International Journal of Research in Dermatology
Ramamurthy J et al. Int J Res Dermatol. 2024 Jan;10(1):32-39
http://www.ijord.com

DOI: https://dx.doi.org/10.18203/issn.2455-4529.IntJResDermatol20233876

Original Research Article

Clinico-epidemiological study of cutaneous changes in pregnancy at a tertiary care centre in Puducherry

Janani Ramamurthy*, Brinda G. David

Department of Dermatology, Venereology and Leprosy, Sri Venkateshwaraa Medical College and Hospital and Research Centre, Puducherry, India

Received: 10 November 2023
Revised: 06 December 2023
Accepted: 08 December 2023

***Correspondence:**
Dr. Janani Ramamurthy,
E-mail: jananiarunkumar9@gmail.com

ABSTRACT

Background: Pregnancy causes various physiological and pathological changes of skin, due to profound immunological, endocrine and vascular changes. This study focus on these changes and hence earlier identification of pathological skin changes helps to improve both the maternal and fetal outcomes. Aims and objectives were to find the prevalence and patterns of these changes in pregnancy and also to find the association of pathological changes with gravida and gestational age.
Methods: A cross sectional study was performed among 250 pregnant women with skin changes, attending dermatology outpatient department (OPD) at tertiary care centre in Puducherry and the findings were documented and the data was analyzed for statistical significance.
Results: In this study, Physiological changes were most common of which linea nigra was commonly seen in (84.4%) cases (n=233) followed by striae distensae seen in (78.4%) cases (n=197). Similarly, in pathological specific dermatoses, polymorphic eruption of pregnancy was seen in (1.2%) cases (n=3), followed by atopic eruption of pregnancy was seen in (0.4%) cases (n=1). Among the pathological non-specific dermatoses, Acne vulgaris in the inflammatory diseases was seen commonly in (7.6%) cases (n=19), followed by cutaneous infections like *Tinea corporis* was seen in (8.4%) cases (n=21) and least common was alopecia areata seen in (0.4%) of cases among the autoimmune disorders.
Conclusions: In this study physiological changes were more common in pregnant women followed by pathological non-specific and specific dermatoses. Also, there was a significant association of pathological changes with gravida and gestational age by Chi-square test with the p value <0.05.

Keywords: Physiological, Pathological, Maternal and fetal outcomes, Prevalence and pattern, Gravida, Gestational age

INTRODUCTION

Pregnancy causes various physiological and pathological changes of skin, due to profound immunological, endocrine and vascular changes. These changes of skin may impair the health of mother or the fetus and they are cosmetically significant. It includes changes in pigmentation, alteration in connective tissue, glandular changes and growth of hair and nails.[1] The common physiological changes include linea nigra and striae gravidarum. The pathological changes are those which are symptomatic and may or may not affect the fetal outcome. It includes both pregnancy specific and non-specific dermatoses.[2] The pregnancy specific dermatoses include heterogenous group of skin diseases which are unique to pregnancy or during the early postpartum period. Non-specific dermatoses are those that may change its nature during pregnancy and occur due to infectious causes, autoimmune causes and inflammatory causes.[3] And infectious causes includes vulvovaginal candidiasis,

dermatophytosis, varicella zoster, genital warts, scabies and autoimmune disorders like systemic lupus erythematosus, pemphigus vulgaris and pemphigus foliaceus and inflammatory cause includes acne vulgaris, urticaria, impetigo herpetiformis. This study focus on both physiological and pathological changes of skin in pregnancy and identification of pathological skin changes helps to improve both the maternal and fetal outcomes.

Aims and objectives

The aim of the study was to find the prevalence, assess the frequency and patterns of both physiological and pathological skin changes in pregnancy. And also to find the association between various patterns of pathological skin changes in pregnancy in relation to period of gestation and also with gravidity.

METHODS

Study design

It was a cross sectional study.

Study area

The study was conducted at the Sri Venkateshwaraa Medical College Hospital and Research Centre (SVMCH and RC), Ariyur, Puducherry.

