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Irritable bowel syndrome frequency and related factors in hemodialysis patients

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Abstract
Background: The incidence of gastrointestinal system (GIS) issues in patients with chronic kidney disease (CKD) is quite high. IBS, one of the GIS disorders, is more prevalent among patients undergoing dialysis. Patients with IBS are more susceptible to psychiatric disorders such as depression and anxiety (CKD).
The purpose of the work: is determining the prevalence of IBS and its associated factors among CKD patients undergoing hemodialysis.
Method and materials: A cross-sectional research was conducted on a group of 200 patients who were receiving hemodialysis. The patients were categorized into two distinct groups: Group A: 100 patients of CKD on hemodialysis and Group B: 100 patients of CKD on non-hemodialysis treatment. All Patients diagnosed to have IBS in hemodialysis according to ROME IV criteria. The presence of depression and anxiety was assessed using the Hamilton Depression Rating Scale (HAM-D) and the Hamilton Anxiety Rating Scale (HAM-A).
Results: In our study IBS in hemodialysis group was significantly (59%) in comparison to non-hemodialysis CKD group was (44%). In this current study we had found depressive symptoms in a significant percentage of patients more than (64%) among those in dialysis and (47%) among those in non-hemodialysis CKD group. In our study, we had found anxiety symptoms in a significant percentage of patients more than (62%) among those in dialysis and (41%) among those in non-hemodialysis CKD group. Patients with IBS had substantially higher ratings for anxiety and sadness compared to those without IBS (p<0.029 and p<0.001, respectively).
Conclusion: Patients undergoing hemodialysis were more likely to have IBS, according to our research. A greater prevalence of depression and anxiety was observed as well in the hemodialysis group when contrasted with the non-hemodialysis CKD group.

Keywords: Hemodialysis, CKD, IBS, hemodialysis

Introduction
Irritable Bowel Syndrome (IBS) is a common condition characterized by frequent stomach discomfort and irregular bowel movements. According to the latest classification of (Rome IV), it is predicted that around 4% of the global population meets the criteria for a diagnosis of IBS. Alongside stomach pain and irregular bowel movements, individuals may have additional gastrointestinal symptoms, including abdominal discomfort and bloating /distension. (Trindade, I., *et al*., 2022) [37]
A functional bowel illness, IBS affects a large percentage of the population; while it does not pose an immediate danger to health, it significantly lowers quality of life and has a significant monetary impact. So yet, there is no known organic etiology of IBS. Despite the fact that characteristics related to the pathophysiology of IBS, including changes in bowel reactivity (motility, secretion), visceral hypersensitivity, and brain-bowel axis irregularity, are believed to have a significant impact (Trindade, I., *et al*., 2022) [37].
Chronic kidney disease (CKD) has a prevalence of 9.1% globally. The 2017 cooperation between the global burden of disease (GBD) and CKD estimated that there were 7.1 million people in Egypt who had CKD. The age-standardized prevalence of CKD in Egypt was calculated to be 106 patients per 1000 population. There was a 5.3% rise in prevalence from 1990 to 2017. (Youssef F., *et al*., 2022) [40]

Gastrointestinal system (GIS) problems are prevalent among individuals suffering from chronic renal disease. The development of renal dysfunction is linked to abnormalities in several organs and systems, including the gastrointestinal tract. The prevalence of GIS has been shown to range from 70% to 80%, and it has been linked to mental illnesses in patients. (Strid H., *et al*., 2002) [36].

IBS, a gastrointestinal illness, is prevalent among dialysis patients, with a prevalence ranging from 11% to 44% in hemodialysis (HD) patients. The study conducted by Cano AE. and colleagues in 2007. Research has shown a correlation between IBS and a higher prevalence of mental disorders. In research involving individuals with IBS, it has been shown that the incidence of anxiety is twice as high and the incidence of depression is three times as high. The prevalence of anxiety was 31% and depression was 26% in patients with CKD. (Ebling B., *et al*. 2011) [7].

Aim of the work

The objective of the study was to determine the prevalence of IBS and its associated variables in CKD patients undergoing hemodialysis.

