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Original Article

Factors determining the occurrence of hyperglycemia in women practicing voluntary depigmentation in four hospitals in Yaoundé, Cameroon

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ABSTRACT

Background: Voluntary depigmentation (VD) is a cosmetic practice with potentially local and systemic complications such as hyperglycemia. The aim of this study was to find determinants of hyperglycemia in women who practices VD. **Methodology:** we carried out a retrospective cohort study with from February to August 2020 in four hospitals in Yaoundé, Cameroon. This study included two groups of women: one made up of women who practices VD (exposed group) and the other of women who does not practices VD (group of "unexposed"). Data were collected on CSPro 7.4 software and analyzed on SPSS 25 software. The association between hyperglycemia and VD was measured using Chi-square test. **Results:** We recruited 181 women: 60 exposed and 121 unexposed. Prevalence of hyperglycemia in the exposed group was 43.3% versus 27.3% in the unexposed group. After logistic regression, the relative risk was significantly higher (RR=5.7; 95% CI: 2.04-15.60) in women practicing DV (p=0.001). The second determinant significantly associated with hyperglycemia was the presence of metabolic syndrome (RR=16.5; 95% CI: 4.82-56.04; p<0.001). **Conclusion:** VD is a risk factor for the occurrence of hyperglycemia in our context.

Key words: Voluntary depigmentation; Hyperglycemia; Diabetes; Cameroon

INTRODUCTION

Voluntary depigmentation (VD) is a process aimed at obtaining a lightening of the skin for cosmetic purposes [1]. It is an old and widespread practice in black African countries, which is also observed in genetically pigmented populations, living in Europe, especially in France, and in United States [2-5]. this phenomenon is called differently depending on the country; it is called "xeesal" in Senegal, "tcha tcho" in Mali, "kwanza" in Gabon or "ndjansang" in Cameroon. It is a practice with real dangers [6-8]. In some countries, light skin is the ideal of beauty; VD offers a relatively quick and inexpensive solution, with, however, underestimated complications [9-11].

Although unknown, systemic complications can appear, depending on the nature and duration of usage of products [7]. Among systemic complications we have hypertension, obesity, diabetes, adrenal insufficiency, hypercorticism, neurological disorders and nephropathy etc. [6,7,12-15]. In sub-Saharan Africa, researchers have been interested on the systemic complications of VD. Thus, in 2005, Raynaud et al. demonstrated in a population of 147 women living in Dakar that VD significantly increased the risk of onset of diabetes

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[16]. In Togo in 2015, in a case-control survey involving 450 participants, Akakpo et al. demonstrated that high blood pressure, obesity and hyperglycemia were the classical complications found [15].

In Cameroon, few studies have been done on this topic. However, data exist on various epidemiological and clinical aspects of VD. In a study conducted in 2003, Sobngwi et al. highlighted the dangers of VD on adrenal function, and it has been clearly established that prolonged use of topical steroids can lead to adrenal insufficiency and diabetes mellitus [17].

In the light of previous studies and observations, with regard to the Cameroonian context two major problems can be individualized: the first is to know if there is a correlation between VD and hyperglycemia, and the second is to know what are determinants of hyperglycemia in depigmented women. Thus, this study aimed to explore the relation between VD and hyperglycemia, and highlight the contributing factors.

MATERIALS AND METHODS

Design and location of the study

We conducted a retrospective cohort study. Data collection was carried out between February and August 2020 in four hospitals in Yaoundé; Cameroon: General Hospital of Yaoundé, University Teaching Hospital of Yaoundé, Gynecological and Obstetrics Hospital of Yaoundé and Elig-Essono District Medical Center. These hospitals were chosen by convenience based on the availability of an experienced dermatologist.

Study population and criteria of selection

We included adult women aged at least 18 years received in the above-mentioned hospitals, who voluntarily agreeing to take part to the study and whose capillary blood glucose level was below 100 mg/dL before.

We excluded: (i)- any woman presenting with any affection or condition that could lead to hyperglycemia, prior to exposure (Cushing›s syndrome, medical corticosteroid therapy, antiretroviral treatment), (ii)- any pregnant women.

