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# ASSESSMENT OF NUTRITIONAL STATUS OF HEMODIALYSIS PATIENTS RECOVERED FROM COVID-19

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**ABSTRACT**

*Malnutrition is commonly present in patients relying on hemodialysis. The aim of this study to assess the nutritional status of hemodialysis patients that have recovered from Covid-19 and to identify the factors associated with malnutrition in hemodialysis patients. Present study is a descriptive cross-sectional study. Settings include in this study were Ittefaq Hospital Lahore, Abdullah General Hospital Okara and District Head Quarter's Hospital Okara, Pakistan. This data interprets that 68% are moderate malnourish, 30% are mild and 1.7% is suffering severe malnutrition. This study concluded that majority HDP suffered with mild to moderate malnutrition and malnutrition is associated with other factors like chronic complications, food intake, gender, BMI and other.*

***Keywords:*** *CKD, hemodialysis, malnutrition, MIS, COVID-19*

## INTRODUCTION

Hemodialysis is a medical treatment used at the 5th stage of chronic kidney disease for renal functioning. According to World Health Organization survey approximately 10-12% population is suffering with chronic kidney disease (CKD) (1). A population health survey of Pakistan that conducted in 2021 to assess the proportion of people that affected with chronic kidney disease, there was twelve percent population affected with CKD (2). Basically, in CKD, there was minimum numbers of nephrons that lead to the totally damage of kidney functions (3). Ultimately least number of nephrons cause irregular blood filtration (4). Due to CKD, patients led to many other conditions such as mental stress, hormones and infectious diseases and malnourished (5). In CKD, patients had to suffer with malnutrition because these patients have to face many problems related to nutrient intake during dialysis period (6). Due to malnutrition many essential macro and micro nutrients could not become the part of body that's why patient's condition worsen day by day, caused many other chronic diseases in body (7). In case of kidney patients' early assessment and diagnosing is very important to prevent from many other complications and stages of hemodialysis and kidney transplant (8). Poor intake, metabolism and absorption of food in dialysis patients lead to increase mortality and morbidity rate specially in hospital ridden patients (9).

Many studies proved positive effect of less protein and protein depletion diet to cure the complications related to CKD (10, 11). After metabolism of food, it eventually passed out form our body through urination or feces but in the case of kidney disease or failure this function is done through dialysis, this process remove body toxins side by side also removed body essential nutrients that cause malnutrition in CKD patients (12, 13).

During pandemic of Covid-19 majority of people are effecting specially those who had weak immunity holder (14, 15). CKD-Covid-19 patients mostly experienced about excess amount of reactive oxygen species, inflamed joints and muscles and weak immune system (16). High rate of mortality was reported in hospitalized patient that were on dialysis but also suffering with COVID-19 (17).

**Literature Review:**

Numerous studies have investigated malnutrition and related complications in chronic kidney disease (CKD) patients, particularly those undergoing hemodialysis and recovering from COVID-19. One study observed that CKD patients showed significant gastrointestinal symptoms such as diarrhea and nausea, with critical complications like pneumonia affecting 81% of patients (18). Another study highlighted the connection between hemodialysis, malnutrition, and aortic dysfunction, with 27% of patients showing malnutrition (19).

Further research focused on the impact of COVID-19 on CKD patients undergoing hemodialysis. It found that diarrhea, caused by Clostridioides difficile, worsened malnutrition and low immunity in these patients (20). In a longitudinal cohort study, 60% of patients exhibited sarcopenia, and others experienced severe complications such as atrial fibrillation and myocardial issues, leading to higher mortality (21).

Studies consistently pointed to the Malnutrition Inflammation Score (MIS) as a reliable tool for assessing malnutrition and protein-energy malnutrition (PEM) in CKD patients. MIS identified significant muscle wasting and weight loss, with one study reporting a 10% weight reduction in patients over time (22). Another study confirmed MIS's effectiveness, showing that 51% of CKD patients on hemodialysis were severely malnourished (23).

The MIS tool also demonstrated its superiority over other assessment methods, such as the Global Leadership Initiative on Malnutrition (GLIM) and Nutritional Risk Index (NRI), by offering more accurate and sensitive measurements of malnutrition in dialysis patients (24, 25). MIS has also been linked to adverse clinical outcomes, including increased hospitalization and mortality rates due to its ability to capture the complex interplay of nutritional and inflammatory markers (26, 27).

