

Cutaneous Manifestations in Chronic Renal Failure Patients on Hemodialysis

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Abstract

Background: Cutaneous disorders are a common manifestation of patients with chronic renal failure (CRF) or end-stage renal disease (ESRD).

Materials and Methods: The study was conducted prospectively on 100 patients diagnosed to have CRF who were undergoing hemodialysis. The patients in this study include patients of hemodialysis unit and referrals made to DVL Department, MGM Hospital, Warangal.

Results: A total of 100 cases were recruited. Detailed history was taken, and complete clinical examination was carried out. The results obtained has been depicted in tabular and graph format.

Conclusion: In patients with CRF on hemodialysis; xerosis, nail changes, pruritus, and diffuse hyperpigmentation are the predominant cutaneous manifestations.

Key words: Chronic renal failure, Cutaneous manifestations, Hemodialysis

INTRODUCTION

Cutaneous disorders are a common manifestation of patients with chronic renal failure (CRF) or end-stage renal disease (ESRD). Nunley¹ reported that 50-100% of patients have at least one dermatological disorder. Picó *et al.*² assessed the prevalence of dermatologic problems among 102 patients with CRF undergoing dialysis. All patients examined had at least one cutaneous lesion with the most prevalent disorder being hyperpigmentation.

ESRD is defined as progressive and irreversible kidney dysfunction that lasts longer than 3 months. Some of the important conditions that lead to ESRD include glomerulonephritis, pyelonephritis, interstitial nephritis, diabetic nephropathy, cystic renal disease, renal vascular

disease, drug-induced nephropathy, unknown causes, and obstructive uropathy.

Nitrogenous by-products of protein catabolism, represented as urea and otherwise known as blood urea nitrogen, commonly accumulate within the serum of these patients due to inadequate renal excretion.

It has been proposed that many of the cutaneous disorders experienced by patients undergoing dialysis have little to do with the uremic syndrome and are related to the underlying pathologic process that induced the renal disease.¹ On the contrary, others proposed that changes in skin histology were more related to the severity and duration of the renal failure and less with its underlying etiology.³⁻⁹

Recent advances in the treatment have improved the quality of life and life expectancy of these patients, resulting in changes in the frequency and types of skin disorders observed in conjunction with ESRD. Dermatologic conditions such as uremic frost, erythema papulatum uremicum, uremic roseola, and uremic erysipeloid now seldom occur.⁵ Various specific and non-specific skin abnormalities are observed in patients with ESRD. Non-specific disorders include pigmentary disorders,

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pruritus, xerosis, acquired ichthyosis, and half-and-half nail. Specific disorders include acquired perforating dermatosis, calciphylaxis, bullous dermatoses, and fibrosing dermopathy of uremia.

Dermatological manifestations of renal disease may further be divided into three general categories including⁵

1. Dermatological manifestations of renal failure patients on hemodialysis.
2. Dermatological manifestations of diseases associated with the development of ESRD.
3. Dermatological disorders associated with renal transplantation.

This study is focussed on the cutaneous manifestations of renal failure patients on hemodialysis.

Aims and Objectives

- To study the different clinical patterns of cutaneous lesions in CRF patients undergoing hemodialysis.
- To study the frequency of distribution of lesions in the skin and nails.
- To study the epidemiology of patients with cutaneous manifestations with CRF on hemodialysis in relation to age, sex, and predisposing factors.
- To study the associated local cutaneous complications at the site of cannula insertion into the arteriovenous (AV) fistula.

MATERIALS AND METHODS

Source of Data

The study was conducted prospectively on 100 patients diagnosed to have CRF who were undergoing hemodialysis. The patients in this study include patients of hemodialysis unit and referrals made to DVL Department, MGM Hospital, Warangal.

Methodology

After obtaining clearance and approval from the Institutional Ethical Committee, 100 cases were included for the study.

Informed written consent was obtained, and the clinical data were recorded as per the pro forma. Detailed history taking and complete clinical examination were done. Clinical photographs were taken at the same sitting.