We formed two groups of women: one made up of women practicing VD (exposed group) and the other of women not practicing VD (unexposed group).

Sampling

Our sampling was non-probabilistic.

The minimum sample size was 81 women divided into 27 exposed and 54 unexposed, obtained from Schlesselman's formula [18]:

We used data collected by Bigna et al. [19], to determine p1, which represented the combined prevalence of diabetes and prediabetes in the general adult population.

Digital Application:
- Confidence interval: 95%
- Power: 90%
- Ratio of unexposed to exposed: 2
- Percentage of non-exposed with results: 12.9%

Procedure

Data were collected from patients present at the study sites using a pre-established and pre-tested questionnaire. We collected their socio-demographic characteristics (age, religion, profession, marital status), their clinical characteristics (antecedents, weight, height, blood pressure, fasting capillary glycemia). Among the exposed group, we collected data on exposure (type of product, nature of active ingredient, frequency and duration of use). The glycemia considered was the fasting glycemia; fasting referred to the absence of caloric intake dating back more than 8 hours [20]. Blood glucose was taken after careful disinfection of the patient's hands. A lancing device was used to take a drop of blood from the patient's finger. The drop of blood was put on the reading head of the glucometer strip and the result appeared after a few seconds. Blood glucose was given in milligrams per deciliter. We considered hyperglycemia for any value greater than or equal to 100 mg/dL [20].

Statistical analysis

Sociodemographic data, history, clinical data and capillary fasting blood glucose were collected on CS Pro 7.4 software and analyzed on SPSS 25 software. Association between hyperglycemia and VD was measured using the Chi test -square. Relative risk and its 95% confidence interval (95% CI) were used to investigate, if any, the strength of association between VD and hyperglycemia, as well as risk factors for hyperglycemia in women practicing VD. We used a

logistic regression model. The statistical significance threshold was set at $p < 0.05$.

Ethics Statement

We have obtained ethical clearance from the Institutional Ethics and Research Committee of Université des Montagnes (2020/075/UdM/PR/CIE); and research authorizations were obtained from the competent authorities of the hospitals. We conducted our study in strict accordance with the fundamental principles of the Helsinki Declaration on Research Involving Persons. Aspects and procedures were fully presented to each potential participant and we included only those who voluntarily gave their consent. Patients who refused to participate did not suffer of any prejudice with regard to their medical follow-up. Fingers have been thoroughly cleaned (with soap and water) before taking the blood sugar, so as to minimize any risk of infection of the injection site. The data was kept confidential and participants received their blood glucose results immediately. Those with abnormal values were referred to the dedicated services for following up. All participants were advertised about adverse effects of VD.

RESULTS

We recruited 181 women, of whom 60 constituted our exposed group and 121 constituted our unexposed group. The age varied between 18 and 64 years, the modal class was [18-30] years (54.2%) (Table 1). The values of age, Body Mass Index (BMI) and systolic blood pressure in exposed group were lower than those of the unexposed group with, respectively, 30 ± 8.6 years; 26.2±2.7kg/m²; 120.1±14.5mmHg. Mean capillary glycaemia in the exposed group (94.9 ± 24.4 mg/dL) was higher than in the unexposed group (91.11 ± 27.2 mg/dL) (Table 2). Active ingredients used for VD were hydroquinone derivatives (48.3%), corticosteroids (28.3%), fruit acids (15%), glutathione (3.3%), caustics (3.3%) and mercury and its derivatives (1.7%) (Fig. 1). Prevalence of hyperglycemia among users of whitening products was 43.3%. The use of whitening products (RR = 5.7, 95% CI: 2.05-15.60; p = 0.001) and metabolic syndrome (RR = 16.5; 95% CI: 4.82-56.04; p < 0.001) were significantly associated with occurrence of hyperglycemia compared to the reference group (Table 3). The use of whitening products whose active ingredient was corticosteroid (p = 0.001) and a longer duration of usage (more than one year) increased the risk of occurrence of hyperglycemia (p = 0.009) (Figs. 2 and 3).