Sample size

Sample size was calculated based on the convenient sampling technique and the minimum sample size calculated was 250, based on the past three years average data of pregnant women attending dermatology outpatient department (OPD) and also referred from obstetrics and gynaecology OPD to dermatology OPD who were satisfying eligibility criteria were included.

Study duration

It was conducted for a period of 1 year and 6-month duration from November 2021 to April 2023.

Study population

Pregnant women with skin changes, attending both dermatology OPD and also referred from obstetrics and gynaecology OPD in tertiary care centre of SVMCHRC.

Inclusion criteria

Pregnant women attending the OPD of both dermatology and those who are referred from obstetrics and gynaecology OPD with cutaneous changes irrespective of parity and gestational age and also those who were willing to give consent and participate in the study were included.

Exclusion criteria

Patients associated with severe systemic illness were excluded.

Data collection

After obtaining the informed and written consent, detailed history with regard to cutaneous changes were obtained. Obstetric details such as duration of pregnancy and obstetrics score were noted. Diagnosis was done on the basis of clinical history and examination and later all the details of patient were entered in proforma and the photographs were recorded.

Data analysis

Data was entered in excel sheet and analysis was done by using statistical package for the social sciences (SPSS) software version 23.0 And data analysis was done for quantitative variables like age, clinical parameters like basic and specific investigations and descriptive statistics were obtained. Also categorical variables like prevalence of physiological and pathological skin changes in pregnancy were expressed in proportion. And also various pattern and frequency of both physiological and pathological changes were expressed in percentage. And association between various pathological skin changes in relation to period of gestation and also with gravidity were expressed in chi square test. And p value <0.05* was statistically significant in this study.

RESULTS

In this study, a total of 250 pregnant patients of age group 18-40 years were included, of which (60.8%) of pregnant women were multigravida and (39.2%) were primigravida. And majority were in third trimester (75.2%) followed by second and first trimester each representing (12.4%) as mentioned in (Figure 1). Majority of study population were in age group of 21-30 years (78%) followed by 18-20 years of age (5.6%). In this study, pregnancy dermatoses were classified into physiological dermatoses, pathological specific dermatoses of pregnancy and pathological non-specific dermatoses of pregnancy. Among them, physiological changes were present in majority of pregnant women followed by pathological non-specific dermatoses and the least common were pathological specific dermatoses of pregnancy.

Physiological changes

The most commonly observed changes were pigmentary changes followed by connective tissue changes as shown in Table 1. Among the pigmentary changes, linea nigra was frequently observed in (84.4%) of cases followed by neck and flexural pigmentation in (28.4%) of cases. The second most commonly observed change was connective tissue changes of which striae distensae over abdomen was seen in (78.4%) of cases followed by thigh in (0.4%) of

cases. And the most common striae noticed was whitish striae seen in (32.4%) of cases followed by purplish striae in (20.8%) of cases and the least commonly observed change was nail changes of which brittleness was seen in (4.4%) of cases. And Table 2 shows the overall prevalence of physiological skin changes in pregnancy and the most commonly seen change was pigmentary changes seen in (93.2%) of cases followed by connective tissue changes seen in (78.8%) of cases and the least common was nail changes seen in (4.4%) of cases. All the physiological changes were commonly seen among multigravida during third trimester of gestation.

Table 1: Prevalence of physiological skin changes in pregnancy.

S. no.	Physiological changes	Num-ber	Perce -ntage
A	**Pigmentary changes**		
1	Linea nigra	211	84.4
2	Neck pigmentation	71	28.4
3	Flexural pigmentation	71	28.4
4	Chloasma	17	6.8
5	Secondary areola	1	0.4
B	**Connective tissue changes**		
1	Striae distensae over abdomen	196	78.4
2	Striae distensae over thigh	1	0.4
3	Whitish	81	32.4
4	Purplish	52	20.8
C	**Vascular changes**		
1	Peripheral pitting edema	139	55.6
2	Peripheral non-pitting edema	3	1. 2
D	**Glandular changes**		
1	Miliaria	32	12.8
2	Montgomery tubercles	1	0.4
E	**Hair changes**		
1	Alopecia	9	3.6
2	Hypertrichosis	6	2.4
F	**Oral cavity**		
1	Aphthous ulcer	13	5.2
G	**Nail changes**		
1	Brittleness	11	4.4

Table 2: Overall prevalence of physiological skin changes in pregnancy.