Relevant blood investigations were done for all patients including:

1. Hemoglobin percentage, total WBC count, and differential count
2. Blood urea, serum creatinine, and serum electrolytes
3. Serum calcium and phosphorus
4. HIV 1 and 2.

Special investigations including Tzanck smear, wet mount preparations from the scraping and microscopy, nail clippings and skin scrapings for fungal culture, skin biopsy for histopathology, pus swab for culture and sensitivity whenever required.

All patients were examined and relevant data collected at one sitting only.

Inclusion Criteria

All cases of CRF diagnosed by the nephrologist depending on the clinical and biochemical parameters who were on hemodialysis were included in the study.

Exclusion Criteria

1. Patients with acute renal failure.
2. Patients with CRF undergoing peritoneal dialysis.
3. Patients with CRF who had undergone renal transplantation.

Sample Size

A total of 100 cases were studied.

Study Duration

The study duration was January 2014 - June 2015 (18 months).

Study Design

The study design was descriptive study.

Sample design

The sample design was purposive sampling.

Severity of CRF was graded based on serum creatinine values: Mild CRF - serum creatinine 1.6-3.9 mg/dl.

- Moderate CRF - serum creatinine 4.0-6.9 mg/dl.
- Severe CRF - serum creatinine >7 mg/dl.

Observations and Results

A total of 100 cases were recruited. Detailed history was taken, and complete clinical examination was carried out.

Age and Sex

Out of 100 cases studied, 63 were males, and 37 were females (Graph 1).

The age group of patients studied ranged from 16 to 70 years. Maximum number of patients in the study belonged to age group of 41-60 years and the least number of patients (4) belonged to age group of <20 years. 4 patients were <20 years, 9 were aged between 21 and 30, 21 were aged between 31 and 40 years, 26 each in the age group of 41-50 and 51-60, and 14 were aged between 61 and 70 years. The pattern of age and sex distribution of the patients is presented in Table 1 and Graph 2.

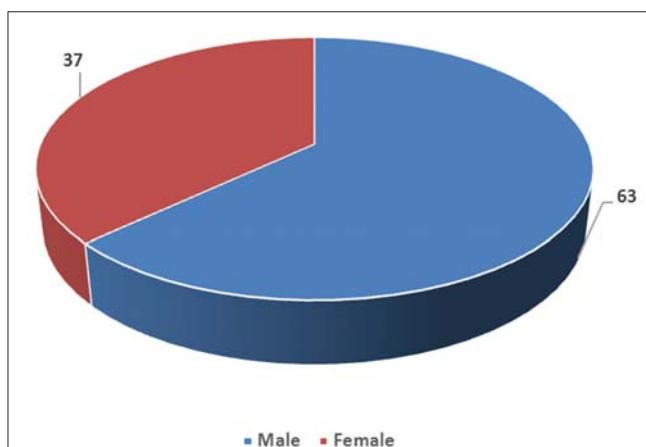
Cause of CRF

The cause of CRF was diabetic nephropathy in 50, chronic glomerulonephritis in 24, chronic interstitial nephritis in 19, pyelonephritis and renovascular disease in 1 each and IgA nephropathy in 3, and polycystic kidney disease in 2 patients. The above data are presented in Table 2. The duration of the disease ranged from 2 weeks to 23 years.

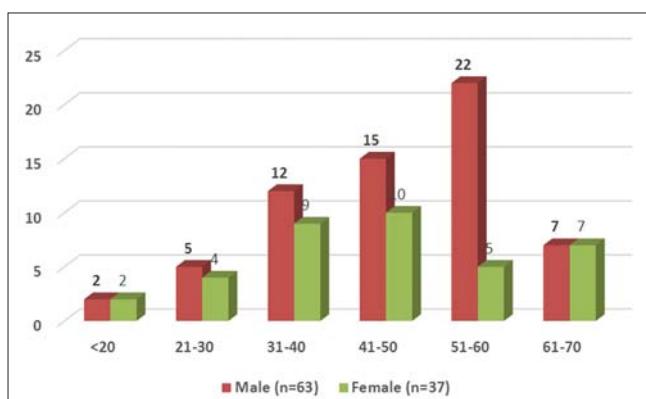
Duration and Total Number of Dialysis

The duration since the patient was undergoing hemodialysis ranged from 15 days to 10 years with majority of patients (66) undergoing dialysis for <6 months, 23 patients between 6 months and 1 year, 12 patients between 1 and 2 years, 5 patients between 2 and 3 years, and 10 patients for more than 3 years. The data regarding the duration of dialysis is presented in Table 3. The frequency of dialysis was either twice or thrice a week in all the patients.