Table 1 : sociodemographic characteristics of the population

variables	Number (N)	Frequency (%)
Age (years)		
[18-30]	98	54.2
[30-45]	55	30.3
[45-64]	28	15.5
Total	181	100
Marital status		
Maried	46	25.4
Single	49	27.8
Cohabiting	76	42
widow	10	4.8
Total	181	100
Occupation		
Trader	43	23.8
Student	45	24.9
Self-employed	43	23.8
Employed	50	27.5
Total	181	100
Religion		
Christian	165	91.2
Muslim	16	8.8
Total	181	100

Table 2 : Clinical characteristic

Variables	Mean	
	Cases (N=60)	Controls (N=121)
Age (years)	30±8.6	33.8±11.5
BMI (kg/m²)	26.2±2.7	26.3±1.19
Systolic Blood Pressure (mmHg)	120.1±14.5	120.4±17.2
Diastolic Blood Pressure (mmHg)	77.2±8.6	76.7±6.1
Abdominal Circumference (cm)	83.4±11.4	83.0±10.7
Glycemia (mg/dL)	94.9±24.4	91.1±27.2

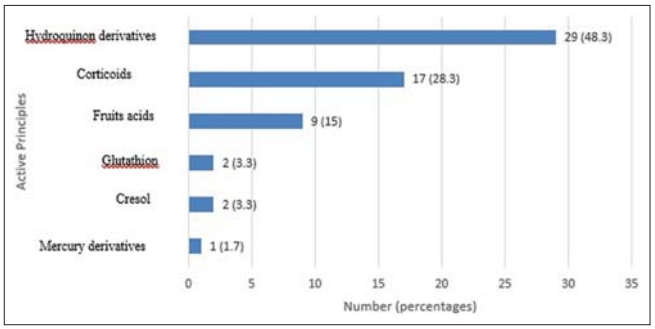

Figure 1: Active Principles used for VD.

DISCUSSION

Prevalence of hyperglycemia in our exposed group was 43.3%, which is similar to 46.3% found by Raynaud et al. among 147 Senegalese women practicing VD [16]. This high prevalence of hyperglycemia among users of lightening products could be explained by the

Table 3 : Associated factors of hyperglycemia after logistic regression

Variables	Relatif Risk RR	CI (95%)		*p* Value
Usage of whitening products	5.65	2.05	15.60	0.001
Metabolic Syndrome	16.45	4.83	56.04	<0.001
Family history of diabetis	2.08	0.80	5.35	0.130
<45 years	3.18	0.73	13.83	0.122
HBP	2.40	0.46	12.60	0.302
Underweight/Obesity	1.33	0.58	3.61	0.579
Tabagism	1.76	0.24	12.93	0.576

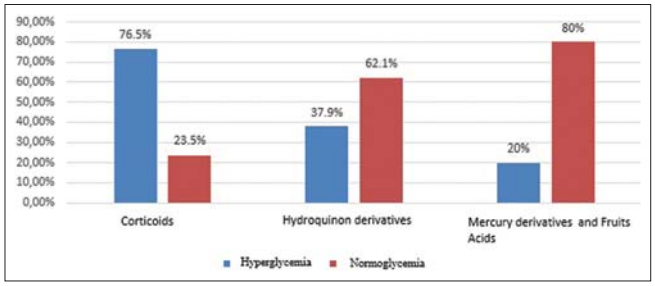

Figure 2: Repartition of hyperglycemia among exposed patient according to active principle.

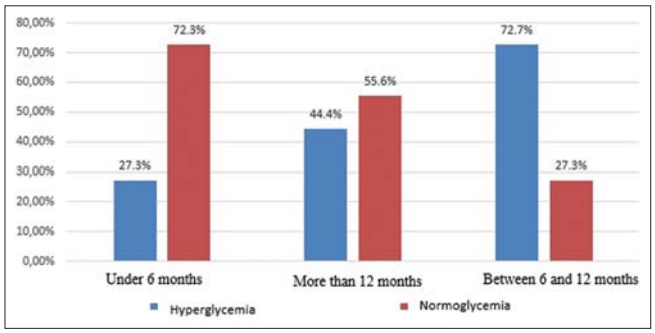

Figure 3: Repartition of hyperglycemia among exposed patient according to the duration of exposition.