Patients and Methods

Study Design: Cross sectional study

Study population: A study was conducted on a group of 200 patients who were receiving HD. The study sample consisted of patients who were chosen from the internal medicine department of Tanta University Hospitals. The selection included individuals from the inpatient, outpatient clinic, and dialysis units. The data collection period spanned from September 2020 to March 2021. The patients were categorized into two groups: Group A consists of 100 patients with CKD who are undergoing hemodialysis. GroupB consists of 100 patients with CKD who are receiving therapy for CKD but not undergoing hemodialysis.

Inclusion criteria: The patients in the HD group who were diagnosed with IBS were between the ages of 18 and 50. Based on the ROME IV criteria: The diagnostic criteria for IBS include experiencing stomach discomfort for at least 6 months, which occurs at least 1 day per week in the previous 3 months. Additionally, two out of the following three criteria must be present. The topic of discussion is to the relationship between defecation and the occurrence of changes in both the frequency and appearance of stool.

The Hamilton Depression Rating Scale (HAM-D) and the Hamilton Anxiety Rating Scale (HAM-A) were used to look into mood and anxiety states. The HAM-D is a questionnaire that is often used to find out how bad depression symptoms are. It has 17 questions. A score of 0 to 7 points means you don't have any depression, 8 to 15 points means you have light depression, 16 to 28 points means you have moderate depression, and 29 points or more means you have serious depression. The HAM-A is a questionnaire with 14 questions that is often used to measure how bad an anxiety disorder is. The total score ranges from 0 to 56. Scores between 0 and 5 mean no anxiety, 6 to 14 mean mild anxiety, and 15 and up mean major anxiety. (Iannuzzo, *et al*., 2006) [19] and (Sajatovic, *et al*., 2012) [32].

Exclusion criteria: The research excluded patients who met the following characteristics, which were utilized as exclusion criteria for individuals with IBS. Alarm symptoms include symptoms that begin after the age of 50, significant weight loss of more than 5 kg in a month, hematochezia (Blood in the stool), dysphagia (Difficulty swallowing), gastrointestinal bleeding, painless chronic severe diarrhea, symptoms that worsen at night, and acute or progressive symptoms in individuals with a family history of colon cancer. Patients who have had angina pectoris, acute myocardial infarction, or coronary artery bypass surgery in the preceding 6 months are often on pharmaceutical treatment, which might potentially affect their laboratory findings. Recent antibiotic use during the last month. Inflammatory bowel syndrome. Present liver pathology. Hypothyroidism and hyperthyroidism. Taking antidepressant medication. Experiencing an ischemic foot ulcer or amputation.

Methods: Recording the patient's background, such as their age, gender, and any medications they have taken in the past for an ongoing illness. A questionnaire was made to test for sadness, worry, and stomach pain. A full medical checkup. Investigations in the lab: Full blood count and kidney function test: Urea in the blood (mg/dl). Creatinine in the blood (mg/dl), eGFR (ml/min/1.73m2) (CKD-EPI creatinine calculation) (Farrington K., *et al*, 2016). Perform the liver function test in its entirety: Serum albumin (g/dL), total bilirubin, direct and indirect bilirubin (mg/dL), SGOT (U/L), and SGPT (U/L). HbA1c%, fasting blood sugar (mg/dL), and 2h postprandial blood sugar (mg/dL). Phosphorus (mg/dL) and calcium (mg/dL). Parathyroid hormone (PTH) (pg/mL), CRP (mg/L), and TSH (u/L) are as follows: Pelvi-abdominal ultrasound.

Results

(Table 1): IBS in hemodialysis group was significantly (59%) in comparison to non-hemodialysis CKD group (44%). The depression prevalence rate in hemodialysis group was (55% mild, 6% moderate 3% severe) and for non-hemodialysis CKD group was (41% mild, 4% moderate,2% severe) with no significant difference between two groups (P =0.110). The anxiety prevalence rates were significantly higher in hemodialysis group (38% No, 53% minor, 9% major) in comparison to non-hemodialysis CKD group (59%No, 36%minor, 5% major) (P= 0.011)

