DERMATOLOGICAL DISORDERS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM. TANZANIA: PREVALENCE, PATTERN, ASSOCIATED FACTORS AND IMPACT ON QUALITY OF LIFE

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By

Conrad Agonza

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Internal Medicine) at

Muhimbili University of Health and Allied Sciences

October, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled; **"Dermatological disorders among patients with chronic kidney disease at Muhimbili National Hospital, Dar es Salaam. Tanzania: Prevalence, pattern, associated factors and impact on quality of life"**, in (partial) fulfillment of requirements for the degree of Master of medicine (Internal Medicine) of Muhimbili University of Health and Allied Sciences.

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Date: _____

DECLARATION AND COPYRIGHT

I, **Conrad Agonza** declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature:……..…… **Date:**…….……..

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DEDICATION

To my daughter

A Special Thank You to My Little Sunshine

I dedicate this dissertation to my precious daughter, Byera. Although you may be too young to understand the complexities of academia, your presence has profoundly influenced my journey.

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With all my love,

ABSTRACT

Background: Dermatological disorders in chronic kidney disease (CKD) are common and occur at any stage of the disease. They can occur denovo or as a consequence of CKD itself, underlying etiology, or treatment modality. However, locally, there is limited current information on their clinical presentation and their effect on quality of life of these patients. This study determined the prevalence, pattern and associated factors of dermatological disorders among patients with CKD and their effects on patients' quality of life.

Methodology: A hospital-based cross-sectional study was conducted from September 2023 to January 2024 at the MNH in Dar es Salaam. Patients were recruited from the Nephrology wards and clinic, as well as the Haemodialysis (HD) unit. All eligible and consenting adult patients (age≥18 years) with CKD attending the unit were consecutively enrolled until the sample size was attained. For each patient, data on socio-demographic, clinical and laboratory characteristics were collected through a structured questionnaire. A thorough dermatological examination was carried out to establish the diagnosis. Digital photographs of all skin lesions were taken for confirmation of the diagnosis by a Dermatologist. The impact on quality of life was assessed using the Dermatology Life Quality Index (DLQI). Results of descriptive statistics were reported as median (IQR) and proportions as appropriate. Comparison of categorical variables was done using the Chi-square or Fisher's exact test, where appropriate. Factors associated with the dermatological disorders were assessed using the Modified Poisson Regression Model at univariate and multivariate level analyses. A p-value <0.05 was considered statistically significant.

Results: Two hundred and twenty-five CKD patients participated in the study, of whom 60.9% were male. The overall median age was 55 years (IQR 43,64). Among the participants; 64% were hypertensive, and 28.9% were diabetic. 86.7% had CKD stage 5,

and 65.3% were on hemodialysis. Related complications were hypocalcemia in 68.4%, hyperphosphatemia in 72.4%, and anemia in 94.7%. The overall prevalence of dermatological disorders was 88.9%. The common dermatological manifestations were pallor (90.5%), xerosis (47.8%), pruritus (29.6%), onychomycosis (25.6%), Lindsay's nail (19.2%), mucosal changes (14%) and hair changes (8.5%). Factors found to be strongly associated with the presence of dermatological disorders were advanced CKD, HIV, hypocalcemia and anemia, (all with $p<0.05$). The statistically significant independent predictors of dermatological disorders were HIV (aPR 1.17), hyperphosphatemia (aPR 1.21) and anemia (aPR 1.72), all with p value<0.05. Quality of life was impaired in 22% of the participants. Pruritus was the only significant predictor of impaired DLQI ($p<0.001$).

Conclusion: Dermatological disorders are highly prevalent among patients with CKD in our setting and are strongly associated with HIV, hyperphosphatemia and anemia. The dermatoses, in particular; pruritus, are associated with a significant negative impact on quality of life among the already burdened CKD patients.

Recommendation: Appropriate strategies in our national and institutional treatment guidelines need to be developed for the early diagnosis and intervention against dermatological disorders among patients with CKD. These should also incorporate an assessment of their impact on quality of life with established tools such as the Dermatological Life Quality Index.

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ABBREVIATIONS

AKI	Acute Kidney Injury
BUN	Blood Urea Nitrogen
CKD	Chronic Kidney Disease
CKD-EPI	Chronic Kidney Disease Epidemiology Collaboration
CPL	Central Pathology Laboratory
CVD	Cardiovascular disease
DLQI	Dermatology Life Quality Index
DM	Diabetes Mellitus
eGFR	estimated Glomerular Filtration Rate
ESRD	End-Stage Renal Disease
Hb	Haemoglobin
HBsAg	Hepatitis B surface Antigen
HCAb	Hepatitis C Antibody
HD	Haemodialysis
HIV	Human Immunodeficiency Virus
HRQoL	Health-related Quality of Life
KDIGO	Kidney Disease Improving Global Outcome
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PI	Principal Investigator
PTH	Parathyroid hormone
QoL	Quality of life
RRT	Renal replacement therapy

SPSS	Statistical Package for Social Sciences
WHO	World Health Organization
β-MSH	Beta Melanocyte Stimulating Hormone

DEFINITION OF KEY TERMS

Chronic Kidney Disease (CKD): is defined as kidney damage that lasts at least three months and is characterized by structural and/or functional derangements of the kidney with or without decreased Glomerular Filtration Rate (GFR) manifested by pathological abnormalities and/or abnormalities in markers of kidney damage. It can alternatively be defined as a GFR <60 ml/min/1.73m^2 for > 3 months with or without kidney damage, according to the Kidney Disease Improving Global Outcome (KDIGO) guidelines(1,2).

Dermatological disorders: are lesions of skin, hair, nails and mucous membranes caused by various factors, including infection, systemic disorders and medications.

The Dermatology Life Quality Index (DLQI): is a 10-question assessment tool that assesses the impact of dermatological diseases on a person's quality of life. It is designed for those who are 16 years old and above(3).

Quality of life (QoL): is defined as "an individual's perception of life in the context of the culture and value systems in which they live and in relation to their expectations, standards and concerns" (WHO).

Health-related Quality of Life (HRQoL): narrows QoL to aspects relevant to health; it is a multidimensional concept that can be viewed as a latent construct which describes the physical, role functioning, social, and psychological aspects of well-being and functioning(4,5).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

CKD has become one of the major contributors to morbidity affecting more than 10% of the general population worldwide, aggregating to more than 800 million individuals(6). Observational studies done in 2016 that were thoroughly reviewed and meta-analyzed to find out the prevalence of CKD in the general community by stage, geographical location, age, and gender showed a global mean prevalence of CKD of 13.4% and a prevalence of 10.6% of all the five CKD stages and CKD stages 3-5 respectively(7).

In Africa, CKD is of public health importance because it has been found to be prevalent at about 15.8% and 4.6% for all five stages and stages 3-5 respectively in the general population. However, these numbers are reported to be high among high-risk groups (Hypertension, Diabetes Mellitus, and HIV) with a prevalence of 32.3% and 13.3% respectively(8). In East Africa, the prevalence of CKD in the general population has been reported to be 6.8%, without much regional differences(9). In Tanzania, community based surveys have reported a prevalence of CKD ranging from 2-15%, with higher numbers observed in the urban population(10,11).

CKD has been associated with dermatological disorders affecting the skin, hair, nails and mucous membranes, and dermatological manifestations are common among patients with CKD(12–18). Indeed, the presence of xerosis, half and half nails, pruritus and hyper-pigmentation in a patient with renal derangement should increase the index of suspicion for possible CKD even in the lack of uremia symptoms. Some known disorders include xerosis, hyperpigmentation, pruritus, xerostomia, gingival friability, pallor, half and half nails, alopecia, easy bruising, gynecomastia, and disease specific ones like acquired perforating dermatosis. These disorders emerge as a result of CKD itself, underlying

etiology of CKD or as a result of treatment modality of CKD. This has posed a burden on CKD patients further affecting their quality of life(13,19,20).

A study done in rural setting in Southern part of Tanzania revealed a prevalence of 34.7% of skin diseases among 800 villagers(21). However, no study has been done to explore the current burden of skin diseases among CKD patients in the country. Hence, this study aimed to explore the burden, pattern, associated factors and health related quality of life (HRQoL) of dermatoses among CKD patients.

1.1.1 Pathophysiology of the commonest dermatological disorders in CKD

The underlying pathophysiology of the common dermatological disorders in CKD is summarized below:

- Xerosis – is due to a reduction in the size of eccrine sweat gland and high dose diuretic regimens(22–30).
- Pruritus – is a consequence of uremia, deposited pruritogens, secondary hyperparathyroidism, xerosis, increased serum levels of calcium and phosphate and iron deficiency anaemia. Furthermore, Hemodialysis (HD) can both initiate the symptom as well as improve it(30–35).
- Pigmentary changes - the brownish-black hyperpigmentation is attributed to the retention of chromogens and deposition of melanin in the basal layer and the superficial dermis due to failure of the kidneys to excrete β-MSH(30,36–38).
- Pallor – is due to the reduced erythropoiesis and increased hemolysis(30,36,37).
- Purpura and ecchymosis – is a result of increased vascular fragility, abnormal platelet function, thrombocytopenia and the use of heparin during dialysis(30,36,37).
- Cutaneous infections – are a consequence of impaired cellular and humoral immunity(39).
- Uremic frost – is due to eccrine deposition of urea crystals on the skin surface(40).

- Calcification and calciphylaxis – is a result of abnormally elevated level of parathyroid hormone (PTH) which may trigger the deposition of crystalline calcium pyrophosphate in the dermis, subcutaneous fat, or arterial walls(41,42).
- Xerostomia – is attributed to mouth breathing and dehydration(30).
- Dry and lusterless hair – is due to a decreased secretion of sebum(30).
- Alopecia – is related to telogen effluvium associated with severity of illness, xerosis, pruritus or due to drugs (heparin, anti-hypertensives, anti-dyslipidemics)(43).
- Half-and-half nails (Lindsay's nails) – is due to increased tissue concentration of β-MSH(44).

1.2 Problem statement

Urbanization, changes in lifestyle, and sedentary behavior have all contributed to an increase in non-communicable diseases, which has resulted in a rapidly increasing number of people with CKD, with a mean worldwide prevalence of 13.4%, in East Africa (6.8%)(9) and as high as 15% in Tanzania (7,10,11).

Patients with CKD are faced with a huge burden of dermatological diseases at a prevalence of 50-100%, which occur secondary to the etiology of CKD, treatment modality or as a consequence of CKD itself. Most patients with CKD present with one or more dermatological disorders which are associated with discomfort, depression, anxiety, poor sleep and profound psychological impact. Patients' social and physical activities including work and sports are adversely affected by dermatological disorders and this has led to further lowering of their quality of life (13,45–49).

Despite the high prevalence and negative impact on morbidity due to dermatological disorders among patients with CKD that has been documented, no study has been done in Tanzania to determine the magnitude of the problem. Therefore, this study was conducted to determine the prevalence, pattern, associated factors, and impact of dermatological disorders on HRQoL of patients with CKD.

1.3 Conceptual framework

There are various factors that are associated with the presence of dermatological diseases among patients with CKD. They include sociodemographic characteristics as well as clinical and laboratory parameters. Sociodemographic characteristics include age, gender, education level, occupation, and employment status. Clinical parameters include etiology of CKD, Stage of CKD, Hemodialysis, Systemic diseases (Diabetes Mellitus, Hypertension, Autoimmune diseases, others) and laboratory parameters include serum calcium and phosphate levels, Haemoglobin level and HIV. Dermatological disorders consequently have an impact on QoL among patients with CKD.

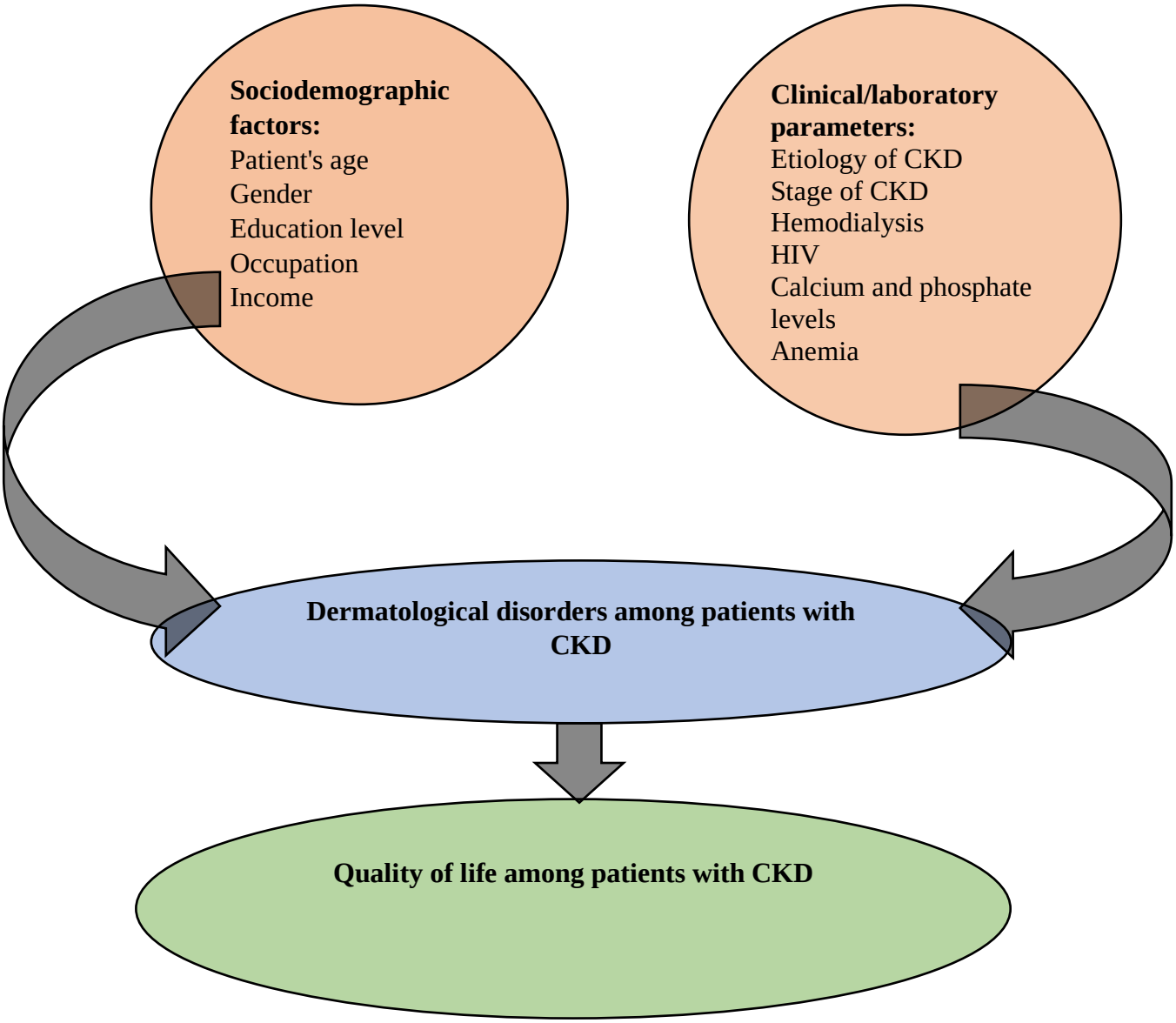


Figure 1: An illustrative conceptual framework showing different factors that are associated with the presence and impact on quality of life of dermatological disorders among patients with CKD.

