



A clinical and epidemiological study of cutaneous manifestations during pregnancy: A cross-sectional observational study.

¹Reshma Biswal, ²Biswaranjan Prusty, ³Smaranika Satapathy, ⁴Jayashree Mohanty, ⁵Kallolinee Samal, ⁶Abdul Sahid Khan.

¹Assistant Professor, Department of Dermatology, Ims & Sum Hospital, Campus LI, Phulnakhara, Odisha, India.

²Associate Professor, Department of General Medicine, Ddmch, Keonjhar, Odisha, India.

³Assistant Professor, Department of Skin And Vd, IMS & Sum Hospital Ii Phulnakhara, Odisha.

⁴Professor, Department of Dermatology, Scb Medical College, Cuttack, Odisha

⁵Assistant Professor, Dermatology Department, Ims & Sum Hospital, Campus II, Phulnakhara, Odisha, India.

⁶Assistant Professor, Department of Skin & Vd, Ims & Sum Hospital, Campus II, Odisha, India.

Abstract

Background:

Pregnancy induces extensive endocrine, immunological, metabolic, and vascular changes that frequently manifest in the skin. These manifestations range from physiological changes to pregnancy-specific dermatoses with potential maternal and fetal implications.

Objectives:

To assess the clinical and epidemiological profile of cutaneous manifestations during pregnancy and classify them into physiological changes, dermatoses modified by pregnancy, and pregnancy-specific dermatoses.

Methods:

This cross-sectional observational study was conducted over 18 months at SCB Medical College and Hospital, Cuttack, involving 400 pregnant women selected through consecutive sampling. Detailed clinical history and dermatological examination were performed. Laboratory investigations and skin biopsy were conducted when indicated. Data were analyzed using descriptive statistics.

Results:

Cutaneous manifestations were observed in all participants, with physiological skin changes being the most common, affecting 280 (70.0%) women. Pigmentary changes were present in 208 (52.0%) cases, and striae gravidarum in 156 (39.0%). Dermatoses modified by pregnancy were observed in 80 (20.0%) women, with atopic dermatitis being the most frequent (8.0%). Pregnancy-specific dermatoses were seen in 40 (10.0%) women, most commonly atopic eruption of pregnancy (6.0%). Cutaneous manifestations were more prevalent in the third trimester (42.5%).

Conclusion:

Cutaneous manifestations are highly prevalent during pregnancy, predominantly physiological and benign in nature. However, pregnancy-specific dermatoses require early identification to prevent maternal and fetal complications.

Recommendation:

Routine dermatological evaluation should be incorporated into antenatal care to facilitate early diagnosis and appropriate management of pregnancy-related dermatoses, improving maternal comfort and pregnancy outcomes.

Keywords: Pregnancy; Skin manifestations; Physiological dermatological changes; Pregnancy-related dermatoses; Atopic eruption of pregnancy

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Corresponding author: Kallolinee Samal

Email: Drkallolinee@gmail.com

Assistant Professor, Dermatology Department, Ims & Sum Hospital, Campus II, Phulnakhara, Odisha, India

INTRODUCTION

Pregnancy is a distinctive physiological state associated with extensive hormonal, immunological, metabolic, and vascular adaptations necessary for fetal development and maternal well-being. These systemic changes frequently involve the skin and its appendages, making cutaneous manifestations among the most common and visible changes during pregnancy. It has been estimated that up to 90% of pregnant women experience some form of skin alteration, ranging from benign physiological changes to pathological dermatoses with potential implications for maternal and fetal health [1].

Cutaneous manifestations during pregnancy are broadly classified into three groups: physiological skin changes, dermatoses influenced by pregnancy, and pregnancy-specific dermatoses. Physiological changes constitute the majority and include pigmentary alterations, striae gravidarum, vascular changes, and variations in hair, nail, and glandular function. Although these changes are generally benign and self-limiting, they may cause significant cosmetic concern and pruritus, leading to anxiety among pregnant women [2]. Hormonal alterations play a central role in the development of pregnancy-related skin changes. Increased levels of estrogen, progesterone, beta-human chorionic gonadotropin, prolactin, and melanocyte-stimulating hormone affect melanocyte activity, vascular permeability, and connective tissue structure. As a result, hyperpigmentation, including melasma, linea nigra, and secondary areola formation, is frequently observed. Melasma, commonly referred to as the “mask of pregnancy,” is of particular concern due to its cosmetic impact and tendency to persist after delivery in some women [3].