(Table 2): the distribution of participants according to pelvi-abdominal US was: Group A, (13%) had Hepatobiliary abnormality, (74%) pelvic abnormality, (83%) Distension colon, and (12%) had other findings especially gynecological one. Group B, (21%) had Hepatobiliary abnormality, (69%) pelvic abnormality, (89%) Distension colon, and (9%) had other findings especially gynecological one

(Table 3): IBS was identified in 59 patients (17.1%) in the HD cohort; of these patients, 30 (50.8%) were male and 29 (49.2%) were female. In the HD group, the average age of patients diagnosed with IBS was 42.49 ± 12.93 years, whereas the average age of patients without IBS was 43.24 ± 12.03 years (P = 0.769). Diabetes mellitus (DM) and hypertension (HTN) were substantially more prevalent in patients with IBS who were prescribed HD (group A). The

study found that HD patients (group A) with IBS had substantially higher levels of depression and anxiety than those without IBS (p<0.001 and p<0.029, respectively). No statistically significant differences were observed in the following parameters in our study: hemoglobin, blood urea, serum creatinin and eGFR, SGPT and SGOT, serum albumin and bilirubin, serum calcium and phosphate, FBG, 2HR, HBA1c, and PTH.

Table 1: Comparison between IBS, depression and anxiety in all studied groups according to

Parameter	Group A (n = 100)		Group B (n = 100)		χ^2	P
	No.	%	No.	%		
IBS						
No	41	41.0	56	56.0	4.504*	0.034*
Yes	59	59.0	44	44.0		
Depression						
No depression	36	36.0	53	53.0	5.946	0.110
Mild depression	55	55.0	41	41.0		
Moderate depression	6	6.0	4	4.0		
Severe depression	3	3.0	2	2.0		
Anxiety						
No anxiety	38	38.0	59	59.0	8.936*	0.011*
Minor anxiety	53	53.0	36	36.0		
Major anxiety	9	9.0	5	5.0		

IBS: irritable bowel syndrome.

Table 2: Pelvic abdominal US finding in studied groups

Parameter	Group A(n = 100)	Group B (n = 100)
Hepatobiliary abnormality	13%	21%
A pelvic abnormality	74%	69%
Distension colon	83%	89%
Others	12%	9%

Table 3: The table shows relation between IBS and different parameters in hemodialysis group

Parameters	IBS				Test of Sig.	P
	No (n= 41)		Yes (n= 59)			
	No.	%	No.	%		
Sex						
Male	17	41.5	30	50.8	χ^2=0.85	0.355
Female	24	58.5	29	49.2		
Age (years)						
Min. – Max.	23.0 – 70.0		20.0 – 71.0		t=0.294	0.769
Mean ± SD.	43.24 ± 12.03		42.49 ± 12.93			
DM						
No	38	92.7	43	42.9	χ^2= 6.163*	0.013*
Yes	3	7.3	16	27.1		
HTN						
No	27	65.9	25	42.4	χ^2= 5.343*	0.021*
Yes	14	34.1	34	57.6		
Depression						
No depression	24	58.5	12	20.3	χ^2= 15.319*	^{MC}p <0.001*
Mild depression	15	36.6	40	67.8		
Moderate depression	1	2.4	5	8.5		
Severe depression	1	2.4	2	3.4		
Anxiety						
No anxiety	22	53.7	16	27.1	χ^2= 7.275*	^{MC}p= 0.029*
Minor anxiety	17	41.5	36	61.0		
Major anxiety	2	4.9	7	11.9		
Systolic (mmHg)						
Min. – Max.	110.0 – 150.0		110.0 – 160.0		t=0.632	0.529
Mean ± SD.	131.22 ± 10.29		132.69 ± 12.99			
Diastolic (mmHg)						
Min. – Max.	70.0 – 110.0		70.0 – 110.0		t=0.432	0.667
Mean ± SD.	82.68 ± 10.25		83.56 ± 9.78			
Hb (g/ dl)						
Min. – Max.	8.30 – 12.0		7.50 – 12.0		t=1.353	0.179
Mean ± SD.	10.02 ± 0.97		9.73 ± 1.08			
TLC (10^3/ µL)						
Min. – Max.	4.10 – 9.20		3.40 – 11.0		U= 1136.0	0.606
Mean ± SD.	6.20 ± 1.45		6.51 ± 2.05			

