Clinical Nutrition ESPEN 63 (2024) 768–775

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Intradialytic eating practices and health outcomes among hemodialysis patients, cross-sectional study

May Hamdan [a], Fatima Al-Amouri [b], Ayat Ali Aljondi [a], Eman Dweik [a], Tarteel Al-joubeh [a], Thabat Al jondi [a], Manal Badrasawi [b, *]

[a] Department, Faculty of Medicine and Health Sciences, Palestine Polytechnic University, Hebron, Palestine
[b] Department of Nutrition and Food Technology, Faculty of Agriculture and Veterinary Medicine, An-Najah National University, Tulkarm, West Bank PO. Box 7, Palestine

ARTICLE INFO

Article history:
Received 13 May 2024
Accepted 8 August 2024

Keywords:
Hemodialysis
Intradialytic eating
Intradialytic hypotension
Dialysis adequacy
Malnutrition

SUMMARY

Background and aims: Intradialytic eating practices is a subject of debate among hemodialysis patients and is associated with a variety of clinical implications. This study aimed to investigate eating practices during hemodialysis and their influence on health outcome, including various symptoms experienced during dialysis, intradialytic hypotension, dialysis adequacy, and malnutrition.

Methods: A cross-sectional study was conducted on hemodialysis patients. A structured questionnaire was used to collect information related to sociodemographic, medical history, lifestyle, dialysis, and eating practices. The occurrence of intradialytic hypotension was determined according to the patients' blood pressure measured at the beginning and end of the session, and dialysis adequacy was determined based on the ultrafiltration rate of the patients. Malnutrition was evaluated using renal inpatient screening tool (renal iNUT), and biochemical data was recruited from the patient's hospital records.

Results: A total of 260 hemodialysis patients participated in this study. The mean age was 51.29 ± 15.92, and half of the participants were females. The findings showed no significant association between intradialytic eating practices and symptoms developed during dialysis session, intradialytic hypotension, or malnutrition ($p > 0.05$). According to Chi-square test, a statistically significant association was found between eating practices and dialysis adequacy ($p = 0.037$), hemoglobin level ($p < 0.001$), and phosphorous level ($p = 0.003$).

Conclusion: Eating practices were not associated with symptoms that developed during dialysis sessions, intradialytic hypotension, or malnutrition, according to our findings. However, findings reveal that it is possible that eating practices may affect the adequacy of dialysis.

1. Introduction

Worldwide, chronic kidney disease (CKD) represented a prevalence of approximately 843.6 million individuals in 2017, amounting to more than 10% of the general population, and emerged as one of the leading causes of death [1]. The ultimate stage of CKD is end-stage renal disease (ESRD) [2], which is expected to occur in over 500 million CKD patients if early diagnosis and treatment are not received [3]. ESRD is characterized by irreversible deterioration of renal function, which is treated with renal replacement therapy, including renal transplantation as the first choice or hemodialysis (HD) as the second choice and the most effective therapeutic procedure among ESRD patients [4].

Hemodialysis is the most common therapeutic practice used for patients with ESRD, with a standard of 3–5 h of thrice weekly hemodialysis in both developed and developing countries. Although HD is considered a safe procedure [5], it is associated with some health implications [5,6]. Among the complications associated with HD, patients reported having muscle cramps, hypotension, hypertension, chills, nausea, vomiting, headache, dizziness, diarrhea, abdominal pain, sleepiness, mental distress, sweating, weakness, shortness of breath, numbness, tremors, and body aches [7]. In addition, HD tends to affect the nutritional status and quality of life of patients due to the catabolic effect of

* Corresponding author.
E-mail address: m.badrasawi@najah.edu (M. Badrasawi).

https://doi.org/10.1016/j.clnesp.2024.08.012

dialysis therapy, which increases the risk of developing malnutrition accompanied by poor appetite, dietary restrictions, and inflammation [8].

It is challenging to maintain a good nutritional status among HD patients [9], since they have restricted food diets, and exhibit appetite-related problems [10]. However, eating during dialysis is a controversial issue [11,12], and regulations vary among countries. In the United States and Canada, for instance, eating practices have many restrictions and limitations, while Germany, Japan, and some Asian and European countries recommend keeping regular eating practices during HD sessions [6].

However, evidence supports eating during treatment due to its effect on reducing mortality and improving nutritional status. Other research suggests that eating during HD is not recommended since it can cause postprandial hypotension, decrease treatment efficiency, gastrointestinal discomfort, and raise concerns related to food safety [11]. It has been observed that consuming food during a HD session can cause a sudden drop in blood pressure after eating and increase the occurrence of symptomatic intradialytic hypotension (IDH) [13], which is the most common complication associated with hemodialysis and affects approximately 20–30% of dialysis patients [14]. Furthermore, consuming meals during HD sessions may negatively impact the effectiveness of the treatment, known as dialysis adequacy [13]. Dialysis adequacy is one of the factors linked to reduced morbidity and mortality, as well as increased quality of life among HD patients [15]. On the other hand, eating during dialysis sessions helps HD patients maintain a good nutritional status [9], particularly patients with malnutrition [16], which represents a global prevalence range from 28% to 54% [17].

