RESEARCH ARTICLE

Correlation of Depression and Social Support with Diet Non-adherence among Maintenance Hemodialysis Patients of Selected Hospitals in Quezon City, Philippines

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Abstract

Previous studies showed estimated prevalence of diet non-adherence among maintenance hemodialysis patients ranged from 10.6 to 60.2%. Aside from the varying range of diet non-adherence worldwide, there is no gold-standard in defining diet non-adherence which emphasizes the need to look into various parameters of diet non-adherence such as medications, socioeconomic factors, depression, social support, etc. This cross-sectional study aimed to determine the following: 1. Correlation of depression with diet non-adherence of maintenance hemodialysis patients; 2. Correlation of social support with diet non-adherence of maintenance hemodialysis patients of 24 maintenance hemodialysis patients from 2 hemodialysis centers in Quezon City, Philippines. Significant moderate positive correlations were shown between mild depression and mild deviation in diet non-adherence (r_s = 0.519, p = 0.009) and between severe depression and very severe deviation in diet non-adherence (r_s = 0.552, p = 0.005). There was significant strong negative correlation between "significant other" and no deviation in diet non-adherence (r_s = -0.662, p = 0.000). Single marital status showed significant moderate negative correlation with moderate deviation in diet non-adherence (r_s = -0.548, p = 0.006). There was significant moderate negative correlation between low income category and very severe deviation in diet non-adherence (r_s = -0.466, p = 0.022). Depression was positively linked with diet non-adherence. Those who are single, having low income, and support from the "significant other" may be more likely to adhere to diet restrictions. This study's findings can be considered in formulating maintenance hemodialysis patient's dietary interventions. However, judicious and critical analysis are needed for interpreting this study's findings due to its small sample size. Additionally, future research may consider expanded sample size to increase generalizability of findings.

Keywords: depression, social support, diet non-adherence, maintenance hemodialysis.

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1 Introduction

Chronic kidney disease is a global health burden with a high economic cost to healthcare systems. A meta-analysis of observational studies estimating chronic kidney disease prevalence among general populations showed that prevalence of chronic kidney disease stages 3 to 5 was 10.6%, varying widely amongst included studies [1]. In Asian low to middle income countries, a meta-analysis aimed to examine the prevalence of chronic kidney diseases stages 3 to 5 showed that the average prevalence chronic kidney disease stages 3 to 5 in 14 low to middle income countries in Asia was 11.2% [2]. The pooled estimate chronic kidney disease prevalence in the Philippines showed higher than estimated global mean chronic kidney diseases stages 3 to 5 prevalence rates and average prevalence of chronic kidney diseases stages 3 to 5 in low to middle income countries in Asia (35.94%) [2]. Additionally, there are no published local studies regarding dietary non-adherence of maintenance hemodialysis patients in the Philippines as of the commencement of this study.

Dietary and fluid restrictions, as well as medication intake, are parts of the complex and rigorous treatment of patients with end-stage renal disease [3]. However, they often fail to follow prescribed dietary and fluid regimen, leading to undesirable outcomes. Non-adherence to the prescribed diet and fluid restrictions are severe health problems that limits the benefits of routine therapies. A meta-analysis showed the estimated pooled prevalence of diet non-adherence among hemodialysis patients worldwide was 60.2% with high heterogeneity observed because of various cut points used to determine non-adherence in each study and use of different instruments to determine non-adherence [4]. The use of various determinants of non-adherence further showed that there is no gold-standard in defining non-adherence among hemodialysis patients [4–7]. A cross-sectional study aimed to determine the overall compliance behavior to therapeutic regimens and the factors contributing to non-adherence of hemodialysis patients showed the percentage of self-reported diet non-adherence using the dialysis diet and fluid non-adherence questionnaire was at 63.8%, respectively [8]. In terms of sex and diet adherence ($r = 0.252$, $p < 0.05$), weak positive correlation was observed, as well [8]. Employment status was found to have a weak negative correlation to diet adherence ($r = -0.355$, $p < 0.01$), suggesting that patients who were employed can be likely to be diet non-adherent [8]. Self-reported diet non-adherence score had a weak positive correlation with biochemical parameter for diet adherence: potassium ($r = 0.236$, $p < 0.05$) [8]. Multivariate linear regression showed that the following variables: higher self- reported diet non-adherence score ($\beta = 0.250$, $p < 0.05$), female sex ($\beta = 0.162$, $p < 0.05$), older age ($\beta = 0.147$, $p < 0.05$) and being unemployed ($\beta = 20.142$, $p < 0.05$) were significant predictors of a higher diet non-adherence [8].

