perception, feelings, and attitudes toward his or her body or parts of the body.¹⁶

Although extensive molecular research continues to be undertaken to understand the pathogenesis of premature canities, treatment options remain far from satisfactory, and no effective therapy is available. Some oral therapies have been tried with inconsistent results so that despite recent studies have been published, therapy and prevention remain elusive.^{5,12,13}

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MATERIALS AND METHODS

Study Design

This study using cross-sectional analytic method. The general objective of this study was to evaluate the association between premature canities and quality of life, to evaluate the correlation between quality of life with age, sex, duration of illness and the severity of subjects who experienced premature canities.

Sample sizes

The target population was male and female subjects who had premature canities and non-premature canities between the ages of 15-25 years at two high schools and the Faculty of Medicine, University of Sumatera Utara Medan, were examined in January 2017 to August 2017 involved 177 participants, with the total sample, are 63 subjects with canities premature and 114 healthy subjects. Samples were taken using consecutive sampling method.

Instruments

Diagnosis of premature canities was made based on clinical examination of hair and calculation the number of gray hairs. Body Image Questionnaires (BIQ) were used to assess the association between premature canities and quality of life, the correlation between quality of life with age, sex, duration of illness and the severity of subjects who experienced premature canities.

Participants

The inclusion criteria in this study were male and female subjects who had premature canities and non-premature canities between the ages of 15-25 and were willing to take part in the study and sign the informed consent. Exclusion criteria were subjects with premature aging syndrome, subjects with hypomelanosis hair disorder, subjects with poliosis, and subjects who had premature canities with psychiatric disorders (anxiety and depression).

Measurements

Severity degree of premature canities defined in the form of mild canities (≤ 50 sheets of gray hair), medium canities (51-100 sheets of gray hair) and severe canities (>100 sheets of gray hair) with a minimum of 5 gray hairs. Subsequently selected subjects conducted a questionnaire to assess quality of life based on Body Image Questionnaires (BIQ) consisting of 15 questions consisting of several criteria: questions about self-image or body parts that are not liked or that interfere with daily appearance, feelings and emotions, frequency and time spent on the conditions experienced, personal and social relationships, the ability to work or learn

about the conditions experienced, and actions that have been and will be done related to the conditions experienced.

The assessed domain of each question has five alternative responses such as: "not disturbed", "sometimes disturbing", "disturbing" and "very disturbing" with a score range of 0 to 8. The total score is calculated by summing the scores of each question; higher scores represent a decline in quality of life. The higher the score, the more disturbed the quality of life of the patient. The quality of life is declared good when the score ≤ 24 and quality of life are declared poor if the score >24 .

Data analysis

The data obtained were processed and analyzed to see the frequency distribution of quality of life in subjects who experienced premature canities and non-canities based on each characteristic and then presented in the form of frequency distribution table. Chi-square test through SPSS statistic software was used to analyze the association between each variable with significance level $p < 0,05$.

RESULTS

Characteristics of subjects experiencing premature canities and non-premature canities were assessed by age, sex, education level, based on prolonged premature canities and severity degree of premature canities.

Based on subject characteristics, from total 117 subjects (63 subjects with premature canities and 114 subjects with non-premature canities), The predominant age distribution in premature canities group was found in the age group less than 17 years (40.2%) whereas in the predominant non-premature canities group the majority were over 17 years (71.4%). By sex, the majority of subjects who experienced premature canities most were men (45.5%), whereas in the non-premature canities group with the majority of subjects were women (72.0%). Distribution based on educational level, the majority on the premature canities group are high school students (38.2%) whereas in the non-premature canities group with the majority are university students (68.7%). (Table 1)

Classification based on the prolonged period of experiencing premature canities, subjects experiencing premature canities were mostly in the range less than 5 years (66.6%), and the lowest percentage in the range >10 years (4.8%). Based on the severity degree of premature canities, the most commonly found with mild canities (76.2%) and severe premature canities (7.9%) is the lowest of a total of 63 samples of premature canities. (Table 2)

Table 1 Subject characteristics of premature canities and non-premature canities

Subject Characteristics	Canities		Non-Canities		Total	
	n	%	n	%	n	%
Age Group						
17 years old	43	40.2%	64	59.8%	107	100.0%
17 years old	20	28.6%	50	71.4%	70	100.0%
Total	63	35.6%	114	64.4%	177	100.0%
Gender						
Male	35	45.5%	42	54.5%	77	100.0%
Female	28	28.0%	72	72.0%	100	100.0%
Total	63	35.6%	114	64.4%	177	100.0%
Educational Level						
Higher education	21	31.3%	46	68.7%	67	100.0%
Senior high school	42	38.2%	68	61.8%	110	100.0%
Total	63	35.6%	114	64.4%	177	100.0%