The main goal of this cross-sectional study was to investigate eating practices among HD patients. In addition, this study aims to determine the association between the eating practices of HD patients and clinical outcomes during dialysis sessions, including symptoms that arise during sessions, intradialytic hypotension, dialysis adequacy, and malnutrition.

2. Methods

2.1. Study design and population

The present study used a cross-sectional design. The sample size was determined using G power software, taking into consideration a two-sided alpha level of 0.05 and a power of 80%. Using the Chi-square test, as the statistical test to examine the association between eating during dialysis and the occurrence of hypotension. The required sample size was 250 participants. Given the dropout rate, the minimal sample size required is 260 patients.

Patients who were included in this study are hemodialysis patients who are at least 18 years old, and started dialysis at least one month ago, capable of oral intake, and who can sign the consent form, while patients with cognitive impairment, pregnant women and cancer patients under chemotherapy were excluded from the study.

2.2. Ethical consideration

This study protocol has been approved by the Deanship of Scientific Ethical Committee at Palestine Polytechnic University, which has a reference number KA/41/2022. In addition, permission and approval were obtained from the Palestinian Ministry of health, while written informed consent was obtained from each participant. This study was conducted in accordance with the Declaration of Helsinki.

2.3. Data collection and research tools

Data was collected from March to July 2023. The study sample was recruited from the hemodialysis departments in Hebron Governate Hospitals through face-to-face interviews. A seven-parts structured questionnaire was developed by the research team, evaluated by five nutrition experts for content validity, and analyzed for reliability using SPSS after pilot study have been conducted on 20 hemodialysis patients. Cronbach's alpha for the study questionnaire is 0.728.

The first part of the questionnaire discuses sociodemographic. The second part focuses on medical history which include questions about 8 different chronic diseases with dichotomous responses (yes and no). The third part includes lifestyle characteristics. The fourth part contains three sub-sections; the first one is related to hemodialysis data, the second one is related to patients eating practices during hemodialysis, the third one is related to their eating habits in normal days and dialysis days. The fifth part includes malnutrition assessment. The sixth part focuses on intradialytic hypertension and dialysis adequacy evaluation, and the questionnaire ended with biochemical data recruited from patients file including albumin, potassium, creatinine, phosphorous, hemoglobin levels.

2.4. Renal inpatient nutrition screening tool (renal iNUT)

Malnutrition risk evaluation was performed using the valid and reliable nutrition screening tool (renal inpatient nutrition screening tool (Renal iNUT)). The reliability of iNUT that assessed by kappa was 0.74. Renal iNUT includes questions on appetite, nutrition intake and supplements, height, measured weight, estimated weight loss, and body mass index (BMI). The score of iNUT is categorized into high (score $\geq$2), medium (score 1), and low risk (score 0) of malnutrition [18].

2.5. Intradialytic hypotension and dialysis adequacy

The patients' blood pressure was measured automatically through the dialysis session by Ambulatory blood pressure monitor. The blood pressure measurements were recorded for the duration of the dialysis session. Intradialytic hypotension is defined when the patient's systolic blood pressure falls by 20 mmHg or less between the highest and lowest readings recorded, regardless of whether or not this is accompanied by symptoms [19]. Dialysis adequacy was determined according to the ultrafiltration rate (UFR) of the patients. Ultrafiltration rate measure was defined as UFR $\geq$13 mL/kg/h for patients with dialysis session length less than 240 min which is developed by the Kidney Care Quality Alliance (KCQA) [20].

2.6. Statistical analysis

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 21. The normality of the distribution of continuous variables was assessed graphically and using the Shapiro-Wilk test. Continuous variables were analyzed using descriptive statistics such as means and standard deviation, while categorical variables were described using percentages and frequencies. To investigate the relationship between continuous and categorical variables, the one-way ANOVA or independent sample t-test was used, while the Chi-square test was used for the evaluation of the relationship between categorical variables, and the level of significance was set at $p < 0.05$.

3. Results

3.1. Patient characteristics

Two hundred and sixty hemodialysis patients with a mean age of 51.29 ± 15.92 years participated in this study. Table 1 displays the sociodemographic characteristics and lifestyle factors of the study participants.

3.2. Medical history

The medical history of the study participants is depicted in Fig. 1, revealing that 83.1% of them had hypertension and 56.5% experienced eye problems. Liver diseases were found to be the least prevalent chronic condition.

3.3. Hemodialysis-related data

The study included patients who had been receiving hemodialysis for an average duration of 3.86 ± 3.82 years. The mean time of each session was 3.08 ± 0.26 h, and patients received hemodialysis an average of 2.76 ± 0.52 times each week. Merely 11.2% of patients adhere to the nutritional guidelines specifically designed for individuals undergoing hemodialysis, as indicated by patients in this study. Furthermore, patients self-reported that only 3.8% follow to doctor suggestions regarding their eating behaviors, whereas 6.9% adhere to a dietitian recommendation. In addition, patients obtain their dietary knowledge from many sources, such as nutritionists (13.1%), doctors (42.3%), nurses (6.9%), and the internet (15.8%).