Pregnancy is also characterized by immunological modulation that promotes maternal tolerance to the fetus. This shift, marked by suppression of cell-mediated immunity and predominance of humoral immune responses, may alter the course of several pre-existing dermatological conditions. Disorders such as atopic dermatitis, acne vulgaris, urticaria, autoimmune diseases, and certain infections may either improve or worsen during pregnancy [4]. Infectious dermatoses, including candidiasis, viral infections, and other opportunistic infections, are clinically significant due to altered host immunity and potential maternal and neonatal complications, underscoring the importance of early recognition and management [5].

Pregnancy-specific dermatoses, although less common, are of particular clinical relevance due to their characteristic

presentation, intense pruritus, and, in some cases, association with adverse fetal outcomes. Conditions such as polymorphic eruption of pregnancy, pemphigoid gestationis, and intrahepatic cholestasis of pregnancy may present with overlapping features, making accurate diagnosis essential. While some conditions have a benign course, others, such as pemphigoid gestationis and intrahepatic cholestasis of pregnancy, are associated with risks including preterm delivery and fetal distress, necessitating prompt diagnosis and multidisciplinary management [6,7].

Despite the high prevalence of dermatological manifestations during pregnancy, data from developing regions, particularly eastern India, remain limited. Variations in genetic background, environmental factors, nutritional status, and healthcare access may influence the pattern and frequency of pregnancy-related dermatoses. A systematic clinical and epidemiological evaluation of cutaneous manifestations during pregnancy is therefore essential to distinguish physiological changes from pathological conditions, facilitate appropriate counseling and management, and improve maternal and fetal outcomes. Therefore, this study was conducted to assess the clinical and epidemiological characteristics of cutaneous manifestations during pregnancy and to classify them into physiological changes, dermatoses modified by pregnancy, and pregnancy-specific dermatoses.

METHODOLOGY

Study Design and Setting

This cross-sectional observational study was conducted at SCB Medical College and Hospital, Cuttack, from January 2024 to June 2025. This study was conducted as a cross-sectional observational study at a tertiary care teaching hospital, S.C.B. Medical College and Hospital, Cuttack. The institution caters to a large and diverse patient population from both urban and rural areas, providing comprehensive antenatal and dermatological services. The study was carried out over a period of 18 months and included pregnant women attending the antenatal clinics and outpatient departments of Dermatology and Obstetrics and Gynecology.

Participants selection method

Participants were selected using consecutive sampling. All pregnant women attending the antenatal clinic and dermatology outpatient department during the study period

who fulfilled the inclusion criteria were enrolled until the required sample size of 400 was achieved.

Study Population and Sample Size

The study population comprised pregnant women at any gestational age who attended the hospital during the study period. The sample size was calculated using a standard formula for prevalence-based cross-sectional studies. Assuming an expected prevalence of cutaneous manifestations during pregnancy of approximately 80%, based on previous studies, with a 95% confidence level and an allowable error of 5%, the minimum required sample size was calculated. Considering feasibility and to ensure adequate representation, a final sample size of 400 pregnant women was included in the study. Participants were enrolled consecutively after fulfilling the eligibility criteria.

Inclusion and Exclusion Criteria

Inclusion criteria included all consenting pregnant women, irrespective of age, parity, or trimester, presenting with or without cutaneous complaints. Both primigravida and multigravida women were included to assess the influence of parity on dermatological manifestations. Exclusion criteria included women in the postpartum period, those with known chronic dermatological disorders diagnosed prior to pregnancy without any change during pregnancy, patients with severe systemic illnesses unrelated to pregnancy, and women who did not provide informed consent to participate in the study.