Physiological changes	Number of patients	Percen -tage
Pigmentary changes	233/250	93.2
Connective tissue changes	197/250	78.8
Vascular changes	142/250	56.8
Glandular changes	33/250	13.2
Hair changes	15/250	6.0
Oral cavity changes	13/250	5.2
Nail changes	11/250	4.4

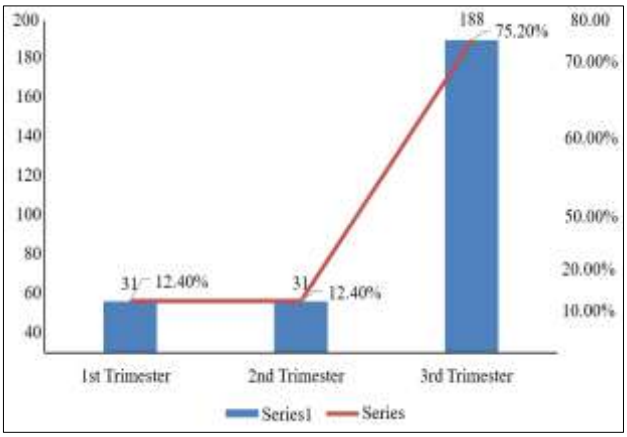

Figure 1: Trimester wise distribution of cutaneous changes in pregnancy.

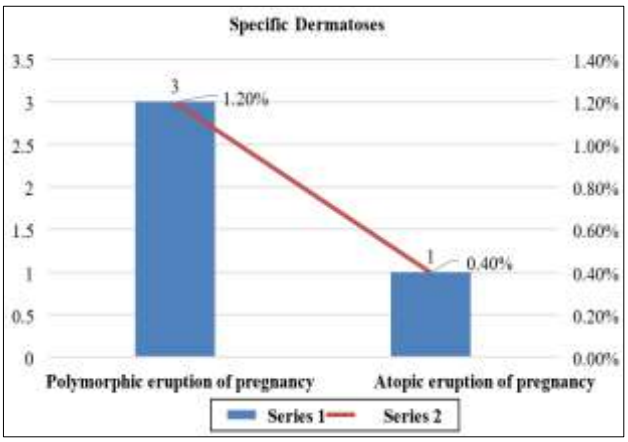

Figure 2: Overall prevalence of pathological specific dermatoses in pregnancy.

Pathological changes

Pathological changes can be specific or non-specific, in this study specific changes were seen in (1.6%) pregnant women and non-specific pathological changes seen in (62%) of cases.

Pathological specific dermatoses

In pathological specific dermatoses, polymorphic eruption of pregnancy (PEP) was seen in 3 cases (1.2%) and atopic eruption of pregnancy (AEP) was seen in 1 case (0.4%). It was observed that specific dermatoses are seen commonly in first trimester among primigravida. And Figure 2 describes the overall prevalence of pathological specific changes in pregnancy.

Pathological non-specific dermatoses

In the pathological non-specific dermatoses, inflammatory diseases, infections, adnexal diseases, benign tumours and miscellaneous conditions were observed in our study. Among each subgroup, the most commonly observed

changes were Acne vulgaris in the inflammatory diseases was seen in 19 cases (7.6%) followed by pityriasis capitis was seen in 12 cases (4.8%) and cutaneous infections like Tinea corporis seen in 21 cases (8.4%). Among the miscellaneous disorders, prurigo simplex was seen in 7 cases (2.8%), sweat retention dermatitis was seen in 18 cases (7.2%) of adnexal disorders. And among the benign tumours, acrochordon was seen in 4 cases (1.6%) of cases and the least common was alopecia areata seen in 1 case (0.4%) among autoimmune disorders as mentioned in Table 3.

Also, Figure 3 describes about the overall prevalence of pathological non-specific dermatoses of which the most common was inflammatory diseases seen in (19.6 %) of cases followed by infectious disorders seen in (18%) of cases and the least common was autoimmune disorders seen in (0.4%) of cases. It was observed that they were most commonly seen among multigravida during third trimester.