4. Eating practices during hemodialysis

Most patients in this study are used to eat during every dialysis session (61.5%), 30.8% sometimes eat, and 7.7% never eat during a dialysis session. Regarding hospital regulations, the study revealed that both nurses (85.8%) and doctors (87.3%) never hindered patients from eating during dialysis sessions. Furthermore, the hospital consistently offered meals to patients during these sessions, with a rate of 83.1% as shown in Fig. 2a. Furthermore, patients consume food during dialysis sessions primarily due to hunger (55.4%) or the desire to feel better after eating (51.2%), as depicted in Fig. 2b. In contrast, patients typically avoid eating during dialysis sessions due to a lack of hunger (41.3%) or a diminished appetite (41.1%), as depicted in Fig. 2c. Nevertheless, a significant majority of patients, specifically 87.5%, have their meals while in a seated position. Additionally, 51.7% of patients choose to eat during the middle of their dialysis session, as depicted in Fig 2d and e.

5. Health outcomes

5.1. Symptoms during hemodialysis session

The participants in this study were asked about on a range of prevalent and distinctive symptoms associated with hemodialysis. The study revealed that headache and nausea were the predominant symptoms reported by patients during dialysis sessions, but stomach cramping was the least frequently observed symptom, as depicted in Fig. 3.

5.2. Malnutrition, hypotension, dialysis adequacy, and biochemical data

The study findings revealed that the mean Body Mass Index (BMI) was 27.04 ± 5.93 kg/m^2. According to the renal iNUT grading, 63.1% of patients showed normal nutrition. Furthermore, a significant majority of 74.6% of patients did not experience hypotension during dialysis session. Moreover, dialysis was found to be inadequate for 52.3% of the patients. Additionally, the average hemoglobin level was measured at 9.32 ± 1.65. Additional information regarding the clinical outcomes of patients is included in Table 2.

Table 1
Patients' sociodemographic and lifestyle characteristics presented in N (%).

Characteristics		N	%
Sex	Male	130	50
	Female	130	50
Marital status	Married	207	79.6
	Single	39	15
	Other	14	5.4
Living area	City	114	55.4
	Village	110	42.3
	Camp	6	2.3
Living status	With family	250	96.2
	Alone	10	3.8
Working status	Full time	15	5.8
	Part time	11	6.6
	Unemployed	216	83.4
	Retired	17	6.6
Monthly income (NIS/month)	<1500	160	61.5
	1500–3000	73	28.1
	3000–5000	21	8.1
	>5000	6	2.3
Smoking status	Smoker	51	19.6
	Former smoker	49	18.8
	Nonsmoker	160	61.5
Sleeping problem	Yes	128	49.4
	Sometimes	59	22.8
	No	72	27.8
Type of sleeping problem	Insomnia	41	21.9
	Sleep apnea	20	19.7
	Irregular sleep	18	9.6
	Two or more problem	108	57.8

NIS: New Israeli shekel.

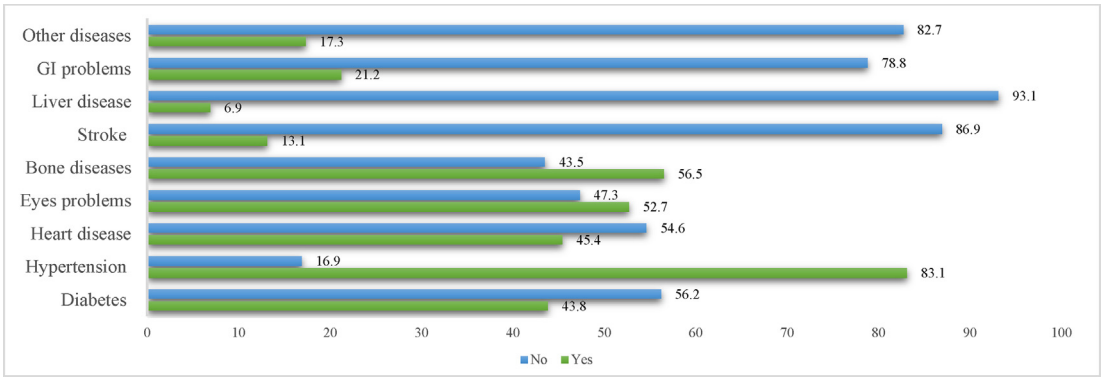
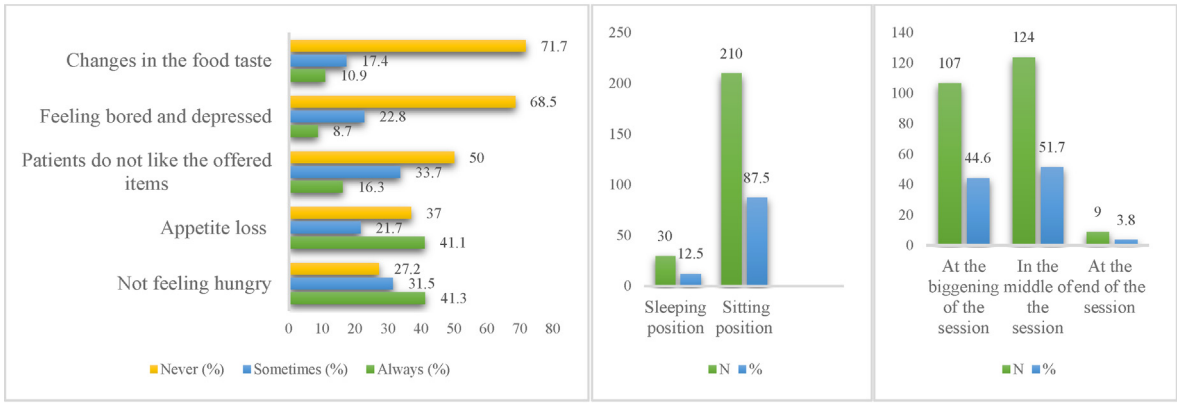