PLT (10^3/ µL)				
Min. – Max.	149.0 – 432.0	150.0 – 455.0	t=0.471	0.638
Mean ± SD.	224.44 ± 55.95	230.02 ± 59.69		
CRP (mg/L)				
Min. – Max.	11.0 – 27.0	11.0 – 48.0	U= 961.50*	0.039*
Mean ± SD.	11.73 ± 2.55	14.03 ± 6.24		
Serum creatinin (mg/dl)				
Min. – Max.	1.60 – 12.0	1.60 – 14.0	U= 1101.50	0.449
Mean ± SD.	7.03 ± 2.22	7.50 ± 2.34		
Blood urea (mg/dl)				
Min. – Max.	60.70 – 183.0	54.0 – 203.0	t=0.628	0.531
Mean ± SD.	121.41 ± 27.60	125.48 ± 34.53		
eGFR(ml/min/1.73m2) Min. – Max.	9.07 – 35.10	9.06 – 30.10	U= 1077.50	0.355
Mean ± SD.	11.40 ± 4.79	10.53 ± 3.32		
SGPT (U/L)				
Min. – Max.	19.0 – 54.0	19.0 – 38.0	U= 1023.50	0.187
Mean ± SD.	27.07 ± 8.35	24.85 ± 6.07		
SGOT (U/L)				
Min. – Max.	22.0 – 48.0	22.0 – 47.0	U= 1203.50	0.964
Mean ± SD.	26.37 ± 6.51	25.11 ± 4.84		
serum albumin (g/dl)				
Min. – Max.	3.10 – 4.90	3.10 – 4.70	t=0.351	0.726
Mean ± SD.	3.89 ± 0.37	3.91 ± 0.37		
T. bilirubin (mg/dl)				
Min. – Max.	0.20 – 1.40	0.20 – 1.30	U= 1124.50	0.549
Mean ± SD.	0.87 ± 0.31	0.82 ± 0.32		
Direct bilirubin (mg/dl)				
Min. – Max.	0.10 – 0.20	0.10 – 0.20	t=0.004	0.997
Mean ± SD.	0.16 ± 0.05	0.16 ± 0.05		
Indirect bilirubin (mg/dl)				
Min. – Max.	0.30 – 0.70	0.30 – 0.70	t=1.262	0.210
Mean ± SD.	0.56 ± 0.15	0.53 ± 0.15		
Ca(mg/dl)				
Min. – Max.	7.20 – 8.21	7.50 – 8.20	U= 1108.0	0.476
Mean ± SD.	7.37 ± 0.58	7.44 ± 1.12		
PO4 (mg/dl)				
Min. – Max.	3.30 – 6.10	2.76 – 6.10	t= 0.061	0.951
Mean ± SD.	5.23 ± 0.82	5.24 ± 0.99		
Mean ± SD.	5.46 ± 0.81	5.73 ± 1.14		

DM: diabetes mellitus, HTN: hypertension, Hb: hemoglobin TLC: total leucocytic count PLT: platelet CRP: C-reactive protein, S. Cr: serum creatinine, S. urea: serum urea, e. GFR: estimated glomerular filtration rate SGPT: Serum glutamic pyruvic transaminase, SGOT: Serum glutamic oxaloacetic transaminase S. Albumin: serum albumin, T. bilirubin: total bilirubin Ca: calcium, P: phosphorus, FBS: fasting blood sugar, 2Hr: two hours post prandial, HbA1c: hemoglobin A

Discussion

IBS is among the most prevalent functional chronic gastrointestinal disorders. In addition to abdominal pain and distress, IBS is distinguished by recurrent episodes of constipation and diarrhea. IBS is diagnosed in accordance with the Rome IV criteria. **(**Defrees DN., *et al*, 2017) [5]. IBS is a gastrointestinal disorder distinguished by recurrent and persistent abdominal discomfort, constipation, diarrhea, and abdominal bloating. Irregularities in the brain-gastrointestinal axis, altered bowel reactivity (Secretion, motility), and visceral hypersensitivity are hypothesized to play a significant role in the pathogenesis of IBS, despite the lack of certainty behind this. (Sobrado CW., *et al*, 2018) [34], IBS patients may experience stress-induced exacerbation of symptoms, which could potentially be associated with psychiatric disorders. (Helvaci MR., *et al*, 2009) [17].