Data Collection and Clinical Evaluation

After obtaining informed consent, detailed demographic and clinical data were collected using a structured proforma. Information regarding age, parity, gestational age, trimester, occupation, socioeconomic status, and place of residence was recorded. A detailed obstetric history, including gravidity, previous pregnancy outcomes, and complications in the current pregnancy, was documented. A comprehensive dermatological examination was performed for each participant under adequate illumination. The examination included assessment of the skin, hair, nails, and mucous membranes. Particular attention was given to identifying physiological changes such as hyperpigmentation, striae gravidarum, vascular changes, and glandular alterations. Pathological dermatoses were evaluated with respect to morphology, distribution, duration, and associated symptoms, especially pruritus.

Based on clinical findings, cutaneous manifestations were classified into three broad categories: physiological skin changes, dermatoses modified by pregnancy, and pregnancy-specific dermatoses. Physiological changes included pigmentary alterations, connective tissue changes, vascular changes, hair and nail changes, and mucosal changes.

Diagnostic Evaluation

Diagnosis was primarily clinical and supported by relevant laboratory investigations wherever indicated. Routine investigations such as complete blood count, liver function tests, and urine examination were performed in suspected cases of pregnancy-specific dermatoses. In patients presenting with generalized pruritus without primary skin lesions, liver function tests were carried out to evaluate for intrahepatic cholestasis of pregnancy.

Skin biopsy was performed in selected cases where the diagnosis was uncertain or when clinically indicated, particularly in suspected cases of pemphigoid gestationis. Histopathological examination was conducted using standard techniques, and direct immunofluorescence studies were performed where appropriate to confirm autoimmune blistering disorders. Microbiological investigations, including potassium hydroxide mount, Gram staining, and culture studies, were carried out in suspected infectious dermatoses. Serological tests were performed when required to support the diagnosis.

Study Size Calculation

The sample size was calculated using the formula:

$$n = Z^2 \times p \times q / d^2$$

Where:

$$Z = 1.96 \text{ (95\% confidence level)}$$

$$p = 0.80 \text{ (expected prevalence)}$$

$$q = 1 - p = 0.20$$

$$d = 0.05 \text{ (margin of error)}$$

$$n = (1.96)^2 \times 0.80 \times 0.20 / (0.05)^2$$

$$n = 3.84 \times 0.16 / 0.0025$$

$$n = 0.6144 / 0.0025$$

$$n = 245.76$$

The minimum sample size required was 246. To improve statistical validity and representation, 400 participants were included.

Ethical Consideration

Ethical approval was obtained from the Institutional Ethics Committee of SCB Medical College and Hospital, Cuttack (Approval No: IEC/SCBMCH/2023/147; Date of approval:

15 December 2023). Written informed consent was obtained from all participants prior to enrollment. Confidentiality and anonymity were strictly maintained.

Bias

To minimize selection bias, consecutive sampling was used. Observer bias was reduced by conducting dermatological examination using a standardized clinical protocol. Diagnostic confirmation was supported by laboratory investigations and histopathological examination where necessary. Data were recorded using a structured proforma to ensure consistency.

Statistical Analysis

Data collected were entered into a Microsoft Excel spreadsheet and analyzed using IBM SPSS Statistics version 26.0. Descriptive statistical methods were employed to summarize demographic variables and the frequency of various cutaneous manifestations. Results were expressed as frequencies, percentages, and mean values where applicable. The distribution of cutaneous manifestations across different trimesters and parity groups was analyzed. Data were tabulated and presented using tables and graphical representations to facilitate clear interpretation of findings.

RESULTS

Participant Flow

A total of 432 pregnant women were assessed for eligibility during the study period. Of these, 18 declined consent, and 14 did not meet the inclusion criteria due to pre-existing dermatological conditions unrelated to pregnancy. Finally, 400 participants were included in the study and analyzed.

A total of 400 pregnant women were included in the study over a period of 18 months. Participants belonged to different age groups, parity status, and gestational periods, providing a representative overview of cutaneous manifestations occurring during pregnancy in a tertiary care setting.