Fig. 1. Chronic diseases among participants presented in percentage (%).

(a) Hospital policy during dialysis session **(b)** Reasons for eating during dialysis session



(c) Reasons for not eating during dialysis session **(d)** Eating position **(e)** Timing of eating

Fig. 2. Eating practices during hemodialysis.

5.3. Food choice and food diversity

According to Fig. 4a, most patients (31.9%) obtain their food from supermarkets, whereas 18.5% of patients rely on hospital meals during dialysis sessions. Regarding the dietary habits of patients during dialysis sessions, it was discovered that 61.9% of participants have whole meals, while the remaining patients choose for fruits, snacks, or beverages, as illustrated in Fig. 4b.

Regarding food diversity, a qualitative diet recall was used to assess food choices during dialysis sessions. The results, shown in Fig. 4c, indicate that patients had diverse preferences for lunch meals, traditional breakfasts, fruits, fast foods, drinks, and snacks. Specifically, 58.5% of patients chose to have drinks during the dialysis session, followed by 46.2% who chose snacks, and 43.8% who preferred traditional breakfasts. Furthermore, food choices are categorized into food groups based on qualitative diet recall on both normal and dialysis days. The study revealed that patients consumed an average of 8.52 ± 3.11 food items, which encompassed 4.27 ± 1.1 food groups. According to the data shown in Fig. 4d, most patients, accounting for 89.6%, primarily select their

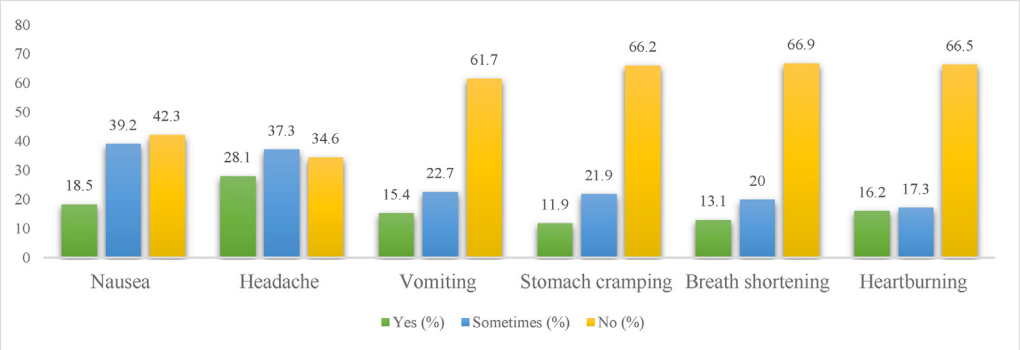


Fig. 3. Symptoms during hemodialysis session presented in percentage (%).

Table 2
Clinical data of hemodialysis patients presented in mean (SD) or N (%).

Variable		N (%)	Mean ± SD (min-max)
Malnutrition	Yes	96 (36.9)	
	No	164 (63.1)	
Hypotension	Yes	66 (25.4)	
	No	194 (74.6)	
Dialysis adequacy	Yes	124 (47.7)	
	No	136 (52.3)	
BMI			27.04 ± 5.93 (11.6–41.7)
UFR			13.42 ± 5.87 (1.81–37)
Albumin (g/L)			36.84 (19–50)
Creatinine (μmol/L)			819.39 ± 486.97 (88.4–7248.8)
BUN (mmol/L)			22.41 ± 6.90 (2.14–38.91)
Potassium (mmol/L)			5.16 ± 0.94 (2.4–9.4)
Sodium (mmol/L)			138.3 ± 3.14 (112–148)
Calcium (mmol/L)			3.93 ± 0.47 (2.55–5.85)
Phosphorous (mmol/L)			1.62 ± 1.51 (0.36–24.23)
Hemoglobin (μmol/L)			93.25 ± 16.53 (51–141)

food from the meat group. This is followed by the vegetable group, which is chosen by 83.1% of patients. On the other hand, legumes, fat, and oil groups are the least consumed among patients on both normal and dialysis days. Furthermore, patients were reported to consume an average of 2.35 ± 0.64 meals each hemodialysis day and 2.43 ± 0.68 meals on a regular day.

