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Skin Disorders Related to Chronic Renal Diseases on Hemodialysis

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ABSTRACT: Patients undergoing chronic hemodialysis may experience many types of cutaneous manifestations associated with metabolic disturbances and the cumulative action of uraemic toxins following chronic renal failure. The objective of this study is to determine types and incidence of cutaneous manifestations among patients undergoing chronic hemodialysis for chronic renal failure. A total of 100 patients undergoing chronic hemodialysis for chronic renal failure between December 2024 to March 2025 were selected for this case series study. A full patient assessment is also conducted to determine cutaneous manifestations associated with chronic renal failure among patients undergoing chronic hemodialysis.

The result showed that all patients had at least one cutaneous manifestation associated with chronic renal failure. The most common dermatologic manifestations were pallor, itching, and xerosis, all of which were found to have a 100% frequency among all patients. Additionally, hyperpigmentation was also present among 74% of patients, followed by petechiae found among 40% of patients, ecchymosis among 30% of patients, and accentuated wrinkling of the skin among 30% of patients as well. Similarly, nail abnormalities also presented high frequency among patients: half and half nails among 76% of patients, koilonychia among 48% of patients, and splinter hemorrhages among 28% of patients. Other abnormalities include xerostomia among 88% of patients and mucosal ulcers among 52% of patients. Other associated findings also showed 42% among all participants for patients reporting changes associated with their hair.

INTRODUCTION:

Chronic kidney disease (CKD) is described as "a gradual loss of kidney function over months to years," normally proceeding through five stages because of a persistent reduction in glomerular filtration rate (GFR) (1). Nevertheless, if this persistent reduction becomes irreparable for beyond three months, CKD advances to end-stage renal disease (ESRD) (1). Hemodialysis is the major mode of treatment for patients undergoing ESRD, whose objectives include prolonging patients' survival as well as enhancing their quality of life (5). This procedure involves the passage of patients' blood through "filtration devices" to eliminate excess fluid and toxic substances while also helping to maintain patients' blood pressure and Electrolytes Balance.

Cutaneous symptoms occur very commonly in patients having concomitant chronic kidney dysfunction and tend to become accentuated as they progress towards ESRD. Many dermatologic abnormalities have been established as potential forerunners for patients suffering from kidney dysfunction: especially xerosis and pruritus (2). It is also estimated that all patients having ESRD tend to have at least one dermatologic anomaly (3).

Pruritus is one of the most prevalent symptoms associated with ESRD and occurs in 50% to 90% of patients (3). Intensity of pruritus usually worsens as kidney failure progresses. Etiopathogenesis is complex and involves iron deficiency anemia, peripheral neuropathy, secondary hyperparathyroidism, xerosis, and atrophy of sweat and sebaceous glands (3). This combination of various factors reaches its culmination in form of severe pruritus.

Xerosis cutis is another widely prevalent complication largely because of sweat gland atrophy seen in ESRD patients as well as patients undergoing hemodialysis (4). Xerosis is also responsible for pruritus and weakening of the barrier function of the skin because of which patients become prone to infections and development of poor wound healing (5). Other associated abnormalities may include macular hyperpigmentation of palms, soles, and mucous membranes because of metabolic abnormalities and toxicity (4). ESRD further affects the hemostatic system by interfering with platelet function and aggregation, leading to manifestations of bleeding diathesis like petechiae, ecchymoses, and pallor (1). Additionally, ESRD promotes immunosuppression, making patients susceptible to infections by various viral, bacterial, and parasitic organisms like rare opportunists Pseudomonas spp. and Mycobacterium tuberculosis (6,7). Immune dysfunction may also occur before starting dialysis therapy, which is usually manifested by lymphopenia, decreased B-cell function, and abnormalities of T-cell function (7,8). Notably, all these dermatologic and immunologic changes highlight the need for prompt management of cutaneous manifestations among patients on hemodialysis.

Nail disorder:

Dermatological abnormalities are also been seen to occur commonly among patients undergoing hemodialysis and represent changes associated with chronic renal failure. Among such patients, the half-and-half nail is regarded as one of those dermatological abnormalities being most prevalent among patients undergoing hemodialysis. This nail condition is otherwise associated with discoloration of the nail to give it a white anterior portion and give it a red-brown posterior portion while having no actual abnormalities on its nail plate itself (4). Another dermatological condition among patients undergoing hemodialysis is Koilonychia which is otherwise mostly associated with fingernails and is rare for toenails while being most prevalent among patients undergoing hemodialysis because of chronic iron deficiency secondary to chronic hemorrhage and consequent iron deficiency anemia (4). Other nail abnormalities among patients undergoing hemodialysis include splinter hemorrhages which result from hemorrhage secondary to extravasation of blood secondary to dilatation of nail beds' longitudinal vessels (4). Other nail abnormalities include onycholysis and Muehrcke's lines.