Demographic and Obstetric Profile

The majority of participants belonged to the 20–30-year age group, accounting for **304 women (76.0%)**. Primigravida women constituted **216 cases (54.0%)**, while **184 women (46.0%)** were multigravida. With respect to gestational age, **88 women (22.0%)** were in the first trimester, **142 women (35.5%)** in the second trimester, and **170 women (42.5%)** in the third trimester. A higher frequency of cutaneous manifestations was observed during the second and third trimesters.

Table 1: Demographic and Obstetric Profile of the Study Population (n = 400)

Variable	Category	Number of Patients (n)	Percentage (%)
Age (years)	<20	32	8.0
	20–25	168	42.0
	26–30	136	34.0
	>30	64	16.0
Parity	Primigravida	216	54.0
	Multigravida	184	46.0
Trimester	First trimester	88	22.0
	Second trimester	142	35.5
	Third trimester	170	42.5
Residence	Urban	178	44.5
	Rural	222	55.5

Overall Distribution of Cutaneous Manifestations

Based on clinical evaluation, cutaneous manifestations were categorized into three major groups. Physiological skin changes were observed in **280 women (70.0%)**,

dermatoses modified by pregnancy were identified in **80 women (20.0%)**, and pregnancy-specific dermatoses were noted in **40 women (10.0%)**. Figure 1 illustrates the proportional distribution of these three major categories of cutaneous manifestations observed in the study population.

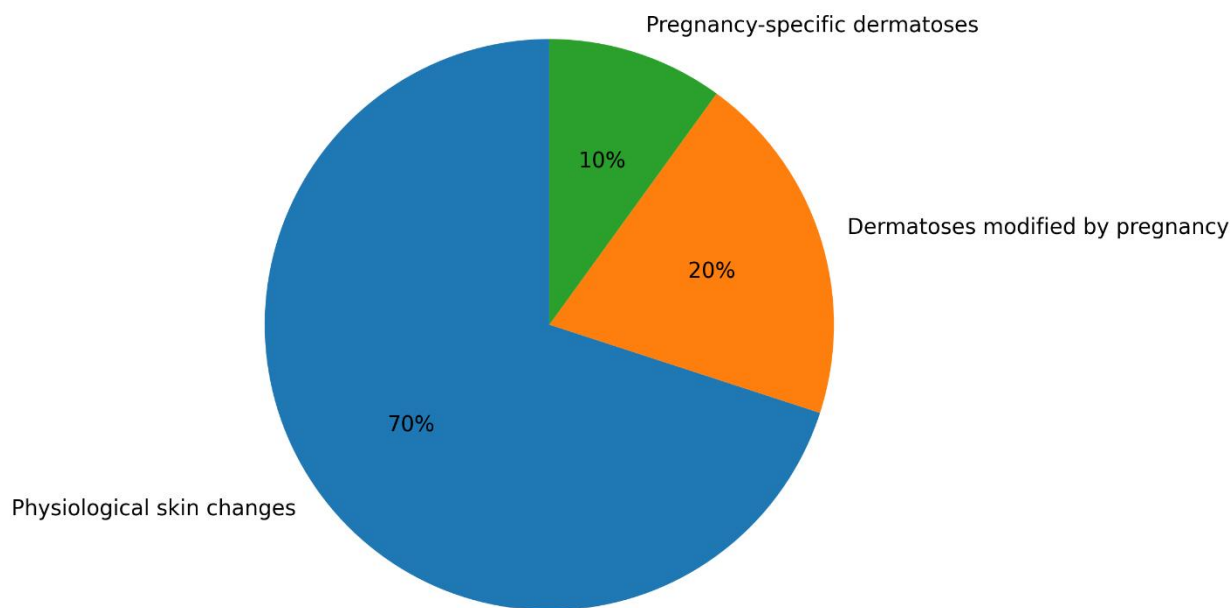


Figure 1: Distribution of Cutaneous Manifestations During Pregnancy

Physiological Skin Changes

Physiological skin changes constituted the most common category and were observed in **280 women (70.0%)**. Pigmentary changes were the most frequent manifestation, affecting **208 women (52.0%)**, and included generalized hyperpigmentation, linea nigra, secondary areola formation, and melasma. Striae gravidarum were documented in **156 women (39.0%)**, predominantly involving the abdomen, breasts, and thighs, with greater prevalence during the third