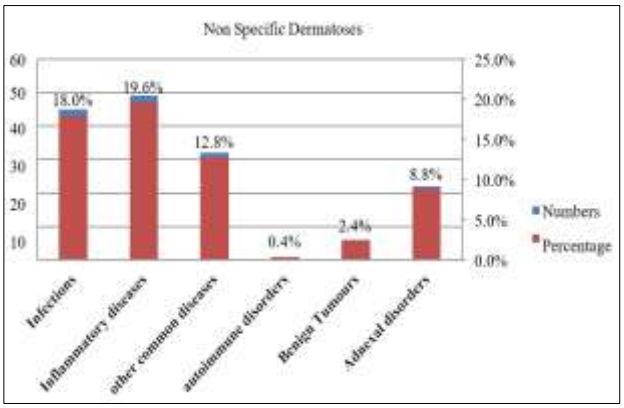

Figure 3: Overall prevalence of pathological non-specific dermatoses.

Figure 4: Linea nigra with striae gravidarum.

Chi-square test was performed to find the association between pathological skin changes and gestational age in pregnancy. It was found that there was significant association between them with $p<0.05$* which was significant as described in (Table 4). Similarly, there was significant association between the pathological skin changes and gravidity with $p<0.05$* as shown in the Table 5.

Table 3: Prevalence of pathological non-specific dermatoses in pregnancy.

S. no.	Non-specific changes	Num-ber	Perce-ntage
A	**Inflammatory disorders**		
1	Acne vulgaris	19	7.6
2	Pityriasis capitis	12	4.8
3	Seborrhoeic dermatitis	5	2.0
4	Erythema multiforme	3	1.2
5	Lichen simplex chronicus	2	0.8
6	Truncal acne	2	0.8
7	Seborrheic melanoses	2	0.8
8	Polymorphic light eruption	2	0.8
9	Allergic contact dermatitis to detergents	1	0.4
10	Forefoot eczema	1	0.4
B	**Infections and infestations**		
1	Tinea corporis	21	8.4
2	Pityriasis versicolor	9	3.6
3	Vulvovaginal candidiasis	3	1.2
4	Papular urticaria	3	1.2
5	Pityorosporum folliculitis	2	0.8
6	Tinea cruris	1	0.4
7	Genital molluscum contagiosum	1	0.4
8	Genital warts	1	0.4
9	Periporitis	1	0.4
10	Scabies	1	0.4
11	Palmar candidiasis	1	0.4
12	Verruca vulgaris	1	0.4
C	**Miscellaneous conditions**		
1	Prurigo simplex	7	2.8
2	Acanthosis nigricans	6	2.4
3	Periorbital melanoses	6	2.4
4	Perioral melanoses	4	1.6
3	Prurigo nodularis	3	1.2
4	Xerosis cutis	2	0.8
5	Post acne pigmentation	2	0.8
6	Post-inflammatory hyperpigmentation	1	0.4
7	Acneform eruptions	1	0.4
D	**Adnexal disorders**		
1	Sweat retention dermatitis	18	7.2
2	Acute paronychia	1	0.4
3	Telogen effluvium	3	1.2
E	**Benign tumours**		
1	Acrochordon	4	1.6
2	Dermatosis papulosa nigra	2	0.8
3	Autoimmune disorders		
4	Alopecia areata	1	0.4

Table 4: Association between gestational age and pathological skin changes in pregnancy.

S. no.	Pathological changes	First trimester	Second trimester	Third trimester	Chi-square value	P value
1	Specific dermatoses	04	0	0	39.391	<0.0001*
2	Non-specific dermatoses	11	11	133		

Table 5: Association between gravidity and pathological skin changes in pregnancy.

S. no.	Pathological changes	Primi	Multi	Chi-square value	P value
1	Specific dermatoses	4	0	7.638	<0.01*
2	Non-specific dermatoses	55	110		

Figure 5: Polymorphic eruption of pregnancy.

Figure 6: Acne vulgaris.

Figure 7: Genital warts.

Figure 8: Prurigo nodularis.

