Clinical and Dermoscopic Study of Hair and Nail Changes in Chronic Renal Failure Patients on Hemodialysis–An Observational Study

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***Abstract*:**

Chronic renal disease is a progressive loss of renal function over a period of three months or more. Atleast 50% of patients with CKD develop dermatological manifestations. Though many studies have described the skin, nail and hair changes in patients with chronic renal disease on hemodialysis there are very few studies which describe the dermoscopic changes in hair and nails in patients with chronic renal disease.

Methodology: This cross sectional study was conducted in a tertiary care setting in rural Puducherry. We interviewed the participants using a standardized questionnaire after obtaining informed from them. Then the dermoscopic examination of their hair and nail changes was done using dermlite DL4 (3rdgeneration).

Results: Majority of the patients were between 41-60 years of age (67.3%) with a Male: Female ratio of 5:1. The median duration of disease in our study population was 42 months while that for hemodialysis was 30 months.The mean haemoglobin level was 8.6 g/dL ± 1.7 g/dL. It had a positive association with telogen effluvium. Most common nail finding noted in our study was Beau's line seen in 55.7% followed by trachyonychia (44.2%). Beau's line had a positive association with duration of dialysis. Half and half nail was noted in 12.8% and did not have a positive association. Most common hair change noted in CKD patients clinically was dry lustureless hair seen in 119(76.3%) and sparseness in 113(72.4%). Telogen effluvium and androgenetic alopecia was 37.8 % and 54.4% respectively both of which had a positive association with single pilosebaceous unit and decreased hair density diameter by less than 10%.

Conclusion: Despite the fact that the clinical assessment of changes in hair and nails has been the subject of numerous research, not all of them have demonstrated a clear correlation with chronic renal disease. Our effort to use dermoscopy to reexamine this region and search for any particular peculiarities showed that telogen effluvium had a positive correlation with decreasing hemoglobin value and Beau's line showed a positive correlation with dialysis time. This could be because many subtle changes which are missed during clinical examination can be picked up using dermoscope.

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***Keywords*:** Chronic, Manifestations, Dermoscopic, Trachyonychia, lustureless.

Introduction:

Chronic kidney disease is defined as derangement of kidney function for a period of more than 3 months. It has been shown that atleast 50% of patients with CKD develop dermatological manifestations which can be seen as manifestations in skin, hair and nail.[1] It is estimated that about 13.4 % of the population worldwide suffer from chronic kidney disease with the majority 79% being in the late stages [3-5] of CKD as the earlier stages of the disease are usually asymptomatic.[1] The studies in Indian population by Varma et al. and Singh et found, estimated the prevalence of CKD were 13% and 17.2%. [2] The most common risk factor for development of CKD in India and worldwide is diabetes and hypertension.[3]

Dermatological manifestations in a renal disease can be due to a primary kidney disease like chronic renal failure or genetic syndromes or secondary to systemic diseases. The non-specific manifestations include xerosis, skin colour changes, nail changes like Lindsay nail. Specific manifestations include acquired perforating dermatoses, calciphylaxis, calcinosis cutis, porphyria cutanea tarda and pseudoporphyria, eruptive xanthoma, iododerma and nephrogenic systemic fibrosis.[4]

There have been many attempts in analysing the clinical pattern of changes in skin, hair and nails in CKD patients on hemodialysis to assess their specificity to this disease. Very few studies had positive correlation while many did not. This study adds on to the existing literature to analyse the pattern of changes in hair and nail in CKD patients on hemodialysis. Dermoscopic patterns of changes in hair and nail in chronic renal failure patients have not been studied so far. Thus this study would shine a ray of light to assess the subtle changes seen in them through dermoscope. Hence with this background, this study was done with the objective to identify the hair and nail changes in chronic renal failure patients on hemodialysis and to study their dermoscopic features.