Out of the 100 patients studied, 49 underwent dialysis for <50 sittings, 32 underwent dialysis for more than 100 sittings, and remaining 19 had 51-100 sittings of dialysis. This is presented in Table 4.



Graph 1: Sex distribution of study patients



Graph 2: Age, group and sex distribution of study patients

Severity of CRF

Majority of the patients (47) in our study had severe CRF with serum creatinine values more than 7 mg/dl at the time of examination. 42 patients had moderate CRF (serum creatinine 4-6.9 mg/dl), and 11 patients had mild CRF (serum creatinine 1.6-3.9 mg/dl). The results are presented in Table 5.

Table 1: Age group and sex distribution of study patients

Age groups	Number of patients (n=100)	Male (n=63)	Female (n=37)
<20	4	2	2
21-30	9	5	4
31-40	21	12	9
41-50	26	15	10
51-60	26	22	5
61-70	14	7	7

Table 2: Causes of CRF in study patients

Causes of CRF	Number of patients undergoing hemodialysis (n=100)
Diabetic nephropathy	50
Chronic glomerulonephritis	24
Chronic interstitial nephritis	19
IgA nephropathy	03
Polycystic kidney disease	02
Pyelonephritis	01
Renovascular disease	01

CRF: Chronic renal failure

Table 3: Duration of dialysis in study patients

Duration of dialysis	Number of patients (n=100)
<6 months	50
6 months up to 1 year	23
1-2 years	12
2-3 years	05
>3 years	10

Table 4: Distribution of study patients according to number of dialysis

Total number of dialysis	Number of patients (n=100)
<50 sittings	49
51-100 sittings	19
>100 sittings	32

Table 5: Study patients distribution according to severity of CRF

Grade of CRF (based on serum creatinine values)	Number of patients (n=100)
Mild (1.6-3.9 mg/dl)	11
Moderate (4-6.9 mg/dl)	42
Severe (>7 mg/dl)	47

CRF: Chronic renal failure

Cutaneous Manifestations

Out of the 100 patients with CRF on hemodialysis, 99 had at least one cutaneous finding, and 1 patient had none.

The most common cutaneous manifestations in our study were xerosis (50) and the least common finding was bullous dermatoses (none). Other cutaneous manifestations included pruritus (38), cutaneous pigmentation (36), nail changes (42), mucosal changes (20), pallor (23), cutaneous infections (27), perforating dermatoses (04), hair abnormalities (04), and calcinosis cutis (2). This is presented in Table 6.

Xerosis was the most common cutaneous finding in our study, observed in 50 patients. 38 patients had generalized xerosis. It was confined to upper limb in 6, the lower limb in 4, and face in 2 patients.

Pruritus was documented in 38 patients, generalized in 30 and localized in 8 patients. Diffuse hyperpigmentation was observed in 36 patients in our study. Calcinosis cutis was observed in 2 patients.

Nail changes observed in this study included leukonychia, onychomycosis, dystrophic nails, half and half nails and melanonychia, paronychia, clubbing, mees' lines, and beau's lines. The frequencies of each nail abnormalities are presented in Table 7.

Table 6: Distribution of cutaneous manifestations in relation to sex of the patient

Cutaneous findings	Number of patients n=100	Male n=63	Female n=37
Xerosis	50	30	20
Pruritus	38	26	12
Diffuse hyperpigmentation	36	21	15
Nail changes	48	32	16
Pallor	23	14	9
Infections	27	21	6
Mucosal changes	20	14	6
Perforating dermatoses	06	4	2
Hair abnormalities	06	3	3
Calcinosis cutis	2	2	0
Miscellaneous	25	17	8

Table 7: Types of nail changes documented in the study

Nail changes	Number of patients (n=48)
Leukonychia	22
Melanonychia	01
Half and half nails	05
Dystrophic nails	06
Onychomycosis	08
Clubbing	02
Paronychia	02
Beau's lines	01
Mees' lines	01

Mucosal changes were observed in 20 patients including black hairy tongue, coated tongue, scrotal tongue, oral candidiasis, fissured tongue, and vaginal candidiasis. This is presented in Table 8.

