Frequency and Clinical Variants of Pigmentary Demarcation Lines in Pregnancy in a Tertiary Health Facility, South Western Nigeria

Olanrewaju F.O.[1], Oripelaye M.M.[1], Akinboro A. O[2] Oninla O. A.[1], Echekwube P. O[3]., Olasode O. A[1], Onayemi E. O[1].

1 Department of Dermatology and Venereology, OAU, Ile-Ife, Osun State, Nigeria.
2 Dermatology Unit, Department of Internal Medicine, LAUTECH Teaching Hospital, Ogbomoso, Oyo State Nigeria.
3 Department of Medicine, College of Health Sciences, Benue State University, Makurdi, Benue State.

Corresponding author: Dr F. O. Olanrewaju, ***E-mail:*** docjufat@yahoo.com.

ABSTRACT

INTRODUCTION: Pigmentary demarcation lines are sharp clear physiological borders of abrupt transition lines from areas of hyperpigmentation to the areas of less pigmentation or normal skin colour. These lines are of clinical important due to the marked cosmetic anxiety caused in pregnancy.

OBJECTIVES: To determine the prevalence and identify the types of pigmentary demarcation lines associated with pregnancy.

MATERIAL AND METHODS: The study included 440 participants comprising 220 primigravidae attending antenatal clinic who were followed-up till third trimester and 220 nulliparous as controls recruited from infertility clinic who fulfilled the inclusion criteria.

RESULTS: The mean age of the subjects and controls were 27.61 ± 3.93 and 26.83 ± 4.07 years respectively. No type-A was noticed among the pregnant subjects. Type-B PDL was not seen in the first trimester. In the second trimester, 1.8% of the subjects developed type-B PDL. This figure was doubled 3.6% by the third trimester. No type-B PDLs was noticed among the controls. Type-A co-existing with type-B was observed in 0.5% of the subjects in first and second trimesters and 1.0% of the subjects in the third trimester.

CONCLUSION: The prevalence of pigmentary demarcation lines is low in this study, it has however created awareness about its existence in this environment. Frequency also increased as pregnancy advanced. Therefore counselling and reassurance of the patients about the physiological nature of these pigmentary changes should be part of the routine antenatal clinics.

INTRODUCTION

Pigmentary Demarcation Lines (PDLs) are also known as Voigt or Futcher's lines.(1,2) They are clear physiological borders of abrupt transition lines from areas of hyperpigmentation to the areas of less pigmentation or normal skin colour. Matzumoto was the first to described PDL in 1913 in a study carried out among the Japanese population.(3) He described the PDL of upper and lower extremities. Subsequently, it was classified into four types A to D by Miura (4) and later a trunk PDL classified as type-E was added by Selmanowitz et al. (5). Facial PDLs F, G, H has also being well documented among Indian population and added to the initial five types of PDLs (6). Pigmentary demarcation lines are essential due to the cosmetic anxiety caused in pregnancy as many had attempted to remove them by various means such as scrubbing with a sponge. The PDLs are physiological, asymptomatic pigmentary skin changes and are usually bilaterally symmetrical. It affects all races and skin types especially during pregnancy when it is commoner and more evident. It is known to be common and better appreciated among the Japanese and the Negroid than the Caucasians due to the sharp difference in skin contrast (5).

The aetiology of PDLs remains largely unknown. However, several theories had been proposed to explain the phenomenon. Among the risk factors for development of PDLs are genetic and racial predisposition- as it is commoner in blacks,

hormonal factors, pigmentary mosaicism, atavistic remnant and axial-neuronal theories.(6,7,10) PDLs can occur on the face, limbs and rarely on the trunk especially the parasternal areas. The site of occurrence had been the basis for classifying them into types A to H.(7) Among the several types of PDLs described in the literature include; Type A that is mostly found in the lateral aspect of the upper arms anteriorly, overlying the pectoral area, type B is located on the posterior medial portion of the lower limbs from the perineum to the ankle, type C is observed as hypopigmented lines in parasternal, presternal or abdominal areas.(7,8) Type D and type E are seen on the posteromedial area of the back and as bilateral hypopigmented bands on the chest respectively. Type-F is described as an inverted cone or "V"-shaped patch on lateral cheeks while G is seen as two adjoining inverted cone or "W"-shaped patch on lateral cheeks, H consists of linear bands extending from the oral commissure to the lateral aspect of the chin (7,8).