1.4 Rationale

There is a dearth of information on the burden of dermatological diseases among CKD patients in Africa and in Tanzania. Understanding the burden of dermatological disorders and associated factors will provide sensitization for the required interventions.

This research aimed at determining the magnitude of dermatological diseases, contributing factors, and how they affect people with CKD's HRQoL. It is expected that this information will be an eye-opener among clinicians and healthcare workers attending these patients. This information will also sensitize healthcare workers in the nephrology unit to improve the care of their patients by identifying these dermatological disorders early and providing them with benefits of treatment including referring them to dermatologists for further management when required and hence enhancing an improvement in quality of life.

Findings from this study are also expected to benchmark the development and incorporation of a simple screening tool of the common dermatoses into CKD management algorithms.

1.5 Research questions

This study aimed to answer the following questions:

1. What is the prevalence of dermatological disorders among patients with CKD at MNH?
2. What is the pattern of dermatological disorders among patients with CKD at MNH?
3. What factors are associated with dermatological disorders among patients with CKD at MNH?
4. What is the impact of dermatological disorders on the quality of life among patients with CKD at MNH?

1.6 Broad objective

To determine the prevalence, pattern, associated factors and impact of dermatological disorders on the quality of life among patients with chronic kidney disease at Muhimbili National Hospital.

1.7 Specific objectives

1. To determine the prevalence of dermatological disorders among patients with CKD at MNH.
2. To describe the pattern of dermatological disorders among patients with CKD at MNH.
3. To assess the socio-demographic, clinical and laboratory factors associated with dermatological disorders among patients with CKD at MNH.
4. To determine the impact of dermatological disorders on quality of life among patients with CKD at MNH.

1.8 Hypothesis

The prevalence of dermatological disorders among patients with CKD is not high, and they do not have a significant impact on HRQoL among these patients.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Prevalence and pattern of dermatological disorders among patients with CKD

Patients with CKD, and especially ESRD, frequently present with cutaneous problems. They are reported to be due to accumulation of nitrogenous by-products of protein catabolism that follows impaired renal excretion. One or more skin conditions are present in 50–100% of CKD patients. According to Asokan et al.'s study, the prevalence of dermatological diseases increases as CKD worsens which could probably be explained by progressive decline in renal excretion ability. It has been reported that 82.8% of patients with advanced CKD had more than one dermatosis, compared to 60% of patients with moderate CKD(16,18).

In 2016, a research conducted in Turkey to evaluate the frequency of pruritus in CKD patients on hemodialysis, found that pruritus was more common in patients over the age of 65 years and in those who had been receiving hemodialysis for 15 or more years. Pruritus among these patients is contributed by uremia, electrolyte imbalances as well as allergic reactions to dialyzer materials(50).

Among 145 patients on HD in Brazil, the distribution of dermatological disorders was observed to involve skin, hair, nails and mucous membranes. Hair loss (33.1%), dry hair (26.9%), and body hair loss (6.2%) were the most frequent appearances, and onycholysis (22.7%) and half-and-half nails (22.0%) were the most prevalent nail disorders. Xerosis (75.2%), ecchymosis (60.0%), and pruritus (53.8%) were the most common skin symptoms(51). A cross-sectional and comparison research conducted in Bir and Shree Birendra Hospitals in Nepal from June 2008 to May 2009 found that dermatological diseases were present in all patients with CKD. The most prevalent manifestations were xerosis, pallor, pigmentary changes, and pruritus(17).

In a research study conducted in Bangladesh from April 2013 to March 2014 that involved 150 hospitalized CKD patients it was found that 126 (84%) of them had dermatological abnormalities. Of these, 69 (54.76%) were not on HD; and 57 (45.24%) were on maintenance hemodialysis. The higher prevalence of dermatological abnormalities among CKD patients not on HD as compared to those on HD was explained to be a result of nitrogenous waste retention(14).

A study done in Egypt among 93 patients with ESRD on HD, out of whom 56 (60.2%) were male and 37 (39.8%) were female, and with ages ranging from 18–80 years, found that the most common cutaneous abnormalities were xerosis, hyperpigmentation, pruritus, and ecchymosis, with prevalence of 86%, 56%, 51.6%, 47.3% respectively. Regarding hair changes, 68.8% and 67.7% of patients were found to have lusterless and brittle hair respectively(52). In another research conducted in Cameroun, 94 (83.9%) of the 112 CKD patients on HD had cutaneous lesions. The most prevalent dermatologic disorders were xerosis (63.3%), pruritus (37.5%) and half-nails (10.7%)(53).

Another research in Southern Nigeria included 105 patients with CKD (56 of whom were male), and found that 94.3% of them had dermatological alterations. The most common dermatological manifestations were pallor (94.3%), hyperpigmentation (58.2%), fluffy hair (55.4%), Lindsay nails (48.7%), and pruritus (41.9%). Pallor occurs as a result of anemia due to decreased erythropoietin production, hyperpigmentation and pruritus are due to nitrogenous waste retention(13).

From above literature, it is obvious that dermatological manifestations among patients with CKD are very common, and that the pattern of presenting dermatoses varies due to a number of factors including geographical factors and CKD treatment modality.

2.2 Associated factors for dermatological disorders among patients with CKD

There are different factors associated with dermatological disorders among patients with CKD. These factors include age and sex of the patient, CKD etiology and stage, HD, medications, systemic diseases, HIV, hyperphosphatemia, hypercalcemia and hypoalbuminemia.

In developing countries, CKD affects the young and middle-aged population especially in 50's and less as opposed to the picture in developed countries where the elderly are more affected. This has led to the differences in mean ages at presentation of dermatological disorders among patients with CKD with the young and middle aged being more affected in developing countries contrary to what is evidenced in developing countries where the elderly are more affected. This has been testified in multiple studies. This difference at age of presentation could be explained by the difference in average life span, better health care services as well as better health education on preventive services in developed countries that delay the presentation of CKD (13,18,52,54).

Male gender is a risk factor for CKD, this has eventually led to higher male to female ratio in terms of dermatological manifestations in CKD. The larger number of male patients with CKD explains a high prevalence of dermatological disorders among patients with CKD (13,52,55).

There are multiple causes of CKD that have been implicated in the appearance of dermatological manifestations among CKD patients. Hypertension, Diabetes and primary glomerulopathies at prevalence of 18(36%),8(16%), and 3(6%) respectively were observed to be the leading etiologies of CKD out of 50 study participants in a study by Shrestha et al in India in 2014(56). Pruritus, xerosis, onychomycosis and Lindsay's nails have been found to be more associated with Diabetes mellitus in some studies(57–64). HIV has been well implicated in fungal infections particularly involving nails as evidenced in a study by Bernard C et al(65).

Some studies done to determine the association of CKD stage and presentation of dermatological disorders have shown various results. Some dermatoses, such as pruritus, seborrheic dermatitis, tinea versicolor, stomatitis, and leukonychia, demonstrated rising prevalence across CKD stages 3-5 in a research by Adejumo et al. conducted in Nigeria, but this tendency did not approach statistical significance with the exception of pallor. Advanced CKD has been associated with rising trend of dermatological disorders due to retention of nitrogenous waste as a result of progressive decline in renal excretion ability(13). Similar findings were also observed in another study by Oripelaye et al(66).

There are various dermatological manifestations among CKD patients on HD as evidenced in multiple studies. In a study done by Asokan et al in India, xerosis was found more among CKD patients on HD and this is explained by water depletion caused by ultrafiltration, and pigmentation unlike pruritus and hair changes which were observed more among CKD patients not on HD as explained by nitrogenous waste retention(18). A study by Adejumo et al in Nigeria showed no statistical difference in occurrence of dermatoses between the two groups with exception of Lindsay nails which was significantly present in the HD group and leukonychia which was significantly present among CKD patients not on HD. The Lindsay's nails has no exact pathophysiological mechanism but it has been associated with an increase in number of capillaries and capillary wall thickness among patients on HD while hyperpigmentation has been associated with hypoalbuminemia(13). Another study by Olarenwaju et al in Nigeria found more xerosis, pruritus among patients on HD as explained by ultrafiltration, diuretics use and allergic reactions to dialyser components, nails changes including Lindsay nails, leukonychia and bluish discoloration of nails were found among patients not on HD(67).

In research conducted in Nepal by Shah et al, it was discovered that the majority (93.3%) of MHD patients had pruritus prior to dialysis, with improvements seen in 20%, deterioration in 10%, and no change in 70% of cases. The pruritus prior HD initiation is

explained by accumulation of nitrogenous waste due to decline in renal waste excretion, the improvement in pruritus following HD initiation is due to removal of waste products, deterioration after HD initiation may be explained by allergic reaction to dialyser materials(17). Shah et al's findings were corroborated by findings from a research conducted in Egypt by Mourad et al. in which all HD patients had one or more skin lesions(52).

Patients with CKD are kept on some medications for different conditions. These medications are responsible for a number of dermatological manifestations. Diuretics may be responsible for xerosis. Heparin use during dialysis may have contributed to the ecchymosis that was found in about 47.3% of ESRD patients receiving HD(52).

The systemic diseases have been implicated in the presence of some dermatological disorders among patients with CKD. These include HIV, Diabetes mellitus, Hepatitis B and C infections. Pruritus has been reported to be frequent and severe among diabetic patients, this has been explained to be contributed by dry lusterless skin present among patients with CKD(68).

Anemia is associated with several dermatoses among CKD patients. These include koilonychia, glossitis, skin hypo-and hyperpigmentation. Hyperphosphatemia and hypocalcemia together leading to a formation of calcium-phosphate complex is one among mineral disorders in CKD, and has been implicated in some dermatoses. Among many explanations as causations of pruritus in this particular population, phosphate and calcium disturbances have established to be one of them, as testified in some studies(48,69–72).

2.3 Quality of life among patients with CKD with Dermatological disorders

Quality of Life is defined as "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHO). HRQoL refers to a multidimensional concept that describes the physical, role functioning, social, and psychological aspects of well-being and functioning(4,5).

QoL among CKD patients has been associated with a number of factors that encompass socio-demographic and disease related characteristics. The implicated socio-demographic characteristics include gender, occupation, education level, socio-economic status/income whereas disease related characteristics include CKD stage, HD, Hb level, comorbidities, medications, as well as the presence of complications like anemia, cardiovascular diseases and dermatological conditions(73–77).

CKD patients with a higher level of education have been shown in some studies to have better QoL(78,79). This is thought to be due to reasons that educated patients have greater access to information about their disease, better economic conditions, and better capacity to evaluate themselves regarding their disease and seek medical attention. It is also assumed that CKD patients with higher education mainly participate in activities that require more intellectual over those that require greater physical effort and hence less fatigue resulting in improved QoL

Socioeconomic status has been implicated in QoL in several studies of CKD patients(73,74,76,77). The explanation for this is based on the fact that CKD patients with low socioeconomic status could not afford the prescribed medications for treatment of various complications and illnesses that coexist with CKD and this affects adherence and their QoL.

It was shown in a study by Braga et al that higher socioeconomic level was significantly associated with better QoL, these findings were consistent with Dasari P et al's findings

that revealed that lower social status characterized by lower education, low financial muscle, or lack of employment was also associated with impaired QoL(73–75). This could be due to the fact that people with low economic status do not access effective health care due to economic constraints and poor adherence because of low education.

Quality of life has been shown to decrease across all stages of CKD in different studies(73,77). This could probably be explained by the chronic nature of the disease, patients may adapt not only to the disease and its treatment but also psychologically to their situations that directly affect patients' QoL over time.

A study in the US indicated that hemoglobin level was positively associated with QoL, similar to other various studies that have shown that hemoglobin greater or equal to 11g/dl was associated with better QoL (73,80–82). This is because low level of hemoglobin is associated with a greater risk of co-morbidities like anemia and cardiovascular diseases which result in fatigue and decreased physical activities, thus, decreasing QoL.