DISCUSSION

A pregnant woman undergoes various physiological changes in the entire gestational period. Skin being the largest organ in the human body undergoes various physiological changes during pregnancy. This study highlights the importance of cutaneous changes that occur during pregnancy.

Demography

In this study majority of the pregnant women were multigravida (60.8%) presented during third trimester (75.2%) of pregnancy. Similar to our study Latha et al and Madhab et al in their study showed majority of the patients were multigravida (68%) and (54.71%), whereas Panicker et al and Kumar et al in their study showed primigravida were more affected (61.67%) than the multigravida (51%) which was discordant from this study.[3-6] Chakraborty et al (63%) and Bangaru et al (54.14%) showed in their study that majority were in third trimester compared to Meena et al in their study found majority of them were in second trimester.[7-9]

Physiological skin changes

The focus of this study was on determining the frequency of physiological changes that occur during pregnancy. The majority of patients (93%) experienced pigmentary alterations, with linea nigra (84.4%) being the most prevalent hyperpigmentation during pregnancy and among

multigravida in the third trimester. Other than the linea nigra, other pigmentation sites included the neck and flexural region (28.4% each), chloasma (6.8%), and secondary areola pigmentation (0.4%), as shown in Table 1. Similar results were found in the study by Panicker et al, which showed that linea nigra was the most prevalent pattern and pigmentation was the most prevalent manifestation seen in (87.67%) of cases.[3] The study findings were consistent with the frequent occurrence of these alterations during the third trimester. In their study, Hassan et al found that linea nigra appeared in (80%) of cases where hyperpigmentation was present.[10] In a similar way, Dabette et al demonstrated that individuals (67.3%) with pigmentary alterations were most likely to be multigravida.[11] Only (55.5%) of primigravida had linea nigra, compared to (93.9%) of multigravida. These observations and results were consistent with the study. Elevated levels of MSH, estrogen, or progesterone cause hyperpigmentation. Progesterone amplifies the actions of estrogen, which causes melanin to be deposited into the epidermal and dermal macrophages. Estrogen enhances the production of melanin from the melanocytes.[12] Chloasma was seen in (6.8%) of pregnant women in this study whereas Mahendra et al (12%).[13] Kumar et al (30%) and Panicker et al (2.16%) had melasma.[3,6] The lower incidence of chloasma in this study can be attributed to less exposure to sun because majority of pregnant women in this study were housewives. The second most common physiological skin change observed in this study was striae distensae over the abdomen and thigh which constitutes (78.8%) of cases which was whitish in (32.4%) and purplish in (20.8%) of cases. The striae were more common in abdomen (78.4%) than the thighs (0.4%) in this study as depicted in. Similarly, striae was the second most common physiological skin changes seen in the study conducted by Chopra et al which was seen in (50%) of cases.[14] Kothamasu et al also showed (76%) prevalence of striae distensae which was concordant with our study.[12] Panicker et al in their study demonstrated that whitish striae (58.8%) was more common than purplish striae (41.41%).[3] Striae distensae occurs due to the stretching of the skin due to the increase in the abdominal girth and many other physical factors. Peripheral pitting edema was common in this study and it was observed in (55.6%) of cases while (1.2%) of cases had non-pitting edema as described in Table 1. Peripheral edema is more in this study when compared to Chakraborty et al and Panciker et al in their study showed a prevalence of (10.2%), whereas Kumar et al showed a little more prevalence of (23.1%) of cases with pedal edema.[3,6,7] This may be due to the poor nutrition among the rural population and also due to the vascular changes due to the raised levels of estrogen during pregnancy.[15] Miliaria was seen in (12.8%) of the pregnant women in this study which was well concordant with Meena and Gehlot in which the prevalence of glandular changes were (11.5%), whereas Kothamasu et al showed a (1.4%) prevalence of miliaria in their study.[9,12] Miliaria and other glandular changes such as hyperhidrosis and dyshidrotic eczema are due to the increased eccrine gland function.[15] Hair changes were seen in (6%) of cases in which (3.6%) of them had alopecia and (2.4%) had hypertrichosis in this study. In a similar study done by Panicker et al observed that (6.16%) of cases complaining of hair changes in which (4.8%) patients noticed improvement in scalp hair whereas (1.2%) noted increased hair loss.[3] Latha and Haritha also showed a (6%) change in hair in pregnancy but they showed more hair growth in their study when compared to hair loss.[4] Apthous ulcer was seen in (5.2%) of pregnant women in this study and this may be due to poor nutrition and vitamin deficiency seen in pregnant women despite supplements. Nail changes were seen in (4.4%) of patients and all had brittleness of the nail whereas Chakraborty et al showed a (2%) changes in nail in their study where brittleness was the most common complaint which is similar to our study.[7]

