



## **Prevalence and Pattern of Pigmentary Changes among Primigravidae Attending a Tertiary Health Facility in South-Western Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author FOO designed the study, performed the data collection, analyzed and wrote the first draft of the manuscript. Authors OO, OAO and ABO managed the statistical analysis and literature searches of the study. Authors AOO, MMO, OIE and OOO developed the structure, critically reviewed the analysis and contributed to the writing up of the manuscript. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Pigmentary skin changes are common presentation among pregnant women. The impact of which is very worrisome. Most of these pigmentary changes were due to increase hormonal influence such as melanocyte stimulating hormone, adrenocorticotrophic hormone, cortisol, progesterone and increased sensitivity of melanocyte at normally pigmented areas.

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**Objective:** The study was aimed at documenting the prevalence and pattern of pigmentary changes as well as providing baseline data among pregnant women in Nigeria.

**Materials and Methods:** This study was a descriptive cross-sectional study of 240 primigravidae who attended antenatal clinic of Obafemi Awolowo University Teaching Hospitals' Complex (OAUTHC), Ile-Ife, Nigeria and 240 controls who were never pregnant. The study was carried out between March, 2013 and March, 2014. Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 16.0. Data were presented in tables and statistical significance (measured as  $P < 0.05$ ) were determined using Chi square and Friedman's tests as appropriate.

**Results:** The general prevalence of pigmentary changes in pregnancy among the subjects in this study was 77.5% in first trimester, 95.8% in second and 95.4% in third trimesters while it was 17.1% in the controls. Nipple, areola, generalized hyperpigmentations and linea nigra were much higher than controls. These pigmentary changes also increased in prevalence as pregnancy advanced. There was statistically significant association between gestational age (trimester) and pigmentary changes ( $P = 0.000$ ). The prevalence of melasma increases as the pregnancy progresses from 5.0% in first trimester to 8.8% in third trimester. The relationship was found to be statistically significant ( $P = 0.000$ ).

**Conclusion:** The prevalence of pigmentary changes among pregnant women in Nigeria was found to be very high. Healthcare workers involved in obstetric care need to be well informed to enable accurate diagnosis and education of patients. The effects of pigmentary changes on quality of life may further be elucidated with further studies.

*Keywords: Pigmentary changes; primigravidae; pattern; South-Western; Nigeria.*

## 1. INTRODUCTION

Pregnancy is a physiological state and a transient period when many of the body systems such as endocrine, immune, metabolic, cardiovascular systems and the skin undergo significant changes aimed at sustaining the normal growth and development of the fetus [1]. One of the commonest skin changes in pregnancy is the pigmentary changes. This has been documented in many studies among Asian population to be more than 80% [2,3]. However, these studies were cross-sectional and were not followed up till the third trimester to see those who will develop pigmentary changes in later part of their pregnancy. Although pigmentary skin changes are physiological and are expected to reduce after delivery but not to the pre-pregnancy level, they cause significant cosmetic anxiety to the pregnant women [4,5]. Primigravidae were used in this study to reflect the actual prevalence since many of the pregnant multigravidae might not have returned to their pre-pregnancy state.

The pigmentary skin changes in pregnancy, a neglected aspect of obstetric care, have not been extensively studied in this environment. This has led to dearth of adequate information and data about the magnitude of the problem in Nigeria and Africa. Most of the studies available are from the Caucasians and Asians population. And because of differences in skin phototype,

increase number, larger and singly dispersed melanosomes, the negroid may likely present different from caucasians during pregnancy, [6] hence need to carry out this study. This work is therefore aimed at documenting the epidemiologic characteristics of these pigmentary skin changes among primigravidae attending Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Nigeria and to stimulate more research in this field.

### 1.1 Aims of the Study

1. To provide a baseline data about the pigmentary changes in pregnancy among black in this environment.
2. To document the prevalence and pattern of pigmentary skin changes among primigravidae attending antenatal clinic of Obafemi Awolowo University, Ile-Ife, Nigeria.

## 2. MATERIALS AND METHODS

This cross-sectional study was conducted at the Antenatal clinic (ANC) of the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Osun State, Nigeria. OAUTHC is a tertiary health care centre located in South-Western geopolitical zone of Nigeria. The study was carried out between March, 2013 and March, 2014.