5.4. Association between eating during dialysis session and health outcomes

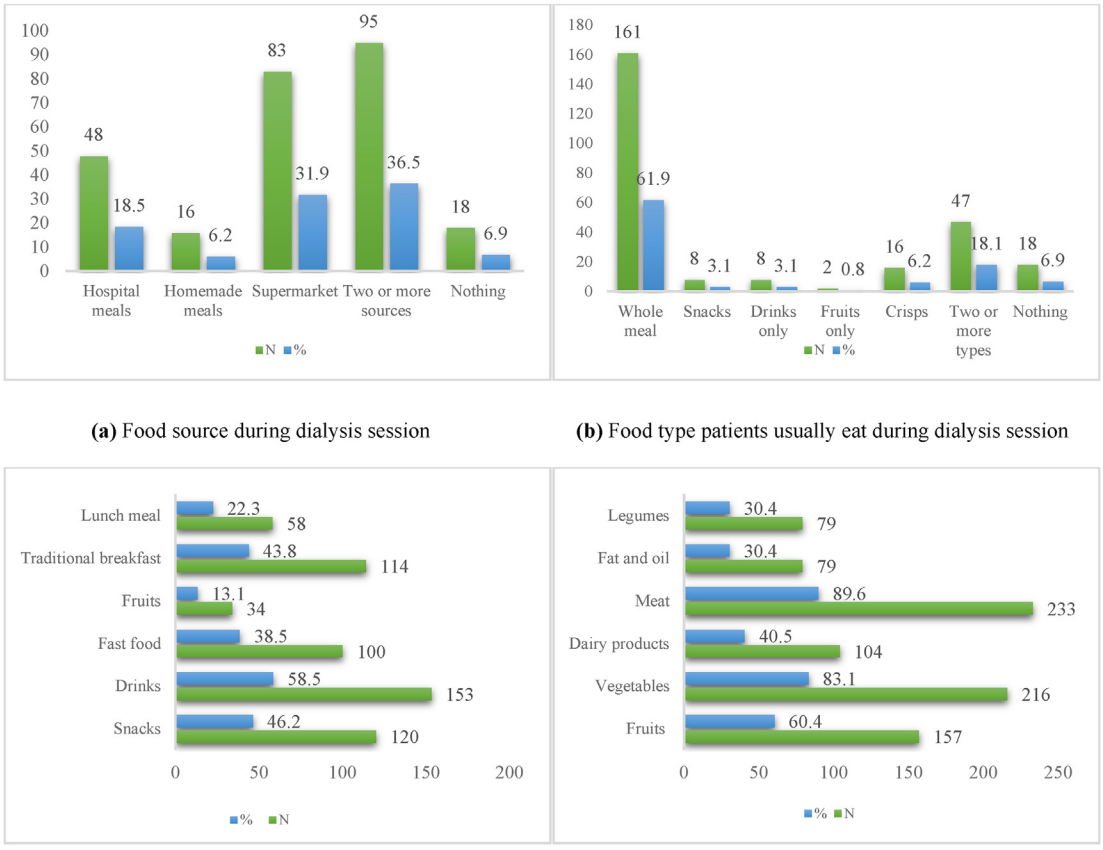
The study analyzed the association between clinical outcomes and eating during dialysis session using Chi-square testing, as shown in Table 3. No significant association was observed between symptoms experienced during dialysis sessions. However, a potential association was found between nausea and headache when eating during dialysis sessions, however it did not reach statistically significant levels. Specifically, the p-value was 0.087 for nausea and 0.051 for headache. Furthermore, the act of consuming food while undergoing dialysis did not demonstrate any significant association with either malnutrition or hypotension ($p > 0.05$) among the individuals. Conversely, there was a significant association between dialysis adequacy and eating during the dialysis session ($p = 0.037$).

The results shown in Table 4 indicate a significant association between phosphorous and hemoglobin levels and eating during the dialysis session ($p = 0.003$, $p < 0.001$), respectively. Conversely, consuming food during dialysis sessions was not shown to have any significant association with patient's BMI or the diversity of food choices they made ($p > 0.05$).

6. Discussion

This study investigated eating practices during hemodialysis and their association with clinical outcomes. The majority of patients in this study eat during dialysis session, which can be attributed to the absence of hospital policies that prevent eating during dialysis and the administration of meals during almost every dialysis session. Furthermore, medical professionals, including both doctors and nurses did not provide any guidance regarding the consumption of food during dialysis session. Patients in this study mainly consume whole meals during dialysis, and the most prevalent food groups selected by patients were meat, vegetables, and fruits. Moreover, variation in food choices did not affect eating practices among patients in this study. Previous findings are limited but varied regarding eating practices among hemodialysis patients. Kistler et al. found that more than two-third of patients choose to eat during dialysis, while candy, oral supplements, and cookies were the most consumed items. In addition, patients consume moderately sized meals and their dietary intake tend to be consistent during treatment [21]. In a study conducted among 98 ESRD patients, it was found that fruits and vegetables are frequently excluded from their dietary intake and patients consumed mainly cooked vegetables [22].