In summary, MIS is validated as an essential tool for monitoring malnutrition, protein-energy wasting, and related complications in CKD patients, providing critical insights into their nutritional and clinical status, ultimately influencing treatment outcomes and survival rates.

**MATERIALS AND METHODS**

The research approach employed a descriptive cross-sectional design. The data for this study was collected from Ittefaq Hospital Lahore, Abdullah General Hospital Okara and District Head Quarter Hospital Okara, Pakistan. Total patient in this study was 60 (male 37 and female 23) undergoing hemodialysis recovered from Covid-19. Inclusion criteria were age 35 to 55 years of both genders, individuals who was conscious and alert. Exclusion criteria were patient receiving hemodialysis treatment for less than 6 months, kidney transplant patients and rely on peritoneal dialysis.

**DATA COLLECTION TOOL**

**Malnutrition-Inflammation Score (MIS)** has 10 components, containing four levels of severity for each. It consists of 4 sections like medical history physical examination, body mass index (BMI), and laboratory values. Each MIS component has four levels of severity from 0 (normal) to 3 (very severe). The sum of all 10 components results in an overall score ranging from 0 (normal) to 30 (severely malnourished).

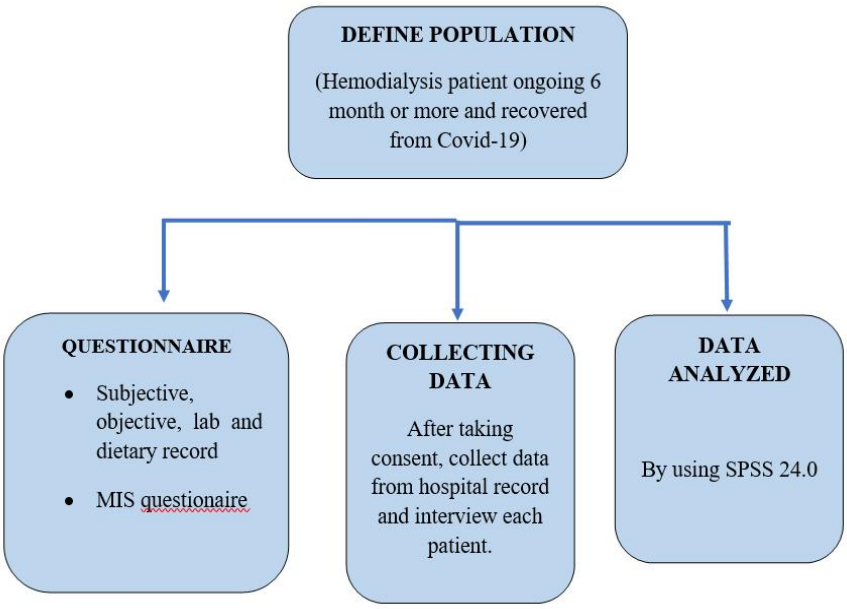
**24-hour dietary recall** used to assess dietary intake according to requirement of study for dialysis patient.

**DATA COLLECTION PROCEDURE:**

For this study patients were selected relying on hemodialysis and recovered from Covid-19. Their subjective and objective data, physical and biochemical assessments and 24-hour dietary recall were carried out through a manual questionnaire. This information was collected with the consent of each patient. Dietary data was

collected by interviewing each patient. Biochemical data of patients were collected from hospital's record. SPSS version 24.0 was used to analyzed collected data.

**Flow diagram**




**RESULTS**

**Table 4.1: Mild, moderate and severe malnutrition percentages**

| Nutritional Categories | Male | Female | Frequency | Percent | Valid % |
|---|---|---|---|---|---|
| Mild MN | 8 | 10 | 18 | 30.0% | 30.0% |
| Moderate MN | 28 | 13 | 41 | 68.3% | 68.3% |
| Severe MN | 1 | 0 | 1 | 1.7% | 1.7% |
| Total | 37 | 23 | 60 | 100.0% | 100.0% |

**Table 4.1:** this table states about the percentages of malnutrition inflammation score present in patients of dialysis but Covid-19 recovered. This data interprets that maximum patients (68%) are moderate malnutrition, mild malnutrition (30%) and minute amount (1.7%) is facing severe malnutrition. As demonstrated through graphical representation below.