CKD is one of the most debilitating conditions worldwide, with a global prevalence rate ranging from 8% to 16% in 2013 to 11% in 2016. Complaints affecting the gastrointestinal system are frequently reported by individuals diagnosed with CKD. **(**Hill NR., *et al*, 2016) [18]. Psychiatric problems, such as anxiety, often occur along with most chronic diseases, including chroni CKD. To evaluate the levels of anxiety and depression, the Hamilton Depression Rating Scale and Hamilton Anxiety Rating Scale were employed. (Kahvecioglu S., *et al*, 2005) [21].

<text> The objective of our research was to ascertain the prevalence of irritable bowel syndrome and its associated factors in patients with chronic kidney disease undergoing hemodialysis. A study was conducted on a cohort of 200 patients who were receiving hemodialysis. The individuals were chosen from the internal medicine department's dialysis units at Tanta University hospitals, namely from the outpatient category The patients were divided into two groups: group A consisted of 100 patients with (Also called CK undergoing hemodialysis, whereas group B consisted of 100 patients with CKD receiving non-hemodialysis treatment. Regarding the study design, all patients in our study underwent a comprehensive assessment, which included obtaining a detailed medical history, conducting a thorough clinical examination, performing a pelvi-abdominal ultrasound, and conducting various laboratory

investigations. These investigations encompassed a complete blood count, liver function test, kidney function test, measurement of serum calcium and phosphorus levels, fasting blood sugar test, 2-hour postprandial blood sugar test, measurement of HbA1c levels, TSH test, PTH test, and CRP test.

The diagnosis of IBS for all patients was based on the ROME IV criteria. The presence of depression and anxiety was assessed using the Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A).

In our study there were in hemodialysis group male were represent by (47%) and female by (53%) and in non-hemodialysis CKD group male were represented by (53%) and female by (47%) with (P=0.396) which is not significant. In agreement with our study, the study by (Kemppinen, *et al*., 2020) [23] which was studying the factors affecting the frequency of IBS in hemodialsis patients. There was significant difference between the two groups (p =0.564).

Also (Fiderkiewicz, B. *et al*., 2011) [10] agreed with our study regarding to gender. This study was concerned with factors affecting IBS in hemodialysis patients found that there were 169 patients without IBS and 27 with IBS 14 of the patients diagnosed with IBS were female and 13 were male and for patients without IBS number of male to female was 105/64 without significant p value with (0.168).

Our study did not agree with study by (Afsar, B. *et al*., 2010) [1] which studied Irritable bowel syndrome in haemodialysis to evaluate prevalence and its effect on quality of life. Which found significant p value with (0.008) between two studied groups regarding to gender.

According to age in our study the mean age of hemodialysis group (42.80±12.51) and non-hemodialysis CKD group was (45.87 ± 13.91) with no statistically significant difference was found between the groups (p =0.102). In agreement with (Ozkan, G. *et al*, 2012) [26] and (Fiderkiewicz, B. *et al*, 2011) [10] studies, our study had another agreement with (Afsar, B. *et al*., 2010) [1] study, it revealed the mean age of patients with IBS was (53.1 ± 13.9) and the mean age of those without IBS was (50.7± 15.4) with no statistically significant difference between the studied groups (P = 0.248).

Our study contradicted the findings of Özkulm *et al*. (2020) [27] regarding age. It observed a statistically significant difference between the two studied groups.

The higher incidence rates of IBS in females can be attributed to several factors. Firstly, women tend to seek medical attention more often than men, which increases the likelihood of IBS diagnosis. Secondly, women are more susceptible to psychological stress, which can exacerbate IBS symptoms. Additionally, female hormones have an impact on visceral sensitivity and can lower the pain threshold, making women more prone to experiencing IBS-related discomfort. Lastly, differences in serotonin levels in the central nervous system may also contribute to the gender disparity in IBS rates.