All consecutive primigravidae attending ANC of OAUTHC who met inclusion criteria and gave informed consent were recruited into the study. The calculated minimum sample size was based on previously documented prevalence rate of 87.9% [7]. The minimum sample size of 152.4 was calculated and this was rounded up to 160. It was further increased (by half) to 240 in order to pick possible rare pigmentary changes and to correct for attrition. A total of 480 subjects comprising 240 primigravidae and 240 controls were then recruited into the study.

Quantitative data were collected from primigravidae using author administered proforma. The proforma included demographic data such as age, occupation and educational qualification. The gestational age by date (GAD) was calculated using the last menstrual period or where this is not possible, the obstetric ultrasound scan was used. The GAD was used to estimate the trimester of pregnancy. The pigmentary changes were recorded against the trimester in which they were observed. The patients were subsequently followed up in their second and third trimesters of pregnancy for persistence of documented or onset of new pigmentary skin changes. Physical examination of the whole skin was conducted in a well-lit room for any pigmentary changes. Magnifying lens was used where appropriate to make some pigmentary changes more obvious.

The patients underwent the following investigations, pregnancy test (PT) or obstetric USS to confirm pregnancy, urinalysis, and HIV screening test to exclude HIV infection. Also where indicated fasting or random blood sugars were done to exclude diabetes mellitus.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 16.0.

Data was represented using descriptive statistics such as tables as necessary and inferential statistics such as Chi square and Friedman's tests.

### 3. RESULTS

The study involved 480 participants comprised of 240 primigravidae recruited consecutively from antenatal clinic and 240 controls that were never pregnant from the primary infertility clinic and general population between March, 2013 and March, 2014. One hundred and seventeen (48.8%) each for subjects and controls were in

the age range 26-30 years. Nine (3.8%) primigravidae were less than 20 years. Fifty one (21.3%) subjects belong to age greater than 30 years. The least number of patients recruited were found in the age range 36-40 years. The age ranges were between 18 and 40 years for both the subjects and controls. The mean age of the subjects and controls were 27.53±3.88 years and 27.15±4.17 years respectively.

Pigmentary changes were present in 110 (45.8%) subjects and only 11 (4.6%) among the controls in the age range 26-30 years. In age more than 30 years pigmentary changes were 20% and none in the controls. Seventy two (30.0%) of the subject and 19 (7.9%) of the controls with pigmentary changes belong to age less than 26 years. There was no statistically significant relationship between age, occupation, education levels of the subjects and pigmentary changes among primigravidae (Table 1) ( $P > 0.05$ ).

Table 2 shows the general prevalence of pigmentary changes in subjects and controls. One hundred and eighty nine (77.5%) subjects had at least one pigmentary change in first trimester, two hundred and thirty (95.8%) and 229 (95.4%) among the subjects had pigmentary changes in second and third trimesters respectively. The prevalence of pigmentary changes was much lower among the controls 41 (17.1%) than any of the trimesters which was 229 (95.4%) in third trimester. There was statistically significant level between increasing age (trimester) of pregnancy and pigmentary changes ( $P < 0.05$ ).

Generalized hyperpigmentation in first, second and third trimester for subject were 75 (31.2%), 112 (46.7%), 115 (47.9%) respectively while none was found in the controls.

Nipple, areola and breast hyperpigmentation were all more than the controls in all the trimesters (Table 3). The subjects with linea nigra were more in third trimester 185 (77.1%) than first trimester of pregnancy 61 (25.4%) while it was 19 (7.9%) among never pregnant controls. Other pigmentary changes observed in this study were scar pigmentation, abdomen, naevi, axilla pigmentation, melanonychia striata and were found to be higher than the controls.

Melasma was more than 5% in the subjects in all the three trimesters while it was 1.2% for the controls (Table 3).