Silverberg et al and Kimel et al similar to Kefale B et al, revealed in their studies that the presence of CKD complications like CVD and anemia were found to be strongly associated with poor QoL (73,83,84). The possible reason for this finding may be that CKD patients with different complications are more likely to be on many drugs at the same time and may also be at advanced stages of CKD, which together with the pill burden contribute to low QoL among these patients.

Existence of dermatological diseases further reduces patients' quality of life, which is already at risk for being compromised in CKD patients. The declined HRQoL among patients with CKD has been reported to be associated with moderate to advanced stage of CKD, anemia, minimal earning, and increased duration of hemodialysis session(85–87). Also, in the study on HRQoL and associated factors among HD patients at MNH by Msilanga et al, hemodialysis adequacy with URR ≥65 was found to be an independent predictor of better HRQoL(88). The presence of dermatological disorders among these

patients will further lower HRQoL as shown in a study by Adejumo et al where certain dermatoses such as hyperpigmentation, pruritus, ichthyosis, tinea versicolor, stomatitis, and Lindsay nails showed significant association with DLQI scores, the number of dermatoses being an independent predictor of QoL among them(13).

A study done among 334 ESRD patients on maintenance HD in 7 European countries; age, presence of pruritus and intensity of xerosis were the associated factors with compromised DLQI scores. Uremic xerosis compromised QoL indirectly by aggravating uremic pruritus(89). Similar findings reflecting an impact of dermatoses, particularly pruritus on DLQI among CKD patients were observed in some other studies(90–94). This is probably due to the nuisance imposed by pruritus upon an affected individual.

In conclusion, dermatological disorders have been reported to be quite common among patients with CKD, and have an impact on their quality of life. A number of factors have been reported to be associated with their presence, and these appear to vary by geographical area, sociodemographic factors, underlying medical conditions for the CKD and advancements in provision of medical care.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a hospital-based cross-sectional study.

3.2 Study duration

The study was conducted for a duration of 5 months, from September 2023 to January 2024.

3.3 Study area

The study was carried out at the Muhimbili National Hospital (MNH), which is located in Dar es Salaam, Tanzania. It is the biggest tertiary hospital in the nation with 1500 bed capacity. The study involved participants that are attended at the nephrology unit encompassing three different sites namely; the hemodialysis unit, nephrology wards, and nephrology clinics. Daily nephrology unit services are run by 8 Nephrologists, 3 Physicians, a varying number of Nephrology fellows, and 3 Medical Officers.

The Haemodialysis unit has about 50 HD machines, with the current total number of about 300 in and out-patients being served.

Nephrology wards include ward 3 for female patients and ward 5 for male patients, located at the Mwaisela block. An average of six patients are admitted on a daily basis, out of whom four are likely to be CKD patients.

Nephrology clinics are conducted in the basement floor of the Paediatrics complex block. Patients being attended are of different categories including pediatric patients, patients with CKD on regular follow-up, ESRD patients on workup prior to renal transplantation, and post-renal transplantation patients. The clinics are conducted for five weekdays in a week with an average of 50 patients per day.

3.4 Study population

The study included all patients with CKD, aged 18 years and above, attending nephrology clinic, and admitted to nephrology wards or on Haemodialysis.

3.5 Study sample

These were patients with CKD at MNH nephrology wards, clinics, and HD unit who fulfilled the inclusion criteria and consented.

3.6 Sample size

Keish and Leslie formula was used to calculate the minimum sample size necessary:

$$n = \frac{z^2 p(1-p)}{\varepsilon^2}$$

Where: n = minimum sample size

z = standard normal deviate (1.96) responding to 95% confidence interval

ε = margin of error (5%)

p= 84.6% of CKD patients in a tertiary hospital in Southern Nigeria had hyperpigmentation and this affected their quality of life to grade 3 on DLQI score, Adejumo et al (13)

$$n = \frac{1.96^2 \times 84.6 \times (100 - 84.6)}{5^2}$$

n = 200

Taking a none response of 10%

$$n' = \frac{200 \times 100\%}{100\% - 10\%}$$

$$n' = \frac{200 \times 100\%}{100\% - 10\%}$$

N= 222

Therefore, the sample size was 225 participants.

3.7 Inclusion and Exclusion criteria

3.7.1 Inclusion criteria

1. All patients with CKD aged 18 years and above visiting a nephrology clinic, being admitted to a nephrology ward, or being on hemodialysis.
2. All those who consented to participate in the study.

3.7.2 Exclusion criteria

1. Patients with CKD who were post-renal transplantation.

3.8 Study variables

For the purpose of this study the following variables were used:

3.8.1 Dependent variable

- Dermatological disorder among CKD patients was measured as a categorical variable and presented as a proportion.

3.8.2 Independent variables

Social demographic characteristics:

1. Age
2. Gender
3. Marital status
4. Employment status
5. Level of education

Clinical parameters:

1. Etiology of CKD
2. Stage of CKD; defined as per KDIGO guidelines(1)

CKD Stage 1 normal estimated glomerular filtration rate (eGFR) ≥90 mL/min per 1.73 m^2 and persistent albuminuria

CKD Stage 2 eGFR between 60 and 89 mL/min per1.73 m^2

CKD Stage 3 eGFR between 30 and 59 mL/min per1.73 m^2

CKD Stage 4 eGFR between 15 and 29 mL/min per1.73 m^2

CKD Stage 5 eGFR <15 mL/min per 1.73 m^2 or end-stage renal disease

3. Hemodialysis
4. Systemic diseases (Diabetes Mellitus, Hypertension, Autoimmune diseases, others)

Laboratory parameters:

1. Haemoglobin; with cut-off values used to define anemia as per WHO criteria of Hb<13g/dl for male, Hb<12g/dl for female
2. Serum calcium; hypocalcemia if calcium< 2.1mmol/L[1]
3. Serum phosphate; hyperphosphatemia if phosphorus>1.52mmol/L[1]
4. Serum albumin; hypoalbuminemia if albumin<35g/L[1]
5. HIV

[1]cut-off values as per MNH Central Pathology Laboratory (CPL)

3.9 Data collection

Data was collected using a questionnaire containing four parts:

3.9.1 Patient interview and medical records

Each participant was interviewed on socio-demographic characteristics like age, gender, marital status, occupation, and level of education as well as dermatological history through an interviewer-based questionnaire.

Factors such as etiology of CKD, stage of CKD, duration of HD and other systemic diseases were enquired and recorded from participants as well as from their medical records.

3.9.2 Health related quality of life tool (DLQI)

HRQoL was assessed using a Swahili version of the validated DLQI tool, and results were recorded in a questionnaire. Ten components make up the DLQI in total, which are broken down into six categories: symptoms and ideas (questions 1 and 2), everyday activity (questions 3 and 4), recreation (questions 5 and 6), work or study (questions 7 and 8), human connections (questions 8 and 9) and care and therapy (question 10). The inquiries gauge how a person has felt about the illness over the past week. The potential answers for each item are "Very much," "a lot," "a little," "not at all," and "not relevant," with a corresponding ordinal grade of 0 to 3. DLQI scores are calculated using the sum of the indices for the ten items that were assessed, such as "no impairment of HRQOL" (0-1), "mild impairment" (2-5), "moderate impairment" (6-10), "severe impairment" (11-20), or "very severe impairment" (21-30)(3). During analysis, DLQI total scores were categorized into two groups; 0-1 as no HRQoL impairment; and ≥2 as presence of HRQoL impairment.

3.9.3 Clinical examination

A thorough head to toe dermatological examination of hair, skin, mucous membranes and nails was done under privacy conditions with adequate light by the Principal Investigator. Findings were recorded into a specially designed questionnaire. Furthermore, digital photographs using an I-Phone 14 pro max camera of all skin lesions was taken and shared with a Dermatologist for confirmation of diagnoses.

3.9.4 Investigations

Laboratory investigations including Hb, serum creatinine, BUN, calcium, phosphorus, albumin, and HIV were recorded from patient' medical records.

3.10 Sampling technique and study procedures

Consecutive recruitment to 225 participants was used to obtain all patients aged 18 years or older with CKD at MNH from September 2023 to January 2024. Participants who fulfilled inclusion criteria and consented were consecutively enrolled in the study until the

sample size was reached. Patients were recruited from nephrology wards, clinic and HD unit.

Data collection procedure commenced after obtaining permission from MNH administration, nephrology ward and clinic in-charges as well as the Head of HD unit.

A written Informed consent was obtained and appropriate data was collected using a structured questionnaire. A detailed dermatological history was taken and patients underwent a thorough head to toe physical examination of hair, skin, mucous membranes and nails so as to diagnose dermatological disorders. As noted above, clinical assessment was performed by a Post-graduate student in Internal medicine (Principal Investigator) after undergoing an intense 3 months exposure of dermatological conditions at the MNH Dermatology clinic.

Furthermore, digital photographs using I-Phone 14 pro max camera of all skin lesions were taken and shared with a Dermatologist for confirmation of diagnoses. Clinical parameters including etiology of CKD, stage of CKD, other comorbidities were extracted from medical records. Laboratory investigations including Hb, serum creatinine, BUN, calcium, phosphorus and HIV were recorded from patient's medical records by a research assistant.

Utilizing the Swahili translation of DLQI questionnaire, participants' HRQoL was evaluated.

3.11 Data management and statistical analysis

The data obtained from the questionnaires was entered into SPSS Version 23 which was then used for data analysis. After data collection, data cleaning and reviewing the filled questionnaires was done to ensure quality control of data.

The main outcome, dermatological disorder was presented as a percentage. Comparison of categorical variables between groups was performed using chi-square test or Fisher's exact test as appropriate.

Univariate analysis was done for each independent variable and those with p value of <0.2 were included in the multivariate model. Modified Poisson Regression Model was performed for the significant factors to explore the association of sociodemographic, clinical and laboratory characteristics with dermatological disorder. Statistical significance level was set at $p<0.05$.

3.11.1 Data storage

The questionnaires used for data collection were stored in a secure place for retrieval whenever necessary, ensuring confidentiality.

3.11.2 Data dissemination

A copy of the error-free dissertation will be made available at the MUHAS library as well as the MUHAS electronic repository. The findings of this study will be shared at the MUHAS scientific conference. A manuscript will be prepared for publication in peer-reviewed medical journals.

3.12 Ethics clearance

Ethics clearance and permission to conduct this study were obtained from the MUHAS Research and Ethics Committee and MNH authorities respectively. A formal written informed consent, in Swahili, was provided by all participants. Privacy was maintained during physical examination. Patient's name and hospital registration number were accessible only to the principal investigator and research assistant as a means to follow up on the laboratory investigation results. Information collected on questionnaires was entered into computer using identification numbers to maintain confidentiality. Participants who were found with dermatological conditions received advice, education, and standard of care recommendations based on existing medical procedures and treatment standards.

CHAPTER FOUR

4.0 RESULTS

4.1 Flow diagram of the study patients

During the study period, a total of 231 patients were screened for eligibility, of whom 225 patients fulfilled the inclusion and exclusion criteria and were enrolled.

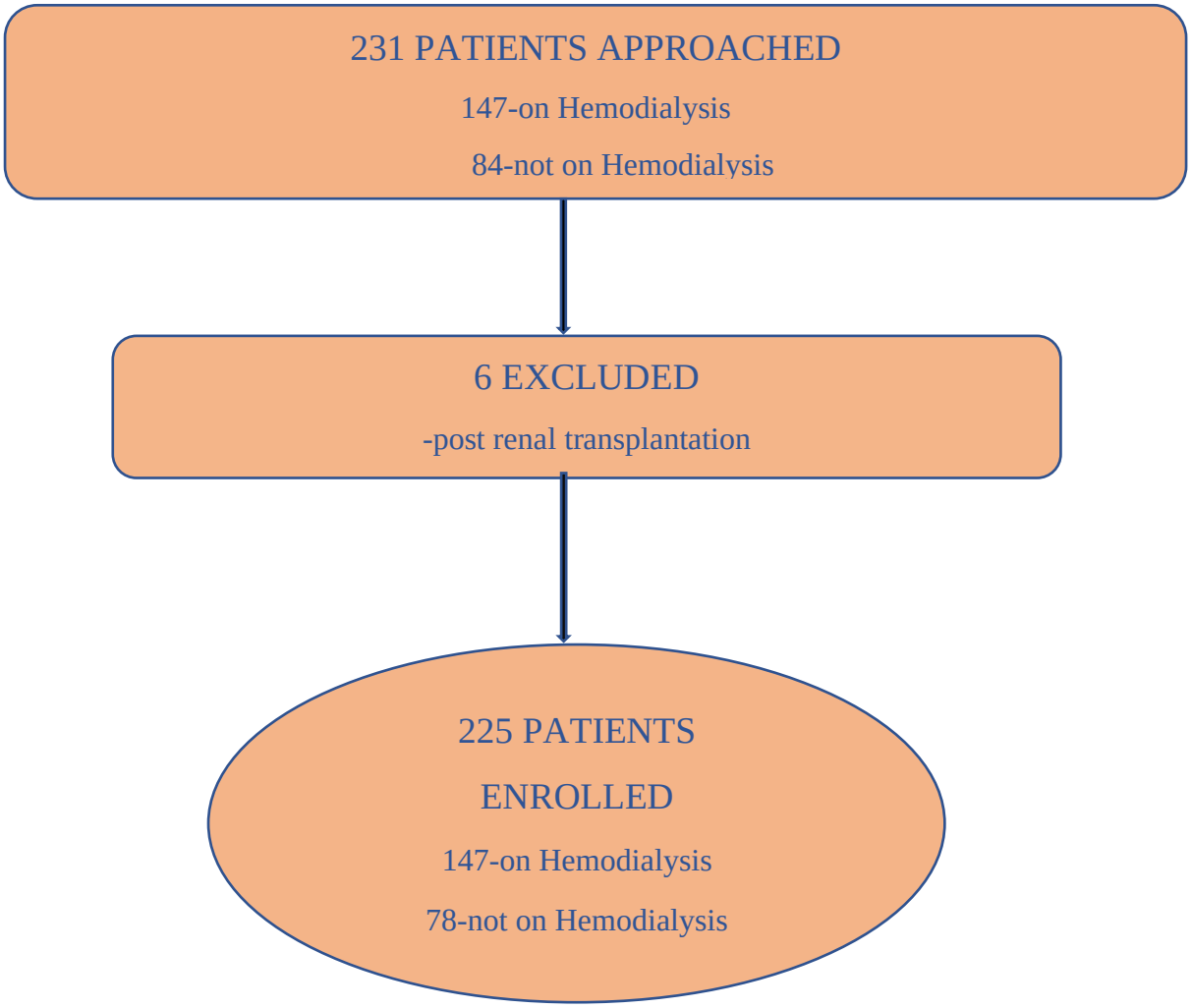


Figure 2: Flow chart showing enrolment of the study patients

4.2 Socio-demographic characteristics of study participants.

A total of 225 patients with CKD participated in this study. Their socio-demographic characteristics are summarized in table 1. The median age of the participants was 55 years, with a range of 43 to 64 years, and 79.6% of the participants were below 65 years of age. The majority of study participants were male (60.9%), married (73.8%), employed (86.7%) with a primary level of education (46.2%) and a monthly income of above 390,000/= Tshs (70.2%).