Maintenance hemodialysis patients often follow complex regimens such as diet and fluid restrictions, medication adherence, and dialysis adherence. Although each of these aspects are essential, non-adherence especially on diet are still widely reported. Worldwide, there were published studies reporting diet non-adherence prevalence of maintenance hemodialysis patients. A cross-sectional study aimed to compare diet and fluid non-adherence between adult US and European hemodialysis patients showed prevalence of diet non-adherence range from 68.1% to 81.6% based on 2 different populations [9]. However, there are no published local studies regarding dietary adherence of maintenance hemodialysis patients in the Philippines. This knowledge gap addresses the need for a preliminary study to look into dietary adherence of maintenance hemodialysis patients in the local setting.

Various factors such as phosphate control have been linked to diet non-adherence among maintenance hemodialysis patients [10, 11]. A cross-sectional study aimed to determine factors associated with hyperphosphatemia of hemodialysis patients who had non or minimal level of depression portrayed higher serum phosphate levels, possibly implying intentional non-adherence [11]. Better adherence on phosphate binder, longer sleep duration, and higher social support were associated with a lower level of serum phosphate level; one of the commonly used objective measurements for diet non-adherence [11]. Looking at a developing country's environment, a cross-sectional study aimed to determine factors associated with diet non-adherence among adult patients with chronic kidney disease on hemodialysis centers in national referral and teaching hospitals in Kenya which utilized a mixed-method convergent parallel design showed that their diet non-adherence was 63.7% ($n = 182$); citing various factors such as BMI (OR = 1.06, 95% CI: 1.00, 1.13; $p = 0.03$), flexibility of the diets in fitting with other meals (OR = 5.51, 95% CI: 2.84, 10.68; $p = 0.0001$), and difficulties in following the recommended diets OR

= 0.18, 95% CI: 0.10, 0.29; p = 0.0001) as contributing factors [12]. On the other hand, a cross-sectional study in Turkey found that the odds of diet non-adherence to hemodialysis sessions was found to be higher in males (OR = 2.704, 95%CI: 1.213, 3.546; p = 0.008); while a longer duration in hemodialysis sessions had lower odds of non-adherence to treatment (OR = 0.992, 95%CI: 0.986, 0.998; p = 0.005) [13]. Furthermore, a prospective cohort study showed emotional representations showed weak positive correlation with dietary self-care proxy measure: serum potassium (r = 0.25; p = 0.03) and to medication self-care proxy measure: serum phosphate (r = 0.23; p = 0.05) [14]. Regression analysis further ascertained that emotional representations were significant predictors of pre-dialysis serum potassium levels ($\beta = 0.443$, p = 0.01) and pre-dialysis serum phosphate levels ($\beta = 0.362$, p = 0.048); which demonstrated support for the self-care model, as illness perception predicted coping through dietary and medication adherence [14]. The previous studies showed initial factors that may be looked as having a possible relationship with diet non-adherence [11–14].

Looking further into depression levels, a cross-sectional study aimed to evaluate relationship between depressive symptoms and fluid and diet non-adherence using objective biomarkers and self-report measures showed depressive symptoms as an independent positive predictor of self-reported diet non-adherence [15]. On the other hand, age was an independent negative predictor of self-reported diet non-adherence; indication that for every 1-year increase in age, the likelihood of diet non-adherence decreased by 5% [15]. In terms of social support, a cross-sectional study aimed to investigate relationship between social support and diet and fluid non-adherence showed strong negative correlation in between total social support and the degree and frequency of diet non-adherence [16]. Negative correlations were also noted in between social support subscales (family, friend, and significant other) and the degree and frequency of diet non-adherence [16]. The aforementioned study's results showcased that higher level of social support had lower level of diet non-adherence [16]. Furthermore, a cross-sectional study aimed to evaluate maintenance hemodialysis patients' diet and fluid non-adherence and level of perceived social support showed unmarried hemodialysis patients were 57% less likely to show diet non-adherence than their married counterparts. And those who had low family support 7% less likely to show diet non-adherence [17].

The objectives of this study are the following: 1. Determine the correlation of depression with diet non-adherence of maintenance hemodialysis dialysis patients; and 2. Determine the correlation of social support with diet non-adherence of maintenance hemodialysis patients in Quezon City, Philippines. The remainder of this paper is organized as follows: 1. Methodology which include the study's design, setting, sample, and instruments used; 2. Results and discussion; and 3. Conclusion.

2 Methodology

2.1 Design and Setting

This study used cross-sectional analytical design to measure the correlation of depression and social support with diet non-adherence of the maintenance hemodialysis patients.