**Table 1. Socio-demographic characteristic of the subjects and controls**

Characteristics	Pregnant cases n=240		Control n=240		Significant level
	Primigravidae N (%)	Pigmentary changes N (%)	Never pregnant N (%)	Pigmentary changes N (%)	
<b>Age (years)</b>					
<20	9 (3.8)	9 (3.8)	9 (3.8)	2 (0.8)	p= 0.52
21-25	63 (26.2)	63 (26.2)	63 (26.2)	17 (7.1)	
26-30	117 (48.8)	110 (45.8)	117 (48.8)	11 (4.6)	df= 4
31-35	47 (19.6)	44 (18.3)	47 (19.6)	11 (4.6)	
36-40	4 (1.7)	4 (1.7)	4 (1.7)	0	$\chi^2 = 3.21$
Total	240 (100)	230 (95.8)	240 (100)	41 (17.0)	
<b>Occupation</b>					
Unemployed	33 (13.8)	30 (12.5)	12 (5.0)	3 (1.3)	p= 0.11
Student	46 (19.2)	46 (19.2)	122 (50.8)	21 (8.8)	
Trading	60 (25.0)	58 (24.2)	22 (9.2)	0	df= 4
Civil servant	64 (26.6)	61 (25.4)	52 (21.6)	7 (29.2)	
Professional	24 (10.0)	24 (10.0)	23 (9.6)	7 (29.2)	$\chi^2 =7.53$
Others	13 (5.4)	11 (4.6)	9 (3.8)	3 (1.3)	
Total	240 (100.0)	230 (95.8)	240 (100.0)	41 (17.0)	
<b>Education level</b>					
No education	2 (0.8)	2 (0.8)	1 (0.4)	1 (0.4)	p= 0.63
Primary	5 (2.1)	5 (2.1)	4 (1.7)	0	
Secondary	26 (10.6)	26 (10.6)	19 (7.9)	1 (0.4)	df= 3
Tertiary	207 (86.2)	197 (86.2)	216 (90.0)	39 (16.3)	
Total	240 (100.0)	230 (95.8)	240 (100.0)	41 (17.1)	$\chi^2 =0.89$
<b>Mean age (years)</b>	27.53±3.88		27.15±4.17		
<b>Median age (years)</b>	27.00		27.50		

**Table 2. General prevalence of pigmentary changes in subjects and controls**

	Presence of pigmentary changes N (%)	Absence of pigmentary changes N (%)	Total n (%)
First trimester	186 (77.5)	54 (22.5)	240 (100)
Second trimester	230 (95.8)	10 (4.2)	240 (100)
Third trimester	229 (95.4)	11 (4.6)	240 (100)
Controls	41(17.1)	199 (83.0)	240 (100)
Significance level	<b>p= 0.000, df= 2, <math>\chi^2 = 80.55</math></b>		

The clinical pattern of melasma is as shown in Table 4. Centrofacial pattern is the commonest clinical type seen in 12 (5%) 18(7.5%) 17 (7.1%) in first, second and third trimester respectively while only one (0.4%) was seen in controls. Only four (1.7%) malar clinical type were seen each in the subjects in the first and second trimester as against the 2 (0.8%) observed in controls. No mandibular pattern was seen in this study. The prevalence of melasma increases as the pregnancy progresses from first trimester to third trimester. The relationship was found to be statistically significant (Table 4).

#### 4. DISCUSSION

Pigmentary skin changes are very common and begins early in pregnancy, the patients rarely voluntarily complain of them especially pigmentation of abdominal wall, nipple and areolar [8,9,10]. Although most of these pigmentary changes are benign, they often caused significant cosmetic anxiety to the patient especially the uncertainty of its disappearance after delivery and the possibility of recurrence in subsequent pregnancy [8].