Table 1: Socio-demographic characteristics of the study participants N = 225

Variable	Frequency (n)	Percent (%)
Age (years)		
≤ 65	179	79.6
>65	46	20.4
Median age in years (IQR)	55 (43, 64)	
Gender		
Male	137	60.9
Female	88	39.1
Marital status		
Married	166	73.8
Single	27	12.0
Widow	21	9.3
Divorced	7	3.1
Separated	4	1.8
Education		
No formal education	7	3.1
Primary	104	46.2
Secondary	65	28.9
College/ University	49	21.8
Occupation		
Employed	74	32.9
Self-employed	121	53.8
Unemployed	30	13.3
Monthly income (Tshs/=)		
≤ 390,000	67	29.8
>390,000	158	70.2
Median monthly income (IQR) (Tshs/=)	600,000/= (300,000/= to 900,000/=)	

Key: IQR: Interquartile range, Tshs: Tanzanian shillings

4.3 Clinical and laboratory characteristics of participants.

Clinical and laboratory parameters have been implicated in the predisposition of dermatological disorders among patients with CKD. Hypertension (64%) was found to be the most common etiology for CKD and the most common systemic disease (86.2%). Among study participants, the majority were having CKD at stage 5 (86.7%), most of whom were on hemodialysis (65.3%) with the median duration on hemodialysis being 15 months. Arterio-venous (AVF) was the most prevalent mode of vascular access (40.4%). Most participants had hypocalcemia (68.4 %), anemia (94.7 %), hyperphosphatemia (72.4%) and normal albumin (59.1%). Table 2.

Table 2: Clinical and laboratory characteristics of the study participants N = 225

Variable	Frequency (n)	Percent (%)
Etiology of CKD*		
Hypertension	144	64.0
Diabetes Mellitus	65	28.9
Hypertension &Diabetes Mellitus	27	12
HIV	14	6.2
Obstructive uropathy	13	5.8
Glomerulopathies	7	3.1
Cervical cancer	5	2.2
Chronic herbal use	3	1.3
Lupus nephritis	3	1.3
Other	6	2.7
Stage of CKD		
2	2	0.9
3	15	6.7
4	13	5.8
5	195	86.7
On hemodialysis		
Yes	147	65.3
No	78	34.7
Median duration on hemodialysis **(IQR)**	15 months (8, 48 months)	
Haemodialysis vascular access (n = 147)		
Permanent catheter	47	32.2
Temporary catheter	40	27.4
AVF	60	40.4
Systemic disease*		
Hypertension	194	86.2
Diabetes mellitus	67	29.8

Autoimmune disease	3	1.3
Other systemic disease	27	12.0
Serum calcium		
Hypocalcemia	154	68.4
Normal	71	31.6
Serum phosphorus		
Normal	62	27.6
Hyperphosphatemia	163	72.4
Anemia		
Yes	213	94.7
No	12	5.3
Serum albumin		
Hypoalbuminemia	92	40.9
Normal	133	59.1

Key: *Participant may have more than one, AVF: Arteriovenous fistula

4.4 Prevalence of dermatological disorders among patients with CKD at MNH

The overall prevalence of dermatological disorders among patients with CKD was 88.9% (figure 3). Out of all dermatological disorders, conjunctival pallor was found at the highest proportion (90.5%), followed by skin disorders (79.5%). (figure 4).

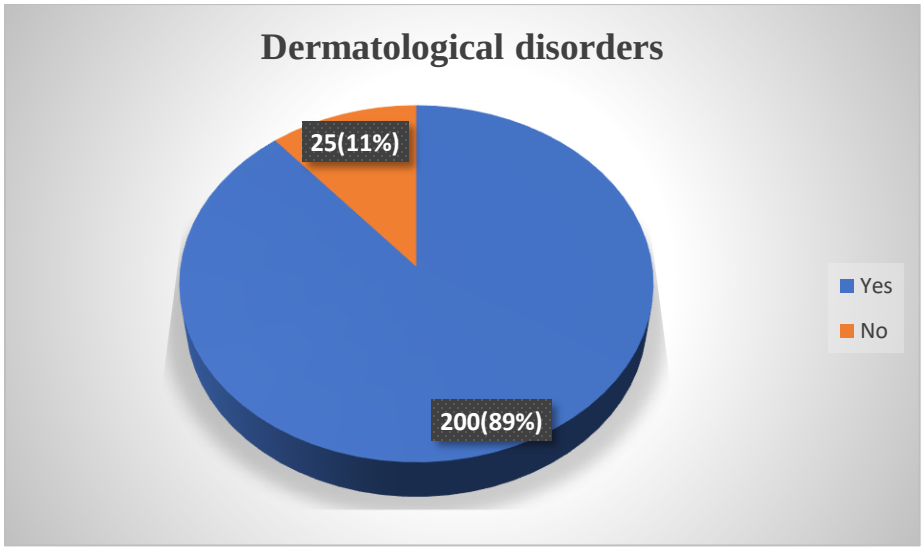


Figure 3: The overall prevalence of dermatological disorders among patients with CKD

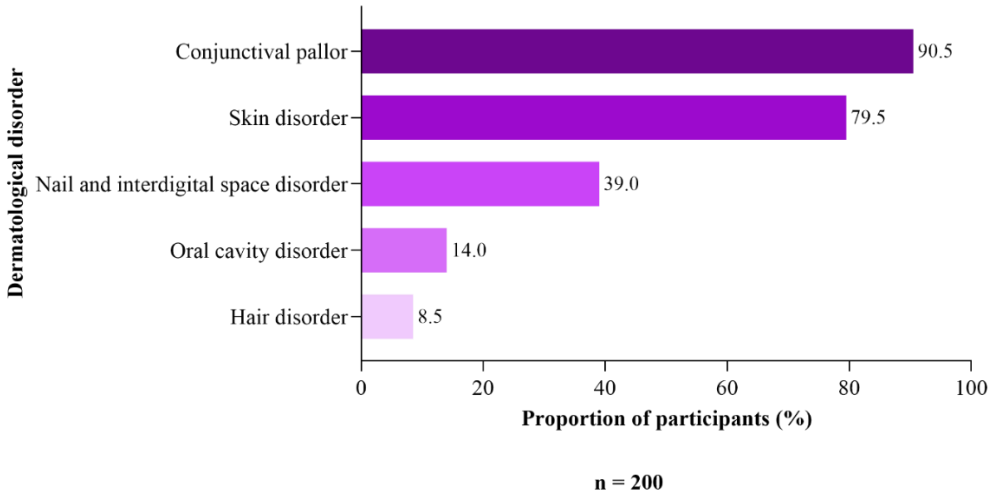


Figure 4: Proportion of dermatological disorders among patients with CKD

4.5 Pattern of dermatological disorders among patients with CKD at MNH

Majority of study participants (88.9%) had at least one dermatological disorder, with conjunctival pallor being the most predominant (90.5%). This was followed by skin, nail, oral cavity and hair disorders (figure 4).

Out of 159 study participants with skin disorders, xerosis was the most common presentation (47.8%) followed by pruritus (29.6%) and hyperpigmentation on sun-exposed areas (25.8%) (Figure 5).

Among 78 participants that presented with nail and interdigital space disorders, onychomycosis was the leading presentation (25.6%). Others with higher proportions included Lindsay's nails, koilonychia, leukonychia, hyperpigmented nails and pincer nail deformity in descending order of frequency (figure 6).

The distribution of hair disorders was in this descending order of occurrence; sparse scalp hair, loss of hair on lower limbs, tinea capitis and acute diffuse alopecia with sparse scalp hair as the most common presentation (82.4%) (Figure 7).

Of all oral cavity disorders that were observed, xerostomia was found to be the leading presentation (71.4%) (Figure 8).