Cutaneous infections in CRF patients on hemodialysis were encountered in 27 patients. They included dermatophytoses, herpes labialis, candidal intertrigo, folliculitis, furuncle, herpes zoster, tinea pedis, and verruca vulgaris. This is presented in Table 9.

Other associated cutaneous findings included linear melanocytic nevi, acrochordon, dermatosis papulosa nigra, pyogenic granuloma, lichen simplex chronicus, milia, comedones, decubitus ulcer, vitiligo, fixed drug eruption, AV fistula dermatitis, keloid, purpura, gynecomastia, periorbital edema, leg ulcer, and idiopathic guttate hypomelanoses. This is presented in Table 10.

Cutaneous Manifestations in Relation to Severity of CRF were as follows

A total of 11 patients had mild CRF. Cutaneous manifestations in this group included pruritus in 3, xerosis in 3, pallor in 3, cutaneous infections in 7, nail changes in 1, and diffuse hyperpigmentation in 1 patient. This is presented in Table 11.

A total of 42 patients had moderate CRF in the study. Cutaneous manifestations in this group included pruritus in 14, xerosis in 22, pallor in 6, cutaneous infections in 12, nail changes in 15, perforating dermatoses in 3, diffuse

Table 8: Types of mucosal changes observed in the study

Mucosal changes	Number of patients (n=20)
Geographic tongue	01
Black hairy tongue	01
Candidiasis	04
Scrotal tongue	05
Lichen planus	01
Bald tongue	04
Fissured tongue	02
Tooth decay	02

Table 9: Types of cutaneous infections in CRF patients on hemodialysis

Infections	Number of patients (n=27)
Dermatophytosis	13
Folliculitis	03
Furuncle	02
Herpes labialis	02
Herpes zoster	01
Intertrigo	03
Verruca vulgaris	02
Leg ulcer	01

CRF: Chronic renal failure

hyperpigmentation in 13, mucosal changes in 11, and hair abnormalities in 2 patients. This is presented in Table 12.

A total of 47 patients had severe CRF in the study. Cutaneous manifestations in this group included pruritus in 21, xerosis in 25, pallor in 14, cutaneous infections in 8, nail changes in 29, perforating dermatoses in 3, diffuse

hyperpigmentation in 22, mucosal changes in 9, and hair abnormalities in 4 patients. This is presented in Table 13.

Cutaneous Manifestations Associated with Number of Dialysis

A total of 49 patients underwent <50 sittings of dialysis. Cutaneous manifestations in this group included pruritus in 29, xerosis in 17, pallor in 10, cutaneous infections in 16, nail changes in 14, perforating dermatoses in 1, diffuse hyperpigmentation in 10, mucosal changes in 7, and hair abnormalities in 3 patients. This is presented in Table 14.

A total of 19 patients underwent 51-100 sittings of dialysis. Cutaneous manifestations in this group of patients included pruritus in 5, xerosis in 12, pallor in 5, cutaneous infections in 7, nail changes in 8, perforating dermatoses in 1, diffuse hyperpigmentation in 4, mucosal changes in 7, and hair abnormalities in 1 patient. This is presented in Table 15.