Pregnancy specific dermatoses

Pathological dermatoses can be specific or non-specific related to pregnancy. The pregnancy specific dermatoses in this study was seen in (1.6%) of patients of which PEP was seen in three patients (1.2%) and AEP was seen in one patient (0.4%) as described in Figure 2. Latha and Haritha in their study showed a prevalence of (2.9%) of patients having specific dermatoses of which pruritus gravidarum was the most common change observed by them.[4] Kumar et al showed (1.96%) prevalence of PUPPP in primigravida which is similar to our study.[6] Dawadi et al in their study showed a (7.33%) prevalence of PUPPP in patients whereas (24%) of patients had prurigo of pregnancy.[16] Similar to our study, the study conducted by Madhab et al showed that PEP was the most common specific dermatoses (22.64%) whereas prurigo of pregnancy accounting for (9.43%) of cases.[5] And other studies like Kumari et al also showed a PUPPP preponderance compared to AEP.[17] PEP is erythematous urticarial papules and plaques which develop initially on the abdomen especially within the striae distensae and spread on to the thighs, buttocks and arms. Rarely may it be seen in the upper body and it is never seen on the face. There are no systemic manifestations usually and there is no morbidity or mortality to the pregnant women. Prurigo of pregnancy in many studies was shown to be the most common specific dermatoses which differ from the finding of our study. It can be due to the exacerbation of the eczema that occur in pregnancy in atopic individuals and it occur in earlier stage than other disorders. Most patients develop eczematous lesions often involving face, neck and flexural aspects of extremities, whereas some develop a papular eruption on the extremities and trunk composed of small erythematous papules or classic prurigo lesions. In this study there were no cases of ICP and PG noted. Pregnancy has specific immunological changes characterized by lack of strong maternal cell mediated immune function and TH1 cytokine production stands in contrast to dominant humoral immunity and increased secretion of TH2 cytokines.[18] So there is exacerbation of the atopic eruption during pregnancy which is explained by the dominant TH2 immune response.

Pathological non-specific dermatoses

The different types of non-specific dermatoses observed in this study were inflammatory diseases, infections and infestations, adnexal disorders, benign tumours, autoimmune and miscellaneous diseases as shown in Table 3. Among them, inflammatory disorders were the most common condition seen in this study which amounts to (19.6%) and the second common was infection and infestations which was seen in (18%) of cases. The findings were similar to Ambros-Rudolph et al in which the most common non-specific dermatoses were inflammatory causes seen in (52%) of cases and infections were the second common seen in (26%) of cases in their study.[19] Similar findings were noted in Bilgili et al inflammatory dermatoses (30%) were most common than infectious dermatoses (19.2%), whereas Latha and Haritha in their study observed infections and infestations (12%) were most common than any other non-specific dermatoses.[4,20] The other non-specific dermatoses observed in this study was adnexal disorders constituting (8.8%) and benign tumors (2.4%) and autoimmune disorders (0.4%) and the miscellaneous diseases constitutes (12.8%) of patients.