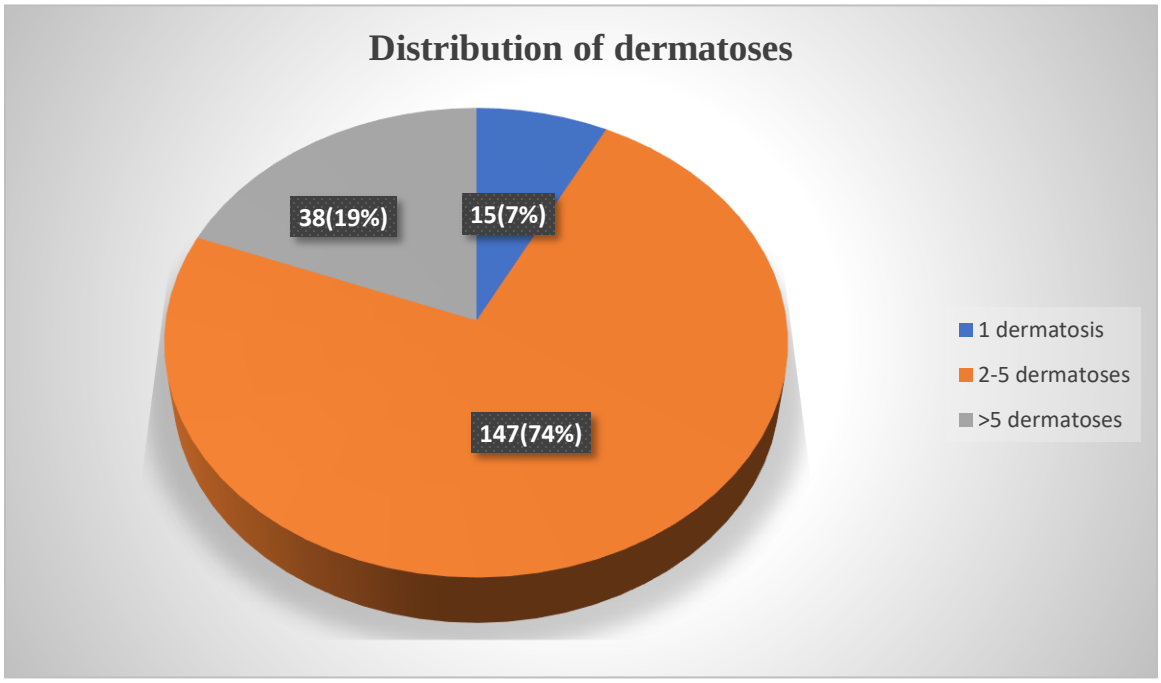


Figure 5: Distribution of dermatological disorders among patients with CKD

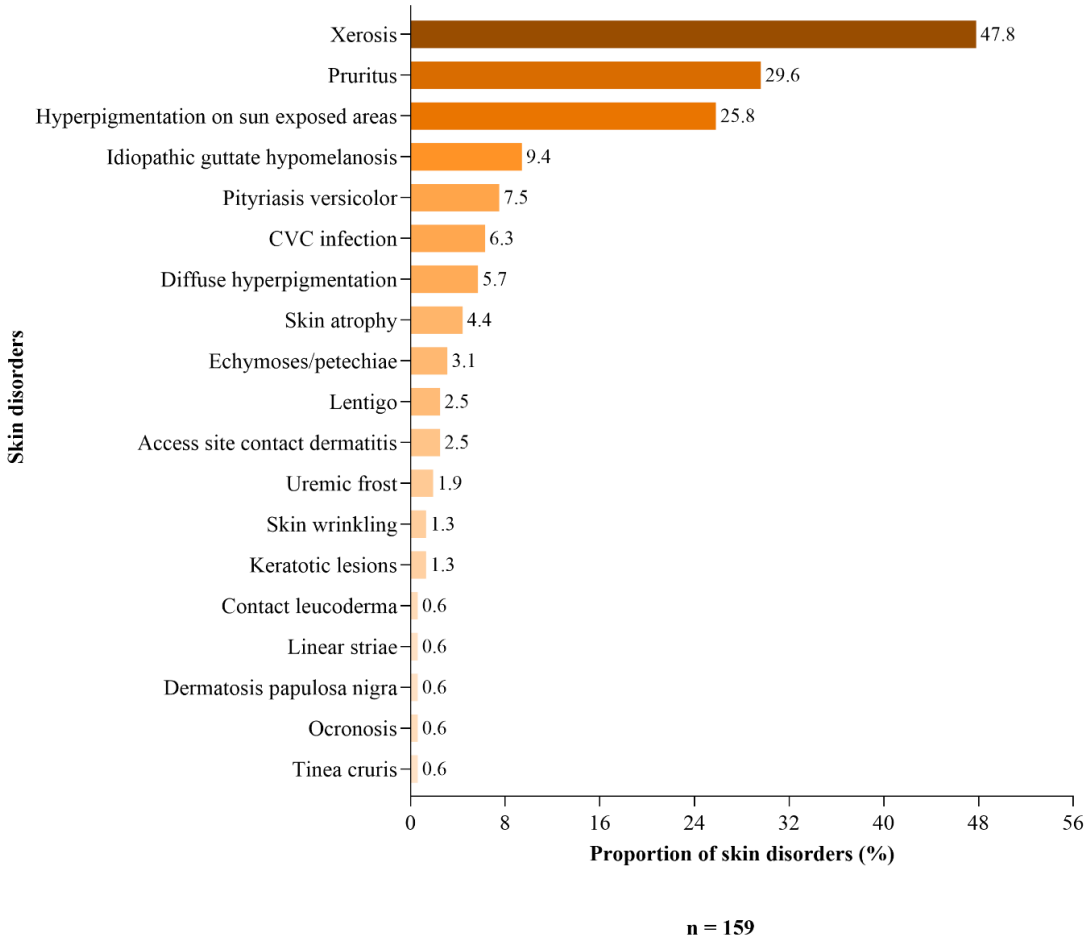


Figure 6: Proportion of individual skin disorders among patients with CKD

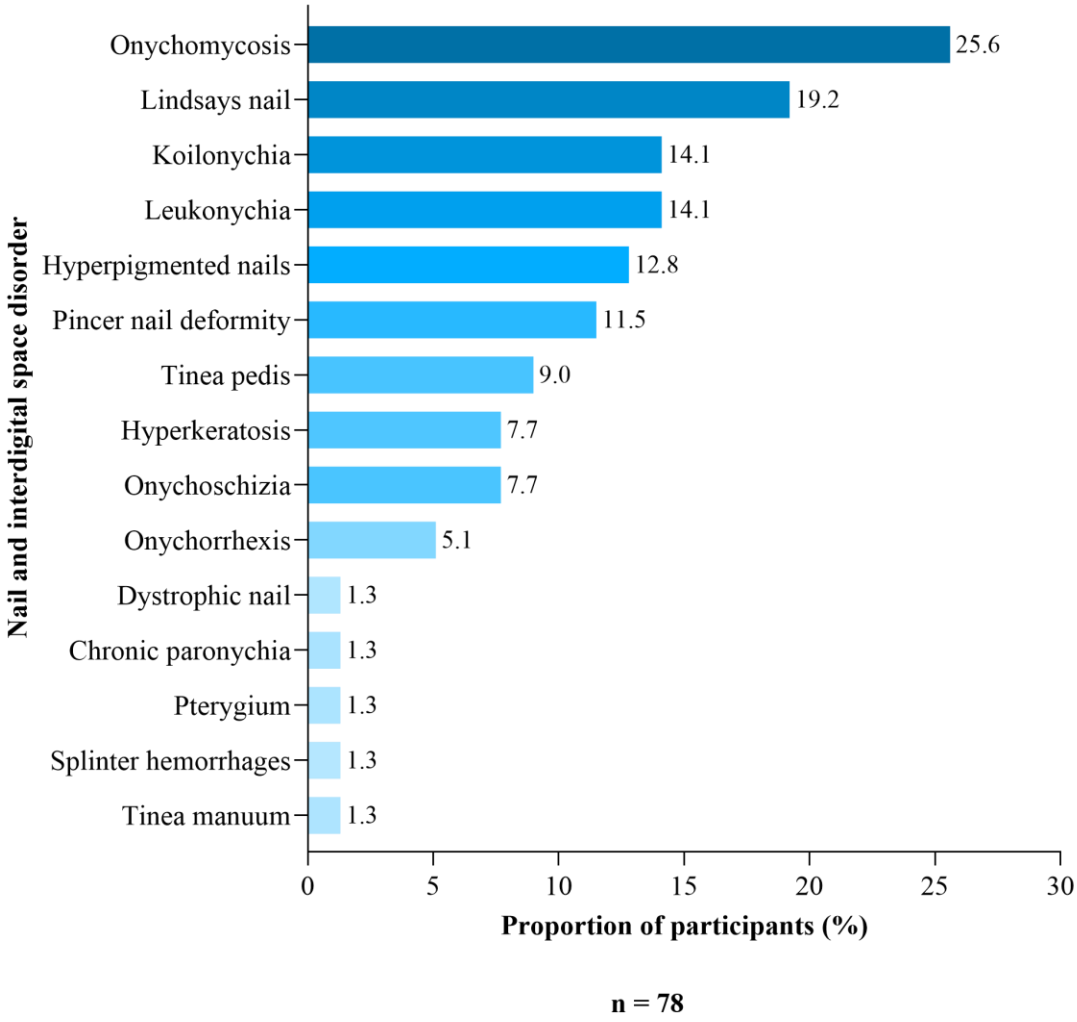


Figure 7: Proportion of individual nail and interdigital space disorders among patients with CKD

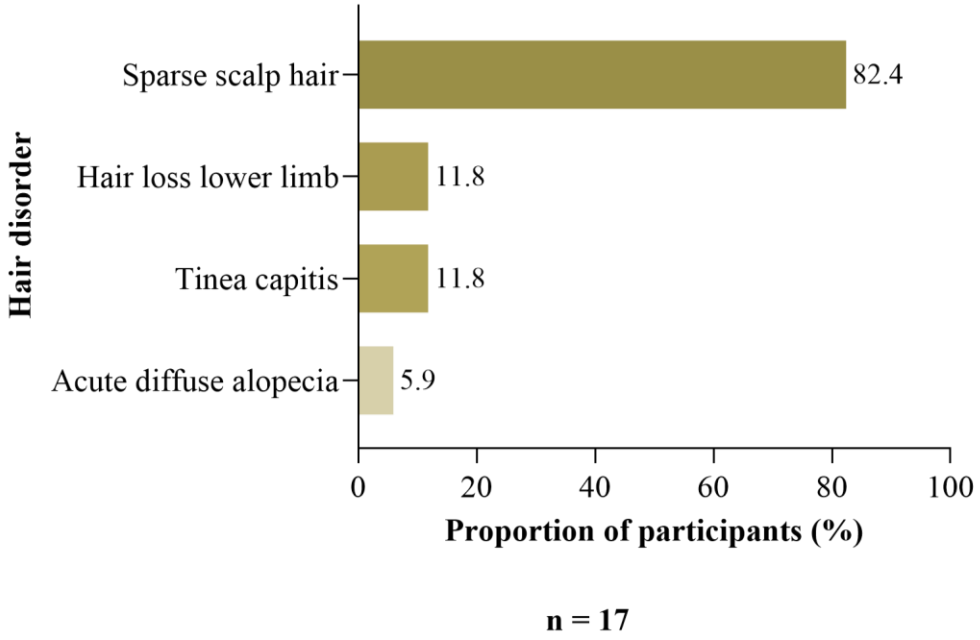


Figure 8: Proportion of individual hair disorders among patients with CKD

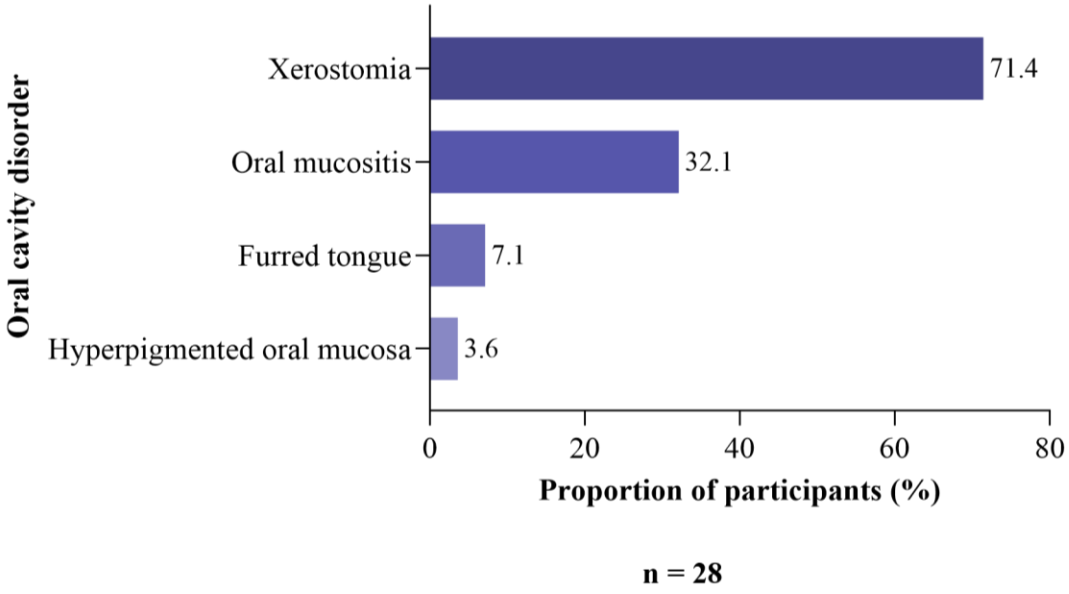


Figure 9: Proportion of individual oral cavity disorders among patients with CKD

4.6 Factors associated with the presence of dermatological disorders among patients with CKD at MNH

In this study, socio-demographic, clinical and laboratory factors were evaluated in association with the likelihood of developing dermatological presentations. The analysis revealed several noteworthy findings.

Age, gender, education level, monthly income and occupation of participants showed no statistically significant association with the occurrence of dermatological disorders.

The occurrence of dermatological disorders was found to be associated with advanced stages of CKD and this association was statistically significant p=0.006. However, on multivariate model analysis it was found that, advanced CKD had a 1.28 times likelihood of developing dermatological disorders without showing independent association.

HIV positivity among participants was statistically significantly associated with the presence of dermatological disorders as it further revealed an independent association on multivariate model p<0.001.

Hypocalcemia showed no independent association despite being statistically significantly associated with dermatological presentations on univariate model analysis p=0.03.

Chronic kidney disease patients with elevated phosphate levels were found to have a higher prevalence of dermatological presentations at a univariate level of logistic regression analysis. On multivariate level, hyperphosphatemia was an independent predictor of CKD patients to develop the disorders p=0.013.

Anemia among patients with CKD was found to be associated with the presence of the disorders and this association was statistically significant on univariate model, p=0.001, and on multivariate analysis it was found to be an independent determinant p=0.047.

Patients with CKD on HD showed to be protected from developing dermatological disorders, however, no statistically significant association was established.

Causes of CKD and other systemic diseases revealed no statistically significant association with dermatological presentations among patients with CKD. Tables 3-5.

Table 3: Socio-demographic factors associated with dermatological disorders N=200

	Presence of dermatological disorders		
Variable	**Yes (%)**	**No (%)**	**p - value**
Age (years)			
≤ 65	159 (88.8)	20 (11.2)	0.953
>65	41 (89.1)	5 (10.9)	
Gender			
Male	121 (88.3)	16 (11.7)	0.735
Female	79 (89.8)	9 (10.2)	
Level of education			
No formal to primary	99 (89.2)	12 (10.8)	0.960
Secondary education	58 (89.2)	7 (10.8)	
College/ University	43 (87.8)	6 (12.2)	
Monthly income (Tshs/=)			
≤ 390,000	57 (85.1)	10 (14.9)	0.236
>390,000	143 (90.5)	15 (9.5)	
Occupation			
Employed	66 (89.2)	8 (10.8)	0.215
Self-employed	110 (90.9)	11 (9.1)	
Unemployed	24 (80.0)	6 (20.0)	

Table 4: Clinical and laboratory factors associated with dermatological disorders N=200

	Presence of dermatological disorders		
Variable	**Yes (%)**	**No (%)**	**p - value**
Hypertension			
Yes	129 (89.6)	15 (10.4)	0.659
No	71 (87.7)	10 (12.3)	
Diabetes mellitus			
Yes	59 (90.8)	6 (9.2)	0.567
No	141 (88.1)	19 (11.9)	
Glomerulopathies			
Yes	5 (71.4)	2 (28.6)	0.176
No	195 (89.4)	23 (10.6)	
Stage of CKD			
Early CKD[a]	11 (64.7)	6 (35.3)	**0.006**
Advanced CKD[b]	189 (90.9)	19 (9.1)	
On hemodialysis			
Yes	134 (91.2)	13 (8.8)	0.137
No	66 (84.6)	12 (15.4)	
HIV			
Positive	32 (100.0)	0 (0.0)	**0.030**
Negative	168 (87.0)	25 (13.0)	
Serum calcium			
Hypocalcemia	142 (92.2)	12 (7.8)	**0.020**
Normal	58 (81.7)	13 (18.3)	
Serum phosphorus			
Normal	52 (83.9)	10 (16.1)	0.140
Hyperphosphatemia	148 (90.8)	15 (9.2)	
Anemia			
Yes	194 (91.1)	19 (8.9)	**0.001**
No	6 (50.0)	6 (50.0)	
Serum albumin			
Hypoalbuminemia	84 (91.3)	8 (8.7)	0.338
Normal	116 (87.2)	17 (12.8)	

Key: a: stage 2-3, b: stage 4-5

Table 5: Univariate and multivariate analysis of the factors associated with dermatological disorders N=200