trimester. Vascular changes such as palmar erythema, spider angiomas, and pedal edema were observed in **64 women (16.0%)**, mainly in late pregnancy. Hair changes, including increased scalp hair density and diffuse hair fall, were noted in **48 women (12.0%)**, while nail changes such as brittleness and increased growth rate were seen in **24 women (6.0%)**. Mucosal changes, including gingival hyperemia and mucosal pigmentation, were observed in **20 women (5.0%)**.

Table 2: Distribution of Cutaneous Manifestations During Pregnancy (n = 400)

Category of Cutaneous Manifestation	Number of Patients (n)	Percentage (%)
Physiological skin changes	280	70.0
Dermatoses modified by pregnancy	80	20.0
Pregnancy-specific dermatoses	40	10.0
Total	400	100

Dermatoses Modified by Pregnancy

Dermatoses whose course was altered by pregnancy were identified in **80 women (20.0%)**. Among these, atopic dermatitis was the most common inflammatory dermatosis, affecting **32 women (8.0%)**, either as exacerbation of pre-

existing disease or new onset during pregnancy. Acne vulgaris was observed in **20 women (5.0%)**, showing variable clinical behavior during gestation. Infectious dermatoses were documented in **24 women (6.0%)**, with candidiasis being the most frequently encountered

infection, followed by viral infections. Autoimmune and metabolic dermatoses, including lupus erythematosus and pemphigus vulgaris, were observed in **4 women (1.0%)**.

Pregnancy-Specific Dermatoses

Pregnancy-specific dermatoses were identified in **40 women (10.0%)** and were commonly associated with significant pruritus. Atopic eruption of pregnancy was the most frequent condition in this group, affecting **24 women (6.0%)**, predominantly during the first and second trimesters. Polymorphic eruption of pregnancy was observed in **10 women (2.5%)**, mainly among primigravida women in the third trimester. Pemphigoid gestationis was diagnosed in **2 women (0.5%)**, confirmed by histopathology and direct immunofluorescence. Intrahepatic cholestasis of pregnancy was noted in **4 women (1.0%)**, presenting with generalized pruritus without primary skin lesions.

Trimester-wise Distribution

An increasing trend in the frequency of cutaneous manifestations was observed with advancing gestational age. Skin changes were observed in **22.0%** of women in the first trimester, **35.5%** in the second trimester, and **42.5%** in the third trimester, with physiological skin changes and pregnancy-specific dermatoses being more common in the later stages of pregnancy.

DISCUSSION

Pregnancy is accompanied by profound physiological, hormonal, immunological, and vascular changes that significantly influence the skin and its appendages. These adaptations, while essential for maintaining a healthy pregnancy, result in a wide spectrum of cutaneous manifestations. The present cross-sectional observational study evaluated the clinical and epidemiological profile of skin changes among pregnant women attending a tertiary care hospital, providing insight into their frequency, pattern, and clinical relevance.

The present study demonstrated that physiological skin changes were the most common manifestation, affecting 70.0% of participants, followed by dermatoses modified by pregnancy (20.0%) and pregnancy-specific dermatoses (10.0%). Pigmentary changes were the most frequent physiological finding, occurring in 52.0% of cases, while striae gravidarum affected 39.0%. Among pregnancy-specific dermatoses, atopic eruption of pregnancy was most common, affecting 6.0% of women. These findings indicate that physiological changes constitute the majority

of dermatological manifestations during pregnancy, while pregnancy-specific dermatoses represent a smaller but clinically significant proportion.

In the present study, cutaneous manifestations were observed in a substantial proportion of pregnant women, supporting the concept that dermatological changes during pregnancy are common rather than exceptional. Physiological skin changes were identified in 70.0% of participants, a finding comparable to previous reports indicating that up to 80–90% of pregnant women experience physiological or pathological skin changes during gestation [8]. This high prevalence reflects the combined effects of endocrine alterations, immunological modulation, and vascular changes occurring throughout pregnancy.