Materials and methods:

Study setting:

Chronic renal failure is a common nephrology problem. The dialysis units caters to the need of many chronic renal failure patients. The patients with chronic renal failure on hemodialysis attending the Dermatology Out Patient Department and Dialysis unit of Nephrology Department in Sri Manakula Vinayagar Medical College and Hospital, Puducherry were included in the study.

Study design:

Ours was a hospital based cross sectional study and was conducted in a tertiary health care set up of Sri Manakula Vinayagar Medical College and Hospital at Kalitheerthalkuppam in rural Puducherry.

Study participants:

All consenting patients above 18 years of age attending Dermatology Out Patient Department and Dialysis unit of Nephrology Department with chronic renal failure on hemodialysis. Chronic renal failure patients on hemodialysis attending Dermatology Out Patient Department and Dialysis unit of Nephrology department above 18 years of age were included in the study. Patients with nail color and hair color application and those with associated diseases like congestive heart failure, leprosy, malaria, rheumatoid arthritis, liver disease, psoriasis, hyperthyroidism were excluded from the study.

Sample size:

Based on the prevalence of nail changes 34.9% among hemodialysis patients in the study conducted by Attia EA et al[5] with 95% confidence interval and 7.5% absolute precision, the sample size was calculated to be 156 using OPEN EPI software.

Sampling technique:

Consecutive sampling was used for participant recruitment.

Study duration:

Study duration was for a period of 18 months from Jan 2023 to June 2024 after ethical committee clearance.

Data collection procedure:

After obtaining consent from the participants for the study, the patients were interviewed using a questionnaire on socio demographic details, chief complaints, duration of disease, duration of treatment, family history. General examination, gross examination of hair and nail including texture, colour, thickness, curvature of nail plates was done on the study participants.

Then dermoscopic examination of the hair and nail changes was done using dermlite DL4 (3rdgeneration)

The anticipated bias in the study was interviewer bias which was overcome by using standardized questionnaire and conducting the interviews by the same investigator.

Analysis plan:

Data was entered in Epi Info software version 7.2.2.6 and using IBM SPSS Statistics version 20. The list of independent variables encountered in the study were name, age, gender, socio economic status, occupation, education, chief complaints, duration of symptoms, duration of treatment, any associated diseases, family history, treatment

history, general examination which was analysed using frequency and percentage. Mean and standard deviation was calculated for duration of symptoms and treatment. Dependent variables encountered in the study were dermoscopic features which were analysed using mean, standard deviation or interquartile range. The significance of association between independent and dependent variables was done using chi-square test wherein a p value of <0.05 was considered as significant.

Implications of the study:

The implication of this study was to study the dermoscopic features of the nail and hair changes in chronic renal failure on hemodialysis. By this, invasive methods such as nail biopsy and hair pull test were avoided and accurate diagnosis was made.

Ethical consideration:

IEC number – EC/77/2022. After getting informed consent from the patient in their native language, dermoscopic visualizationof hair and nail changes was done using Dermlite DL4dermoscope and analysed. No invasive procedure was done on the patient, in the study.

Reporting of study guideline:

Throughout the entire study STROBE checklist was followed.

Results:

Of the 156 participants included in the study setting We observed that most common age of the patients on hemodialysis secondary to CKD is 41- 60 years which constitutes about 67.3% of the study population with male:female ratio being 5:1. A majority of them were illiterate and unemployed constituting about 39.1% and 43% respectively. A major group of the study population 134[85%] were in dialysis for less than 5 years with predominant risk factor noted in almost half of them being hypertension followed by diabetes with hypertension[32.7%].

Of the 150 patients studied the most common nail finding noted in our study is Beau's line seen in 55.7% followed by trachyonychia(44.2%), longitudinal melanonychia(33.3%), pallor (29.4%), splinter hemorrhage (27.5%), absent lunula (24.3%). The list of clinical changes noted in the nail of CKD patients has been listed in table 2. The dermoscopic patterns of these clinically observed nail findings are listed in table 3.