**Table 4.2: Significant values for caloric and macronutrients intake**

| | Mean | Std. Deviation | Correlation | P value |
|---|---|---|---|---|
| Required calories | 1582.2500 | 178.34490 | .582 | .000 |
| Intake of calories | 1385.4807 | 201.97479 | | |
| Required carbohydrate | 217.4818 | 24.54235 | .270 | .000 |
| Intake of carbohydrate in gram | 190.6037 | 27.20732 | | |
| Required protein | 59.2488 | 6.67492 | .177 | 0.037 |
| Intake of protein in gram | 64.9876 | 20.91994 | | |
| Required fat | 52.6480 | 5.94194 | .107 | .000 |
| Intake of fat in gram | 34.9335 | 14.74079 | | |

**Table 4.2:** This table gives information about p values and correlation between different groups on the basis of calories, carbs, protein and fats recommendations and intakes. Calories intake and recommendations showed mean values as 1385.4±201.9 kcal, P= 0.00. Carbohydrate intake mean values and standard

deviation is 190.6±27g p=0.00. Protein intake group exhibit significant results as 64.98±20.9g p= 0.03. Calories intake results demonstrated as 34.93±14.7g, p=0.00. These paired groups showed highly correlation to recommended and intake levels of each food group.

**Table 4.4: Categories of malnutrition groups according to their BMI**

| BMI | Mild MN | Moderate MN | Severe MN | Total |
|---|---|---|---|---|
| Normal | 14 | 23 | 1 | 38 |
| Underweight | 1 | 8 | 0 | 9 |
| Overweight | 2 | 6 | 0 | 8 |
| Obese | 1 | 4 | 0 | 5 |
| Total | 18 | 41 | 1 | 60 |

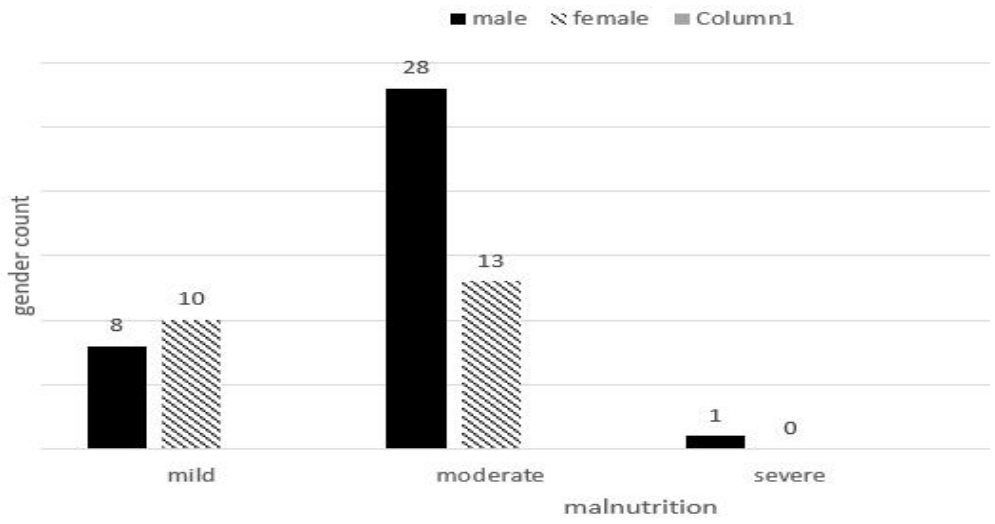
**Table 4.4:** This table stated about body mass indices for different categories of malnutrition. There are 14 normal, 1 underweight, 2 overweight and 1 person is obese in mild malnutrition group. There are 23 normal, 8 underweight, 6 overweight and 4 obese in moderate malnutrition category patients. The last one category is severe malnutrition which comprises on normal, underweight, overweight and obese persons as 1,0,0,0 respectively.

**Table 4.5: Correlation between mild and moderate malnutrition groups with respect to recommended and actual caloric and nutrient intake**

| Nutritional. Categories | | Frequency | Correlation | Significance | |
|---|---|---|---|---|---|
| | | | | One-Sided p | Two-Sided p |
| Mild MN | Calories | 18 | .694 | .001 | .001 |
| | Carbohydrate | 18 | .184 | .013 | .026 |
| | Protein | 18 | .299 | .020 | .041 |
| | Fat | 18 | -.005 | .000 | .001 |
| Moderate MN | Calories | 41 | .558 | .000 | .000 |
| | Carbohydrate | 41 | .310 | .000 | .000 |
| | Protein | 41 | .078 | .0.165 | .329 |
| | Fat | 41 | .170 | .000 | .000 |

