# Eyebrow colour in diabetics

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ABSTRACT

**Background.** Hair colour may be affected by a metabolic disease. Systematic investigations in diabetics are missing.
**Objective.** A clinical study was performed to evaluate whether dark colour of eyebrows in greying males is associated with diabetes or not.
**Setting.** Academic teaching hospital, inpatient and outpatient department.
**Methods.** In an uncontrolled analysis two groups of male patients between 50 to 70 years of age were investigated for evidence of diabetes mellitus. Inclusion criteria were original scalp hair colour brown to black with more than 50% greying hair, no chemotherapy, hormone (except insulin) or interferon treatment, current or previous, no artificial colouring of hair, and absence of total alopecia. Group A consisted of 50 males with dark eyebrow colour, group B of 50 males with greying of eyebrows. A careful medical history and clinical examination was performed. In patients without known diabetes, blood sugar levels (profile during the day) and HbA1c were evaluated.
**Results.** In group A 38 of 50 patients (76 %) were diabetics type II. The mean duration of diabetes was 3.4 years (SD 6.8 years; range 1year to 31 years). Six patients were diagnosed as having diabetes for the first time. In group B 9 of 50 patients (18%) were diabetics, two of type I and 7 of type II. One patient with a newly detected diabetes type II was seen. The mean duration of diabetes was 4.1 years (SD 7.6 years; range: 1 year to 39 years). The difference in diabetes frequency is statistically highly significant (two-sided t-test: $p<0.0001$). Odds ratios (OR) for diabetes are higher in greying males with dark eyebrows (OR 3.17) vs. those with greying eyebrows and scalp hair (OR 0.19) in this age group.
**Conclusions.** In male diabetics at the age of 50 years or more greying of the eyebrows seems to be inhibited or delayed. The presence of dark eyebrows with greying scalp hair in males might be a clinical sign for patients at risk of diabetes type II.

KEY WORDS

**diabetes, patients, eyebrow colour, prayer's sign**

Diabetes is one of the most common metabolic disorders in the Western world. Skin manifestations are a hallmark of the disease in both type I and type II diabetes. They include non-infectious dermatoses like granuloma annulare, necrobiosis lipoidica, acanthosis nigricans, lipoid proteinosis or Morbus Kyrle, just to mention a few. Adverse effects of treatment, infectious disease, ulcerations and wound healing may also contribute to

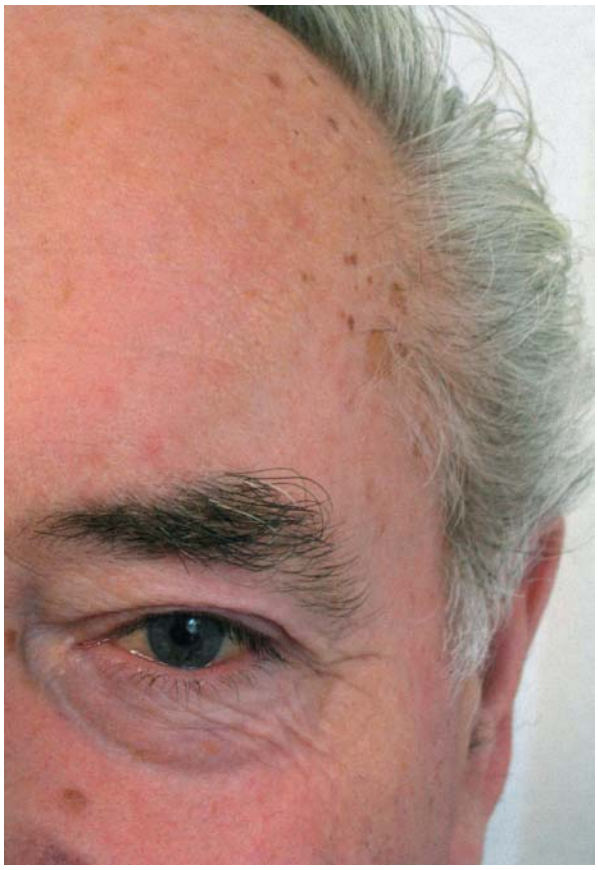

**Figure 1a. Dark eyebrows and greying scalp hair in a 64-year old diabetic male patient.**

the appearance of the skin (1,2). Nail disorders mainly due to mycotic or bacterial infections are a common problem whereas the hair has not been the subject of comparable interest (3,4). Hair glycosylation as measured by the thiobarbituric acid reaction is significantly higher in diabetics than controls irrespective of sex, age or hair colour (5).