In our study IBS was significantly higher in hemodialysis group (59%) in comparison to non-hemodialysis CKD group (44%) which detected by using the Rome IV criteria.

(Afsar *et al*. 2010) [1] reported that 29.2% of 236 dialysis patients were diagnosed with IBS according to the Rome IV diagnostic criteria. In another study of 128 dialysis patients by (Kahvecioglu *et al*., 2005) [21], 44.5% of patients had IBS. And (Kemppinen, *et al*., 2020) [23] study showed that IBS was (27%) in hemodialysis patients. We think that the variation in prevalence rates between the present research and other studies is due to differences in the patients' knowledge about expression of their symptoms

In this current study we had found depressive symptoms in a significant percentage of patients more than (64%) among those in dialysis and (47%) among those in non-hemodialysis CKD group. The depression prevalence rate in hemodialysis group was (55% mild, 6% moderate 3% severe) and for non-hemodialysis CKD group was (41%mild, 4% moderate,2% severe) with no significant difference between two groups (P =0.110).

When we compared our result with **(**Hawamdeh, S. *et al*, 2017) [16] which was interested with determination and prevalence of depression in patients with chronic renal disease, there was agreement with our result, as the depression represented by (8% mild, 26% moderate, 8% severe) and for non-hemodialysis CKD group (33%mild, 15% moderate and 8% severe) without significant difference between the studied groups.

Our result did not agree with (Javadi, A.*et al*, 2018) [15] The research examined the prevalence of sadness and anxiety in individuals with chronic renal disease who undergo hemodialysis. When analyzing the factors of depression, it was found that out of the hemodialysis patients, 14 (35%) experienced maximum mild depression, compared to 34 (85%) persons in the control group. In terms of the moderate depression-severe index, 26 (65%) hemodialysis patients experienced it, while only 6 (15%) individuals from the control group did. The difference between the two groups was statistically significant ($p<0.001$). The disparity might perhaps be attributed to the fact that the research done by Javadi, A. *et al* was a limited case control study including a sample size of just 40 patients.

The variation in the occurrence of depression and anxiety observed in our study compared to previous studies could potentially be attributed to the disparity in the duration of IBS. It has been suggested that anxiety is linked to IBS in the short term, whereas depression is more prevalent among patients with chronic IBS.

(Cole *et al*. 2006) [4], reported that 12.8% of IBS patients on regular hemodialysis were diagnosed with depression, while depression was present in 6% of individuals without IBS.

In our study, we had found anxiety symptoms in a significant percentage of patients more than (62%) among those in dialysis and (41%) among those in non-hemodialysis CKD group with significant p value (p=0.011).

Our study agreed with (Javadi, A. *et al*., 2018) [15] In relation to the anxiety variable, there were 23 hemodialysis patients (57.5%) who had maximal mild anxiety, compared to 33 persons (82.5%) from the control group. In terms of moderate to severe anxiety, there were 17 hemodialysis patients (42.5%) vs 7 individuals (17.5%) from the control group (p=0.015). Neither abdominal nor colonic imaging tests are likely to reveal the structural abnormalities that explain symptoms of IBS in patients with no alarm features.

Our study showed that the distribution of participants according to pelvi-abdominal US was: Group A**,** (13%) had Hepatobiliary abnormality, (74%) pelvic abnormality, (83%) Distension colon, and (12%) had other findings especially gynecological one. Group B**,** (21%) had Hepatobiliary abnormality, (69%) pelvic abnormality, (89%) Distension colon, and (9%) had other findings

especially gynecological one. Abdominal ultrasound failed to reveal any serious intra-abdominal pathology. Although abnormalities were detected in our patients, findings did not change a diagnosis.

Our results had some similarity with the study by (Francis, *et al*., 1996) [11], revealed that (28%) of IBS patients had Hepatobiliary abnormality, and (18%) had gynecological abnormalities.