Even though PDLs rarely requires any forms of treatment, persistent PDL has been documented to be effectively treated with Q-switched alexandrite laser without any side effect (9). Other modalities of treatment such as chemical peeling and sunscreen has not been satisfactory especially for facial PDLs with return of pigmentation after stopping the treatment (10). PDLs in pregnancy usually regress spontaneously during post-partum period and rarely persist beyond twelve months, patients should be reassured about the benign nature of these physiological skin changes (9,11).

This study therefore sought to determine the frequency and identify the different types of pigmentary demarcation line associated with pregnancy among these Negroid pregnant cohort.

MATERIAL AND METHODS

Study Location

The study was conducted at the Antenatal clinic of the Department of Obstetrics and Gynaecology, Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC) Ile-Ife. OAUTHC is a 650 beds hospital located in the South-West geopolitical zone of Nigeria. The geopolitical zone is one of the six zones in Nigeria and comprises of six states. OAUTHC Ile-Ife is a referral center attending to patients' population referred from various parts of the zone.

Study Design

This study was a cross-sectional case-control study and a convenience sampling requiring the consecutive recruitment of all primigravidae that presented within a six month period between June and December in their first and second trimesters and subsequently re-examined at least once in second and third trimester trimesters during their follow-up. A total of 440 participants were recruited. The participants consist of 220 primigravidae comprising 120 patients recruited in the first trimester and 100 patients in the second trimester as the subjects and 220 nulligravida age matched were recruited as the control from Infertility clinics. All primigravidae who were 18 years and older that presented within the study period and who gave inform consent were included in the study. Primigravidae below the 18 years were excluded from the study. The inclusion criteria for the controls were those 18 years and above, gave informed consent and nulliparous. Those on hormonal contraceptives were excluded from the study.

With the aid of a questionnaire, sociodemographic characteristics like age, marital status, education status, and nationality were obtained. Participants were examined in daylight for PDLs. A detailed physical examination of the skin aided by magnifying lens was carried out by the Dermatologists. The PDLs were documented against the trimesters in which they occurred.

Data Analysis

Data were analyzed using version 20.0 SPSS statistical software. The demographic characteristics and pigmentary demarcation lines were presented using descriptive statistics such as frequency, percentage, mean. The level of significance is set at $p < 0.05$.

Ethical Consideration

Approval of Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC) Ile-Ife, was sought and obtained before the study was carried out. Informed consent was also obtained from all patients that participated in the study. Information linking patients with the data was excluded to ensure confidentiality.

RESULTS

Two hundred and twenty primigravidae and 220 controls gave consent to participate in the study. The highest number of participants were found in the age

group 21-30 years for both subjects and controls which are respectively 163 (74.1%) and 171 (77.7%). The least number of participant fall within the age less than 20 years which were 9 (4.1%) each for both subject and control. The mean age of the subjects is 27.61 ± 3.93 and that of the controls is 26.83 ± 4.07. All patients recruited into the study were Negroid. There is statistically significant difference in education between the subjects and controls *P*=0.001.

The pigmentary demarcation lines observed among the study participants were depicted in table 2. Type-A was only observed in 1 (0.5%) of the controls and none in the subjects. No type-B PDL was seen in the first trimester. In the second trimester, 4 (1.8%) subjects developed type-B PDL. This figure was doubled 8 (3.6%) in the third trimester. No type-B PDL was noticed among the controls. Type-A PDL was found co-existing with type-B in one (0.5%) patient in the first trimester which continued till the third trimester while 1 (0.5%) additional patient developed type-A coexisting with type-B in third trimester and none among the controls.

Table 1: Demographic information of the participants

Demographics	Subject N (%)	Control N (%)	p-value
Age			
<20	9 (4.1)	9 (4.1)	
21-30	163 (74.1)	171 (77.7)	
31-40	48 (21.8)	40 (18.2)	0.780
Total	220 (100.0)	220 (100.0)	
Mean age	27.61 ± 3.93 (SD)	26.83 ± 4.07 (SD)	
Marital status			
Single	3 (1.4)	158 (71.8)	
Married	216 (98.1)	61 (27.7)	0.913
Divorced	1 (0.5)	1 (0.5)	
Total	220 (100.0)	220 (100.0)	
Education level			
Nil formal education	2 (0.9)	1 (0.5)	
Primary	5 (2.3)	7 (3.2)	
Secondary	22 (10.0)	15 (6.8)	0.001
Tertiary	191 (86.8)	197 (89.5)	
Total	220 (100.0)	220 (100.0)	
Nationality	All Nigerians (220)	All Nigerians (220)	

DISCUSSIONS

Pigmentary changes in pregnancy is the commonest physiological cutaneous changes witness by pregnant women (12). As many as over 90% developed one form of pigmentary changes or the other with lots of cosmetic concerns to the patients (12). However, despite high proportion of pregnant women having pigmentary changes, the prevalence