		Bivariate analysis			Multivariate analysis		
Variable	**Category**	**cPR**	**95% CI**	**p - value**	**aPR**	**95% CI**	**p - value**
Age (years)	≤ 65	0.99	0.89 – 1.12	0.953			
	>65	Ref					
Gender	Male	0.98	0.90 – 1.08	0.732			
	Female	Ref					
Education	No to primary	1.02	0.90 – 1.15	0.796			
	Secondary	1.02	0.90 – 1.16	0.808			
	College/University	Ref					
Monthly income	≤ 390,000	0.94	0.84 – 1.05	0.280			
	>390,000	Ref					
Occupation	Employed	1.12	0.92 – 1.36	0.276			
	Self-employed	1.14	0.94 – 1.37	0.182			
	Unemployed	Ref					
Hypertension	Yes	1.02	0.93 – 1.13	0.666			
	No	Ref					
Diabetes mellitus	Yes	1.03	0.94 – 1.13	0.547			
	No	Ref					
Glomerulopathies	Yes	0.80	0.50 – 1.28	0.349			
	No	Ref					
Stage of CKD	Advanced	1.40	0.99 – 2.00	0.060	1.28	0.93 – 1.77	0.132
	Early	Ref					
On hemodialysis	Yes	1.08	0.97 – 1.20	0.173	0.96	0.88 – 1.05	0.349
	No	Ref					
HIV	Positive	1.15	1.09 – 1.21	< 0.001	1.17	1.08 – 1.26	**< 0.001**
	Negative	Ref					
Serum calcium	Hypocalcemia	1.13	1.02 – 1.27	0.047	1.11	0.99 – 1.23	0.078
	Normal	Ref					
Serum phosphorus	Hyperphosphatemia	1.14	0.99 – 1.24	0.193	1.21	1.01– 1.26	**0.013**
	Normal	Ref					
Anemia	Yes	1.82	1.03 – 3.21	0.038	1.72	1.01 – 2.93	**0.047**
	No	Ref					
Serum albumin	Hypoalbuminemia	1.05	0.96 – 1.15	0.322			
	Normal	Ref					

Key: cPR: crude Prevalence Ratio, aPR: adjusted Prevalence Ratio, Ref: Reference category, CI: confidence interval

4.7 Quality of life among CKD patients with dermatological disorders using the Dermatological Life Quality Index (DLQI) at MNH

Health related quality of life (HRQoL) among CKD patients with dermatological disorders was assessed using the DLQI tool. The tool has a set of questions with assigned scores, total scores ranging from 0 to 30. The scores were divided into two categories depending on whether there was an impairment or not in terms of the patient's quality of life i.e. a score of 0-1 designated as no impairment of HRQoL, 2 and above designated as impairment of HRQoL. The study revealed that the majority (78%) of the participants had their HRQoL not impaired by dermatological disorders. Pruritus exhibited an impact on participants' HRQoL and it was the only presentation that showed statistically significant association $p<0.001$.

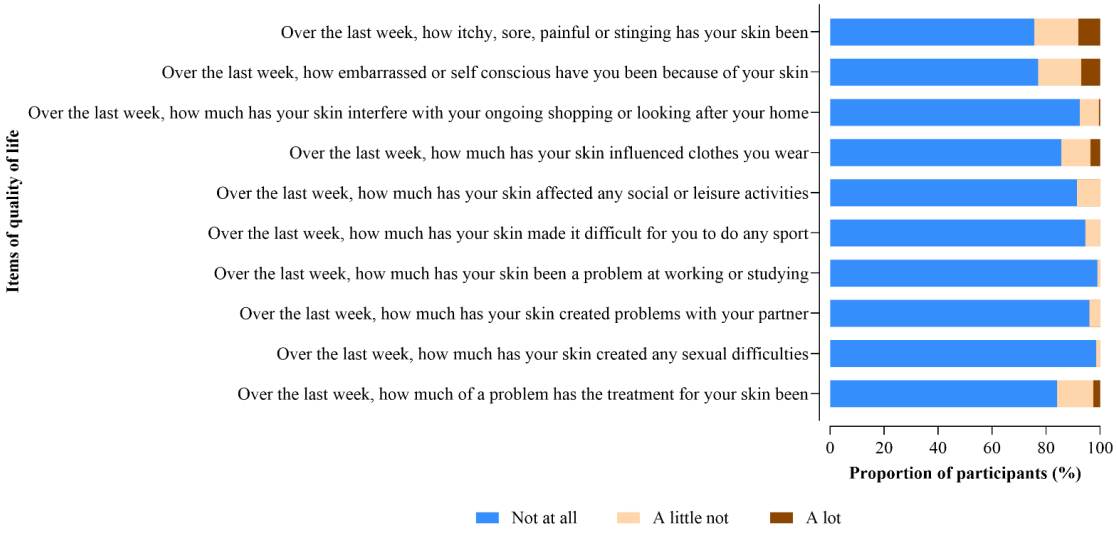


Figure 10: Proportion of patients' responses on DLQI

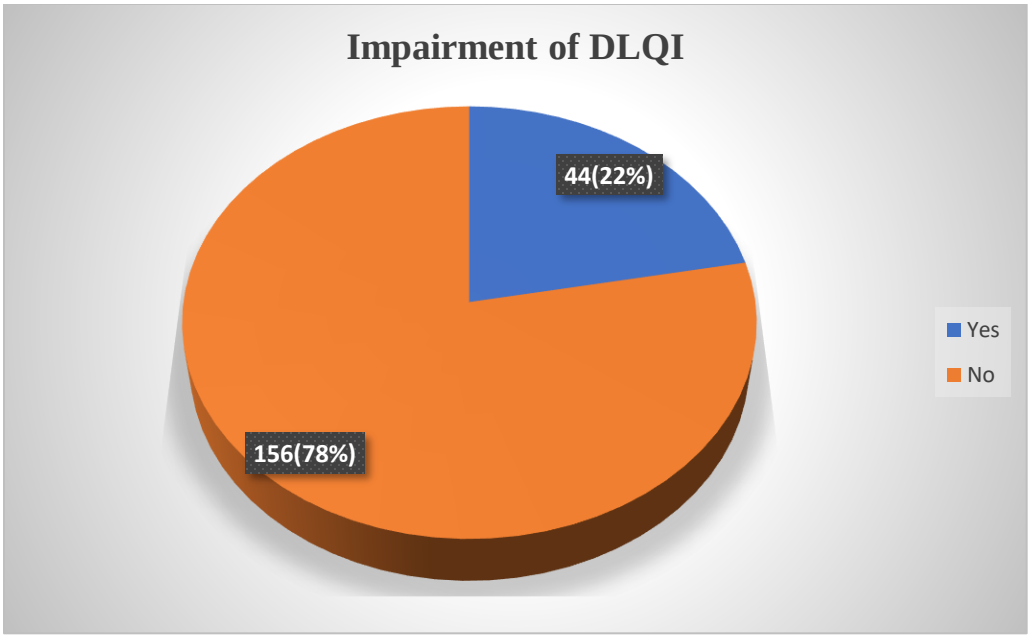


Figure 11: Impact of dermatological disorders on DLQI

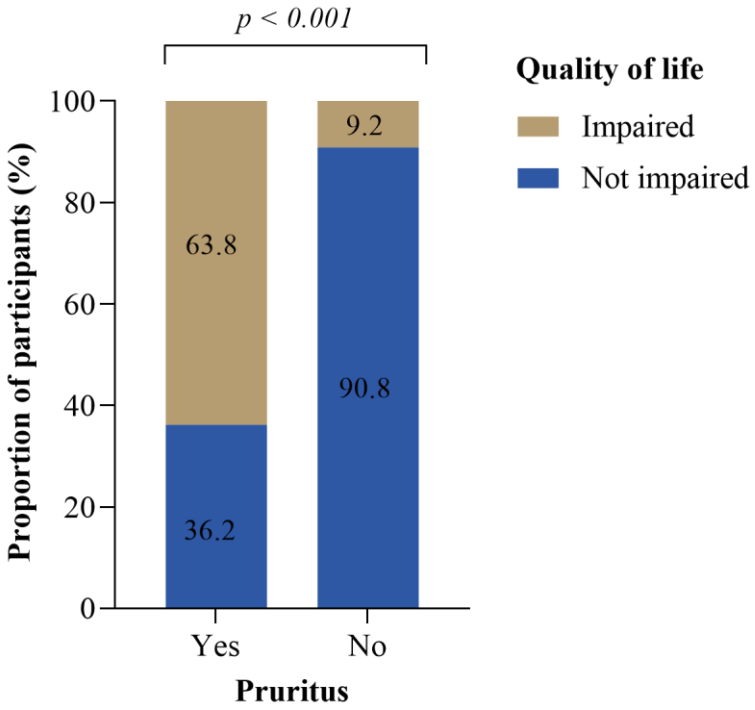


Figure 12: Impact of Pruritus on DLQI

CHAPTER FIVE

5.0 DISCUSSION

5.1 Discussion

With a comprehensive exploration of the prevalence, pattern, associated factors, and impact on the quality of life of dermatological disorders among patients with chronic kidney disease (CKD), the study enlightens on a critical aspect of healthcare in this particular population.

The primary focus of the study was to understand the intricate relationship between CKD and dermatological disorders. By addressing questions related to prevalence, patterns, associated factors, and the consequent impact on the health-related quality of life, it was aimed to contribute valuable insights to the interdisciplinary discourse surrounding the holistic care of CKD patients.

Investigating the prevalence of dermatological disorders among patients with CKD has revealed a noteworthy spectrum of conditions. The prevalences documented in this study underscore the significant burden of dermatological issues in this population. Notably, it was found that the overall prevalence of dermatological disorders was 88.9%, indicating a substantial occurrence of dermatological manifestations in CKD patients. This prevalence extends to include a diverse array of dermatological conditions.

To contextualize these findings, the prevalence documented in this study was compared with existing literature. Similar to this study, the prevalence of dermatological disorders in other studies ranged from 84% to 96%, except in a study by Asokan et al where it ranged from 60%-82.8%, slightly lower than this study and others(13,14,18,95,96). This difference could be explained by variations in characteristics of study participants like CKD etiology and biochemical profile. The alignment of results in this study with previous research validates the consistency of dermatological manifestations in CKD.

The patterns observed in dermatological disorders within this cohort of patients with CKD showcased a rich and diverse spectrum. The study identified a range of dermatological manifestations, including mucosal (conjunctival pallor, xerostomia, oral mucositis, hyperpigmented oral mucosa), skin (xerosis, pruritus, hyperpigmentation, fungal infections and others), nail and interdigital space (onychomycosis, Lindsay's nails and others), and hair (sparse scalp hair, acute diffuse alopecia and others) presentations.

This study revealed a noteworthy prevalence of conjunctival pallor among the CKD patient population, with 90.5% of individuals exhibiting this clinical sign. The same prevalence was depicted in some other studies (13,17,67) but Levillard et al study(12) showed a lower prevalence than this study and some other studies. This difference could be attributed by different ways of assessing pallor as well as examiner's error. Conjunctival pallor is often indicative of anemia or impaired oxygen-carrying capacity, anemia in CKD patients is mainly due to undersecretion of erythropoietin from kidneys(30). Clinicians should recognize conjunctival pallor as a potential marker for anemia and an underlying need for further hematological evaluation.

The cause of pruritus in CKD is not fully known, however, it is partly associated with uremic toxins, an immune response to CKD or treatment modalities for CKD in terms of medications and renal replacement therapy (RRT) among many other theories(30,31). In our study it was found that 29.6% of all cutaneous dermatoses was occupied by pruritus manifestation. This observation is low when compared to other studies(13,17,56,97,98). This discrepancy was possibly contributed by the fact that some studies were done among HD patients alone, some were done among patients not on HD, it could also be explained by the difference in types of vascular access, hemodialysis and participants' characteristics.

Xerosis is one of the most irking manifestations of CKD, its occurrence among patients with CKD is multifactorial. Some of the stipulated causes include reduction in size of eccrine sweat gland, use of medications like high dose diuretics and ultrafiltration during

HD(30,99). Our study revealed that xerosis among patients with CKD occurred at a prevalence of 47.8%, this is not consistent with what was shown in a study by Jacek C et al with prevalence of 50-85%(89). This higher prevalence compared to our study is because Jacek C et al studied only end stage renal disease patients.

Hyperpigmentation among patients with CKD is a common dermatological condition characterized by the darkening of the skin, nails and mucosal surfaces. It may be patchy or diffuse, may also involve only sun exposed areas or generalized. Among patients with CKD, there are several causations but mainly it is due to retention of beta-MSH(30,37,100). In our study the overall prevalence of hyperpigmentation was 47.9% encompassing sun exposed areas, nails, generalized and oral mucosa. There is a number of studies that show similar findings as this study, but some have revealed varied prevalences (12,17,98). These variations could be attributed to some factors including different geographical locations, stage of CKD studied, patients on hemodialysis against those not on hemodialysis and etiology of CKD.

Ecchymosis/petechiae are among known cutaneous dermatoses in patients with CKD, mainly due to heparin use during HD, lost skin elasticity because of aging, sun exposure and possibly uremia as well as decreased platelet function(30,101). In our study, 3.1% of study participants presented with ecchymosis. This prevalence is very low in comparison to what was observed in a review done by Vivek G et al(30). This discrepancy is attributed to the difference in baseline characteristics of the studied population including age, stage of CKD, medications used by some patients and renal transplantation status.

CVC infection is one of the complications encountered by CKD patients on haemodialysis causing significant hospitalization and mortality. In this study, it existed at a prevalence of 6.3%, low as compared to 33%-34% that was revealed in two cross sectional studies done in Ghana and Nigeria(102,103). This is due to the fact that AVF is the most common route for hemodialysis at our center, and infections involving AVF are not common.