The maintenance hemodialysis patients who participated in the study came from 2 hemodialysis units of a 100-bed private tertiary hospital situated in Project 8, Quezon City and a 120-bed private tertiary hospital situated in Project 4, Quezon City. The hemodialysis patients were chosen by total population sampling. Inclusion criteria were: adult patients age 19-69 years old at the time of the study, renal patients diagnosed with chronic kidney disease stage 5/end-stage renal disease who requires dialysis treatment with a glomerular filtration rate of <15ml/minute, on maintenance hemodialysis defined as 3 hemodialysis sessions per week, each of 3-5 hour duration for at least 3 months, had at least retained functional literacy, had laboratory measurements within 30 days at the time of data collection, and had provided their informed consent. Exclusion criteria were: renal patients diagnosed with acute kidney injury/acute renal failure which require hemodialysis treatment and recipient of kidney transplant. The study received its ethics approval from the Philippine Women's University – Research and Development Office: Ethics Review Committee which were recognized by the 2 hospitals of the hemodialysis units. Informed consent forms were obtained from the eligible participants and confidentiality of the data were maintained.

2.2 Sample

A total of 69 maintenance hemodialysis patients were potential participants for this study. 45 maintenance hemodialysis patients didn't meet the inclusion criteria.

Eligible maintenance hemodialysis patients were 24, all of whom were willing to participate in the study and provide their informed consent. Figure 1 shows the consort flow diagram of the study.

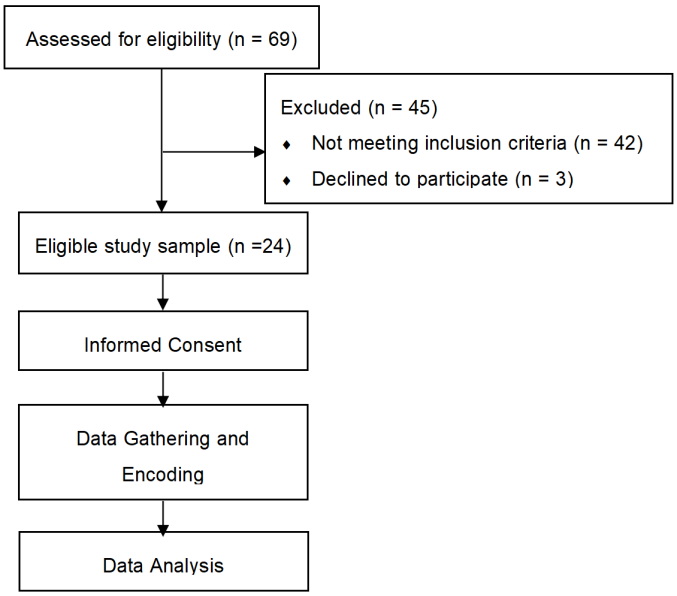

Figure 1. Consort flow diagram.

2.3 Instruments

Dialysis malnutrition score was used to determine the level of nutritional status of the maintenance hemodialysis patients. It was a healthcare provider-administered modified subjective global assessment consisted of 7 features: weight change, dietary intake, GI symptoms, functional capacity, co-morbidity, subcutaneous fat and signs of muscle wasting; specifically designed for dialysis patients [18, 19]. The initial development of the dialysis malnutrition score used the components of the conventional SGA; having a sensitivity of 94% and specificity of 88% in comparison to the latter [18]. A pilot use of the dialysis malnutrition score was also done in the Philippine setting in 2014 [19]. Each component was assigned a score from 1: normal, 2-4: moderate malnutrition, 5: severe malnutrition. Total scores were the sum of each component which was used to determine the nutritional status of the dialysis patient. A total score of seven was considered as well-nourished. A score of 11-21 was considered as mild/moderately malnourished. A score of 22-35 was considered as severely malnourished [18, 19].

Beck's depression inventory (BDI-II) was used to determine the level of depressive symptoms of the maintenance hemodialysis patients [15, 20, 21]. It was a 21-item self-administered questionnaire that measured cognitive-affective symptoms and attitudes, impaired performance, and somatic symptoms associated with depressive symptoms. BDI-II was the more recent version of original 21-item Beck's depression inventory (BDI) [20]. The items were rated on a four-point Likert scale ranging from 0-3 with 0 indicated no symptoms and 3 indicated severe symptoms. Scores were calculated by summation of the responses for the 21 items and the total possible score range was 0-63. Total score was categorized as follows: minimal (0-13), mild (14-19), moderate (20-28), and severe (29-63) [15, 21].

Multi-dimensional scale of perceived social support was used to determine the level of social support of the maintenance hemodialysis patients. It was 12-item self-report questionnaire that identify an individual's perception of social support from three sources: family, friend, and "significant other". This questionnaire was developed in 1988 [22]. Scales were enumerated from 1-7 with 1 represented "very strongly disagree", 2 represented "strongly disagree", 3 represented "mildly disagree", 4 represented "neutral", 5 represented "mildly agree", 6 represented "strongly agree", and 7 represented "very strongly agree" [16, 17, 22]. The multi-dimensional scale of perceived social support was divided into 3 subscales, which were family subscale, friends subscale, and "significant other" scale along with a total score scale [16, 17, 22]. The total possible score ranged from 12-84 [16, 17, 22]. To categorize the levels of total social support score, respondents' scores were trichotomized into 3 groups with the lowest group (score ranging from 12-35) designated as low perceived support, middle group (score ranging from 36-60) as medium perceived support, and highest group (score ranging from 61-84) as high perceived support.