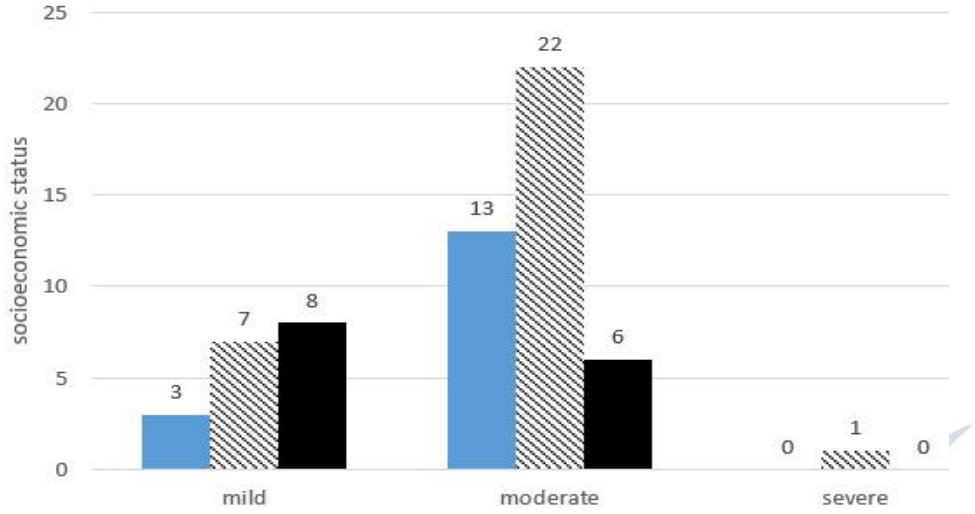
**Table 4.5:** It showed moderate and mild malnutrition correlation to intake and recommendations of calories, carbs, protein and fat. For mild malnutrition calories correlation is (0.694), for carbs (0.184), for protein (0.29) and for fat (-0.005) respectively. Correlations are for moderate malnutrition of calories (0.558), carbs (0.310), protein (0.78) and for fat (0.170).

**Figure 4.1: Depiction of malnutrition percentages according to male and female**



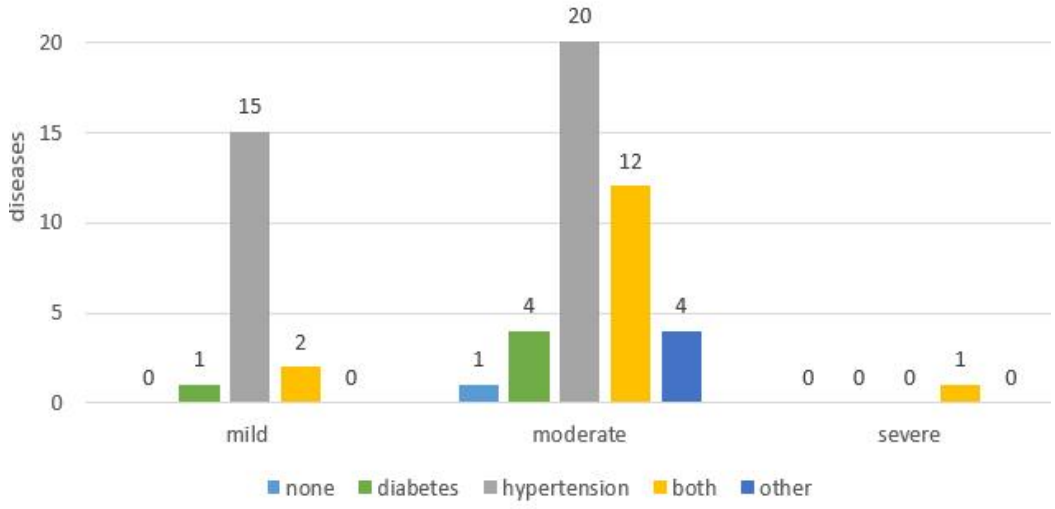
This figure evaluated about malnutrition status in CKD patients according to gender. Group one is for mild malnutrition that indicates females are more prone to mild malnutrition as compared to male persons. Group two is for moderate malnutrition that indicates about more prevalence in male as compared to female. Third group is shown severe malnutrition category of CKD patients that indicates male persons have more chances to severe malnutrition with CKD as compared to female kidney patients.

**Figure 4.2: Categorization of malnutrition as per different socioeconomic statuses.**




This figure gives results about categorical description of malnutrition status in CKD patients according to different socioeconomic status. Group one is for mild malnutrition that indicates highest ratio in high-class, middle-class belongings are less prone to mild nutrition and third one low class economical patients are at lowest level of mild malnutrition. Second group is for moderate malnutrition in which highest malnutrition values achieved by middle class socio economical CKD patients as compared to high- and low-class patients. Third group is for severe malnutrition in which highest quantitative value achieved by high class patients.