A variety of symptoms and complications are prevalent among hemodialysis patients during dialysis session [5,23]. In this study, the onset of nausea, vomiting, stomach cramping, heartburn, headache, and breath shortening were not associated with intradialytic eating practices. But an increasing pattern was found regarding the onset of nausea and headache among patients who



(a) Food source during dialysis session

(b) Food type patients usually eat during dialysis session

(c) Food choice based on qualitative diet recall in dialysis days

(d) Food groups as food choice in normal and dialysis days

Fig. 4. Food choices among hemodialysis patients.

tend to eat during dialysis, even though, not at a significant level, which might be related to the noncomparable data set. Previous findings indicated that eating during dialysis session does not show a significant impact on nausea and vomiting [6], and there was no difference in GI symptoms among patients who did or did not eat [21]. Otherwise, no previous research studied the association between eating during dialysis and the onset of stomach cramping, headache, heartburn, and breath shortening.

Intradialytic hypotension was not found to be associated with eating practices during dialysis session in this study. Several studies have examined the relationship between food intake and hypotension during hemodialysis. In contrast with our findings, previous studies indicated that eating during hemodialysis can cause higher IDH frequency [14,24], and food intake caused a drop in the systolic and diastolic blood pressure according to Borzou et al. [6]. In addition, Raja et al. found that 4 in 5 of the IDH events were associated with meal intake during dialysis session [5]. The difference between our results and the previous findings might be related to sample size and methodology variation.

In the current study, approximately half of the patients had adequate dialysis, and a significant association was found between dialysis adequacy and intradialytic eating. In a prior study that compare between pre-dialytic and intradialytic eating regarding dialysis adequacy, it was found that the intake of a protein-rich meal prior to dialysis is associated with better dialysis adequacy than eating during dialysis [25]. In a recent study, eating during dialysis session was associated with reduced adequacy of the delivered dialysis [16].

In the current group of hemodialysis patients, malnutrition showed a considerable prevalence with no significant association with intradialytic eating. To our knowledge, previous findings regarding the relationship between intradialytic meals and malnutrition are limited. But a non-randomized study finds that high-protein meals during hemodialysis has no effect on nutritional status [26]. However, the level of hemoglobin and phosphorous were significantly associated with eating practices during dialysis session, and both parameters were significantly higher among patients who never eat during dialysis session in comparison with patients who eat during dialysis session. On the other hand, the level of albumin, creatinine, BUN, potassium, sodium, and calcium showed no significant variation regarding intradialytic eating practices. According to a former research, a comparison of dietary intake patterns in hemodialysis patients revealed that hemoglobin and serum albumin levels were significantly higher in well-nourished patients than in the poorly nourished patients, while phosphorous, creatinine, BUN, potassium, sodium, and calcium did not differ significantly between well and poorly nourished patients [10].

Our study has important strengths, including a large sample size and providing worthy data regarding the impact of eating practices during dialysis session on health outcomes. However, this study has

Table 3
Association between clinical outcome and eating during dialysis using Chi-square test.

Studied Variables		Eating during dialysis session						P-value
		Always		Sometimes		Never		
		N	%	N	%	N	%	
Nausea	Yes	30	18.8	15	18.8	3	15	0.087
	Sometimes	69	43.1	30	37.5	3	15	
	No	61	38.1	35	43.8	14	70	
Headache	Yes	49	30.6	22	27.5	2	10	0.051
	Sometimes	60	37.5	32	40	5	25	
	No	51	31.9	26	32.5	13	65	
Vomiting	Yes	28	17.5	10	12.5	2	10	0.119
	Sometimes	41	25.6	17	21.3	1	5	
	No	91	56.5	53	66.3	17	85	
Stomach cramps	Yes	22	13.8	6	7.5	3	15	0.361
	Sometimes	38	23.8	17	21.3	2	10	
	No	100	62.5	57	71.3	15	75	
Breath shortening	Yes	25	15.6	8	10	1	5	0.193
	Sometimes	36	22.5	14	17.5	2	10	
	No	99	61.9	58	72.5	17	85	
Heartburn	Yes	32	20	7	8.8	3	15	0.256
	Sometimes	28	17.5	14	17.5	3	15	
	No	100	62.5	59	73.8	14	70	
Malnutrition	Yes	60	37.5	32	40	4	20	0.246
	No	100	62.5	48	60	16	80	
Hypotension	Yes	37	23.1	23	28.7	6	30	0.567
	No	123	76.9	57	71.3	14	70	
Dialysis adequacy	Yes	86	53.8	29	36.3	9	45	0.037*
	No	74	46.3	51	63.7	11	55	

Significant at *: $p < 0.05$, **: $p < 0.001$ according to Chi-square test.

Table 4
Association between clinical outcome and eating during dialysis using one-way ANOVA.