Dialysis diet and fluid non-adherence questionnaire was used to determine the level of diet non-adherence of the maintenance hemodialysis patients. It was a self-report instrument consisting of 4 subscales: 2 regarding frequency and intensity of diet non-adherence and 2 subscales regarding frequency and intensity fluid non-adherence [8, 9, 11, 16, 17, 23]. The questionnaire was developed in 2001 [23]. The frequency of non-adherence was assessed for the previous 14 days. The intensity of non-adherence is scored on a Likert-type scale from "no deviation" to "very severe deviation".

Table 1. Characteristics of the participants.

Category	Subcategory	n	%	mean	SD
Age (years)	-	-	-	53.13	12.376
Sex:	Male	11	46%		
	Female	13	54%		
Marital Status:	Single	12	50%		
	Married	8	33%		
	Widowed	4	17%		
Employment Status:	Unemployed	9	38%		
	Employed	7	29%		
	Retired	8	33%		
Comorbidities:	None	2	8%		
	CVD	4	18%		
	DM	12	55%		
	HTN	18	82%		
Healthcare Insurance:	PhilHealth	24	100%		
	HMOs	8	33%		
eGFR (ml/min.)	-	-	-	5.71	2.136
Dialysis Duration (months)	-	-	-	26.25	19.548
Dialysis Adequacy (Kt/V)	-	-	-	1.64	0.483
IDWG (%)	-	-	-	3.47%	2.771
Smoking Status:	Yes	0	0%		
	No	24	100%		
Phosphate Binder Adherence:	Yes	19	79%		
	No	5	21%		

Abbreviations: CVD cardiovascular diseases, DM diabetes mellitus, HTN hypertension, eGFR estimated glomerular filtration rate, IDWG interdialytic weight gain

2.4 Data Analysis

Categorical data were summarized using frequencies and percentages. Quantitative variables were summarized through mean and standard deviation.

Spearman's correlation was used to determine the correlation between factors: demographics, socioeconomic factors, depressive symptoms level, social support level, and diet non-adherence level. The preset alpha of 0.05 was used as the basis for statistical significance in this study.

3 Results and Discussion

The characteristics of participants as shown in Table 1 featured a total of 24 maintenance hemodialysis patients with age that ranged from 25-68 years old (mean age = 53.13), on hemodialysis treatment that ranged from 5-75 months (mean dialysis duration = 26.25), and had a mean dialysis adequacy of 1.64. In terms of comorbidities, majority (75%) of the maintenance hemodialysis patients had hypertension and 50% were diabetic. Notably, 17% have of the maintenance hemodialysis patients had cardiovascular disease; and 8% of the maintenance hemodialysis patients reported no comorbidities. 33% of the maintenance hemodialysis patients used health maintenance organization coverage on top of PhilHealth dialysis coverage. Most (79%) of the maintenance hemodialysis patients were currently taking phosphate binder medications. All maintenance hemodialysis patients were categorized as non-smokers at the time of study. This was not delved further to the maintenance hemodialysis patients' smoking history whether they previous smokers or were absolute non-smokers.

Table 2 showed educational attainment of maintenance hemodialysis patients shows that the majority (63%) are college graduates, while smaller proportions completed high school (17%), elementary education (8%), or post-baccalaureate studies (8%). Only 4% attended short-cycle tertiary degree programs. The income statuses of maintenance hemodialysis patients showed that 29 % fall into the "poor" category, while both "low income" and "lower middle class" brackets comprised of 17% of the maintenance hemodialysis

patients' population; which underscored that a sizeable portion of patients face financial challenges. Another 29% belong to the "middle class;" and 8% are categorized as "upper middle class."

Table 2. Socioeconomic of the participants.

Category	Subcategory	n	%
Educational Attainment:	Grades 1 to 6	2	8%
	High School (Old Curriculum)	4	17%
	Short-Cycle Tertiary	1	4%
	College Graduate	15	63%
	Post-Baccalaureate	2	8%
Income Classification:	Poor	7	29%
	Low Income	4	17%
	Lower Middle Class	4	17%
	Middle Class	7	29%
	Upper Middle Class	2	8%

Table 3 showed nutritional status of maintenance hemodialysis patients revealed that the majority (67%) were categorized as mild to moderately malnourished, while only 25% were well-nourished, and 8% were severely malnourished. The levels of depressive symptoms among maintenance hemodialysis patients, as measured by the Beck's depression inventory (BDI-II), showed that half of the patients (50%) fell within the minimal depression category, which indicated low levels of depressive symptoms. However, 29% exhibited mild depression, 8% had moderate depression, and 13% experienced severe depression. The levels of perceived social support among maintenance hemodialysis patients revealed that 63% reported medium level of social support, while 37% reported high levels. Notably, none of the patients fell into the low social support category. In terms of the subscales, the majority of the maintenance hemodialysis patients declared family (63%) as their highest social support subscale, followed by "significant other" (58%). The least proportion declared friend support (33%) as their highest social support subscale. It was also important to note that 2 maintenance hemodialysis patients declared all subscales at the highest score (highest subscale score = 28). There were also 9 patients who declared 2 highest subscale scores: namely family support and friend support (n=3), and family support and "significant other" support (n=6).