Table 2: Frequency and clinical variants of pigmentary demarcation lines in subjects and controls

Types of pigmentary demarcation lines	First trimester n = 220	Second trimester n = 220	Third trimester n = 220	Control n = 220
	N (%)	N (%)	N (%)	N (%)
Type A	0	0	0	1 (0.5)
Type B	0	4 (1.8)	8 (3.6)	0
Type A coexisting with type B	1 (0.5)	1 (0.5)	2 (1.0)	0
Total	1 (0.5)	5 (2.3)	10 (4.6)	1 (0.5)

of pigmentary demarcation lines (PDL) are low in these studies (12,13). Type-B is the commonest pigmentary demarcation lines found in pregnancy since Matzumoto first described PDLs in 1913. (3) This present study assessed the prevalence and types of PDLs associated with pregnancy among Negroid population in this locality.

The highest proportion of participants, recruited for this study belong to the age less than 30 years. The pattern of age distribution in this study is similar to that reported by Kumar et al (13) and Rathore et al (14) in their studies of cutaneous changes in pregnancy. This may reflect higher proportion of the younger age population in their reproductive year.

Type-A PDL was not observed among the pregnant women studied but was noticed in 0.5 percent of the controls group this due to the fact that type-A occur mostly outside pregnancy. None of the patients studied had type-B PDLs in their first trimester. The proportion of patients with type-B PDL in second trimester was 1.8%, this figure was however doubled by third trimesters suggesting the fact that PDL tend to occur more as pregnancy advances attributable to possible neurogenic inflammation from compression of peripheral nerves S_1 and S_2 by enlarging uterus (15) and increasing pregnancy hormones. This result is similar to 2% earlier reported by Kumar et al (13). However, other researchers have documented lower prevalence than our study. Rathore et al (14) reported 0.25%, Kumari et al (12) 0.3% and Singh et al (6) 0.32% among pregnant population. The higher prevalence observed in this study compare to these previous studies may be due to the fact that our patients were followed-up to the third trimester, some of which could have been missed in earlier trimesters without follow up. Besides, type-B PDL are observed to develop more in later part of pregnancy probably as a result of increasing pregnancy hormones. Other possible reasons for discrepancies is the skin phototypes and racial differences of the studied populations as it has been observed to be commoner among Negroids (5). Type-B can also co-exist with type-A PDL although this is an infrequent phenomenon (16). This pattern was evident in this study as one patient had type A and B PDL together for the first time throughout her pregnancy and another one only develop type B co-existing with type-A only in third trimester. This pattern is similar to the findings by Nakama et al (17) and Arunachalam et al (18).

The pathogenesis of pigmentary demarcation lines especially type-B, is largely unknown (19). The influence of pregnancy hormones such as beta-melanocyte-stimulating hormone, eostrogen and progesterone has been suggested as one of the possible explanations for the development of pigmentary demarcation lines (20,21). The hormonal theory appeared plausible when the cases in our study are compare with the controls, this was however challenged by the fact that type-B PDL has been reported in amenorrhiec Chinese woman with

low estradiol (2). This should further prompt more research to unravel the pathogenesis of PDLs.

Other types of pigmentary demarcation lines C, D, E which are very rare and facial PDL F, G, H were not observed in this study. This may probably be due to the fact that skin of Negroid pregnant woman present with darker generalized hyperpigmentation that make this types of PDLs difficult to discern. (12) Other possible explanations is the close resemblance of facial PDLs to melasma, exogenous onchronosis, periorbital hyperpigmentation and post inflammatory hyperpigmentation, naevus of Ota or Ito which may portend a diagnostic challenge (10,22,23).

CONCLUSION

This study assessed the prevalence and types of pigmentary demarcation lines associated with pregnancy. Even though the prevalence of PDLs is low in this study, it has however created awareness about the existence of these underdiagnosed and overlooked pigmentary changes. PDLs can also impact negatively on the quality of life of the few patients due to the overwhelming cosmetic anxiety it caused. All the cases encountered in the course of this study were adequately counselled and reassured to alleviate their cosmetic anxiety.

We recommend further research to determine the effects of PDLs on quality of life, possible aetiology of this enigma and prevalence of PDLs at the community level. The obstetricians, dermatologists and other healthcare provider involve in the care of pregnant women should be aware of the existence and benign nature of PDL in other to counsel the patients adequately with a few to ameliorating their marked cosmetic concerns.

FIGURES

Figure 1: Type B Pigmentary demarcation lines on the right posterior aspect of lower limbs

Figure 2: Type B: Pigmentary Demarcation line on the left posterior aspect of lower limbs

Figure 3. : Type B Pigmentary demarcation lines on the posterior aspect of lower limbs bilaterally.