Physiological Skin Changes

Physiological skin changes constituted the most frequent category of cutaneous manifestations in the present study. Pigmentary alterations were the predominant findings, including hyperpigmentation, linea nigra, and secondary areola formation. These observations are consistent with the findings of Wong and Ellis, who reported pigmentary changes as the most common physiological manifestations during pregnancy, particularly among women with darker skin types [8]. The high frequency of pigmentary changes observed in the present study reinforces the role of pregnancy-related hormonal stimulation of melanocyte activity. Melasma was frequently observed, particularly during the second and third trimesters, and was more common among primigravida women. Similar trimester-wise patterns have been reported in earlier studies, with hormonal influences, genetic predisposition, and ultraviolet exposure identified as contributing factors [8]. The cosmetically distressing nature of melasma and its tendency to persist into the postpartum period underscore its clinical relevance despite its benign nature.

Striae gravidarum represented another major physiological finding, particularly in women in advanced gestation. In the present study, striae were predominantly observed over the abdomen, breasts, and thighs, findings that are comparable to those reported in Indian and international literature [11]. The development of striae gravidarum has been attributed to mechanical stretching of the skin combined with hormonal effects on collagen and elastin fibers, supporting the multifactorial etiology suggested by previous studies.

Vascular changes such as palmar erythema, spider angiomas, and lower limb edema were observed in a subset

of patients, predominantly during the third trimester. These findings are consistent with earlier reports attributing vascular changes to estrogen-induced vasodilatation and increased blood volume during pregnancy [8]. Hair, nail, and mucosal changes were less frequent but clinically notable, with increased scalp hair density during pregnancy and mucosal pigmentation reflecting heightened vascularity and hormonal influence.

Dermatoses Modified by Pregnancy

Dermatoses influenced by pregnancy accounted for 20.0% of cases in the present study, making this the second most common category of cutaneous manifestations. Among inflammatory dermatoses, atopic dermatitis was the most frequently observed condition. Many women experienced either exacerbation of pre-existing disease or first-time onset during pregnancy. Similar observations have been reported in previous studies, where the immunological shift toward a Th2-dominant state during pregnancy was associated with increased susceptibility to atopic disorders [12]. Acne vulgaris demonstrated variable clinical behavior, with some patients reporting improvement and others experiencing exacerbation. This inconsistency has been attributed to fluctuating androgen levels and altered sebaceous gland activity during pregnancy and has been documented in earlier studies as well [11].

Infectious dermatoses were also commonly encountered, with candidiasis being the most frequent infection. Increased estrogen levels, altered vaginal pH, and relative immunosuppression during pregnancy are known to predispose women to fungal infections. Viral infections such as herpes simplex virus infection and human papillomavirus-related lesions were also observed, findings that align with previous reports emphasizing the importance of early diagnosis and management to prevent maternal and neonatal complications [11].

Autoimmune and metabolic dermatoses were less common but clinically significant. Conditions such as lupus erythematosus and pemphigus vulgaris showed altered disease activity during pregnancy. The unpredictable influence of pregnancy-related immunological changes on autoimmune diseases observed in this study is consistent with earlier observations [13].

Pregnancy-Specific Dermatoses

Pregnancy-specific dermatoses were identified in 10.0% of the study population and were commonly associated with significant pruritus. Atopic eruption of pregnancy was the most frequent pregnancy-specific dermatosis,

predominantly presenting during the first and second trimesters. The early onset and clinical patterns observed in the present study are comparable to those described by Ambros-Rudolph et al., who highlighted the role of immunological mechanisms in its pathogenesis [9].

Polymorphic eruption of pregnancy was observed in primigravida women during the third trimester, with lesions characteristically involving the abdominal striae while sparing the periumbilical region. These findings are consistent with previous studies reporting a benign course and favorable maternal and fetal outcomes [10]. Pemphigoid gestationis was rarely encountered in the present study but remains clinically significant due to its autoimmune etiology and potential association with adverse fetal outcomes. The diagnosis and disease course observed in this study were consistent with earlier descriptions [10].