The levels of diet non-adherence among maintenance hemodialysis patients as shown in Table 4 indicate that 33% exhibited mild deviation in diet non-adherence, while 38% exhibited moderate deviation in diet non-adherence, making it the most common degree of diet non-adherence among maintenance hemodialysis

Table 3. Nutritional status, depression level, and perceived social support of the participants.

Category	Subcategory	n	%
Nutritional Status (DMS):	Well-Nourished (7-10)	6	25%
	Mild/Moderately Malnourished (11-21)	16	67%
	Severely Malnourished (22-35)	2	8%
Depression Level:	Minimal	12	50%
	Mild	7	29%
	Moderate	2	8%
	Severe	3	13%
Total Perceived Social Support:	Low (12-35)	0	0%
	Medium (36-60)	15	63%
	High (61-84)	9	37%
Perceived Social Support Subscales:	Family	15	63%
	Friend	8	33%
	SO	14	58%

Abbreviations: SO significant other

patients. Severe and very severe deviation in diet non-adherence were less common, each reported by only 4% of patients. Notably, 21% of patients reported no deviation in diet non-adherence. Day frequency of diet non-adherence (mean days = 4.792) among maintenance hemodialysis patients indicated they deviated frequently from their dietary restrictions. The non-adherence levels to fluid restrictions among maintenance hemodialysis patients show that 42% reported no deviation in fluid non-adherence. 38% fall under moderate deviation in fluid non-adherence, making it the most common category among those with various levels of fluid non-adherence. Mild deviation in fluid non-adherence was observed in 17%, and only 3% (n = 1) report very severe deviation in fluid non-adherence. No maintenance hemodialysis patients classified under severe deviation in fluid non-adherence. These fluid non-adherence results showed that while a significant portion of patients manage their fluid intake well, moderate fluid non-adherence was still a concern, potentially leading to complications like interdialytic weight gain and fluid overload.

Table 5 featured correlation of factors with various degrees of diet non-adherence using Spearman's correlation analysis. A significant moderate negative correlation was found between single marital status and moderate deviation in diet non-adherence (r_s = -0.548, p = 0.006), suggesting that single patients were less likely to exhibit moderate diet non-adherence. It is important to take note that this study defined the participants' marital status based on their actual civil

Table 4. Self-reported non-adherence of participants.

Category	Subcategory	n	%	mean	SD
Frequency of diet non-adherence (days)	-	-	-	4.792	5.556
Diet non-adherence:	No Deviation	5	21%		
	Mild Deviation	8	33%		
	Moderate Deviation	9	38%		
	Severe Deviation	1	4%		
	Very Severe Deviation	1	4%		
Frequency of fluid non-adherence (days)	-	-	-	4.750	6.067
Fluid non-adherence:	No Deviation	10	42%		
	Mild Deviation	4	17%		
	Moderate Deviation	9	38%		
	Severe Deviation	0	0%		
	Very Severe Deviation	1	3%		

status reflected in official documents at the time of the data collection. Though there were contradicting direction in terms of marital status' correlation with diet non-adherence, it could be agreed upon that single marital status possibly imply a role in diet non-adherence. No correlations were found among educational clusters: basic education and higher education; with levels of diet non-adherence. No correlations were also found between employment status and levels of diet non-adherence.

Significant moderate negative correlation was found between low income group and very severe deviation in diet non-adherence (r_s = -0.466, p = 0.022). The result on income classification was interesting because it showed that belonging to the low-income group avoid chances of being diet non-adherent. However, a previous study showed that there were no significant association between family income and diet non-adherence (r = -0.129, p > 0.05) [8]. This result was corroborated by perceived barriers wherein those reporting difficulties in dietary regimen cited "need to change eating habits and inability to resist favorite foods" (88.1%) and "high complexity of dietary recommendation" (87%); instead of "financial constraints and lack of transportation facility" (0%) [8]. Despite the previous study's result on income classification, this study's result on income classification must still be put into consideration especially in clinical practice because patients in low to middle income countries wherein lower income class are prevalent always consider budget constraints foremost [8]. Aside from a relatively small sample size (n = 188), selection bias was also possible wherein patients who were generally healthier or more health conscious were more likely to participate in the study. Therefore, this interpretation of the study result must be treated with judicious and critical analysis.