Among the inflammatory disorders acne vulgaris was the most common with (7.6%) of patients and the second common was pityriasis capitis (4.8%) followed by seborrheic dermatitis (2%) as described in Table 4. Panicker et al in their study showed a (10.3%) incidence of acne vulgaris were more common than seborrheic dermatitis (1.1%).[3] Nazsamina et al in their study showed a incidence (6.1%) of acne vulgaris in pregnant women which is almost parallel to our study.[21] The more incidences of acne vulgaris can be attributed to the increased activity of sebaceous glands during pregnancy.[22] Other inflammatory disorders observed in our study are erythema multiforme (1.2%), lichen simplex chronicus, truncal acne, seborrheic melanoses, polymorphic light eruption, contact dermatitis allergic to detergents and forefoot eczema which accounts for less (1%) of patients with non-specific dermatoses. Among the infections and infestations, fungal infections were most common in our study with tinea corporis (8.4%), pityriasis versicolor (3.6%) and vulvovaginal candidiasis (1.2%) as shown in Table 3. Scabies infestation was seen only in (0.4%) of patients. Sharma et al showed a (5%) incidence of vulvovaginal candidiasis in their study and viral infection with a (1%) of incidence which is concordant with this study.[1] Viral infection such as genital warts and genital molluscum cantagiousm was seen only in (0.4%) of patients. Dawadi et al also showed a similar observation that fungal infections were more common than the viral.[16] Chaudhary et al showed a similar incidence of tinea corporis (7.2%) being more common in fungal infections but scabies was found to be in (3.8%) of patients in their study.[23] Panicker et al showed a similar infection rate of genital warts and herpes genitalis being (1%) whereas in our study it was less than (1%).[3] Infections were more common because of the decreased cellular immunity during pregnancy. In Adnexal disorders, sweat retention dermatitis were most common in this study (7.2%) and in benign tumors acrochordon was seen commonly in (1.6%) of patients. Latha and Haritha observed a similar finding in which (1%) of patients had acrochordon.[4] Ali et al also showed a similar incidence of (1.5%) of patients having acrochordon.[24] This is more common in third trimester which is concordant with our study. Non-specific disorders were common in multigravida during third trimester which were concordant with Latha and Haritha study.[4] This study found an association of gestational age and gravidity with pathological changes in pregnancy and it is dependent of each other and the difference was statistically significant ($p<0.05$) (Tables 4 and 5).

Limitations

In this study, the prevalence of pregnancy specific dermatoses was less as compared to non-specific dermatoses as few were not willing for cutaneous examination due to reduced awareness among them. So we could not find the exact prevalence of specific dermatoses in this study.

CONCLUSION

In our study, physiological skin changes were the most commonly observed followed by pathological non-specific and specific dermatoses. Among the prevalence of physiological skin changes in pregnancy, pigmentary changes were seen in (93.2%) of cases, of which linea nigra was the most common seen in (84.4%) of cases, followed by striae distensae over abdomen was seen in (78.4%) of cases. And all of these changes were commonly seen among multigravida during third trimester of gestation. Among the pathological non-specific dermatoses, inflammatory diseases were the commonly observed changes of which acne vulgaris was seen commonly in (7.6%) of cases. In (18%) of patients infectious disorders was seen and the least common was autoimmune disorders like alopecia areata which was seen only in one patient in this study. These changes were commonly seen among multigravida during third trimester. Specific dermatoses of pregnancy were observed only in 4 number of patients. Among them, PUPPP was seen in (1.2%) and AEP was (0.4%) of cases. These changes were observed in primigravida in first trimester. Also it was observed that there was a significant association of both pathological specific and Non-specific dermatoses in relation to both gravida and gestational age.