Table 10: Various miscellaneous cutaneous manifestations in CRF patients in the study

Miscellaneous cutaneous findings	Number of patients (n=25)
Melanocytic nevi	02
Scar	01
Dermatoses papulosa nigra	02
Acrochordon	03
Keloid	02
Lichen simplex chronicus	01
Milia	01
Acne	01
Pyogenic granuloma	01
Keratolysis exfoliativa	01
Decubitus ulcer	02
Vitiligo	01
AV fistula dermatitis	01
Fixed drug eruption	01
Idiopathic guttate hypomelanoses	01
Periorbital edema	01
Traumatic leucoderma	01
Non-palpable purpura	01
Gynecomastia	01

AV: Arteriovenous, CRF: Chronic renal failure

Table 11: Cutaneous manifestations in patients with mild CRF

Cutaneous manifestations	Number of patients n=11 (%)
Pruritus	03 (27.2)
Xerosis	03 (27.2)
Diffuse hyperpigmentation	01 (9.1)
Perforating dermatoses	0 (0)
Nail changes	01 (9.1)
Pallor	03 (27.2)
Hair abnormalities	0 (0)
Mucosal changes	0 (0)
Cutaneous infections	07 (63.6)

CRF: Chronic renal failure

Table 12: Cutaneous manifestations in patients with moderate CRF

Cutaneous manifestations	Number of patients n=42 (%)
Pruritus	14 (33.3)
Xerosis	22 (52.3)
Diffuse hyperpigmentation	13 (30.9)
Perforating dermatoses	03 (7.1)
Nail changes	15 (35.7)
Pallor	06 (14.3)
Hair abnormalities	02 (4.7)
Mucosal changes	11 (26.2)
Cutaneous infections	12 (28.5)

CRF: Chronic renal failure

Table 13: Cutaneous manifestations in patients with severe CRF

Cutaneous manifestations	Number of patients n=47 (%)
Pruritus	21 (44.6)
Xerosis	25 (53.1)
Cutaneous hyperpigmentation	22 (46.8)
Perforating dermatoses	03 (6.3)
Nail changes	29 (61.7)
Pallor	14 (29.7)
Hair abnormalities	04 (8.5)
Mucosal changes	09 (19.1)
Cutaneous infections	08 (17)

CRF: Chronic renal failure

Table 14: Cutaneous manifestations in patients undergoing <50 sittings of dialysis

Cutaneous manifestations	Number of patients n=49 (%)
Pruritus	29 (59.1)
Xerosis	17 (34.6)
Diffuse hyperpigmentation	10 (20.4)
Perforating dermatoses	01 (2)
Nail changes	14 (28.4)
Pallor	10 (20.4)
Hair abnormalities	03 (6.1)
Mucosal changes	07 (14.2)
Cutaneous infections	16 (32.6)

Table 15: Cutaneous manifestations in patients undergoing 51-100 sittings of dialysis

Cutaneous manifestations	Number of patients n=19 (%)
Pruritus	05 (26.3)
Xerosis	12 (63.1)
Diffuse hyperpigmentation	04 (21.1)
Perforating dermatoses	01 (5.2)
Nail changes	08 (42.1)
Pallor	05 (26.3)
Hair abnormalities	01 (5.2)
Mucosal changes	07 (36.8)
Cutaneous infections	07 (36.8)

A total of 33 patients underwent more than 100 sittings of dialysis. Cutaneous manifestations in this group included pruritus in 4, xerosis in 21, pallor in 8, cutaneous infections in 4, nail changes in 23, perforating dermatoses in 4, diffuse hyperpigmentation in 22, mucosal changes in 6, and hair abnormalities in 2 patients. This is presented in Table 16.

Cutaneous Manifestations in Relation to Predisposing Factors

Diabetic nephropathy accounted for the most common cause for CRF in our study (50%), of which pruritus was seen in 20 (40%), xerosis in 29 (58%), diffuse hyperpigmentation in 23 (46%), and nail changes in 26 (52%) of patients.

Chronic glomerulonephritis was the second most common cause of CRF (24). Pruritus was present in 5 (21%), xerosis in 10 (42%), diffuse hyperpigmentation in 8 (33%), and nail changes in 12 (50%) patients.

Chronic interstitial nephritis was the predisposing cause of CRF in 19 patients. Pruritus was present in 10 (53%), xerosis in 8 (42%), diffuse hyperpigmentation in 3 (16%), and nail changes in 8 (42%) patients. This is presented in Table 17.

Cutaneous Manifestations in Relation to Age of Patients

Patients were grouped into three groups, age <30 years, 31-50 years, and 51-70 years for comparing the frequency of cutaneous manifestations such as pruritus, xerosis, diffuse hyperpigmentation, and nail changes.