Going into depression levels, mild depression level's relationship with mild deviation in diet non-adherence showed a Spearman's rho of 0.519 (p = 0.009), indicating a significant moderate positive correlation. The relationship between severe depressive level and very severe deviation in diet non-adherence indicated a significant moderate positive correlation (r_s = 0.552, p = 0.005). This study's results on the relationship of depressive symptoms and diet non-adherence showed that it is plausible that depressive symptoms were positively linked to diet non-adherence.

In terms of total social support levels, there were no statistical significance found between social support levels and levels of diet non-adherence. Social support subscales indicated that high "significant other" support showed a different trend compared to high family and high friend support. Significant strong negative correlation was found between high

Table 5. Correlation of factors associated with diet non-adherence.

		No Deviation	Mild Deviation	Moderate Deviation	Severe Deviation	Very Severe Deviation
		rs (*p*)	*rs* (*p*)	*rs* (*p*)	*rs* (*p*)	*rs* (*p*)
Marital Status:	Single	(0.169)	0.438 (0.033 *)	-0.548 (0.006 *)	(0.492)	(0.492)
	Married	(0.143)	(0.409)	(0.223)	(0.328)	(0.328)
	Widowed	(0.831)	(0.132)	(0.0.97)	(0.665)	(0.665)
Income:	Poor	(0.569)	(0.763)	(0.742)	(0.533)	(0.533)
	Low Income	(0.281)	(0.461)	(0.591)	(0.665)	-0.466 (0.022 *)
	Lower Middle Class	(0.831)	(0.713)	(0.591)	(0.665)	(0.665)
	Middle to Upper Middle Class [a]	(0.499)	(0.772)	(1.000)	(0.162)	(0.492)
Depression:	Minimal	(0.143)	(0.090)	(0.689)	(0.328)	(0.328)
	Mild	(0.116)	0.519 (0.009 *)	(0.582)	(0.533)	(0.533)
	Moderate	(0.471)	(0.620)	(0.718)	(0.770)	(0.770)
	Severe	(0.588)	(0.207)	(0.880)	(0.714)	0.552 (0.005 *)
Social Support Subscales:	Significant Other	-0.662 (0.000 *)	(0.079)	(0.757)	(0.451)	(0.451)
	Family	(0.160)	(1.000)	(0.487)	(0.575)	(0.083)
	Friend	(0.169)	(0.561)	(1.000)	(0.492)	(0.492)

[a] *Upper middle class MHD patients (n = 2) were collapsed with middle class MHD patients; Statistical significance is met at p-value of less than 0.05 **

"significant other" support and no deviation in diet non-adherence (r_s = -0.662, p = 0.000); suggesting that higher "significant other" support reduce the likelihood of diet non-adherence. This study's finding aligned with a previous study with regard to the correlation of "significant other" support and diet non-adherence [16]. Absence of statistical significance was found between high "significant other" support and mild deviation in diet non-adherence (p = 0.079), moderate deviation in diet non-adherence (p = 0.757), severe deviation in diet non-adherence (p = 0.451), and very severe deviation in diet non-adherence (p = 0.451). Incidentally, there was an inverse relationship between single marital status and moderate deviation in diet non-adherence. This trend is possibly due to the maintenance hemodialysis patients' partner's pivotal role in their health care routine, moral support, etc.; especially among those with live-in partners or married. But as pointed out earlier, some of these patients were either in a relationship or had a common law spouse. Aside from married patients, single patients which comprise half of the sample size with some of them who had a life partner could possibly weigh in on this result pertaining to the correlation between high "significant other" support and diet non-adherence. The previous study emphasized on family support (mean = 11.19, SD = 1.34) as the highest level of perceived social support subscale [16]. This study pointed on the same direction wherein family support was the highest level of perceived social support subscale (62.5%). These results validate that due to the maintenance hemodialysis patient's need for special care in their condition, their partner or spouse and family play a great part in improving their compliance to diet restrictions.

4 Conclusion

This study's results showed that depression was positively related with maintenance hemodialysis patients' diet non-adherence. In terms of social support, one of the social support subscales: "significant other" showed an inverse relationship with diet non-adherence. Moreover, single marital status and low-income category were inversely related to diet non-adherence.

This study showed that majority of the maintenance hemodialysis patients were non-adherent to their dietary restrictions. Half of this study's participants had either minimal depressive symptoms, ranging from mild to severe. This study's participants also had medium to high total social support. Though most of the participants had fairly good support and half of the participants had depressive symptoms, it may be imperative to do regular screening for depressive symptoms and social support among maintenance hemodialysis patients as this may provide insight not just into their diet non-adherence, but also to other aspects of their compliance such as maintenance hemodialysis, itself; medications, etc.