Our study shows that the major hair change noted in clinical examination is dry lustureless hair seen in 119(76.3%) and sparseness in 113(72.4%). Telogen effluvium was observed in 59(37.8%) of cases and also showed a positive association with hemoglobin value.

Table 1:

S.No	Variable	Category	Number [N]	Percentage (%)
1	Age	19-40	15	9.6
		41-60	105	67.3
		>60	36	23
2	Gender	Male	130	83.3
		Female	26	16.6
3	Disease duration	1-5	122	78.2
		5-10	29	18
		10-20	5	3.2
4	Duration of hemodialysis	1-5	134	85
		5-10	22	14.1
5	Risk factor	DM	3	2
		SHTN	78	50
		DM with HTN	51	32.7
		DM HTN CVD	4	2.6
		Alcohol& Smoking	36	23.1
		Others	2	1.3

Table 2: Clinical observed changes of nail

Nail examination – clinical	N [%]
Beau's line	87 [55.7]
Trachyonychia	69 [44.2]
Longitudinal melanonychia	52 [33.3]
Leukonychia	47 [30]
Pallor	46 [29.4]

Splinter hemorrhage	43 [27.5]
Absent lunula	38 [24.3]
Onychomycosis	26 [16.6]
Terry's nail	22 [14.1]
Beau's line	Transverse wavy ridges	87 [55.7]
Longitudinal melanonychia	Parallel regularly spaced lines of varying colours	52 [33.3]

Table 3: Summary of dermoscopic findings

Nail findings	**Onychoscopic pattern**		**N [%]**
Trachyonychia	Longitudinal ridges		69 [44.2]
	Distal splitting of nails		9 [5.7]
	Both patterns		7 [4.5]
Leukonychia	Punctate dots		42 [27]
	Transverse lines		9 [5.7]
	Pseudo leukonychia		0
Hemorrhage	Splinter hemorrhage	Dots	10 [6.4]
		Linear streaks	33 [21.1]
	Traumatic hemorrhage	Homogeneous globular	3 [1.9]
		Variable globular structures	6 [3.8]
Onychomycosis	aurora borealis		2 [1.2]
	Jagged borders with spikes		15 [9.6]
Subungual hyperkeratosis	Non-ruin pattern		14 [9]
	Ruin pattern		6 [3.8]

Table 4: clinical examination of hair changes

Clinical examination of hair changes	**N%**
Dry, lustureless hair	119(76.3)
sparseness	113(72.4)
Telogen effluvium	59(37.8)
Androgenetic alopecia	85(54.4)

Discussion:

This hospital based cross sectional study assesses the pattern of clinical and dermoscopic changes in hair and nail in chronic renal failure patients on hemodialysis in a tertiary care setup in rural Puducherry. Early diagnosis of CKD is still a challenge owing to the asymptomatic initial stages of the disease and poor awareness regarding regular screening for CKD. Thus most of the cases of CKD at their time of initial diagnosis is in stage 4/5 thereby making hemodialysisor renal transplant as their main modality of treatment. This asymptomatic nature of the disease and complications associated with hemodialysis has made us look into and analyse the effect of them on visible structures like skin and its appendages for early suspicion and diagnosis.

There have been many attempts in analysing the clinical pattern of changes in skin, hair and nails in CKD patients on hemodialysis to assess their specificity to this disease. Literature shows that very few studies shows correlation while many did not. This study adds on to the existing literature to analyse the pattern of changes in hair and nail in CKD patients on hemodialysis in our study setting.

