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Sex Differences in Skin Colour in Man

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SUMMARY

Skin reflectances were obtained at 685 mμ wave length from the medial upper arm and the forehead regions among 105 Tibetan males and 105 Tibetan females, in order to study sex differences in human skin pigmentation. The forehead pigmentation of males was always found to be darker than that of females, and the difference to be significant during middle and late adolescence The medial upper arm pigmentation of girls was found to be darker than that of boys, during early adolescence; but during middle adolescence the two sexes exhibited just similar pigmentation and during late adolescence females emerged to be significantly lighter than males. The present study, thus, suggests that one of the factors causing sex differences in human skin pigmentation may be the physiological changes occurring during adolescence, which may be genetically determined.

Introduction

Differences in human skin colour are chiefly due to the variations in the amount of melanin in skin (Edwards and Duntley, 1939). One of the most recent methods for the measurement of the melanin pigmentation of skin is the spectrophotometric technique explored by Sheard et al (1926) and Edwards and Duntly (1939). Weiner in 1951 introduced the use of an easy portable spectrophotometer (EEL[1] spectrophotometer) in the anthropological studies on skin pigmentation. It was later shown by Harrison (1957/58) that the percentage reflectance at 685 mμ wave length (employed in the EEL spectrophotometer) bears a reciprocal relationship with the amount of melanin in skin. Thus, the various anthropological problems regarding the human skin pigmentation can best be solved using the spectrophotometric technique. Sex differences in human skin colour is one of the very interesting problems posed before us. In the present paper we have attempted to present some of our observations on this problem.

Material and Methods

Percentage skin reflectances at 685 mμ wave length were obtained from the medial upper arm site (Harrison and Owen, 1964) and the forehead site (Lasker, 1954*a*, 1954*b*; Das and Mukherjee, 1963; Walsh, 1963) among 105 Tibetan males and 105 Tibetan females in

[1] Evan's Electroselenium Ltd., London.

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the respective adolescent ages (i.e., 12-18 years in males and 10-16 years in females). The present Tibetan samples were drawn from the hostelers of the Tibetan Refugee school, Happy Valley, Mussoorie. These Tibetans have been residing at Mussoorie since last 6 to 7 years and the subjects in the respective sexes may be easily envisaged to be exposed to similar environmental conditions influencing skin pigmentation (i.e., outdoor/indoor activities and the uniforms that protect the skin from sun tanning), especially because of the strict rules and regulations of the hostels and the school. Evidently, within each sex, the fluctuations in skin pigmentation, due to differential solar exposure, may be assumed to be very little.

Results and Discussion

The male and the female Tibetan samples have been presently classified into three age groups; namely: (1) early adolescence (12-14 years in males and 10-12 years in females); (2) middle adolescence (14-16 years in males and 12-14 years in females), and (3) late adolescence (16-18 years in males and 14-16 years in females). The value of the percentage skin reflectances at 685 mμ wave length from medial upper arm and forehead sites, respectively, and their standard errors, have been computed for the males and the females in the respective age groups, and the values are set out in Tab. I.

It may be seen from Tab. I that while in early adolescence the medial upper

Tab. I. Mean percentage reflectances at 685 mμ wave length (i.e., R 685 mμ) and the standard errors for the medial upper arm and the forehead regions among the Tibetan males and females

Age	Sex	N.	Medial upper arm		Forehead	
			Mean R 685 mμ	S. E.	Mean R 685 mμ	S. E.
Early adolescence						
(12-14 yrs)	♂	45	54.7	0.47	49.4	0.46
(10-12 yrs)	♀	45	54.0	0.58	50.7	0.50
Middle adolescence						
(14-16 yrs)	♂	45	54.8	0.41	49.3	0.62
(12-14 yrs)	♀	45	54.8	0.50	50.9	0.46
Late adolescence						
(16-18 yrs)	♂	45	53.9	0.47	49.2	0.78
(14-16 yrs)	♀	45	55.8	0.42	52.2	0.46

arm skin of females is darker than that of males, during middle adolescence both males and females show just similar medial upper arm pigmentation, and during late adolescence, the medial upper arm skin of females emerges to be much lighter than that of males. Moreover, while the differences in the medial upper arm pigmentation between the two sexes were found to be statistically not significant (at 5%

probability level) in the early adolescence and the middle adolescence respectively, the medial upper arm skin of females at late adolescence emerged to be significantly lighter (or less pigmented) than males. The reason of this is obviously the gradual loss of the skin pigmentation by females and a sudden increase in skin pigmentation during late adolescence among males.