This study's findings emphasize the role of the maintenance hemodialysis patients themselves, their companion/s, and their healthcare providers. This study may help them understand diet non-adherence, what modifiable factor/s influence it and consider these factor/s to support holistic, optimal care for a maintenance hemodialysis patient. This study had a small sample size (n = 24) because of a high non-response rate. Because of the high non-response rate, non-response bias was possible wherein MHD patients who were unwilling or unable to take part in the study may differ significantly from those who participated. Small sample size may lead to an inaccurate representation of the population and a reduced ability to detect true effects. The small sample size may lead to both Type I and Type II errors. Type I error may have been caused by failing to account for confounding variables, the use of an alpha level of 5%, selection bias, and a possible observer bias. Type II error may have reduced statistical power and generalizability of the findings in this study. The self-reported questionnaires used in the current study were also susceptible to response and recall bias which may draw the study participants to inaccurately respond to the questionnaires. All of the questionnaires used in this study were validated from previous studies which limited the use of questionnaires to the format and language it was used in the validation study. In terms of the participants' answers to the questionnaires, their answers mainly relied on the participants' final comprehension of the specific questions of the forms with the elaboration of technical terms by the researcher. Additionally, multi-dimensional scale of perceived social support which was the instrument used for measuring perceived social support may not be culturally sensitive since it had not adequately defined whether "significant other" pertained solely to romantic partners or not. Cross-sectional analytical studies only provide a snapshot of the maintenance hemodialysis patients' characteristics or trends at the time of the data collection and make it unsuitable to track changes over time. However, cross-sectional

analytical design prevents the establishment of a cause-effect relationship. These limitations emphasize the need for judicious and critical analysis when interpreting this study.

This study's results may serve as preliminary evidence on addressing diet non-adherence of maintenance hemodialysis patients in the Philippine setting. This study used a cross-sectional analytical design which analyzed the frequency of diet non-adherence and hypothesis generation. The inclusion of multiple variables such as demographic and socioeconomic factors, depressive symptoms, and social support enabled the exploration of its relationship with diet non-adherence.

Future research may consider an expanded sample size, specifically to include both urban and rural areas, in order to increase the generalizability of the findings. The use of a larger sample size could also boost chances for a more accurate representation of the population, detect true effects, and avoid type I and type II errors, respectively. Lastly, future research may also consider appropriate interventions as part of ethical considerations for those who will be found to have mild to moderate malnutrition, mild to moderate depression, and low to medium social support; accordingly.

Data Availability Statement

Data will be made available on request.

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Conflicts of Interest

One of the authors (R.A.C.) was employed at one of the study sites during the period of data collection. All necessary institutional approvals were obtained prior to conducting the study, and the research procedures were carried out in accordance with the ethical guidelines and administrative regulations of the respective institution. The authors declare that this affiliation did not influence the study design, data collection, analysis, interpretation of results, or the decision to publish the findings.

AI Use Statement

The authors declare that no generative AI was used in the preparation of this manuscript.

Ethical Approval and Consent to Participate

This study involved human participants who were maintenance hemodialysis patients. Ethics review and approval was given by the Philippine Women's University – Research and Development Office: Ethics Review Committee with the protocol number: ERB2024_190 .

References

[1] Hill, N. R., Fatoba, S. T., Oke, J. L., Hirst, J. A., O'Callaghan, C. A., Lasserson, D. S., & Hobbs, F. R. (2016). Global prevalence of chronic kidney disease–a systematic review and meta-analysis. *PloS one, 11*(7), e0158765. [CrossRef]

[2] Suriyong, P., Ruengorn, C., Shayakul, C., Anantachoti, P., & Kanjanarat, P. (2022). Prevalence of chronic kidney disease stages 3–5 in low-and middle-income countries in Asia: A systematic review and meta-analysis. *PLoS One, 17*(2), e0264393. [CrossRef]

[3] Ikizler, T. A., Burrowes, J. D., Byham-Gray, L. D., Campbell, K. L., Carrero, J. J., Chan, W., ... & Cuppari, L. (2020). KDOQI clinical practice guideline for nutrition in CKD: 2020 update. *American Journal of Kidney Diseases, 76*(3), S1-S107. [CrossRef]

[4] Kugler, C., Vlaminck, H., Haverich, A., & Maes, B. (2005). Nonadherence with diet and fluid restrictions among adults having hemodialysis. *Journal of Nursing Scholarship, 37*(1), 25-29. [CrossRef]

[5] López-Gómez, J. M., Villaverde, M., Jofre, R., Rodriguez-Benítez, P., & Pérez-García, R. (2005). Interdialytic weight gain as a marker of blood pressure, nutrition, and survival in hemodialysis patients. *Kidney international, 67*, S63-S68. [CrossRef]