Table 2 Characteristics based on duration and severity degree of premature canities

Duration of illness	n	%
< 5 years	42	66.6
5-10 years	18	28.6
> 10 years	3	4.8
Total	63	100.0
Severity Degree		
Mild	48	76.2
Moderate	10	15.9
Severe	5	7.9
Total	63	100.0

Distribution of subjects with premature canities and non-premature canities based on Body Image Questionnaires (BIQ) values, in premature canities subjects, was found to be the majority with poor quality of life (58.0%) while in non-premature canities subjects it was found that the majority had a good quality of life (86.5%). Based on the statistical test, there was a significant association between premature canities and quality of life with p-value 0.000 ($p < 0.05$) Table 3. Subject quality of life who had premature canities and non-premature canities by age group, most of whom had a poor quality of life was in the age group over 17 years (54.3%). While good quality of life is most often found in the age group less than 17 years (53.3%). Based on the statistical test, there was no significant association between quality of life with age on premature canities and non-premature canities subjects with p-value 0.203 ($p > 0.05$). The poor quality of life in the premature canities and non-premature canities subjects by sex was most prevalent in female

sex (53.0%). While the best quality of life found in men (54.5%). Based on statistical test, there was no significant correlation between quality of life and sex on premature canities and non-premature canities subjects with p-value 0.199 ($p > 0.05$). The correlation between quality of life with education level in premature canities and non-premature canities subjects was obtained subjects with high quality of life were found in subjects with high school education level (54.5%). Meanwhile, the majority of poor quality of life is found on subjects with higher education level (56.7%). Based on statistical test, there was no significant correlation between quality of life with education level in premature canities and non-premature canities subjects with p-value 0.097 ($p > 0.05$). (Table 4)

Quality of life based on duration suffering premature canities was found the majority of subjects have a good quality of life with subjects suffering premature canities less than 5 years (23.8%). While subjects with poor quality of life were found in subjects with duration suffering from premature canities more than 10 years (100.0%). The total number of subjects with premature canities who had poor quality of life when associated with duration suffering from premature canities is 81.0%. Based on statistical test, there was no significant correlation between quality of life and duration suffering from premature canities with p-value 0.117 ($P > 0.05$). The quality of life associated with the severity degree of premature canities was found subjects with severe canities had the worst quality of life (80.0%). This suggests that out of a total of 63 major premature canities, the majority had poor quality of life when associated with the severity degree of premature canities where the greater severity degree of premature canities showed worse

Table 3 Association between Premature Canities with quality of life based on age, gender, duration and severity degree of premature canities

Quality of life	Canities		Non Canities		Total		p-value
	n	%	n	%	n	%	
Good (24)	12	13.5%	77	86.5%	89	100.0%	0.000
Poor (>24)	51	58.0%	37	42.0%	88	100.0%	
Total	63	35.6%	114	64.4%	177	100.0%	

Table 4 Association between Premature Canities with quality of life based on age, gender, duration and severity degree of premature canities

	Good (24)		Poor (>24)		Total		p-value
	n	%	n	%	n	%	
Age group							
17 years old	57	53.3%	50	46.7%	107	100.0%	0.203
≥ 17 years old	32	45.7%	38	54.3%	70	100.0%	
Total	89	50.3%	88	49.7%	177	100.0%	
Gender							
Male	42	54.5%	35	45.5%	77	100.0%	0.199
Female	47	47.0%	53	53.0%	100	100.0%	
Total	89	50.3%	88	49.7%	177	100.0%	
Educational level							
Higher education	29	43.3%	38	56.7%	67	100.0%	0.097
Senior high school	60	54.5%	50	45.5%	110	100.0%	
Total	89	50.3%	88	49.7%	177	100.0%	
Duration of premature canities							
< 5 years	10	23.8%	32	76.2%	42	100.0%	0.117
5-10 years	2	10.5%	17	89.5%	19	100.0%	
> 10 years	0	00.0%	2	100.0%	2	100.0%	
Total	12	19.0%	51	81.0%	63	100.0%	
Severity degree of premature canities							
Mild	10	20.8%	38	79.2%	48	100.0%	1.000
Moderate	2	20.0%	8	80.0%	10	100.0%	
Severe	0	00.0%	5	100.0%	5	100.0%	
Total	12	19.0%	51	81.0%	63	100.0%	

quality of life compared with mild degree of premature canities. However, there is no statistically significant correlation between quality of life and severity degree of premature canities with p-value 1.000 ($p > 0.05$). (Table 4)