Studied Variables	Eating during dialysis session						P-value
	Always		Sometimes		Never		
	Mean	SD	Mean	SD	Mean	SD	
BMI	26.61	5.94	27.95	6.15	26.76	4.65	0.251
Albumin	37.02	4.65	36.30	5.53	37.60	4.71	0.443
Creatinine	796.95	265.03	839.84	777.92	917.10	335.49	0.527
BUN	22.68	6.43	21.34	7.42	24.62	7.97	0.121
Potassium	5.26	1.01	4.97	0.83	5.12	0.67	0.091
Sodium	138.20	3.37	138.37	2.66	139.05	3.03	0.523
Calcium	3.95	0.53	3.84	0.46	3.39	0.47	0.648
Phosphorous	1.56	0.56	1.48	0.53	1.62	1.51	0.003*
Hemoglobin	93.18	15.12	90.05	17.23	106.70	18.60	<0.001**
Number of food items	8.49	3.12	8.68	3.20	8.10	2.66	0.754
Number of food groups	4.29	1.13	4.18	1.06	4.42	0.96	0.653

Significant at *: $p < 0.05$, **: $p < 0.001$ according to one-way ANOVA test.

some limitations. First, this study is conducted using cross-sectional data, which means it does not provide evidence for causal inferences. Furthermore, the study only included hemodialysis patients from one center, therefore the findings are not representative. In addition, certain data is based on self-reporting, which makes it prone to personal bias.

7. Conclusion

To conclude, the findings of this study showed that intradialytic eating practices do not have an association with intradialytic symptoms, including nausea, vomiting, stomach cramp, headache, breath shortening, heartburn, and intradialytic hypotension. However, it is worth noting that it may alter the adequacy of dialysis. In addition, eating practices during dialysis sessions were not associated with malnutrition. Nevertheless, the question of whether to eat or not during a dialysis session remains a critical matter, and further research is advised to provide a definitive answer to the contentious controversy surrounding intradialytic eating.

Ethical statement

This study protocol has been approved by the Deanship of Scientific Ethical Committee at Palestine Polytechnic University, which has a reference number KA/41/2022. In addition, permission and approval were obtained from the Palestinian Ministry of health, while written informed consent was obtained from each participant. This study was conducted in accordance with the Declaration of Helsinki.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author's contribution

MB: principal investigator optimizes the methodology and approve the final analysis and the final version of the manuscript, M H and F A: data analysis and draft the manuscript, A Al, E D, T A, and T A: write the research proposal, apply for ethics, data collection, data entry and primary data analysis. All the authors approved the final version of the manuscript.

Research data

Row data are available on Mendeley data repository, DOI:10.17632/cc3hpdrgrv.1.

Declaration of competing interest

The authors declare no conflict of interest.

Acknowledgments

We express our gratitude to all the patients who participated in this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2024.08.012.