**Table 3. Prevalence and pattern of pigmentary skin changes in pregnant subjects and controls**

Pigmentary skin changes	Pregnant cases n = 240			Controls N (%)
	First trimester N (%)	Second trimester N (%)	Third trimester N (%)	
Nipple hyperpigmentation	158 (65.8)	197 (82.1)	197 (82.1)	6 (2.5)
Areola hyperpigmentation	147 (61.2)	184 (76.7)	185 (77.1)	5 (2.1)
Generalized hyperpigmentation	75 (31.2)	112 (46.7)	115 (47.9)	0
Linea nigra	61 (25.4)	180 (75.0)	185 (77.1)	19 (7.9)
Sun exposed area (Face and neck)	57 (23.8)	81 (33.8)	79 (32.9)	5 (2.1)
Abdomen	49 (20.4)	71 (29.6)	69 (28.8)	1 (0.4)
Breast	26 (10.8)	35 (14.6)	37 (15.4)	1 (0.4)
Inner thigh	24 (10.0)	33 (13.8)	33 (13.8)	5 (2.1)
Axillae	14 (5.8)	23 (9.6)	23 (9.6)	4 (1.7)
Melasma	12 (5.0)	22 (9.2)	21 (8.8)	3 (1.2)
Melanocytic naevi	2 (0.8)	6 (2.5)	5 (2.1)	0.0
Scar pigmentation	2 (0.8)	3 (1.2)	4 (1.7)	3 (1.2)
Melanonychia	1 (0.4)	3 (1.2)	3 (1.2)	1 (0.4)

**Table 4. Clinical pattern of melasma in pregnancy and control**

	Centrofacial	Malar	Mandibular
First trimester	12 (5)	0	0
Second trimester	18(7.5)	4 (1.7)	0
Third trimester	17 (7.1)	4 (1.7)	0
Controls	1 (0.4)	2 (0.8)	0
Significance level	<b>p= 0.000, df= 2, <math>\chi^2 = 16.55</math></b>		

The general prevalence of pigmentary changes in pregnancy among the subjects in this study was 77.5% in first trimester and greater than 95% each in second and third trimesters while it was 17.1% in the controls. The pigmentary changes were also observed to increase in prevalence as pregnancy advanced. In similar studies by Kumari et al. [2] and Rathore et al. [3], they also documented high prevalence of pigmentary changes in up to 91.4% and 85.9% respectively among Indian population. The higher prevalence in this study compared to the two studies above could be due to the fact that the patients were followed up to see those who developed or had improved pigmentary changes in the third trimester. There was statistically significant association between increasing gestational age (trimester) and pigmentary changes in pregnancy ( $P < 0.05$ ). This showed that pigmentary changes are common and more as the gestational age increases possibly due to increased secretion and activities of some hormones such as adrenocorticotrophic hormone (ACTH), melanocyte stimulating hormone (MSH) and cortisol which are known to induce hyperpigmentation [11].

Nipple hyperpigmentation was observed in 65.8% in first trimester, 82.1% each in second and third trimesters while it was only 2.5% of the controls. Areola hyperpigmentation was seen in 61.2%, 76.7%, 77.1% and 2.1% in first, second, third trimesters and controls respectively. The pattern of these normally pigmented areas was significantly higher than other pigmentary changes and the controls. The nipples and areola hyperpigmentations showed increasing prevalence from first to third trimester similar to observed prevalence in breast pigmentations. These findings are similar to previous study by Mahboobe et al. [12] where they documented 84.4% for nipple and 91.1% for areola hyperpigmentation. Kumari et al has also documented high prevalence in these normally pigmented areas [2]. This is possibly due to high level of oestrogen, progesterone and probably greater population and more sensitivity of melanocytes to these hormones in these localized areas. [10] Hyperpigmentations especially in the normally pigmented areas tend to occur early in first trimester, and can signal early signs of onset of pregnancy when it appears besides linea nigra [9].



**1. Scar hyperpigmentation**



**2. Hypertrophic scar pigmentation**



**3. Linea nigra (midline pigmentation)**



**4. Abdominal pigmentation**



**5. Nipple and areola hyperpigmentation**



**6. Naevus hyperpigmentation**



**7. Finger nails pigmentation**



**8. Melanonychia striata of right index finger**

**Pictures 1-8. Pigmentary changes of the skin and nail in pregnancy**

Linea nigra is the darkening of the midline on the anterior abdominal wall. It overlies linea alba and extend from pubis symphysis to the umbilicus but sometimes can reach the xiphoid process [9].

The prevalence observed in this study was 25.4% of the subjects in first trimester, 75.0% subjects in the second trimester and 77.1% subjects in the third trimester. This is comparable

to lower prevalence of 7.9% seen in control population. It was observed that the prevalence increased as pregnancy advanced. Previous studies also documented similar high prevalence of linea nigra in pregnancy [12,13,14]. It can also occur in normal individuals as evidence in the control group in this study and other previous studies [15]. It has been reported in benign prostatic hypertrophy, prostate cancers and those taken oral contraceptive.[16] These are evidence of possibility of sex hormone influence in its aetiopathogenesis [15,16].