Hair colour can be affected by metabolic diseases such as iron-deficient anaemia, oculocutaneous albinism and phenylketonuria, or premature ageing triggered by RecQ helicase-deficiency syndromes, like Werner's or Rothmund-Thomson's syndrome (6). Premature greying of the hair was thought to be a coronary risk factor in males under the age of 50 years but not related to diabetes (7,8).

## *Patients and methods*

The study sample consisted of 100 male patients treated at the dermatology department of an academic teaching hospital for skin problems and aged between 50 and 70 years. Both inpatients and outpatients were included without any preselection after being admitted to the hospital.

The inclusion criteria were Fitzpatrick skin types II and III, original scalp hair colour brown to black, with more than 50% greying hair, no chemotherapy, hormone (except insulin) or interferon treatment – current or previous, no artificial colouring of hair, and absence of total alopecia. Group A consisted of 50 males with dark eyebrow colour, group B of 50 males with greying of the eyebrows. The mean age of group A was 58.2 years (SD 5.3 years, range: 50 to 68 years). The mean age of group B was 56.2 years (SD 6.3 years, range: 50 to 68 years).

A careful medical history and clinical examination was performed. In patients without known diabetes, blood sugar levels (profile during the day) and HbA1c were evaluated. If these parameters were above nor-

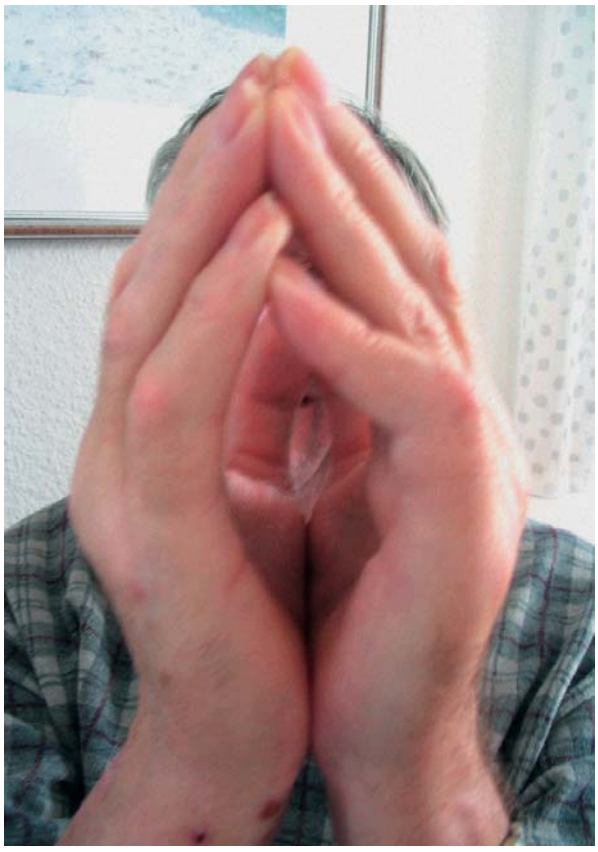

**Figure 1b. Prayer's sign in the same patient.**

mal, a clinical endocrinologist was consulted for confirmation of diagnosis.

## Statistics

A two-sided t-test was performed (SPSS 11.5 software). A p value of less than or equal to 0.5 was considered to be statistically significant.