DISCUSSION

Graying hair that occurs at an earlier age is referred as premature canities. It is primarily thought to be caused by complex interaction of genetics with various environmental factors.⁵⁻⁷ Premature canities may also appear alone without underlying pathology as an autosomal dominant condition.⁸ Premature canities is graying hair condition occurs

before the age of 20 in Caucasian race, before the age of 30 on African races, and before the age of 25 in the Asian race.⁸⁻¹²

Premature canities is a problem that is quite prominent among the public, especially most often affects young age. In this study, it was found that the characteristics of subjects who are experiencing premature canities based on age range were found in the majority within the age group less than 17 years (40.2%) whereas in the group of non-premature canities with the majority aged over 17 years (71.4%). Based on the research of the sample data, in this study the earliest onset of the subject had premature canities is 9 years,

and the age range of the sample in this study was 15 years old, and the oldest age was 25 years. From the results of this study note that subjects who experience premature canities more often at a young age.

Another study by Phandi et al. shows premature canities in Asian race as much as 88.5% appear at an age before 25 years.¹⁷ Meanwhile, study by Deepasheree et al. in India also mentioned that the earliest onset of premature canities is 3 years old and the average onset of age of premature canities is before the age of 16.¹⁹

Based on gender characteristics, the majority of subjects who experienced premature canities were men (45.5%), whereas in the non-premature canities group subjects were women (72.0%). The results of this study differ from those obtained in previous studies conducted by Deepasheree et al. where the prevalence of premature canities was more prevalent in women (51.9%) than in men (48.1%) out of 52 cases and controls respectively.^{12,17} Another study conducted by Hyoseung et al. in Korea who assessed the association between premature canities with family history and lifestyle, there was no sex predilection between men and women.¹⁸ Meanwhile, another study by Bhat et al. in India that assessed the characteristics profile of subjects with premature canities shows ratio between male and female is 1: 1 indicating no sex predilection.¹⁹

Distribution based on educational level, the majority on the subject in premature canities group are high school students as much as 38.2% while in the group of subjects with non-premature canities are higher education (68.7%). These findings also correspond to the results obtained based on the age distribution where premature canities are most prevalent at the age less than 17 years.

Another study conducted earlier by Deepasheree et al. and Phandi et al. related to age onset of premature canities, mentioning premature canities more commonly found in younger age subjects.^{17,19} Other research results conducted by Bhat et al. also found that premature canities are more common in subjects in high school compared with university students with an average age of onset of premature canities is 15 years.¹⁹

Based on the duration of illness, subjects with premature canities were mostly within duration less than 5 years (66.6%), and the lowest percentage in the age range >10 years (4.8%). The results of this study indicate the majority duration time range of subjects who experienced premature canities is less than 5 years. This phenomenon might occur because based on data, the onset of the earliest age of premature canities in this study is about 9 years, and the majority of the subject age in this study

is less than 17 years so that the results obtained subjects who experienced premature canities with a long period of suffering is not too long.

Previous studies conducted by Bhat et al. shows that the average duration experiencing premature canities was less than 5 years.¹⁹ Meanwhile, the results of this study differ from the results of previous studies obtained by Deepasheree et al. who get the average time span of subjects experiencing premature canities is more than 10 years where the earliest onset of premature canities age in this study was 3 years.¹⁷

In this study, the assessment of the severity degree of premature canities is based on the presence of at least 5 sheets of gray hair and the use of the gray hair calculation scale format, where the scores are divided into mild canities (≤ 50 sheets of gray hair), moderate canities (51-100 sheets of hair gray) and severe canities (>100 sheets of gray hair).^{6,14} In this study, based on the severity degree of premature canities, the most prevalent were mild premature canities (76.2%), and severe premature canities (7.9%) is the lowest of a total of 63 samples of premature canities.