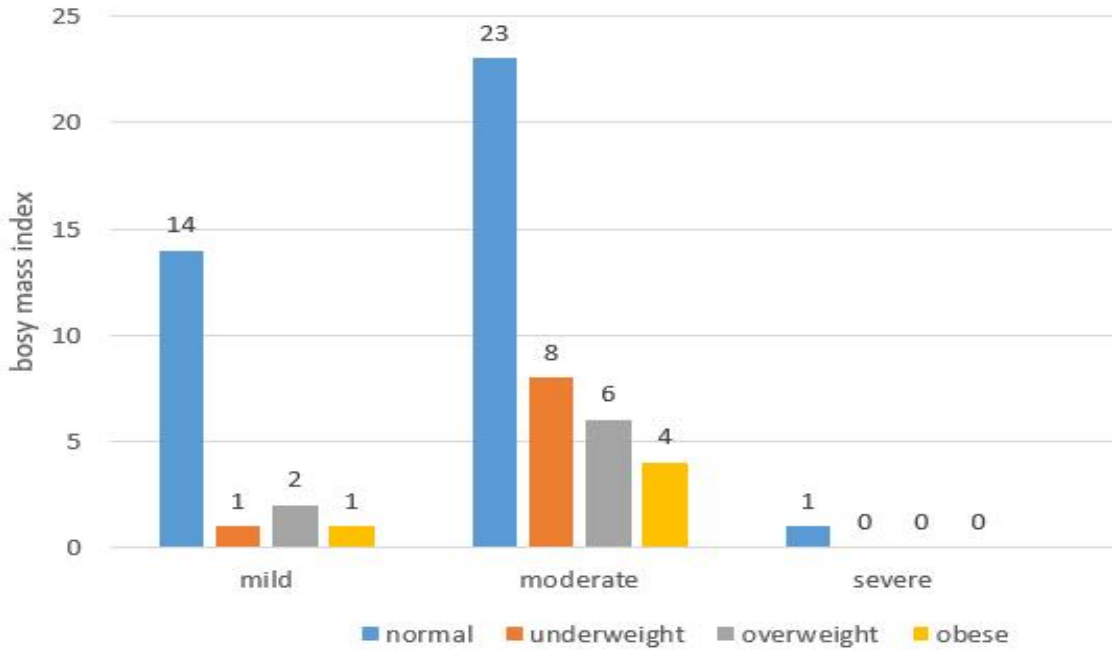
**Figure 4.3: Other diseases occurrence rate related to malnutrition**




This figure gives information about other complications related to malnutrition in chronic kidney disease patients. First group is for mild malnutrition in which highest ratio is attained by hypertension, on second are both hypertension and diabetes collectively and at third slot diabetes mellitus were observed. Second group

is for moderate malnutrition in which highest ratio is again attained by hypertension on second highest place was for both hypertension and diabetes on third place both diabetes and all conditions and the fourth one ratio is for those patients who has no chronic disease due to malnutrition. Third group was for severe malnutrition in which major chronic diseases (hypertension and diabetes) is noted.

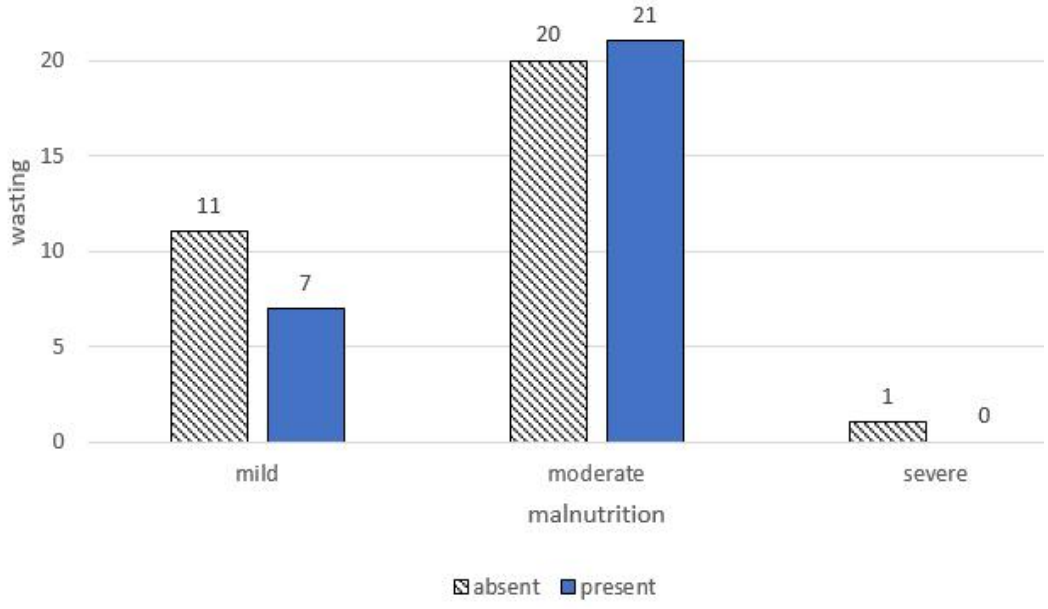
**Figure 4.4: Difference of Body Mass Index (BMI) according to various malnutrition status**