References

[1] Kovesdy CP. Epidemiology of chronic kidney disease: an update 2022. Kidney Int Suppl 2022;12:7–11. https://doi.org/10.1016/j.kisu.2021.11.003.
[2] Nazzal Z, Khader S, Zawyani H, Abdallah M, Sawalmeh O, Hamdan Z. Bone mineral density in Palestinian patients with end-stage renal disease and the related clinical and biochemical factors: cross-sectional study. PLoS One 2020;15:1–12. https://doi.org/10.1371/journal.pone.0241201.
[3] Malekmakan L, Tadayon T, Roozbeh J, Sayadi M. End-stage renal disease in the Middle East: a systematic review and meta-analysis. Iran J Kidney Dis 2018;12:195–203.
[4] Zyoud SH, Daraghmeh DN, Mezyed DO, Khdeir RL, Sawafta MN, Ayaseh NA, et al. Factors affecting quality of life in patients on haemodialysis: a cross-sectional study from Palestine. BMC Nephrol 2016;17:1–12. https://doi.org/10.1186/s12882-016-0257-z.
[5] Raja SM, Seyoum Y. Intradialytic complications among patients on twice-weekly maintenance hemodialysis: an experience from a hemodialysis center in Eritrea. BMC Nephrol 2020;21:1–6. https://doi.org/10.1186/s12882-020-01806-9.
[6] Borzou SR, Mahdipour F, Oshvandi K, Salavati M, Alimohammadi N. Effect of mealtime during hemodialysis on patients' complications. J Caring Sci 2016;5:277–86. https://doi.org/10.15171/jcs.2016.029.
[7] Tinôco JD. de S, de Paiva M. das GMN, Lúcio KDB, Pinheiro RL, de Macedo BM, Lira ALB. de C. Complicações em pacientes renais crônicos submetidos à hemodiálise. Cogitare Enferm 2017;22(4). https://doi.org/10.5380/ce.v22i4.52907.
[8] Visiedo L, Rey L, Rivas F, López F, Tortajada B, Giménez R, et al. The impact of nutritional status on health-related quality of life in hemodialysis patients. Sci Rep 2022;12:1–8. https://doi.org/10.1038/s41598-022-07055-0.
[9] Piccoli GB, Lippi F, Fois A, Gendrot L, Nielsen L, Vigreux J, et al. Intradialytic nutrition and hemodialysis prescriptions: a personalized stepwise approach. Nutrients 2020;12:1–25. https://doi.org/10.3390/nu12030785.
[10] Lee JE, Kim HJ, Lee MJ, Kwon YE, Kyung MS, Park JT, et al. Comparison of dietary intake patterns in hemodialysis patients by nutritional status: a cross-sectional analysis. Kidney Res Clin Pract 2020;39:202–12. https://doi.org/10.23876/j.krcp.20.037.
[11] Kistler BM, Benner D, Burrowes JD, Campbell KL, Fouque D, Garibotto G, et al. Eating during hemodialysis treatment: a consensus statement from the international society of renal nutrition and metabolism. J Ren Nutr 2018;28:4–12. https://doi.org/10.1053/j.jrn.2017.10.003.
[12] Agarwal R, Georgianos P. Feeding during dialysis - risks and uncertainties. Nephrol Dial Transplant 2018;33:917–22. https://doi.org/10.1093/ndt/gfx195.
[13] Fotiadou E, Georgianos PI, Chourdakis M, Zebekakis PE, Liakopoulos V. Eating during the hemodialysis session: a practice improving nutritional status or a risk factor for intradialytic hypotension and reduced dialysis adequacy? Nutrients 2020;12:1–11. https://doi.org/10.3390/nu12061703.
[14] Jelicic I. Relationship of food intake during hemodialysis and symptomatic intradialytic hypotension. Hemodial Int 2021;25:333–7. https://doi.org/10.1111/hdi.12923.
[15] Tosun N, Kalender N, Cinar FI, Bagcivan G, Yenicesu M, Dikici D, et al. Relationship between dialysis adequacy and sleep quality in haemodialysis patients. J Clin Nurs 2015;24:2936–44. https://doi.org/10.1111/jocn.12908.
[16] Fotiadou E, Georgianos PI, Vaios V, Sgouropoulou V, Divanis D, Karligkiotis A, et al. Feeding during dialysis increases intradialytic blood pressure variability and reduces dialysis adequacy. Nutrients 2022;14:1–10. https://doi.org/10.3390/nu14071357.
[17] Sahathevan S, Khor BH, Ng HM, Gafor AHA, Daud ZAM, Mafra D, et al. Understanding development of malnutrition in hemodialysis patients: a narrative review. Nutrients 2020;12:1–30. https://doi.org/10.3390/nu12103147.
[18] Jackson HS, MacLaughlin HL, Vidal-Diez A, Banerjee D. A new renal inpatient nutrition screening tool (Renal iNUT): a multicenter validation study. Clin Nutr 2019;38:2297–303. https://doi.org/10.1016/j.clnu.2018.10.002.
[19] Stefánsson BV, Brunelli SM, Cabrera C, Rosenbaum D, Anum E, Ramakrishnan K, et al. Intradialytic hypotension and risk of cardiovascular disease. Clin J Am Soc Nephrol 2014;9:2124–32. https://doi.org/10.2215/CJN.02680314.
[20] Kramer H, Yee J, Weiner DE, Bansal V, Choi MJ, Brereton L, et al. Ultrafiltration rate thresholds in maintenance hemodialysis: an NKF-KDOQI controversies report. Am J Kidney Dis 2016;68:522–32. https://doi.org/10.1053/j.ajkd.2016.06.010.
[21] Kistler BM, Biruete A, Chapman-Novakofski K, Wilund KR. The relationship between intradialytic nutrition and gastrointestinal symptoms using a modified version of the gastrointestinal symptom rating scale. J Ren Nutr 2018;28:129–34. https://doi.org/10.1053/j.jrn.2017.08.006.
[22] Maraj M, Kuśnierz-Cabala B, Dumnicka P, Gala-Błądzińska A, Gawlik K, Pawlica-Gosiewska D, et al. Malnutrition, inflammation, atherosclerosis syndrome (MIA)and diet recommendations among end-stage renal disease patients treated with maintenance hemodialysis. Nutrients 2018;10. https://doi.org/10.3390/nu10010069.
[23] Lykke C, Sørensen J, Liem YS, Eidemak I, Larsen S, Sjøgren P, et al. Co-occurrence of prevalent symptoms in patients receiving hemodialysis - a cross-sectional survey. Nephrol Nurs J J Am Nephrol Nurses' Assoc 2023;50:497–504.
[24] Avci M, Arikan F. The effect of food intake during hemodialysis on blood pressure: a nonrandomized experimental trial. Ther Apher Dial off Peer-Reviewed. J Int Soc Apher Japanese Soc Apher Japanese Soc Dial Ther 2023;27:661–8. https://doi.org/10.1111/1744-9987.13967.
[25] Rao NS, Chandra A, Saran S, Kulshreshta MR, Mishra P, Tiwari P. Predialytic versus intradialytic nutrition: a study to assess effects on intradialytic blood pressure, dialysis adequacy, and urea removal. Blood Purif 2021;50:823–8. https://doi.org/10.1159/000512540.
[26] Choi MS, Kistler B, Wiese GN, Stremke ER, Wright AJ, Moorthi RN, et al. Pilot study of the effects of high-protein meals during hemodialysis on intradialytic hypotension in patients undergoing maintenance hemodialysis. J Ren Nutr 2019;29:102–11. https://doi.org/10.1053/j.jrn.2018.06.002.