The results of this study differ from the results of previous studies by Bhat et al., the most common severity degree of premature canities was moderate canities of 65.7% compared with mild or moderate degrees, of a total of 35 samples and controls respectively.¹⁹ Other studies by Hyoseung et al. in Koreans who assessed the association between premature canities and quality of life in subjects with age less than 30 years found the severity degree of premature canities was predominantly in severe canities compared with mild or moderate canities.¹⁸

Considering the important role of hair in social communication, premature canities has significant side effects on appearance, self-esteem, and socio-cultural acceptance of the affected individuals. Premature canities is generally non-infectious and life-threatening, but the disease has a significant impact on the accusative person quality of life, involving various aspects of life including physical, psychological, psychosocial and emotional effects.^{21,22}

Quality of life is generally measured using a validated questionnaire. Body Image Questionnaires (BIQ) is a questionnaire that specifically assesses the impact of self-appearance on the individual on self-esteem and its influence in everyday life where it affects the quality of one's life.¹⁶

In this study subject quality of life who experienced premature canities based on Body Image Questionnaires (BIQ) majority were with poor quality of life of 58.0%, while good quality of life was 13.5% out of 63 total premature canities. While on the subject of non-premature canities obtained

that 86.5% of subjects have a good quality of life, and poor quality of life was 42.0% of a total of 114 subjects. Overall of a total of 177 subjects (premature canities and non-premature canities), the subject with premature canities had a worse quality of life compared with a non-premature canities subject. Based on the statistical chi-square test, there was a significant correlation between the incidence of premature canities with quality of life with p-value <0.05.

Previous studies conducted by Jin Jo et al. in Korea who assessed the relationship between premature canities with lifestyle. From this study, it was found that a large number of patients with premature canities (0.5% of the total sample of 52 subjects of premature canities and control), had a sedentary lifestyle compared to those who enjoyed a dynamic lifestyle. The results of this study indicate a deterioration in the quality of life of patients with premature canities compared with their control group.²⁰ Meanwhile, another study by Chakrabarty in India who assessed factors contributing to premature canities such as assessing living habits, irregular eating habits, smoking and other factors such as hemoglobin levels, serum ferritin and trace elements, this study shows there was a decrease in the quality of life in samples with smoking habits, irregular lifestyle and eating habits of 24% of a total of 50 samples with premature canities and control.²²

Based on quality of life, subject who had premature canities and non-premature canities by age group, most of whom had poor quality of life was in the age group over 17 years (54.3%). While good quality of life is most often found in the age group less than 17 years (53.3%). These findings suggest that subjects with premature canities and non-premature canities with younger age majority gave a better percentage of quality of life than subjects with older age (>17 years). Based on the statistical chi-square test, there was no significant correlation between quality of life with age on the subject with premature and non-premature canities with p-value 0.203 (p > 0.05).

The poor quality of life in the subject with premature canities and non-premature canities based on gender preference was most prevalent in female gender (53.0%). While good quality of life found in men (54.5%). Based on statistical chi-square test, there was no significant correlation between quality of life and gender in subject with premature canities and non-premature canities with p-value 0.199 (p > 0.05).

Correlation between quality of life with education level in premature canities and non-premature canities was obtained, subjects with good quality of life were found in subjects with high school

education level (54.5%). While the majority of poor quality of life is found on subjects with higher education level (56.7%). Based on statistical chi-square test, there was no significant correlation between quality of life with education level in subject with premature canities and non-premature canities with p-value 0.097 (p > 0.05).

Quality of life based on duration experiencing premature canities found that the majority of subjects have a good quality of life is subject to duration experiencing premature canities less than 5 years (23.8%). While subjects with the poor quality of life were found in subjects with long duration experiencing premature canities more than 10 years (100.0%). The total number of subjects with premature canities at most had poor quality of life when associated with duration experiencing premature canities (81.0%). These findings suggest that subjects with premature canities with prolonged duration experiencing from premature canities more than 10 years have a worse quality of life compared to subjects with a shorter duration of suffering or less than 5 years. Based on statistical chi-square test, there was no significant correlation between quality of life and duration suffering on the subject with premature canities with p-value 0.117 (p > 0.05).

Another study by Deepasheree et al. shows a different result, the average duration of subjects experiencing premature canities is more than 10 years.¹⁷ In another study by Chakrabarty et al. also revealed long-term premature canities associated with the quality of life of subjects where subjects with prolonged premature canities more than 5 years had a lower quality of life compared to a duration of fewer than 5 years.²²

The quality of life associated with the severity degree of premature canities found subjects with severe degrees canities had the worst quality of life (80.0%). This suggests that out of a total of 63 subjects with premature canities, the majority had poor quality of life when associated with the degree of premature canities where the greater severity degree of premature canities showed worse quality of life compared with mild degree premature canities. However, no statistically significant correlation between quality of life and degree of severity in the subject with premature canities with p-value 1.000 (p > 0.05).