This figure gives data about difference of Body Mass Index (BMI) in various group related to malnutrition. In mild malnutrition group majority patients are with normal BMI. In moderate malnutrition group major patients are with normal BMI second highest value is for underweight patients then overweight and at last obese patients are present. In severe malnutrition group majority patients are with normal BMI.



**Figure 4.5: Muscle wasting percentages due to malnutrition.**



This figure evaluated about muscle wasting percentages due to malnutrition during chronic kidney disease. With mild malnutrition majority patients are with no muscle wasting output, about half of the patients are with muscle wasting complain. With moderate malnutrition maximum patients with muscle wasting. In severe malnutrition group normally, patients are with no muscles wasting output.

**Discussion:**

The current study investigates the nutritional status of hemodialysis patients (HDP) in Pakistan, focusing on malnutrition prevalence and its association with various factors. The findings reveal that most patients (68.3%) suffer from moderate malnutrition, a result that aligns with previous research by Naini et al. (19), but shows a slightly lower prevalence compared to studies by Harvinder GS et al. and Deniz G. et al. (28, 29). Caloric and macronutrient intake, as measured in this study (1385 kcal, 190g carbohydrates, 64g protein, 34g fat), was consistent with Diaz-Martinez et al.'s findings (30), though specific nutrient levels varied. BMI data indicated that most patients were within the normal weight range, with a small percentage classified as underweight or obese. This result is similar to Avesani CM et al.'s study, which also observed normal BMI as the most prevalent category (24).

Gender-wise analysis revealed higher malnutrition in males, with mild malnutrition being more common in females. These gender differences were consistent with the findings by Karavetian et al. (31). The study also explored correlations between malnutrition (MN) and socioeconomic factors, with no significant association found between MN and BMI, gender, or income, which contrasts with the findings of Ekramzade et al. (32) and Oliveira et al. (33).

Furthermore, the study linked malnutrition with chronic diseases, particularly hypertension and diabetes, as similar studies by Hertz Berg et al. (22) and Navaneethan SD et al. (34) have highlighted. It was observed that severe malnutrition exacerbates complications such as muscle wasting and joint diseases, significantly impacting the quality of life. The results regarding protein-energy malnutrition (PEM) and muscle wasting are in line with previous research by de Oliveira et al. and Chan GC et al. (35, 36), showing a strong association between malnutrition and lean muscle loss.

In conclusion, this study highlights the critical issue of malnutrition among HDP, especially its link to chronic diseases and muscle wasting. Early identification and intervention for malnutrition are crucial in managing chronic kidney disease effectively.



**CONCLUSION**

This survey-based study MIS gave significant output of the diagnosis of malnutrition in hemodialysis patents. This study concluded that majority HDP suffered with mild to moderate malnutrition and relate malnutrition to other factors like dietary intake, BMI, muscle wasting, gender, socioeconomic status and other chronic diseases (hypertension, diabetes and other) in HDP.

**Limitation of study:**

The prevalence of malnutrition in hemodialysis patient has not yet been documented in Okara, Pakistan. This was the first study to detect malnutrition in hemodialysis patient in Okara using inexpensive nutritional assessment called MIS score.

There were some hurdles affect the study in order to collect data like financial constraints, least resources and cooperation of people in regard to their information.

**Recommendations:**

This type of study must be funded so that each student will conduct this research with large sample size without hurdles.

Settings should be cooperative and gather information about health of dialysis patients related to different usual factors of that are ignored by saying inaccessible points.

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