Chronic Kidney Disease (CKD) itself does not directly cause onychomycosis, but individuals with CKD may be at an increased risk of developing fungal infections due to various factors associated with the disease and its treatments. These factors may include peripheral edema, weakened immune system, hemodialysis, etiology of CKD especially diabetes, and use of immunosuppressants post kidney transplantation(104). Our study revealed a 25.6% prevalence of onychomycosis, consistent with a study by Kuvandik G et al(105) but contrary to higher prevalences in other studies ranging from 19-51.9%(104,106–112), these higher prevalences than in the general population<10%(113,114) are explained by factors above. Other fungal infections that were portrayed in this study include tinea capitis (11.8%), pityriasis versicolor (7.5%), tinea pedis (9%) and tinea manuum (1.3%).

Half-and-half nail formerly known as Lindsay's nail refers to a specific nail finding in which the proximal half (closest to the cuticle) of the nail is white, and the distal half (farther from the cuticle) is brown. The white proximal portion is believed to result from decreased blood supply, while the brown distal portion may be associated with increased concentration of β-MSH(44,115). We obtained a prevalence of 19.2% from our study, higher than 10.7% in a study by Emmanuel K et al (116) and lower than 40%-45.7% which was found in other studies(13,67,117) and this difference may be explained by hemodialysis and variations in etiology of CKD especially diabetes mellitus. Some other nail presentations that were studied are leukonychia, koilonychia, hyperpigmented nails, pincer nail deformity and splinter hemorrhage.

Our study revealed a prevalence of 8.5% of hair disorders, out of which sparse scalp hair was the commonest (82.4%) followed by hair loss of lower limbs (11.8%). A cross sectional study done by Rattan S et al showed a 60.6% prevalence of hair changes(20). This disparity may be explained a higher number of patients on hemodialysis (65%) in our study as compared to 41% in a study by Rattan S et al, as the use of heparin in dialysis is

deemed to predispose to hair changes. Again, in both studies, other potential medications that could cause hair changes were not studied.

Xerostomia was found to be the most common mucosal change among CKD patients at a prevalence of 71.4%. This rate is higher than a 12.3% prevalence observed in Rattan S et al's cross sectional study(20). Higher proportion of patients on hemodialysis on constant ultrafiltration observed in our study could explain this discrepancy.

In summary, our study showed some similarities and differences in the pattern of dermatoses to what is known in other literature. The differences are attributable to differences in baseline characteristics of the population studied and geographical location among others.

Several factors are significant contributors to the prevalence and pattern of the observed dermatological disorders in CKD. Some of these factors include accumulation of uremic toxins, high dose diuretics, reduced erythropoiesis, impaired immunity, dehydration, increased vascular fragility and heparin use during HD. Building an understanding of these factors is crucial for developing targeted interventions that address the root causes of dermatological disorders in CKD patients.

The median age of the participants in this study was 55 years (IQR 43, 64) with more than three quarters of the participants aged below 65years. The findings in this study showed that participants with age < 65years were 0.99 times less likely to develop dermatoses, however, age was not found to be significantly associated with the presence of dermatological disorders. From our study, it was observed that, a greater proportion of patients with CKD lies in the young to middle age, similar to studies done in other African countries like Nigeria, but contrary to observations from studies done in developed countries where the elderly are more affected and hence higher prevalences of dermatoses among the elderly. This difference could be explained by the difference in average life

span, better health care services as well as better health education on preventive services in developed countries that delay the presentation of CKD(13,18,52,54).

Over 60% of study participants in this study were male. In terms of numbers, male patients were more affected by dermatological disorders, however, there was no established significant association, this is consistent with other studies. This observation is because male gender is a risk factor for developing CKD(13,52,55).

Hypertension was a predominant cause of CKD accounting for over two thirds of the studied population. It was followed by diabetes mellitus, HIV and others. Our study showed that HIV positivity was an independent predictor of dermatological disorders $p<0.001$. Like in the general population, similarly, HIV causes a number of dermatological presentations through a number of mechanisms(118). Xerosis occurs due to impairment in barrier function of stratum corneum, which occurs as a result of lipid content decrease within the viable epidermis and dermis and excessive concentration of carotenoids, especially lycopene, within the epidermis. This dermatologic condition is the main cause of premature skin ageing in HIV patients and one of the reasons of pruritus in these patients(119). HIV is as well implicated in other dermatological disorders like fungal infections particularly with nail involvement as evidenced by Bernard C et al(65). In other studies, diabetes mellitus has been associated with half and half nails by Mohamed E et al in Egypt with $p=0.004$(57), xerosis, pruritus(58)and onychomycosis(59–64), however this was not evident in our study.

This study showed that advanced CKD was associated with presence of dermatosis $p=0.006$ at a univariate analysis level, however, at multivariate analysis level, it was not found to be an independent determinant despite that patients with advanced CKD were1.4 times more likely to present with the disorders. This is in keeping with studies by Adejumo et al and Oripelaye et al in Nigeria who also reported increasing frequency of dermatosis across the CKD stages but this trend did not attain statistical significance(13–15,18). This pattern of increasing frequency of dermatoses across stages of CKD could be

explained by more retention of nitrogenous waste as a result of progressive decline in renal excretion ability, declining immunity, and invasive procedures like CVC insertion predisposing to CVC infections.

Investigating the association between hemodialysis and dermatological disorders, our study found that being on hemodialysis led to a 1.08 times likelihood of having dermatoses, however, no significant association was established. The existence of dermatoses among pre dialysis or dialysis patients can be viewed in different perspectives. First, there is an argument that hemodialysis was found to be associated with a decrease in occurrence of some of the dermatoses like nail and hair changes(17). Second argument is that some dermatoses like Lindsay's nail, pruritus, xerosis, hyperpigmentation, leukonychia and infections were found to be predominant in dialysis group(120,121). It is important at this juncture to explain why some dermatoses increase or are aggravated by hemodialysis and some decrease or are relieved by hemodialysis particularly pruritus. Etiology of pruritus in CKD is due to accumulation of uremic toxins, calcium-phosphate complex deposition and hyperparathyroidism but also could be induced by sensitivity to dialyzer materials that come in contact with blood in the extracorporeal circulation during HD(31,122–125). With this explanation hemodialysis can initiate, aggravate or relieve pruritus, and hence, variations in findings from different studies.

Majority (90.5%) of participants in this study presented with pallor. This finding is consistent with several other studies(13,17,52,95). Pallor is usually used as an indicator of anemia, whereby anemia is confirmed upon blood work up to quantify hemoglobin level. Other dermatological manifestations of anemia that were revealed in our study are glossitis, skin hypo/hyperpigmentation, koilonychia and onychoschizia. Our study showed that anemia is associated with dermatoses among CKD patients, further analysis at multivariate level, it proved to be an independent predictor p=0.047. With this understanding, clinicians are expected to promptly investigate patients in case they encounter these clinical features for early intervention.

In CKD, imbalances in calcium and phosphorus levels can contribute to various dermatological disorders. Hypocalcemia and hyperphosphatemia are common biochemical disturbances in CKD. In this study, hyperphosphatemia stood out as an independent predictor for dermatoses p=0.013, but, manifestations are viewed as a result of interaction of the two in a calcium-phosphate complex. The interaction between these mineral imbalances and the skin can result in several dermatological manifestations including pruritus, xerosis, calciphylaxis, eczematous dermatitis, onychoschizia and hair changes as observed in our study. In support of the findings from our study, phosphate and calcium disturbances have been established among etiologies of uremic pruritus(48,69–72). Management of some dermatological issues in CKD involves addressing the underlying mineral and bone disorders and this underscores the relevance of viewing skin as a mirror of the entire body processes.

The ultimate goal of interventions including renal replacement therapy deployed among patients with CKD is to improve patients' health related quality of life. With this notion in mind, several studies have been conducted to assess the effectiveness of these interventions in terms of HRQoL. A study by Msilanga et al on quality of life among hemodialysis patients at MNH revealed that overall HRQoL was significantly impaired(88), and this was supported by similar findings from several prior studies(126–129). On top of an already impaired HRQoL, our study aimed to determine an impact of dermatological disorders; it was found that 22% of the participants reported an impairment of quality of life through DLQI, and only pruritus was found to have a statistically significant association $p<0.001$. In a study by Jacek C et al, pruritus was found to be an independent contributor to DLQI deterioration $p < 0.0005$(90), these findings are consistent with our study. A strong significant positive correlation was found between pruritus and the degree of quality of life of patients on hemodialysis ($r = 0.923$; $p = 0.000$) concluding similarly that pruritus would negatively impact CKD patients' quality of life undergoing hemodialysis(91). Similar findings have been hammered in international

results from the Dialysis Outcomes and Practice Patterns Study (DOPPS)(92–94,130–132). Of note in our study, only 22% of participants had low DLQI scores, this is because participants involved a mixture of patients from all CKD stages, dialysis and non-dialysis, but of utmost importance is that; may be CKD, treatment options and its complications are major concerns than these dermatological presentations in this particular population.

5.2 Strengths of the study

To the best of our knowledge, this is the first study to be done in our setting, adequately powered to determine the burden, pattern, associated factors and the impact of dermatoses on the HRQoL that was assessed using a validated DLQI tool. Due to the prospective nature of data collection, real time data with a complete set of variables was obtained in the study. Moreover, the study involved dermatologists who provided proper dermatological diagnoses. Inclusion of all stages of CKD in our study was also a strength. Therefore, this study can later be used as a benchmark for other studies.

5.3 Study limitations and mitigations

The limitations included:

i. This was a single centered study conducted at the country's tertiary referral national hospital which received a large number of patients with advanced stages of CKD and thus few patients with other stages of CKD were studied and this could have contributed to the high prevalence noted.

ii. Due to the cross-sectional nature of the study, it was difficult to ascertain whether the dermatological disorders were the direct result of the underlying CKD.

iii. The self-reported nature of questions in the DLQI tool during assessment of HRQoL could introduce recall bias.

iv. Dermatological examination and diagnosis was done by the PI who is not a dermatologist.

v. Systematic errors while taking photographs of the lesions which could lead to false interpretation and hence wrong diagnosis.

Strategies to overcome the limitations were:

i. The PI underwent an intense 3months exposure of dermatological conditions at the dermatology clinic of MNH prior to commencement of study.
ii. A dermatologist reviewed all digital photographs of skin lesions taken from participants for confirmation of diagnoses.
iii. The photographs of the lesions were carefully taken with high quality camera (Iphone 14 pro max) with highest resolution for better visualization.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Dermatological disorders occur commonly in CKD patients in our setting. HIV, anemia and hyperphosphatemia were found to be independent predictors of the presence of dermatological disorders. Dermatoses, particularly pruritus significantly affected DLQI in our CKD patients. This study highlights the significant burden that dermatological disorders add to CKD.

6.2 Recommendations

On the basis of findings obtained from this study, the following recommendations are being made:

1. Due to high prevalence of dermatoses among patients with CKD, there is a need for inclusion of appropriate strategies in our national and institutional treatment guidelines for early diagnosis and intervention against these disorders in this population.
2. The high prevalence of dermatoses and their impact on HRQoL warrants the need for inclusion of dermatological disorders in the registry as other comorbidities like hypertension and diabetes mellitus among patients with CKD. This will enable practitioners to have substantial statistics that will guide appropriate interventions.
3. A multicenter study involving lower levels of health facilities should be conducted to address variations in prevalence of dermatoses that are attributed to different stages of CKD. This is due to the fact that early CKD patients are captured at lower levels of health facilities.
4. These results will aid in the development of a model for predicting health-related quality of life among CKD patients with dermatoses, as well as determining the

type of intervention that can be used to improve the quality of care provided. Therefore, a measure of HRQOL which is cheap, simple to administer and applicable to our settings represents an important outcome measure that can be employed.

5. These findings show that, some biochemical disturbances are important predictors of dermatoses, this information should be disseminated to practitioners attending these patients so as to put emphasis on the importance of appropriately monitoring and managing correctable factors associated with these dermatoses. Some correctable causes include anaemia, hypocalcemia and hyperphosphatemia.

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APPENDICES

Appendix I: Consent form-English version

CONSENT TO PARTICIPATE IN THE STUDY ON DERMATOLOGICAL DISORDERS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM. TANZANIA: PREVALENCE, PATTERN, ASSOCIATED FACTORS AND IMPACT ON QUALITY OF LIFE.

Age ----------

Dear Sir/Madam,

My Name is Dr Conrad Agonza, a resident doctor in Internal Medicine at Muhimbili University of Health and Allied Sciences (MUHAS). I am conducting a research study on prevalence, pattern, associated factors, impact on quality of life of dermatological disorders among patients with chronic kidney disease at Muhimbili National Hospital, Dar es Salaam. Tanzania.

I would like to conduct this study as a requirement for the fulfillment of my postgraduate studies.

Purpose of the study: This study aims to determine prevalence, pattern, associated factors, impact on quality of life of dermatological disorders among patients with chronic kidney disease at Muhimbili National Hospital, Dar es Salaam. Tanzania.

How to participate: Participants who are willing to participate in this study will have to sign a consent form.
A short interview and physical examination will be done and a photo of the skin lesions shall be taken for further review.

Confidentiality: All findings obtained will not be disclosed to anybody except the attending investigator and participant him/herself.
The information from this study will be beneficial by creating awareness on prevalence, pattern, associated factors and impact on quality of life of dermatological disorders among patients with chronic kidney disease at Muhimbili National Hospital, Dar es salaam. Tanzania. It will eventually help in undertaking proper measures to treat dermatological disorders among this group of individuals at our hospital and nation at large.

Costs: You will not be required to pay any amount for your participation in this study.
Voluntary participation and the right to withdraw from the study:
Your participation is voluntary, and you have the right to withdraw from participating in this study at any time. Whatever your decision may be, it will not affect in any way to your rights to care and treatment.

Risks: There are no risks associated with your participation in the study.