Figure 4. Type A Pigmentary Demarcationline on the left anterior aspect of the arm.

REFERENCES

1. Gupta LK, Kuldeep CM, Mittal A. Paliwal V, Singhal H, Agarwal K et al. Pigmentary demarcation lines in pregnancy. Indian J Dermatol Venereol Leprol 2005;71: 292-3.
2. Hui-Jun Ma, Guang Zhao, Yu-Ping Dang. Type B pigmentary demarcation lines in a Chinese amenorrheic woman. International Journal of Dermatology 2008; 47: 505-507.
3. Maztumoto S. Uber eine eigentumliche pigmnetverteilung an den Voitschen linien. Arch Dermatol Syphilol 1913;118:157.
4. Miura O. On the demarcation lines of pigmentation observed among the Japanese, on inner sides of their extremities and on anterior and posterior sides of their medial regions. Tohoku J Exp Med 1951;54:135-40. [PUBMED]
5. Selmanowitz VJ, Krivo JM. Pigmentary demarcation lines. Comparison of Negroes with Japanese. Br J Dermatol 1975; 93: 371-7.
6. Malakar S, Dhar S. Pigmentary demarcation lines over the face. Dermatol 2000;200:85-6.
7. Al-Samary A, Al Mohizea S, Bin-Saif G, Al-Balbeesi A. Pigmentary demarcation lines on the face in Saudi women. Indian J Dermatol Venereol Leprol 2010;76:378-81.
8. Singh N, Thappa DM. Pigmentary demarcation lines. Pigment Int 2014;1:13-6.
9. Bukhari IA. Effective treatment of Futcher's lines with Q-switched alexandrite laser. J Cosmet Dermatol 2005;4: 27–28.
10. Somani VK, Razvi F, Sita VNVL. Pigmentary demarcation lines over the face. Indian J Dermatol Venereol Leprol 2004;70: 336-41.
11. Nakama T, Hashikawa K, Higuchi M, Ishii N, Miyasato M, Hamada T, et al. Pigmentary demarcation lines associated with pregnancy [published online ahead of print June 10, 2009]. *Clin Exp Dermatol*. 2009;34:e573-e576.
12. Kumari R, Jaisankar TJ, Thappa DM. A Clinical study of skin changes in pregnancy. Ind J Dermatol, Venereol, Leprol, 2007; 73: 141.
13. Kumar SBC, Aneesh S, MG Gopal, Ramesh

M, Nandini, Divya Gupta. Clinical and epidemiological study of cutaneous manifestations of pregnancy. Journal of Evolution of Medical and Dental Sciences. 2013;2(44):8667-8677.

14. Rathore SP, Shashi G. Vipin G. Pattern and prevalence of Physiological cutaneous changes in pregnancy: A study of 2000 antenatal women. Ind J of Dermatol Venereol and Leprol. 2011; 77(3): 402.
15. Delmonte S, Parodi A, Rebora A. Pigmentary demarcation lines type B in a white non-pregnant woman. *Acta Derm Venereol* 1997; 77: 82.
16. Chandran V, Kurien G, Mohan V. Pigmentary demarcation line in pregnancy. Indian J Dermatol. 2016;61:127.
17. Nakama T, Hashikawa K, Higuchi M, Ishii N, Miyasato M, Hamada T, et al. Pigmentary demarcation lines associated with pregnancy [published online ahead of print June 10, 2009]. *Clin Exp Dermatol*. 2009;34:e573-e576.
18. Arunachalam M, Bruscino N, Bassi A, Difonzo E. Type A and B pigmentary demarcation line in a white, pregnant woman- a rare observation? Eur J Dermatol 2011;21:787-8.
19. Jeremy WP, Carrie AC. Futcher Lines: A Case Report in Pregnancy and Literature Review. *Cutis*. 2013; 92: 100-101.
20. Thody AJ, Plummer NA, Burton JL. Plasma beta-melanocyte-stimulating hormone levels in pregnancy.J Obstet Gynaecol Br Commonw 1974; 81: 875-877.
21. Snell RS, Bischitz PG. The effects of large doses of oestrogen and progesterone on melanin pigmentation. J Invest Dermatol 1960; 53: 7382.
22. Ito K. The peculiar demarcation of pigmentation along the so-called Voigt's lines among the Japanese. Dermatologia Internationalis 1965;4:45.
23. Weary PE, Behlen CH. Unusual familial hypopigmentary anomaly. Arch Dermatol 1965;92:54-55.