ACKNOWLEDGEMENTS

Authors would like to thank teachers, parents and husband for their constant support and encouragement for the successful completion of this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sharma A, Jharaik H, Sharma R Chauhan S, Wadhwa D. Clinical study of pregnancy associated cutaneous changes. Int J Clin Obstet Gynaecol. 2019;3(4):71-5.
2. Agarwal P, Chaudhari SV, Jagati A, Rathod SP, Neazee ST. Clinical spectrum of pregnancy related dermatoses in a tertiary care hospital in western India. Natl J Comm Med. 2020;11(12):450-5.
3. Panicker VV, Riyaz N and Balchandran PK. A clinical study of cutaneous changes in pregnancy. J Epidemiol Glob Health. 2017;7(1):63-70.
4. Latha SM, Haritha B. To study the pattern and frequency of skin changes in pregnancy. JMSCR. 2017;5(5):21948-57.
5. Madhab V, Das D, Gupta B, Saha M. A Prospective Study on Dermatoses in Pregnancy in a Tertiary Care Hospital of Southern Assam. J Evol Med Dent Sci. 2015;4(71):12287-91.
6. Sharath Kumar BC, Aneesh S, Gopal MG, Ramesh M, Nandini, Gupta D. Clinical and epidemiological study of cutaneous manifestations of pregnancy. J Evol Med Dent Sci. 2013;2(44):8667-77.
7. Chakraborty A, Wankhade VH, Supekar BB, Chopkar AD, Singh RP. Dermatological changes in pregnancy in central India: a cross sectional study. Int J Res Dermatol. 2019;5:411-5.
8. Bangaru H, Sudha R, Lingaiah NB, Sathish S, Surendran KAK. Cutaneous changes in pregnancy: A comprehensive study of 700 cases at a tertiary care centre from South India. Indian J Clin Exp Dermatol. 2019;5(3):249-54.
9. Meena M, Gehlot H. A clinical study of skin disorders in pregnancy. Int J Reprod Contracept Obstet Gynecol. 2018;7:715-8.
10. Hassan I, Bashir S, Taing S. A clinical study of the skin changes in pregnancy in Kashmir valley of north India: A hospital based study. Indian J Dermatol. 2015;60:28-32.
11. Dabette KL, Bijayanti T, Hafi BN, Singh RL. Skin changes during pregnancy: A study from Northeast India. Indian Dermatol Online J. 2018;9:455-7.
12. Kothamasu LS, Shetty V, Najmuddin F, Bhandary PR, Shetty NJ. A clinical study of pregnancy induced dermatoses. J Pak Assoc Dermatol. 2016;26(1):12-20.
13. Mahendra, Peta B, Lakshmi V. Cutaneous manifestation in pregnancy. Obs Gyne Rev. 2018;4 (3):62-6.
14. Chopra D, Sharma A, Mohi MK, Bahl RK, Mohi K. Myriad of cutaneous changes in pregnancy: a study in tertiary care hospital in north India. Int J Sci Res. 2017;6(8):2277-9.
15. Snell RS, Bischitz PG. The effect of large doses of estrogen and estrogen and progesterone on melanin pigmentation. J Invest Dermatol. 1960;35:73-82.
16. Dawadi P, Rijal A, Upredi D. Study of pregnancy dermatoses in patients attending outpatient of BP Koirala institute of Health sciences, Dharan, Nepal. NJDVL. 2015;13(1):38-44.
17. Kumari R, Jaishankar TJ, Thappa DM. A clinical study of skin changes in pregnancy. Indian J Dermatol Venerol Leprol. 2007;73(2):141.
18. Vora RV, Gupta R, Mehta MJ, Chaudhari AH, Pilani AP, Patel N. Pregnancy and skin. J Fam Med Prim Care. 2014;3:318-24.
19. Ambros-Rudolph CM, Müllegger RR, Vaughan-Jones SA, Kerl H, Black MM. The specific dermatoses of pregnancy revisited and reclassified: results of a retrospective two center study on 505 pregnant patients. J Am Acad Dermatol. 2006;54(3):395-404.
20. Bilgili MA, Bilvanisi SK, Bilgilli SG, Okyay AG, Dursun R, Karadag AS. Specific and non-specific dermatoses of pregnancy in the emergency department. East J Med. 2019;24(2):176-81.
21. Naz S, Khan S, Monika, Abbasi S, Yasmeen, Joyo RMA. A Study of Specific Skin Disease Dermatosis Affected by Pregnancy. PJMHS. 2022;16(3):1157-9.
22. Pérez-Maldonado A, Kurban AK. Metabolic diseases and pregnancy. Clin Dermatol. 2006;24(2):88-90.
23. Chaudhary AF, Goel S, Mehta A. A cross-sectional study of cutaneous changes during pregnancy in a tertiary care hospital in Northern India. Int J Res Dermatol. 2022;8:320-4.
24. Ali S, Parveen A, Hassan S. Cutaneous changes during pregnancy: A hospital based prospective study. Int J Health Sci. 2022;6(S6):2970-6.

Cite this article as: Ramamurthy J, David BG. Clinico-epidemiological study of cutaneous changes in pregnancy at a tertiary care centre in Puducherry. Int J Res Dermatol 2024;10:32-9.