Other pigmentary changes in this study were generalized hyperpigmentation in more than 30% in all the trimester compare to 0% in the controls, accentuation of normally pigmented areas such as the axillae, nevi, and inner thigh. The other sites of increased localized pigmentation were seen over the abdomen, scar pigmentation and sun exposed areas (face and neck). In this study, pigmentary changes were mostly commonest in the third trimester, followed by second trimester and least in the first trimester. This is similar to the study by Neerja et al. [17] where it was observed that the skin changes in pregnancy were commonest in the third trimester, followed by second trimester and least in the first trimester. These demonstrated that pigmentary changes in pregnancy are common and it is directly proportional to the gestational age. This is probably due to increased output of some pituitary, placental and ovarian hormones such as  $\beta$ -melanocyte stimulating hormone, progesterone, oestrogen, ACTH and cortisol [18].

Melasma was observed in 5%, 9.2%, and 8.8% of the patients in first, second and third trimesters respectively which were higher than the 1.2% found in controls. The prevalence of melasma in pregnancy varied widely in previous studies. Kumari et al. [2] reported prevalence of 2.5% in a study of 607 pregnant women, Smith et al. [19] documented prevalence of 75%, Raj et al. [20] and Muzzafar et al. [21] reported 8.5% and 46.4% respectively. These variations might be due to differences in skin phototype and effects of sun exposures in different climates. The most common clinical type was centrofacial in this study seen in up to 7.5% in second trimester compare with 1.7% in malar, 0% in mandibular types and only 0.8% seen among the control group. This finding is consistent with the previous study where it was demonstrated that centrofacial is the commonest clinical type [2,22]. This is possibly because this area has more melanocyte population and sun exposure than

other sites which potentiate tyrosinase activity and thus induce melanogenesis [11]. Increasing gestational age (trimester) was statistically significantly associated with increased prevalence rate ( $P < 0.05$ ). The lower prevalence in this study compared to Smith et al. [19] and Muzzafar et al. [21] is because pigmentation is less discernible in black skin than light complexion [16]. Genetic predisposition and racial differences also play a role in the prevalence of melasma in pregnancy. The pathogenesis of melasma has been attributed to elevated oestrogen, progesterones, increased MSH levels and increased number of melanocyte [23] in some areas resulting in excessive deposition of melanin in the epidermis, dermal macrophages, or both [23,24].

Melanonychia striata was seen for the first time in pregnancy in only 0.4% in first trimester, 1.2% each in second and third trimester and only 0.4% of the control. Melanonychia has been reported to have low prevalence from previous similar studies [9,18]. Although the prevalence of melanonychia in pregnancy is low and often benign, it is important to recognize, diagnose, counsel and follow up the few patients because of its semblance to subungual melanoma which is highly malignant with very high mortality compare to other cutaneous melanomas especially in the environment where melanoma is a common finding [25]. The pathogenesis of this interesting pigmentary change in pregnancy is not completely understood efforts should be made when in doubt to do nail biopsy to exclude subungual melanoma [26].

## 5. CONCLUSION

This study has demonstrated the prevalence of pigmentary changes among primigravidae in this negroid population attending ANC of OAUTHC in South-Western Nigeria. The data and information from this study can be used by relevant health policy makers to plan more comprehensive antenatal care for the pregnant women to ameliorate the cosmetic anxieties in this studied population. The study has also provided useful information for the physicians and other allied health workers to recognize these pigmentary changes as physiologic and benign so as to adequately provide education, counseling and reassure these patients that the pigmentary changes usually return to almost normal after delivery. This will help to avoid evoking unnecessary apprehension. It is hope that these baseline data for this environment will also

stimulate more research to evaluate the effect of pigmentary changes on quality of life of pregnant women.

## CONSENT

Patients consented to be part of the study, examination, and diagnoses and agreed to have their pictures taken.

## ETHICAL APPROVAL

Approval of Ethics and Research Committee of OAUTHC was sought and obtained before the study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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