Both oral and cutaneous symptoms are also very common among patients with end-stage renal failure requiring hemodialysis. The oral complaints consist of mucous membrane ulcers, xerostomia, metallic sensation in the mouth, halitosis, and loose teeth (4). Premature aging of the skin occurs and is usually manifest by actinically induced elastosis, marked creasing of the back of the neck (cutis rhomboidalis nuchae), and telangiectasias (9). Poor wound healing is also a supplementary risk associated with decreased cutaneous perfusion and is directly proportional to the duration of hemodialysis (10). Other complications associated with ESRD include Raynaud's phenomenon secondary to increased sensitivity to cold and induced by ESRD, which is also accentuated by hemodialysis (11, 12). Another is Dupuytrens contracture secondary to cutaneous calciphylaxis and microvascular changes (11, 12).

Given this context of diverse dermatological as well as systemic manifestations associated with dermatological lesions, this study proposes to assess the prevalence and manifestations of dermatological lesions among patients undergoing hemodialysis for chronic renal failure.

METHODS

A case series study was done at Al-Husseini Hospital-Dialysis Center from December 2024 to March 2025. The population consisted of 100 patients aged 20 to 65 years, with a mean age of 43.2 ± 10 years, all of whom suffered from Chronic Renal Failure (CRF). This composition consisted of 54 males (54%) and 46 females (46%). All patients underwent frequent hemodialysis sessions for 3-4 hours thrice a week.

A structured interview schedule was designed to document various demographic and clinical parameters such as patient's name, age, duration of renal illness, evolution and development of cutaneous lesions, and information regarding frequency and duration of hemodialysis performed on patients. Each patient was also assessed for any dermatological manifestations associated with chronic renal failure by expert dermatologists and professionals after evaluating all regions associated with dermatology, including cutaneous areas associated with patients undergoing chronic hemodialysis.

RESULTS

The most common observations included pallor at 100 (100%), pruritus at 100 (100%) and xerosis at 100 (100%). Additionally, hyperpigmentation was observed in 78 (78%) , ecchymosis at 70 (70%), petechae in 40 (40%) and wrinkles also at 30 (30%) were noted as detailed in table 1.

Table 1. The quantity and proportion of hemodialysis patients having Skin symptoms

Skin disorder	Females		Males		Total	
	No.	%	No.	%	No.	%
Pallor	39	39	61	61	100	100
Pruritus	39	39	61	61	100	100
Xerosis	40	40	60	60	100	100
Hyperpigmentation	30	38	48	61	78	100
Ecchymosis	10	25	50	71	70	100
Petechiae	15	37	25	62	40	100
Wrinkles	8	26	22	73	30	100

The nail disorders were Half and half nail 64 (64%), koilonychias 55 (55%), and splinter hemorrhage 35 (35%) as shows in table 2

Table 2. The quantity and proportion of hemodialysis patients having nails disorders.

Nail Disorder	Females		Males		Total	
	No.	%	No.	%	No.	%
Half and half nail	16	25	48	75	64	100
Kiolonychias	20	36.4	35	63.5	55	100
Splinter Hemorrhage	15	42.8	20	57.2	35	100

Table 3 shows that the oral disorders were and xerostomia 78 (78%) and ulceration 55 (55%).

Table 3. The quantity and proportion of hemodialysis patients having oral disorders.

Oral Disorders	Female		Male		Total	
	No.	%	No.	%	No.	%
Xerostomia	40	51.2	38	48.7	78	100
Ulceration	35	63.6	20	36.3	55	100

Other manifestations were hair changes 40 (40%). As in table 4

Table 4. The quantity and proportion of hemodialysis patients having hair disorders.

Hair Disorders	Female		Male		Total	
	No.	%	No.	%	No.	%
	28	70	12	30	40	100

Table 3 shows that 27 patients (54%) experienced cutaneous symptoms related to hemodialysis after hemodialysis, 15 patients (30%) during hemodialysis, and 8 patients (16%) before to hemodialysis.

