

EVALUATION OF THE CORRELATION BETWEEN CANITIES AND T₃ LEVEL, AND AGE IN FEMALE SUBJECTS

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Background

Canities is the graying of hair. It is usually hereditary and a most dramatic change in hair, which finally ends as white hair. The pathogenesis is not yet clear though several hypotheses have been suggested. This study was aimed at establishing the relationship of canities with triiodothyronine (T₃) level and age in female subjects. Eighty-eight (88) apparently healthy subjects aged eighteen (18) and above were used. Triiodothyronine level was determined using Enzyme Linked immunoabsorbent Assay (ELISA) as modified by Accubind ELISA microwellmonobindInc, lake Forest, CA 92630, USA. Data analysis were done using Fisher exact test, ANOVA, chi-square test and linear correlation coefficient by using SP statistical software 15.0 for windows 7 (SPSS Inc., Chicago, IL USA). Comparison of both Mean \pm SD of subjects with canities and without canities revealed a statistically significant difference between canities and T₃ level ($p = 1.79E - 09$). There was a positive significant correlation between canities and T₃ level ($r = 0.59$). Also comparison the five groups according to those with canities and those without canities revealed that there was a statistically significant difference between age and having canities ($p = 6.45E - 11$).

Introduction

Hair is a complex structure of keratinized epithelial cells and acts as the most effective protector of scalp especially from sunlight. Its appearance gives clue to the race, ethnicity, and gender of the person. Significant change in pigmentation of hair occur in humans during their life time from birth to young adulthood, middle age, and beyond resulting in graying (canities) and finally white hair. Canities is a physiological phenomenon and conspicuous sign of aging occurring equally in both sexes. It occurs due to an admixture of normally pigmented, hypomelanotic, and amelanotic melanosomes, (Sehrawat *et al.*, 2017). Temporal area is involved in males first while in females, it is the frontal area. With respect to age, parietal and occipital areas are involved in persons of young age and frontal area in late onset individuals. Research has shown that 50% of the people have 50% gray hair by the age of 50. Premature graying refers to graying that occurs before the age of 20, 25, 30, and 40 years in Caucasians, Asians, Africans, and Bantus respectively, (Sehrawat *et al.*, 2017; Rehab & Mahdi 2019). The pathogenesis of premature canities remains incompletely understood but the alteration in pH and cysteine levels in melanosomes, the role of trace metal ions, vitamin B₁₂ and folic acid, vitamin D₃, and oxidative stress have been suggested to be involved.

Mittal, Kaur & Vishwakarma (2014) and Ashraf *et al.*, (2017) observed a significant association between premature canities and quality of life and a no significant association between age and sex. But Jo *et al.*, (2019) observed that hair graying pattern depends on gender, age of onset, and smoking habits. The thyroid gland plays an important role in the readjustment of the hormonal milieu that occurs with aging. It produces Triiodothyronine (T_3) and thyroxine (T_4). Almost all of the T_3 and T_4 found in the blood are bound to protein. T_3 is the active hormone in peripheral cells, while T_4 is a prohormone, [Economidou *et al.*, (2011); Wajner & Maia. (2012)]. Changes in thyroid hormone production, metabolism and action occur during the aging processes. Sheikhet *et al.*, (2016) strongly associated hypothyroidism with premature canities while Daulatabad *et al.*, (2016) in their studies reported no association with thyroid abnormality. But Rehab & Mahdi (2019) in their study observed that 1.1% of subjects with premature canities studied have thyroid disease. Severe iron deficiency and copper deficiency have also been associated with premature canities, (Dawber & Gummer, 1997). Additional causes include ingestion of certain drugs, like chloroquine, dixyrazine, mephenesin, phenylthiourea, triparanol, fluorobutyrophenone, imatinib (an epidermal growth factor receptor inhibitor) and interferon-alpha, as well as the use of certain chemicals (medicated oils) and topically applied agents like dithranol, prostaglandin F₂ alpha analogue, and chrysarobin [Trüeb, (2009); Balagula *et al.*, (2011); Pandhi & Khanna, (2013)].

The continuous research to understand the pathogenesis of premature canities stimulated the desire to study the correlation of canities with T_3 level, and age.