About 13 patients were aged <30 years in the study. 7 patients (54%) had pruritus, 5 patients (38%) had xerosis,

3 patients (23%) had diffuse hyperpigmentation, and 5 patients (38%) had nail changes.

About 47 patients were aged between 30 and 50 years in the study. 18 patients (38%) had pruritus, 20 patients (43%) had xerosis, 18 patients (38%) had diffuse hyperpigmentation, and 19 patients (40%) had nail changes.

About 40 patients were aged between 50 and 70 years in the study. 13 patients (33%) had pruritus, 25 patients (62%) had xerosis, 15 patients (37%) had diffuse hyperpigmentation, and 24 patients (60%) had nail changes. This is presented in Table 18.

DISCUSSION

Cutaneous manifestations in patients with CRF on hemodialysis were found to be present in 99% of patients in this study. This is comparable to other studies including the study conducted by Udaykumar *et al.*⁵ and Picó *et al.*² who had documented cutaneous disorders in all the patients (100%) in the study. Hajheydari and Makhloogh⁷ had 94.1% patients suffering from cutaneous manifestations due to CRF.

Pruritus was documented in 38% of patients in this study. The prevalence of pruritus in patients with respect to a total number of dialysis varied. It was 59.1%, 26.5%, and 12.5% in patients who underwent <50, 50-100, and >100 dialysis, respectively. Picó *et al.*² have recorded pruritus in 42%, Gilchrest⁶ has reported a prevalence of 19.90%, and Hajheydari and Makhloogh⁷ found 38.6% to have pruritus. The incidence of pruritus decreased significantly as the duration of dialysis increased probably due to clearance of pruritogenic substances by hemodialysis.

Xerosis was the most common finding in this study documented in 50% of patients. The incidence increased as the duration of CRF and total number of dialysis increased. It was 34.6%, 63.1%, and 65.6% in patients who underwent <50, 50-100, and >100 dialysis, respectively.

Tawade *et al.*⁸ reported an incidence of 46% xerosis. Tawade *et al.*⁸ reported xerosis in 90% and Hajheydari and Makhloogh⁷ had reported in 22.8% patients to have xerosis in their study.

Table 16: Cutaneous manifestations in patients undergoing>100 sittings of dialysis

Cutaneous manifestations	Number of patients n=32 (%)
Pruritus	04 (12.5)
Xerosis	21 (65.6)
Diffuse hyperpigmentation	22 (68.7)
Perforating dermatoses	04 (12.5)
Nail changes	23 (71.8)
Pallor	08 (25)
Hair abnormalities	02 (6.2)
Mucosal changes	06 (18.7)
Cutaneous infections	04 (12.5)

Table 17: Cutaneous manifestations in relation to predisposing factors

Cutaneous manifestations	Diabetic nephropathy n=50 (%)	Chronic glomerulonephritis n=24 (%)	Chronic interstitial nephritis n=19 (%)
Pruritus	20 (40)	5 (21)	10 (53)
Xerosis	29 (58)	10 (42)	8 (42)
Diffuse hyperpigmentation	23 (46)	8 (33)	3 (16)
Nail changes	26 (52)	12 (50)	8 (42)

Table 18: Cutaneous manifestations in relation to age of patients

Cutaneous manifestations	<30 years n=13 (%)	31-50 years n=47 (%)	51-70 years n=40 (%)
Pruritus	7 (54)	18 (18)	13 (33)
Xerosis	5 (38)	20 (43)	25 (62)
Diffuse hyperpigmentation	3 (23)	18 (8)	15 (37)
Nail changes	5 (38)	19 (40)	24 (60)

Xerosis was more frequent in severe and moderate CRF with an incidence of 53.1% and 52.3%, respectively, as compared to mild CRF 27.2%. This could be due to severe impairment of sweat gland function, which may have a linear relationship with severity of CRF.

Diffuse hyperpigmentation was noted in 36% of patients in this study. It increased with the severity of CRF, 9.1%, 30.9%, and 46.8% in mild, moderate, and severe CRF, respectively. This could be due to increased activity of beta-melanocyte-stimulating hormone.