Most common nail finding observed in our study is Beau's line. It showed a positive association with duration of dialysis. Previous studies have shown the presence of Beau's line in CKD patients but none of them showed a positive association. Beau's line in CKD could be because of multiple insults to nail matrix occurring in CKD patients, associated malnutrition and underlying non communicable diseases. Dermoscopy of Beau's line shows opaque to translucent lustreless nail with ridges arranged in a transverse wavy pattern that has varying inter ridge interval depending upon the time of insult to the nail matrix.[6-10]

Trachyonychia is the second most common nail change noted in our study. Only one previous study has reported the presence of trachyonychia in CKD so far. Dermoscopy of these nails show multiple fine superficial longitudinal ridges, fine superficial scales and distal splitting of the nail plate.[11]

Longitudinal melanonychia has been noted in 33.2% in our study. Similar findings has been noted in Maurad B et al., in about 24.7%. This is probably because of decreased excretion of beta melanocyte stimulating hormone in CKD. Dermoscopic pattern noted in longitudinal melanonychia shows regular parallel evenly spaced lines.[12]

Splinter hemorrhage is observed in 43[21.5%]. This is visible clinically and dermoscopically as red to dark brown longitudinal streaks or dots visible through the nail plate and occurs due to capillary fragility and thrombocyte dysfunction in CKD patients. Similar findings has been noted in studies by Saray Y et al., in about 13.7% of their study population.[8]

Our study shows the presence of Half and half nail in about 12.8% which is similar to that noted in previous studies. They did not show any association with CKD. This is in contrast to study by Udayakumar et al., which showed presence of half and half nail in 21% that showed a positive association.[6,8,13]

Our study shows that the major hair change noted in clinical examination is dry lustureless hair and sparseness Previous studies by Malkud et al., shows similar changes in 16.6%, Udayakumar et al., shows similar changes in 16%, Singh et al., in 30% and Attia et al., in 33.7%. Telogen effluvium was observed in 59(37.8%) of cases and also showed a positive association with hemoglobin value. Thus these changes could be due to multiple factors like malnutrition, anemia, chronic stress, multiple drugs used for treatment. The note of these changes may not be specific to CRF probably due to multiple factors mentioned. Association between telogen effluvium and dermoscopic changes shows that there is a positive correlation between hair density diameter > 10% and single pilosebaceous unit.[10,13]

Study by Birch et al., showed that, at 35 years of age the density of hair was 293±61.3 hairs/cm^2 and at 70 years it was 211±55.1 hairs/cm^2. A density of less than half this normal distribution is considered as a decrease in hair density.[14]

Strengths of the study:

- Analysing the Pattern of hair and nail changes in a rural tertiary care set up in south India
- Dermoscopic assessment has helped us in picking the changes earlier than clinically appreciable
- The specific association of hair and nail changes in CKD is yet to be addresed
- Dermoscopic correlates of the hair and nail changes has not been analysed so far.
- Using Dermoscopy in confirming the clinical observation has helped us in more accurate diagnosis
- Interobserver variation of the observed features can be minimized by correlating clinical and dermoscopic findings
- Larger sample size has helped us in better analysis.
- Though there are many observational studies on the clinical examination of skin and nail, studies showing hair changes in CKD is very limited
- Assessing the hair changes clinically and correlating their trichoscopic findings has helped us in better understanding of these changes

Limitations:

- Only the hair and nail changes of CKD patients in hemodialysis have been studied.
- This study does not give a broad view of the nail changes along the entire spectrum of

chronic kidney disease.

- Dermoscopy being a newer diagnostic tool is yet to be explored in various aspects of nail changes thereby limiting the detailed pathology behind the observed feature.
- There are multiple confounders in the same patient that can cause similar hair and nail changes.

Conclusion:

Chronic kidney disease is defined as an alteration of kidney function lasting longer than three months. Dermatological symptoms have been demonstrated to occur in at least 50% of CKD patients. Despite the fact that the clinical assessment of changes in hair and nails has been the subject of numerous research, not all of them have demonstrated a clear correlation with chronic renal disease. We made an effort to use dermoscopy to reexamine this region and search for any particular peculiarities. We discovered that telogen effluvium had a positive correlation with decreasing hemoglobin value and Beau's line showed a positive correlation with dialysis time. The research on these alterations is thus expanded by our dermoscopic assessment and further research in larger population is recommended to validate the study's conclusions

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