Table 5. The beginning of symptoms

Beginning of symptoms	Female		Male		Total	
	No.	%	No	%	No	%
Before	2	22.2	7	77.7	9	100
After	26	46.4	30	53.5	56	100
With	20	57.1	15	42.8	35	100

DISCUSSION

Pruritus was also found to be the most frequent cutaneous manifestation among this group of patients and affected all 100 study participants. Studies conducted have shown variations regarding pruritus frequency among patients undergoing chronic renal failure management, ranging from 19% to 90% (references 13 and 14). It is considered to have one of the most reliable signs of chronic renal failure (reference 15). While its presence is not entirely alleviated by hemodialysis, kidney transplants have been demonstrated to reduce its intensity to some extent (reference 14). The actual pathogenesis is still not entirely understood but is mainly associated with chronic renal insufficiency secondary to low urine volume of 500 mL/day or less (reference 16). Hypervitaminosis A is also considered to cause pruritus because patients undergoing ESRD mainly take fat-soluble vitamins, usually accumulating because of compromised renal clearance (reference 17).

Xerosis is another significant cause of pruritus itself (reference 5). The mechanism involves neuron-specific enolase-positive nerve fibers that grow diffusely within the epidermis of patients on chronic renal failure, growing toward stratum basale and potentially increasing itch perception (reference 18). Elevated levels of histamine also may contribute to pruritus secondary to allergic reactions to the components of the dialyzer membrane and decreased clearance of histamine by patients' kidneys. This may also partly account for why UVB phototherapy is beneficial: it reduces histamine-releasing factors in serum and reduces epidermal vitamin A concentration. Other contributory factors include elevated magnesium and albumin concentrations and iron deficiency anemia (reference 19).

Xerosis was found to exist in all patients, which is higher than what is documented in initial studies (46–90%) (references 20 and 21). Sweat gland atrophy is considered as one of the major causative agents, but high doses of diuretic intake have also been linked to cutaneous xerosis (reference 21). Pallor was seen in all patients, which is higher than 60% documented among Indian patients having chronic renal failure (reference 22). It is largely because of chronic anemia secondary to inadequate production of erythropoietin, iron deficiency, folate or vitamin B12 deficiency, or shortened lifespan of erythrocytes (reference 4).

It was noted to occur in 74% of patients, whereas it was 63% hitherto (reference 23). This is because of excess melanin deposition at the basal level and inefficient renal excretion of beta melanocyte-stimulating hormone (reference 24). Petechiae

and ecchymosis occurred in 40% and 30% of patients, respectively, against 20% reported in other studies (reference 22). This could be because of platelet dysfunction or anticoagulant action of heparin (reference 25).

Wrinkling was also seen to occur in 30% of patients, as against 16% reported elsewhere (reference 13). This may be due to actinic elastosis or premature actinic elastosis, especially among patients undergoing lengthy hemodialysis (reference 22). Half-and-half nail changes were also high at 76% of patients, against 21% to 20% reported earlier (references 22 and 26). While not clearly established, these nail changes may be linked to renal failure, pharmacotherapy, or undergoing hemodialysis (reference 26). Koilonychia was found to occur at 48%, against 17% reported earlier, and splinter hemorrhages at 28%, against 7% reported earlier (reference 13).

Abnormalities of the hair occurred in 42% of patients, primarily diffuse thinning. This correlation may exist between use of heparin or coexisting hypothyroidism and is higher than 10 to 30% reported in other series (reference 22). Xerostomia is present in 88% of patients, higher than 31% reported in former series (reference 22). Dehydration or oral hyperventilation may cause this condition (reference 22). Oral mucous membrane ulcers were found to occur at 52% of patients, higher than 29% reported in former series (reference 22). Contributing factors may include candidiasis secondary to xerostomia (reference 27) or smoke exposure (reference 28). Conclusion: Cutaneous complications are very common among patients suffering from chronic renal failure and also constitute one of the major morbidity factors for them. Many of these cutaneous complications are resistant to treatment and tend to progress as patients continue to have renal insufficiency and remain on dialysis for a longer period of time.

CONCLUSION

Dermatologic, nail, and hair abnormalities as well as oral abnormalities are very prevalent among patients undergoing hemodialysis due to chronic renal failure, with nearly all patients having at least one dermatologic anomaly. Among the most frequent dermatologic abnormalities are pruritus, xerosis, pallor, and hyperpigmentation, while others include nail abnormalities, mucous membrane ulcers, and alopecia or thinning of the hair among others. These abnormalities can be associated with the complex alterations of metabolism, hematologic changes, and immunologic changes associated with chronic renal insufficiency undergoing dialysis treatment. Many of these abnormalities have been reported to confer significant pain and morbidity to patients while being resistant to standard treatment modalities among others. It is also imperative to seek further scientific endeavors to understand these abnormalities clearly for further preventive and curative measures to emerge.

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