The incidence of diffuse hyperpigmentation is significantly more in patients who underwent >100 dialysis (68.7%) when compared to those who underwent <100 dialysis (21%), probably due to more prolonged duration of CRF in the former group of patients.

Picó *et al.*² have reported diffuse pigmentation 70%, Udaykumar *et al.*⁵ in 43%, Dyachenko *et al.*¹⁰ in 75.7%, and Hajheydari and Makhloogh⁷ in 66.3% and 36% in this study.

Acquired perforating dermatosis was found in 6% of patients in this study. Yosipovitch *et al.*¹¹ have reported 4.5%, and Mettang *et al.*¹² have reported 10% incidence of acquired perforating dermatoses in CRF patients who underwent dialysis.

Patients with <50 sittings of dialysis had 2% incidence of acquired perforating dermatoses, whereas it was 12.5% (significantly more) in the patient group who underwent more than 100 dialysis. This can be explained probably by prolonged duration of CRF in the latter group of patients.

The incidence of nail changes in this study was 48%. The most common nail change was leukonychia (23%), followed by onychomycosis (8%). Half and half nails characteristic of CRF patients on hemodialysis was found in 5% of patients only.

Attmeyer *et al.*¹³ have reported nail disorders in 71.4% uremic patients. The reported incidence of nail disorders. The reported incidence of nail disorders in published literature ranges from 52% to 71% and comparable to this

study. Dyachenko *et al.*¹⁰ have reported half and half nails in 18.6% patients.

Pallor was reported in 23% of patients in this study, distributed almost equally in all groups of patients irrespective of the severity of CRF and number of dialysis. Dyachenko *et al.*¹⁰ have reported pallor in 75.7% and Udaykumar *et al.*⁵ have found 60% incidence of pallor which is significantly higher compared to this study.

The cause of anemia may be decreased erythropoietin production by the diseased kidney or malnutrition or anemia of chronic disease.

Mucosal changes were found to present in 20% of patients in this study, and it included scrotal tongue, bald tongue, fissured tongue, geographic tongue, and oral lichen planus.

Hajheydari and Makhloogh⁷ have reported 23.8% incidence of mucosal changes which are similar to this study.

Cutaneous infections occurred in 27% of patients in this study, with 16% fungal, 6% bacterial, and 5% viral infections.

Udaykumar *et al.*⁵ have reported 55% incidence of cutaneous infections, with 30% fungal, 13% bacterial, and 12% viral infections.

Miscellaneous cutaneous findings found in 25% of patients included two each of decubitus ulcer, keloid, dermatoses papulosa nigra, and melanocytic nevus. Three patients had acrochordon and one each had lichen simplex chronicus, milia, acne, pyogenic granuloma, keratolysis exfoliativa, vitiligo, AV fistula dermatitis, fixed drug eruption, gynecomastia, non-palpable purpura, periorbital edema, and traumatic leucoderma.

AV fistula dermatitis was an iatrogenic skin manifestation found at the site of AV fistula which was created for hemodialysis.

Gynecomastia, a rare finding in CRF was found in one patient in our study.

None of our patients had other rare manifestations of CRF such as uremic frost, bullous dermatoses, and nephrogenic systemic fibrosis.

The cutaneous manifestations in relation to predisposing factors for CRF were similar. The frequency of xerosis, pruritus, diffuse hyperpigmentation, and nail changes was comparable in all groups of patients with different predisposing causes, including diabetic nephropathy, chronic glomerulonephritis, and chronic interstitial nephritis.

A comparison of cutaneous findings between this study and other published studies is presented in the tabular form. The incidence of various cutaneous findings is widely variable from one study to another. The incidence of xerosis ranged from 23% to 79%, and it was 50% in this study. The incidence of pruritus ranged from 32% to 53%, and it is 38% in this study. The incidence of diffuse hyperpigmentation varied from 22% to 66%, and it was 36% in this study. The incidence of nail changes and mucosal changes in this study are comparable to other studies, whereas the incidence of pallor and infection is less in this study when compared to others (Table 19).