high proportion of women using products containing corticosteroids (28.3%), an active ingredient which was strongly associated with hyperglycemia (76.5%). Corticosteroids are well known for their hyperglycemic effect [21,22]. Causality and power of the association between VD and occurrence of hyperglycemia were measured and evaluated. This enabled us to establish a relative risk of hyperglycemia associated to VD of 5.7 (95% CI: 2.05-15.60; p = 0.001). This result can be compared to that found in 2015 by Akakpo et al. who found a correlation between VD and hyperglycemia (OR= 1.5; 95% CI: 1.2-9.65) in a sample of 450 women whose clinical characteristics were similar to those of our sample, but whose definition of hyperglycemia (glycemia greater than or equal to 1.5 g/L) was different from ours [15]. Two hypotheses explain the association between VD and the onset of hyperglycemia. Firstly, the usage of topical corticosteroids for VD; the systemic effects of topical corticosteroids have been well described, particularly the occurrence of chronic hyperglycemia [23,24]. Corticosteroids increases hepatic gluconeogenesis and increases resistance of muscle cells to insulin [25]. Secondly, the non-mention of harmful active ingredients, in particular hydroquinone and corticosteroids on most whitening products, could induce underestimation of the number of products containing corticosteroids.

The class of corticosteroid (p = 0.001) and usage longer than one year (p = 0.009) were significantly associated with the occurrence of hyperglycemia. Whitening products made with corticosteroids were those most often associated with hyperglycemia. We found that 76.5% users of these products had hyperglycemia compared with 37.9% users of lightening products based on hydroquinone and 20% users of products containing the other active ingredients (AHA, glutathione, cresol). This is due to the fact that after prolonged application of topical corticosteroids, they are absorbed by the skin and reach the general circulation [23,24].

Various studies mentioned the harmful effect of corticosteroids, culminating in their alteration of mechanisms regulating carbohydrate metabolism, which leads irremediably to hyperglycemia [23-25]. As far as the other active ingredients are concerned, no study has clearly highlight relation between them and hyperglycemia, with regard to hydroquinone [26], AHAs [27] and glutathione [28]. In these cases, hyperglycemia can be due to factors other than the nature of the lightening product such as metabolic syndrome or the existence of an unmentioned active ingredient [29-31].

The longer a woman uses a lightening product, the more she is exposed to hyperglycemia. Proportion of women with hyperglycemia among users of lightening products increased from 27.3% for those who used products for less than 6 months, to 44.4% for those who used them between 6 and 12 months, then 72.7% for those over one year old. These results are in line with those of Phan et al., who demonstrated the association between the risk of having type 2 diabetes and usage of topical corticosteroids [23]. The potency of this combination depends on cumulative dose and cumulative duration of use [23]. The same result was found by Andersen et al. whose study showed the existence of a dose-dependent relationship between topical corticosteroids and occurrence of type 2 diabetes [24]. In this study, an increased risk of having

type 2 diabetes was found in patients whose duration of use exceeded one year, compared to those whose duration did not exceed one year.

Metabolic syndrome was significantly associated with hyperglycemia (relative risk 16.5; 95% CI: 4.82-56.04; $p < 0.001$). This could be explained by the fact that metabolic syndrome is a clinical entity whose elements, taken individually, are able to cause hyperglycemia such as abdominal obesity and high blood pressure [32,33].

Limits

Various constraints have plagued our work. Covid-19 pandemic slowed the progress of our study, which was suspended during April and May. Once recruitment resumed, we had to face the low attendance of hospitals by the targeted patients. Despite the fact that this is the first study in Cameroon interested in the relationship between VD and hyperglycemia, usage of non-probability sampling limits its representativeness. On the other hand, it was difficult to demonstrate the absence of hyperglycemia before exposure.

CONCLUSION

VD is a risky cosmetic practice. The prolonged use of topical corticosteroids accentuates the occurrence of hyperglycemia in users of lightening products in our context. Preventive measures should be undertaken to screen for glycemic disorders in people practicing VD.

Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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