[6] Vijay, V. R., & Kang, H. K. (2022). The worldwide prevalence of nonadherence to diet and fluid restrictions among hemodialysis patients: a systematic review and meta-analysis. *Journal of Renal Nutrition, 32*(6), 658-669. [CrossRef]

[7] Vitolins, M. Z., Rand, C. S., Rapp, S. R., Ribisl, P. M., & Sevick, M. A. (2000). Measuring adherence to behavioral and medical interventions. *Controlled clinical trials, 21*(5), S188-S194. [CrossRef]

[8] Chan, Y. M., Zalilah, M. S., & Hii, S. Z. (2012). Determinants of Compliance Behaviours among Patients Undergoing Hemodialysis in Malaysia. *PLoS ONE, 7*(8), e41362. [CrossRef]

[9] Kugler, C., Maeding, I., & Russell, C. L. (2011). Non-adherence in patients on chronic hemodialysis: an international comparison study. Journal of nephrology, 24(3), 366-375. [CrossRef]

[10] Shinaberger, C. S., Greenland, S., Kopple, J. D., Van Wyck, D., Mehrotra, R., Kovesdy, C. P., & Kalantar-Zadeh, K. (2008). Is controlling phosphorus by decreasing dietary protein intake beneficial or

harmful in persons with chronic kidney disease?. *The American journal of clinical nutrition, 88*(6), 1511-1518. [CrossRef]

[11] Ng, E. S. Y., Wong, P. Y., Kamaruddin, A. T. H., Lim, C. T. S., & Chan, Y. M. (2020). Poor sleep quality, depression and social support are determinants of serum phosphate level among hemodialysis patients in Malaysia. *International journal of environmental research and public health, 17*(14), 5144. [CrossRef]

[12] Opiyo, R. O., Nyasulu, P. S., Olenja, J., Zunza, M., Nguyen, K. A., Bukania, Z., ... & Were, A. O. (2019). Factors associated with adherence to dietary prescription among adult patients with chronic kidney disease on hemodialysis in national referral hospitals in Kenya: a mixed-methods survey. *Renal Replacement Therapy, 5*(1), 41. [CrossRef]

[13] Ozen, N., Cinar, F. I., Askin, D., Mut, D., & Turker, T. (2019). Nonadherence in hemodialysis patients and related factors: a multicenter study. *Journal of Nursing Research, 27*(4), e36. [CrossRef]

[14] O'Connor, S. M., Jardine, A. G., & Millar, K. (2008). The prediction of self-care behaviors in end-stage renal disease patients using Leventhal's Self-Regulatory Model. *Journal of psychosomatic research, 65*(2), 191-200. [CrossRef]

[15] Khalil, A. A., Frazier, S. K., Lennie, T. A., & Sawaya, B. P. (2011). Depressive symptoms and dietary adherence in patients with end-stage renal disease. *Journal of renal care, 37*(1), 30-39. [CrossRef]

[16] Ahrari, S., Moshki, M., & Bahrami, M. (2014). The relationship between social support and adherence of dietary and fluids restrictions among hemodialysis patients in Iran. *Journal of caring sciences, 3*(1), 11. [CrossRef]

[17] Kara, B., Caglar, K., & Kilic, S. (2007). Nonadherence with diet and fluid restrictions and perceived social support in patients receiving hemodialysis. *Journal of Nursing Scholarship, 39*(3), 243-248. [CrossRef]

[18] Kalantar-Zadeh, K., Kleiner, M., Dunne, E., Lee, G. H., & Luft, F. C. (1999). A modified quantitative subjective global assessment of nutrition for dialysis patients. *Nephrology, dialysis, transplantation: official publication of the European Dialysis and Transplant Association-European Renal Association, 14*(7), 1732-1738. [CrossRef]

[19] Boado, J. R. V., Redondo, D. C., Flauta-Orio, J., Gomez, M. L., Valencia, A., & Ingalla, M. J. (2014). Nutrition assessment of patients on maintenance hemodialysis using dialysis malnutrition score (DMS). *J Parenter Enteral Nutr, 24*, 74-88.

[20] Upton, J. (2020). Beck depression inventory (BDI). In *Encyclopedia of behavioral medicine* (pp. 202-203). Cham: Springer International Publishing. [CrossRef]

[21] Inventory-Ii, B. D. (2010). Beck depression inventory-II. *Corsini Encycl. Psychol, 1*(1), 210. [CrossRef]

[22] Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of personality assessment, 52*(1), 30-41. [CrossRef]

[23] Vlaminck, H., Maes, B., Jacobs, A., Reyntjens, S., & Evers, G. (2001). The dialysis diet and fluid non-adherence questionnaire: validity testing of a self-report instrument for clinical practice information point: Kendall's Tau. *Journal of clinical nursing, 10*(5), 707-715. [CrossRef]

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