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Method

Eighty-eight (88) apparently healthy females aged 18 and above were used for the study. To determine the correlation with T₃ level, forty-three (43) were the test group made of females with canities while forty- five (45) were the control group made up of females without canities. While to study the relationship with age the subjects were grouped into five groups, groups A, B, C, D, and E, representing age groups, 18-27, 28-37, 38-47, 48-57, and 58 and above respectively.

Blood samples were collected using standard procedure into plain dry vacutainer test tube and allowed to clot at room temperature, spun and serum separated into another plain dry sample container and stored frozen at -25^oc until analysed for T₃ level. Analysis was done using Enzyme Linked immunoabsorbent Assay (ELISA) as modified by Accubind ELISA microwellmonobindInc, lake Forest, CA 92630, USA. All absorbance were read within 30minutes. Statistical presentation and analyses of the study were conducted using the mean \pm standard deviation, Fisher exact test, ANOVA, chi-square test and linear correlation coefficient by using SP statistical software 15.0 for windows 7 (SPSS Inc., Chicago, IL USA). Probability values ($p < 0.05$) was considered for statistical significance.

Result

Table 1.

The correlation between canities and T₃ level.

	Mean \pm SD	f- cal	p-value	f-critical	r-value
With canities	0.48 \pm 0.50	45.31	1.79E – 09	3.95	0.59
Without canities	1.16 \pm 0.45				

From the study Mean \pm SD of subjects with canities was 0.48 \pm 0.50. Also the Mean \pm SD of subjects without canities were 1.16 \pm 0.45. Comparing both Mean \pm SD of subjects with canities and without canities revealed a statistically significant difference between canities and T₃ level ($p = 1.79E – 09$). There was a positive significant correlation between canities and T₃ level ($r = 0.59$).

Table 2.

Distribution of the subjects according to age groups and presence of canities.

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Group	Age range(years)	Subjects with canities (%)	Subjects without canities (%)	X ²	p- value	R
A	18 – 27	0 (0)	16 (100)	24.463	0.000	9.49
B	28 – 37	0 (0)	15 (100)			
C	38 – 47	8 (50)	8 (50)			
D	48 – 57	18 (75)	6 (25)			
E	≥ 58	17 (100)	0 (0)			
Total		43 (48.86)	45 (51.14)			

Among the subjects there were 43 (48.86%) with canities and 45 (51.14%) without canities. Sixteen subjects (18.18%) were in the age range of 18 – 27 years and none had canities; fifteen subjects (17.05%) were in the age range of 28 – 37 years and also non had canities. In the age range of 38 – 47 years, there were sixteen subjects (18.18%) in which eight were with canities while the remaining eight were without canities. For the age range from 48 – 57 years, with 24 (27.27%) subjects, six were without canities while eighteen had canities. Finally, for the subjects 58 years and above, we had 17 (19.32%) subjects and all of them had canities. Comparing the five groups according to those with canities and those without canities revealed that there was a statistically significant difference between age and having canities ($p = 6.45E - 11$).

The positive significant correlation seem to be in line with the observation made by Sheikhet *al.*, (2016) who strongly associated hypothyroidism with premature canities unlike Rehab and Mahdi, (2019) and Daulatabad *et al.*, (2016). While Daulatabad *et al.*, (2016) observed no association of any thyroid abnormality in all their subjects with premature canities, Rehab and Mahdi (2019) recorded only 1.1% of subjects with premature canities and thyroid disorder. The positive correlation in this study may not be unconnected with the role of free radicals on the function/role of the deiodinases 3 (DIO3) in the conversion of T₄ to T₃ as well as a cause of premature canities, (Arcket *al.*, 2006; & Fraczek-Jucha *et al.*, 2019).

That none in the first group had canities may be said to agree with the assertion that premature canities usually do not occur in Africans below 30 years, (Rehab & Mahdi, 2019). The increasing number of canities among subjects within the groups as age increase is also in tandem with views of some researchers that canities is age dependent, (Sehrawat *et al.*, 2017). Overt hypothyroidism has been stated to increase in elderly and approximates to 5% in those older than 60 years. Observation of increase in prevalence of hypothyroidism with age was also made by Helfand, (2004)

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