CONCLUSION

There is a significant association between premature canities and quality of life, but there is no association between age, sex and severity degree of premature canities with the quality of life. The

results of the study are expected to contribute improving the strategy through multidimensional approach includes physical, psychological and psychosocial aspects to improve the quality of life of subjects with premature canities.

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CONFLICT OF INTEREST

The authors have no conflicts of interest.

REFERENCES

- Mistry S, Gosh JR, Bandyopadhyay AR. Histomorphological and Quantitative Characteristics of Black and Gray Human Scalp Hair. *Journal of Life Science*. 2010;2(1):49-52.
- Trüeb RM. Pharmacologic interventions in aging hair. *Clinical Interventions in Aging*. 2006;2:121-9.
- McDonough PH, Schwartz RA. Premature Hair Graying. *Pediatric Dermatology*. 2012;89:161-5.
- Trüeb RM. Oxidative stress in aging of hair. *Int J Trichol*. 2009;1:6-14.
- Pandhi D, Khanna D. Premature graying of hair. *Indian J Dermatol Venereol Leprol* 2013;79:641-53.
- Trüeb RM. Aging of hair. *Journal of Cosmetic Dermatology*. 2005;(4):60-72.
- Tobin DJ. Human hair pigmentation-biological aspects. *International Journal of Cosmetic Science*. 2008;30:233-57.
- Slominski A, et.al. Hair Follicle Pigmentation. *J Invest Dermatol*. 2005;124(1):13-21.
- Praharsini IGAA. Kelainan warna rambut. Dalam: Wasitaatmadja SM, Prakoeswa CRS, Sukanto H, Martodihardjo S, editor. "Everything About Hair". Jakarta:Badan Penerbit FKUI; 2014:1-100.
- Wasitaatmadja SM. Penuaan rambut. Dalam: Wasitaatmadja SM, Prakoeswa CRS, Sukanto H, Martodihardjo S, editor. "Everything About Hair". Jakarta:Badan Penerbit FKUI; 2014:205-12.
- Toruan TL, Thaha MA. Struktur Rambut. Dalam: Wasitaatmadja SM, Prakoeswa CRS, Sukanto H, Martodihardjo S, editor. "Everything About Hair". Jakarta:Badan Penerbit FKUI; 2014:1-9.
- Sonthalia S, Sarkar R. Premature graying of hair: The voids and tiffs. *Pigment International*. 2015;2:73-5.
- Eva M, Peters J, Imfeld D, Graub R. Graying of the human hair follicle. *Journal of Cosmetic Science*. 2011;62:121-5.
- Ahmed A, Leon A, Daniel C, Butler BS, Reichenberg J. Quality of Life Effects of Common Dermatological Diseases. *Frontline Medical Communications*. 2013:101-9.
- Barankin B, DeKoven J. Psychosocial effect of common skin diseases. *Canadian Family Physician*. 2002;48:712-6.
- Michele K, Marilou BS. *The Body-Image Questionnaire (BIQ): An Extension*. Department Of Psychology, University of Bordeaux 2, France. *Perceptual and Motor Skills*. 2002;94:189-96.
- Deepashree D, Aschana S. Profile of Indian patients With Premature Canities. *Indian Journal Of Dermatology Venereology and Leprology*. 2016;8(2):169-72.
- Hyoseung S, Hyeong HS. Association of premature hair graying with family history, smoking, and obesity: A cross-sectional study. *J Am Acad Dermatol*. 2015;1(3):321-7.
- Bhat RM, Rashmi S. Epidemiological and Investigative Study of Premature Graying of Hair in Higher Secondary and Pre-University School Children. *International Journal Of Technology*. 2013;5(1):17-21.
- Jin Jo S, et.al. Hair Graying Pattern Depends on Gender, Onset Age, and Smoking Habits. *Journal Compilation Dermato-Venereologica*. 2012:160-1.
- Aggarwal A, Srivastava S. Premature graying of hair an independent risk marker for coronary artery disease in smokers: a retrospective case control study. 2015;5:123-8.
- Chakrabarty S, Krishnappa P. Factors Associated with Premature Hair Graying in a Young Indian Population. 2016;8(1):11-4. doi:10.4103/0974-7753.179384.



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