Intrahepatic cholestasis of pregnancy was diagnosed in women presenting with generalized pruritus without primary skin lesions. Given its established association with fetal distress, preterm labor, and intrauterine fetal demise, early diagnosis and close obstetric monitoring are essential. The findings of the present study reinforce the importance of evaluating unexplained pruritus during pregnancy [13].

Trimester-wise Distribution and Clinical Implications

An increasing frequency of cutaneous manifestations with advancing gestational age was observed in the present study. Physiological skin changes and pregnancy-specific dermatoses were more commonly observed during the second and third trimesters, while dermatoses modified by pregnancy were often noted earlier in gestation. Similar trimester-wise trends have been reported in previous studies and reflect the progressive hormonal, immunological, and mechanical changes of pregnancy [9,12]. The findings of this study emphasize the importance of distinguishing physiological skin changes from pathological dermatoses to avoid unnecessary anxiety and interventions. At the same time, early recognition of pregnancy-specific dermatoses and dermatoses modified by pregnancy is crucial for appropriate management and improved maternal and fetal outcomes.

CONCLUSION

Cutaneous manifestations are exceedingly common during pregnancy and represent a diverse spectrum ranging from benign physiological changes to pathological dermatoses with potential maternal and fetal implications. The present

cross-sectional observational study conducted among 400 pregnant women at a tertiary care hospital demonstrated that physiological skin changes constituted the most frequent findings, followed by dermatoses modified by pregnancy and pregnancy-specific dermatoses. Pigmentary alterations, striae gravidarum, and vascular changes were the predominant physiological manifestations, reflecting the profound hormonal, immunological, and vascular adaptations of pregnancy. Dermatoses influenced by pregnancy, particularly inflammatory and infectious conditions, showed variable clinical behavior, emphasizing the role of pregnancy-related immunological modulation in altering disease course. Pregnancy-specific dermatoses, though less common, were clinically significant due to intense pruritus and the need for accurate diagnosis to differentiate benign conditions from those associated with adverse fetal outcomes, such as pemphigoid gestationis and intrahepatic cholestasis of pregnancy. An increasing frequency of cutaneous manifestations with advancing gestational age was observed, highlighting the progressive impact of pregnancy-related changes on the skin. Early recognition, correct classification, and appropriate management of these dermatological conditions are essential to alleviate patient anxiety, prevent complications, and ensure optimal maternal and fetal outcomes. A multidisciplinary approach involving dermatologists and obstetricians is crucial for comprehensive antenatal care. The findings of this study contribute valuable epidemiological data on pregnancy-related dermatoses and underscore the importance of routine dermatological evaluation during pregnancy, particularly in tertiary care settings, to improve patient counseling, clinical decision-making, and overall quality of maternal healthcare.

Limitations

This study was conducted at a single tertiary care center, which may limit generalizability to the general population. The cross-sectional design prevented assessment of the temporal progression of dermatoses. Additionally, follow-up after delivery was not performed, limiting the evaluation of postpartum resolution.

Generalizability

The findings of this study are generalizable to pregnant women attending tertiary care hospitals in similar settings, particularly in developing countries. However, variations in environmental, genetic, and socioeconomic factors may influence prevalence.

Recommendations

Routine dermatological screening should be incorporated into antenatal care. Early diagnosis and management can prevent complications and improve maternal quality of life. Further multicenter longitudinal studies are recommended.

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This study received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

RB: Study design, data collection
BP: Data analysis
SS: Literature review
JM: Supervision
KS: Manuscript drafting
ASK: Final review

List of Abbreviations

SCBMCH – SCB Medical College and Hospital
SPSS – Statistical Package for Social Sciences
IEC – Institutional Ethics Committee

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Author Biography

Dr. Reshma Biswal is an Assistant Professor of Dermatology with research interests in pregnancy dermatoses and clinical dermatology.

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