Summary

1. The study was conducted at MGM Hospital, (Kakatiya Medical College), Warangal between January 2014 and June 2015 for 18 months.
2. This prospective and descriptive study included 100 patients with CRF who were undergoing dialysis.
3. Of the 100 patients, 63 were males, and 37 were females, and the age ranged from 16 years to 70 years, with the majority of them in the age group of 41-60 years.
4. The predominant cause of CRF was diabetic nephropathy (50%) followed by chronic glomerulonephritis (24%) and chronic interstitial nephritis (19%).
5. The predominant cutaneous manifestations included xerosis (50%), pruritus (38%), cutaneous pigmentation (36%), nail changes (42%), mucosal changes (20%) pallor (23%), cutaneous infections (27%), and perforating dermatoses (6%).
6. The most common nail change was leukonychia observed in 22 patients, and the most common cutaneous infection was fungal infection observed in 16 patients.
7. The nail changes documented in the study included leukonychia (22%), dystrophic nails (6%), onychomycosis (8%), half and half nails (5%),

clubbing (2%), paronychia (2%), beau's lines (1%), and mees' lines (1%).

8. The cutaneous infections observed in the study included dermatophytosis (13%), folliculitis (3%), intertrigo (3%), furuncle (2%), herpes labialis (2%), verruca vulgaris (2%), herpes zoster (1%), and leg ulcer (1%).
9. The cutaneous findings specific to CRF including perforating dermatoses (6%), calcinosis cutis (2%), beau's lines (1%), mees' lines (4%), and gynecomastia (1%) were also documented in the study.
10. The incidence of pruritus, xerosis and diffuse hyperpigmentation increased as the severity of CRF increased. In patients with mild CRF, the incidence of pruritus, xerosis, and diffuse hyperpigmentation was 27.2%, 27.2%, and 9.1%, respectively, whereas, in those with severe CRF, the incidence was 44.6%, 53.1%, and 46.8%, respectively. The incidence of cutaneous infections was predominantly seen in patients with mild CRF (63.6%).
11. The incidence of xerosis, diffuse hyperpigmentation, and nail changes was significantly more in patients undergoing more than 100 dialysis which was 65.6 %, 68.7%, and 71.8%, respectively, when compared to their occurrence in patients with <50 dialysis which was 34.6%, 20.4%, and 28.4%, respectively. However, the incidence of pruritus was significantly less in patients who underwent more than 100 dialysis with 12.5%, when compared to those with <50 dialysis which was 59.1%.

CONCLUSION

1. In patients with CRF on hemodialysis; xerosis, nail changes, pruritus, and diffuse hyperpigmentation are the predominant cutaneous manifestations.
2. The distribution of cutaneous manifestations in relation to age groups, sex, and predisposing factors is comparable.

Table 19: Comparison of cutaneous findings between this study and other published studies

Cutaneous manifestations	Present study (%)	Udaykumar et al. ⁵ (%)	Hajheydari and Makhloogh ⁷ (%)	Attia et al. ¹⁴ (%)	Praveen Kumar et al. ¹⁵ (%)	Deshmuk et al. ¹⁶ (%)
Xerosis	50	79	23	54	52	80
Pruritus	38	53	39	32	81	66
Diffuse hyperpigmentation	36	43	66	22	39	31
Nail changes	48	59	44	35	20	60
Pallor	23	60	-	42	-	69
Infections	27	55	-	-	-	35
Mucosal changes	20	41	24	16	27	
Perforating dermatoses	6	21	-	5	7	17
Hair abnormalities	6	27	38	34	22	26
Calcinosis cutis	2	0	-	-	-	-
Gynecomastia	1	1	-	-	-	-
Uremic frost	0	3	-	-	-	-

3. The incidence of nail changes, xerosis, and diffuse hyperpigmentation increases as the duration of CRF and the total number of dialysis increases.
4. The incidence of pruritus decreases significantly as the total number of dialysis is increased to more than 100, as compared to those with <50 dialysis.
5. The incidence of pruritus, xerosis, and diffuse hyperpigmentation increased as the severity of CRF increased.

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