## Results

In group A 38 of 50 patients (76 %) were diabetics, all of type II. The mean duration of diabetes was 3.4 years (SD 6.8 years; range 1 to 31 years). Six patients were diagnosed as having diabetes for the first time. All of these had a type II disease. Twelve patients had also a positive family history for diabetes.

In group B 9 of 50 patients (18%) were diabetics, one of type I and 8 of type II. The mean duration of diabetes was 4.1 years (SD 7.6 years; range: 1 to 39 years). One patient with a newly detected diabetes type II was seen. Seven patients (two without diabetes) had a family history for diabetes.

The difference in diabetes frequency, for both total number and type II diabetes, is statistically highly significant (two-sided t-test: $p<0.0001$). The odds ratio for diabetes type II in greying male patients with dark eyebrows was 3.17 vs. 0.19 in patients with both greying scalp and eyebrows.

Figure 1 shows a typical finding of dark eyebrows in association with greying scalp hair in a diabetic patient. There were other dermatologic findings associated with diabetes. The details are listed in table 1. None of these dermatoses showed a significant association with dark eyebrows.

Table 1. Dermatologic findings in both groups of diabetic patients (group A with dark eyebrows; group B without dark eyebrows).

| Dermatologic findings | Frequency | |
|---|---|---|
| | Group A | Group B |
| Necrobiosis lipoidica | 3/50 | 4/50 |
| Intertrigo | 8/50 | 8/50 |
| Tinea pedum or corporis | 14/50 | 16/50 |
| Onychomycosis | 19/50 | 21/50 |
| Scleromyxedema | 1/50 | 0/50 |
| Prayer's sign | 3/50 | 2/50 |
| Diabetic foot ulcers | 2/50 | 5/50 |

## Discussion

In humans, the literature on hair changes in diabetes is very sparse (4). In this clinical analysis we observed a higher frequency of diabetes in greying males aged 50 to 70 years with dark eyebrows compared to those with greying of the eyebrows.

Hair colour is controlled by tightly coordinated programs of melanin synthesis and involves signalling through the MC-1 receptor. Binding of alpha-MSH to the MC-1 receptor results in production of eumelanin. In mice, the ligation of MC-1 receptor by agouti signalling leads to synthesis of pheomelanin. In humans, carriage of the G allele of the agouti signalling protein is significantly associated with dark hair and brown eyes (9).

In transgenic mice, expression of the agouti gene causes features of diabetes type II and yellow fur probably due to the intracerebral interference of agouti protein with the alpha-melanocyte-stimulating hormone (alpha-MSH) at the melanocortin receptor MC-4, involved in neuroendocrine and sympathetic control (10). The agouti protein is expressed in hair follicle fibroblasts and keratinocytes. Bone morphogenetic protein-4 (BMP-4) has been identified as a stimulator of the expression of agouti transcripts and protein. Interaction between the BMP-4 and the MC-1 receptor is involved in the modulation of the balance between eumelanogenesis and pheomelenogenesis during hair growth (11,12).

Physiological greying of hair develops mostly during the 4$^{th}$ decade of life in caucasians. Up to the 50$^{th}$ year of age half of the population shows at least 50% of grey scalp hair (13). The process of greying is caused by ultrastructural changes of hair matrix, loss of tyrosinase activity and disturbance of melanosome melanization. Melanocytes however are still present within the hair follicle but decreased in number. If grey hair turns white there has been a complete loss of melanocytes (14,15). According to Commo both the bulb and the outer hair root sheath are affected (16). In addition the involvement of oxygen free radicals in greying has been assumed (17).

In humans diabetes is not associated with a certain hair colour. From the present clinical findings, however, diabetes seems to be associated with a delay or inhibition of greying in eyebrow hair follicles. The mechanism remains to be elucidated. The finding itself might be of some clinical relevance in the identification of patients at risk for diabetes.

The **prayer sign** indicates the presence of the diabetic stiff joint syndrome. The patient is unable to approximate the palmar surfaces of the digits, despite maximal effort (18,19,20).

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