The medial upper arm skin may be thought to be least affected by the difference in degree of exposure to sun between the two sexes because it invariably remains unexposed to sun throughout the year in both sexes. This is because of the temperate climate of Mussoorie. Thus the differences observed in the medial upper arm pigmentation between Tibetan males and females from early adolescence to late adolescence vis-à-vis middle adolescence may be more sex oriented than environmentally designed.

The forehead pigmentation whose intersex differences may be, in part, due to differential sun tanning, is always found to be less pigmented in females than in males. Moreover, the difference in forehead pigmentation between the two sexes is found to increase with the increase in age. While this intersex difference in forehead pigmentation was found to be statistically not significant during early adolescence, it was found to be significant during both middle and late adolescence. While this difference may be partly due to the males having more outdoor activities and thus becoming more exposed to sun tanning than the females, it may also be, in part, due to the females becoming progressively lighter during adolescence. But it is difficult to assess any distinct sex difference in skin tanning as envisaged by Tobias (1961).

On reviewing the literature we find considerable variations in sex differences of human skin pigmentation. Lasker (1954*a*), working on Mexican Parachoan, found that significant sex differences exist in the percentage reflectance of 650 mμ wave length only at the forehead region, with males being darker than the females. He didn't find any significant sex differences in the medial upper arm pigmentation. Barnicot (1958) also observed that Yoruba males were significantly darker than females at the medial forearm site; but Tobias (1961) found no significant differences in the skin pigmentation of Bushman males and females, though he too observed females tending to be lighter than the males. However, Harrison and Salzano (1966) found that Caingang males were significantly darker than females even at the medial upper arm site; but as contrast to the Tibetans, the Caingang females typically wear long sleeved dresses while the males don't and thus the so observed significant sex difference in the medial upper arm pigmentation of the Caingang may be to some extent of environmental origin.

In the present study we have found that only in early adolescence females are darker (but not significantly) than males; but Lequebe (1961) working on large samples of Belgian students found that the male arm skin was significantly lighter than the female one.

From all these different findings it is presently difficult to ascertain any single

genetical factor operating in causing the sex differences in human skin pigmentation. However, from our observations it may be suggested that one of the factors causing sex differences in human skin pigmentation may be the physiological changes occurring during adolescence, which may be genetically determined.

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Riassunto

In un campione tibetano di 105 maschi e 105 femmine, sono stati rilevati (ad una lunghezza d'onda di 685 mμ) i riflessi cutanei sulla faccia mediale del braccio e sulla fronte allo scopo di valutare le eventuali differenze sessuali di pigmentazione. La pigmentazione della fronte è risultata sempre più scura nei maschi, con una differenza significativa nell'adolescenza avanzata. La pigmentazione del braccio è risultata più scura nelle femmine, nella prima adolescenza, ma leggermente più scura nei maschi nella tarda adolescenza. Fra i fattori responsabili delle differenze sessuali di pigmentazione potrebbero dunque rientrare i cambiamenti fisiologici dell'adolescenza, che sono geneticamente determinati.

Résumé

Chez un échantillon tibétain de 105 garçons et 105 jeunes filles, les reflets de la peau ont été mesurés (à une longueur d'onde de 685 mμ) sur le bras et sur le front, dans le but d'évaluer les différences de pigmentation entre les deux sexes. La pigmentation du front est plus significative dans l'adoléscence avancée. La pigmentation du bras est plus sombre chez les jeunes filles dans la première adoléscence et chez les garçons dans l'adoléscence avancée. Les changements physiologiques de l'adoléscence, déterminés génétiquement, pourraient donc être responsables de ces différences de pigmentation entre les sexes.

ZUSAMMENFASSUNG

An einem Muster von 105 männl. und 105 weibl. Tibetanern wurden, um die evtl. Geschlechtsunterschiede in der Pigmentierung festzustellen, die Hautreflexe (bei einer Wellenlänge von 685 mμ) an der Medialseite des Arms und an der Stirn gemessen. Dabei war die Pigmentierung auf der Stirn immer dunkler bei den männl. Probanden, besonders in der späteren Adoleszenz. Die Pigmentierung am Arm war in der frühen Adoleszenz dunkler bei den Mädchen, in der späteren Adoleszenz hingegen bei den jungen Männern. Es ist daher möglich, das die Geschlechtsunterschiede in der Pigmentierung durch die erbbedingten physiologischen Veränderungen der Adoleszenz zu erklären sind.

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