Benefits: Your participation in this study will help you know about whether you have dermatological disorders and the possible associated factors. You will as well get advice on the proper measures of treatment of dermatological disorders.

It is our hope that the information from this research will help improve the quality of care of skin conditions among patients with chronic kidney disease.
I will be grateful if you willingly agree to participate in this study.

INVESTIGATOR'S STATEMENT

I, the investigator, have educated the research participant on the purpose and applications of this study

Signed…… Date…….

PARTICIPANT'S STATEMENT

I am willing to participate in this study on prevalence, pattern, associated factors, impact on quality of life of dermatological disorders among patients with chronic kidney disease at Muhimbili National Hospital, Dar es salaam. Tanzania. I do this with a full understanding of the purposes of the study and the procedures involved, which include filling out a study questionnaire, undergoing physical examination and that a photograph of the skin lesions will be taken, all of which have been explained to me by Dr. Conrad Agonza.

Signature of Participant----------

Date----------

If you have questions during the course of the study, you may contact the following:

Dr. Conrad Agonza
Principal Investigator
Muhimbili University of Health and Allied Sciences (MUHAS)
Department of Internal Medicine
P.O. Box 65001 Dar es Salaam.
Mobile phone: 0757652002

OR

Professor Muhammad Bakari (MD, MMED, PhD)
Supervisor for this research.
Muhimbili University of Health and Allied Sciences (MUHAS)
Department of Internal Medicine
P.O. Box 65001
Dar es Salaam.

In case of any ethical concerns please contact

The Chairperson of Research and Ethics Committee
Muhimbili University of Health and Allied Sciences (MUHAS)
P.O. Box 65001
Dar es Salaam.
Tel. 022-2152489

Appendix II: Maelezo ya idhini ya ushiriki wa utafiti

RIDHAA YA KUSHIRIKI KWENYE UTAFITI KUHUSU MAGONJWA YA NGOZI KWA WAGONJWA WENYE UGONJWA WA FIGO WA MUDA MREFU WANAOPATA MATIBABU KATIKA HOSPITALI YA TAIFA MUHIMBILI, DAR ES SALAAM. TANZANIA. UTAFITI HUU UNAANGALIA KIWANGO, AINA, VIASHIRIA VINAVOAMBATANA NA UGONJWA WA NGOZI NA ATHARI KATIKA MAISHA YA KILA SIKU.

Umri……..

Kwa Bibi/Bwana,

Jina langu Dr.Conrad Agonza,mwanafunzi wa Shahada ya Uzamili katika Chuo cha Afya na Sayansi Shirikishi, Muhimbili, Idara ya Magonjwa ya Ndani.nafanya utafiti kuangalia kiwango, aina,viashiria vinavoambatana na ugonjwa wa ngozi na athari katika maisha ya kila siku kwa wagonjwa wenye ugonjwa wa figo wa muda mrefu wanaopata matibabu katika hospitali ya taifa Muhimbili, Dar es salaam. Naomba ushiriki wako katika utafiti huu.

Jinsi ya kushiriki katika utafiti huu: Unaweza kushiriki katika utafiti kwa kujaza kwa hiyari yako fomu ya kuridhia kushiriki.

Utafiti huu utakuwa na mahojiano kwa kutumia dodoso, kufanyiwa uchunguzi wa mwili na picha ya ugonjwa wa ngozi itachukuliwa kwa uchunguzi zaidi.

Utunzaji wa siri: Taarifa zote zitakazochukuliwa katika utafiti huu zitakuwa ni siri na zitatunzwa kwa usiri na zitatumika katika utafiti huu ili ziweze kusaidia katika kuboresha huduma . Taarifa hizi za matokeo ya uchunguzi zitasaidia jamii kujua kiwango, aina,viashiria vinavoambatana na ugonjwa wa ngozi na athari katika maisha ya kila siku

kwa wagonjwa wenye ugonjwa wa figo wa muda mrefu wanaopata matibabu katika hospitali ya taifa Muhimbili, Dar es salaam

Gharama za Ushiriki: Ushiriki katika utafiti huu ni bure yaani hakuna gharama yeyote kwa mshiriki.

Hiyari ya kushiriki na kujitoa katika utafiti huu Ushiriki katika utafiti huu ni wa hiyari na pia ni haki yako kujitoa katika utafiti huu muda wowote unapohisi kufanya hivyo. Maamuzi yako ya kuamua kutoshiriki au kujitoa katika utafiti huu hayataathiri haki yako ya kupata huduma na matibabu.

Madhara ya kushiriki utafiti: Hakuna madhara yeyote yatakayompata mshiriki wa utafiti huu.

Manufaa ya kushiriki utafiti huu: Ushiriki wako katika utafiti huu utakuwa na faida kwako kwa kuweza kujua kama una tatizo la ngozi na kutambua aina,viashiria vinavoambatana na ugonjwa wa ngozi na athari katika maisha yako kila siku.

Pia, matokeo ya utafiti huu yatasaidia kushauri katika matibabu sahihi ya magonjwa wa ngozi kwa wagonjwa wenye ugonjwa wa figo wa muda mrefu.

Nitashukuru sana kama kwa hiyari yako utaamua kushiriki katika utafiti huu.

Kauli ya Mtafiti Mimi mtafiti, nakiri nimemuelewesha mshiriki wa utafiti huu kuhusu huu utafiti.

Sahihi……

Tarehe…….

Kauli ya Mshiriki

Natoa idhini mwenyewe bila aina yoyote ya kushurutishwa au kulazimishwa kushiriki katika

utafiti uliotajwa hapa kuhusu utafiti wa kuangalia kiwango, aina,viashiria vinavoambatana na ugonjwa wa ngozi na athari katika maisha ya kila siku kwa wagonjwa wenye ugonjwa wa figo wa muda mrefu wanaopata matibabu katika hospitali ya taifa Muhimbili, Dar es

salaam. Nafanya hivi baada ya kuelewa taarifa zote nilizoelezwa na mtafiti, Dr Conrad Agonza, na pia amenijibu na kunielewesha zaidi maswali niliyomuuliza.

Nimeelezewa kikamilifu kuhusu madhumuni na hali yake na naelewa kuwa nitaulizwa maswali kadhaa, kufanyiwa uchunguzi wa mwili na picha kuhusu ugonjwa wa ngozi itachukuliwa.

Pia naelewa kuwa naweza kujiondoa wakati wowote iwapo nitabadilisha mawazo.

Sahihi ya mshiriki……
Tarehe……..

Mawasiliano kwa wahusika:
Kwa maswali au maoni kuhusiana na utafiti huu tafadhali wasiliana na wafuatao:
Dr. Conrad Agonza
Mtafiti mkuu
Chuo kikuu cha afya na tiba shirikishi Muhimbili
Idara ya Magonjwa ya ndani
S.L.P 65001 Dar es Salaam
Nambari ya simu: 0757652002
AU

Professor Muhammad Bakari (MD,MMED,PhD)

Msimamizi wa utafiti huu.

Chuo kikuu cha afya na tiba shirikishi Muhimbili

Idara ya Magonjwa ya ndani

S.L.P 65001 Dar es Salaam**.**

Kwa mawasiliano zaidi kuhusuana na haki zako kwenye utafiti huu kama mshiriki, tafadhali wasiliana na;

Mwenyekiti wa tume ya tafiti na uchapishaji wa tafiti

Chuo kikuu cha Afya na tiba shirikishi Muhimbili

S.L.P 65001 Dar es Salaam

Nambari ya simu: 022-2152489

Appendix III: Questionnaire

STUDY QUESTIONNAIRE ON DERMATOLOGICAL DISORDERS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM. TANZANIA: PREVALENCE, PATTERN, ASSOCIATED FACTORS AND IMPACT ON QUALITY OF LIFE

PATIENT'S IDENTIFICATION

Questionnaire No. .....

MR. No.....

Date of study enrollment.....

Participant's initials.....
Telephone Number.....
Physical address.....

Part 1: Socio-Demographic characteristic of respondent

1. Age.....
2. Gender
    a) Male
    b) Female
3. Marital Status
    a) Single
    b) Married
    c) Divorce
    d) Separated
    e) Widow
4. Education Level
    a) No formal education
    b) Completed Primary school education

c) Completed Secondary school education

d) College/University education

5. Occupation

a) Office / white color job

b) Mining /industrial work

c) Petty trader

d) Farmer

Mention.....

6. Monthly income.....

Part 2: Associated factors for dermatological disorders among patients with CKD

7. Etiology of CKD
   a) Hypertension
   b) Diabetes Mellitus
   c) Glomerulonephritis
   d) Chronic herbal use
      Mention.....
8. Stage of CKD
   a) 1
   b) 2
   c) 3
   d) 4
   e) 5
9. On Haemodialysis
   a) Yes
   b) No
10. If Yes, for how long.....
11. Vascular access for Haemodialysis
    a) AVF
    b) AV graft
    c) IJV catheter
    d) Femoral catheter
    e) Subclavian catheter
    f) Permanent catheter

12. Systemic diseases
    a) HTN
    b) Diabetes Mellitus
    c) Autoimmune disease
       Mention.....

Part 3: Dermatological History

13. Main presenting complaint:
    a) Itching
    b) Dry skin
    c) Hypopigmentation
    d) Hyperpigmentation
    e) Blister
    f) Others .....

14. When did the skin problem start?
    a. Before CKD diagnosis
    b. After CKD diagnosis

Part 4: Dermatological Life Quality Index

DERMATOLOGYLIFEQUALITYINDEX

DLQI

Hospital No: Date:
Name:
Address: Diagnosis: Score:

Theaimofthisquestionnaireistomeasurehowmuchyourskinproblemhasaffectedyourlife OVERTHELASTWEEK.Pleasetick one box for each question.

1.	Overthelastweek,how **itchy, sore, painful** or **stinging** has your skin been?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	
2.	Overthelastweek,how **embarrassed** or **self conscious** have you been because of your skin?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	
3.	Overthelastweek,how much has your skin interfered with your going **shopping** or looking after your **home** or **garden**?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
4.	Overthelastweek,how much has your skin influenced the **clothes** you wear?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
5.	Overthelastweek,how much has your skin affected any **social** or **leisure** activities?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
6.	Overthelastweek,how much has your skin made it difficult for you to do any **sport**?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
7.	Overthelastweek,has your skin prevented you from **working** or **studying**?	Yes No	❒ ❒	Not relevant ❒
	If "No", overthelastweek how much has your skin been a problem at **work** or **studying**?	A lot A little Not at all	❒ ❒ ❒	
8.	Overthelastweek,how much has your skin created problems with your **partner** or any of your **close friends** or **relatives**?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
9.	Overthelastweek,how much has your skin caused any **sexual difficulties**?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒
10.	Overthelastweek,how much of a problem has the **treatment** for your skin been, for example by making your home messy, or by taking up time?	Very much A lot A little Not at all	❒ ❒ ❒ ❒	Not relevant ❒

Please check you have answered EVERY question.
Thank you.

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Part 5: Dermatological examination

15. Hair

a) Scalp hair.....

b) Body hair.....

16. Mucous membranes

a) Oral cavity.....

b) Eyes.....

17. Skin.....

18. Nails

a) Finger nails.....

b) Toe nails.....

c) Interdigital spaces.....

Part 6: Laboratory Investigations

19. Serum Creatinine.....
20. Serum BUN.....
21. Plasma Calcium.....
22. Plasma phosphorus.....
23. Haemoglobin level.....
24. HIV status.....
25. Serum Albumin.....

Biopsy, if any.....

Appendix IV: Dermatological Life Quality Index tool

DERMATOLOGYLIFEQUALITYINDEX

DLQI

Hospital No: Date:
Name: Score:
Address: Diagnosis:

TheaimofthisquestionnaireistomeasurehowmuchyourskinproblemhasaffectedyourlifeOVERTHELASTWEEK.Pleasetick oneboxforeachquestion.

1.	Overthelastweek,how**itchy**,**sore**, **painful**or**stinging**hasyourskin been?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	
2.	Overthelastweek,how**embarrassed** or**selfconscious**haveyoubeenbecause ofyourskin?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	
3.	Overthelastweek,howmuchhasyour skininterferedwithyougoing **shopping**orlookingafteryour**home**or **garden**?	Verymuch Alot Alittle Notatall	❒ ❒ ❒ ❒	Notrelevant❒
4.	Overthelastweek,howmuchhasyour skininfluencedthe**clothes** youwear?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	Notrelevant❒
5.	Overthelastweek,howmuchhasyour skinaffectedany**social**or **leisure**activities?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	Notrelevant❒
6.	Overthelastweek,howmuchhasyour skinmadeitdifficultfor youtodoany**sport**?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	Notrelevant❒
7.	Overthelastweek,hasyourskinprevented youfrom**working**or**studying**?	Yes No	❒ ❒	Notrelevant❒
	If"No",overthelastweekhowmuchhas yourskinbeenaproblemat **work**or**studying**?	Alot Alittle Notatall	❒ ❒ ❒	
8.	Overthelastweek,howmuchhasyour skincreatedproblemswithyour **partner**oranyofyour**closefriends** or**relatives**?	Verymuch Alot Alittle Notatall	❒ ❒ ❒ ❒	Notrelevant❒
9.	Overthelastweek,howmuchhasyour skincausedany**sexual** **difficulties**?	Verymuch Alot AlittleNot atall	❒ ❒ ❒ ❒	Notrelevant❒
10.	Overthelastweek,howmuchofa problemhasthe**treatment**foryour skinbeen,forexamplebymaking yourhomemessy,orbytakinguptime?	Verymuch Alot Alittle Notatall	❒ ❒ ❒ ❒	Notrelevant❒

Please check you have answered EVERY question.
Thank you.