The clinical data of our study included mean of systolic blood pressure in CKD with hemodialysis group and CKD without hemodialysis group was (132.09 ± 11.93, 128.68 ± 12.03) respectively with significant difference p=0.045, and for diastolic blood pressure was (83.20±9.94, 82.48±7.71) respectively with no significant difference p=0.56

These results were consistent with **(**Özkul, *et al*., 2020) [27], in relation to diastolic blood pressure (p=0.45). However, our findings did not align with theirs in terms of systolic blood pressure (p=0.33). The discrepancy may be due to varying durations of hypertension history and the use of different antihypertensive medications.

In our study mean values of platelet counts in hemodialysis group was significantly lower than non-hemodialysis CKD group (p<0.001). As study showed that the mean of platelets in hemodialysis group was (227.73± 57.97) in comparison with non-hemodialysis CKD group was (256.93± 60.48)

(Kahdina, M. *et al*., 2018) [20] was in agreement with our study, it revealed that the platelet count was significantly lower in hemodialysis patients with IBS. The probable cause for a low normal platelet count among chronic hemodialysis patients is likely to be due to platelet degranulation and adherence in the dialyzer.

As regarded to hemoglobin level in our study, there was no statistically significant difference between the studied groups (p=0.66). Similar results were obtained in (Afsar *et al*. 2010) [1] study performed among HD patients in which no significant association was found between laboratory findings and IBS

In our study, mean creatinine level was significantly higher in hemodialysis group (7.31 ± 2.29) in compared to non-hemodialysis CKD group (2.81 ± 1.16) (p = 0.001).

Our results were agreed with (Lai, S. *et al*., 2016) [24] which compared the kidney function between hemodialysis and non-hemodialysis CKD group patients with CKD showed S. creatinine level was markedly elevated with mean (9.6 ± 1.4 mg/dl) in hemodialysis group compared to non-hemodialysis CKD group (1 ±0.16 mg/dl) which was highly significant (P=0.0001). While there was a disagreement with (Yılmaz, *et al*., 2021) [39] study, it showed no significant difference between studied groups regarding to creatinine (p=0.085). this disagreement due to its single-center nature, and their patients had been undergoing regular hemodialysis for more than 3 years.

In current study, mean urea level in hemodialysis group was significantly higher (123.81 ± 31.78) in compared to non-hemodialysis CKD group (67.87 ± 25.92) (p<0.001).

However, (Yılmaz, *et al*., 2021) [39] had a different results regarding to urea level in IBS patients on dialysis, the mean S.Urea level in hemodialysis group was (72.35 ± 12.26) and (69.77 ± 17.62) in non-hemodialysis CKD group which was non statistically significant (p=0.056).

eGFR which is known to be a sensitive indicator of renal function in patients with CKD, in our study hemodialysis group had a markedly lower estimated glomerular filtration rate in comparison with non-hemodialysis CKD group with statistically significant result between two groups (p<0.0001). In agreement with (Verberne, W. *et al*., 2018) [38] showed similar result to our finding Which mean value of eGFR in hemodialysis group was (13.3 ±4.3) and in non-hemodialysis CKD group was (15.6±5) (p<0.0001)

Liver enzymes are serum glutamic-pyruvic transaminase ALT and serum glutamic-oxaloacetic transaminase AST. Our study reported mean ALT (19.0 – 54.0) in hemodialysis group and for non-hemodialysis CKD group it was (21.0 – 45.0) with (P=0.326) which is not significant, and for AST it was (22.0 – 48.0) in hemodialysis patients and in non-hemodialysis CKD group patents it was (16.0 – 42.0) with significant value (p<0.001). This result may be due to that IBS has an impending adverse effect on serum liver enzymes AST and its components possibly due to its effect on nutrient absorption, food digestion, or dietary pattern (Gadour, *et al*., 2021) [12] against to our study (Shittu, M. *et al*., 2014) [33], it reported mean ALT (7.1± 6.6) in hemodialysis group and for non-hemodialysis CKD group it was (17.1 ± 5) with (p<0.001) and for AST it was (17.1 ± 7.1) in hemodialysis patients and in non-hemodialysis CKD group patents it was (23.8 ± 3.2) with (p<0.001).

In our study, it was found that both of diabetes mellitus was significantly higher in patients with IBS than those without. DM in IBS patients was 16 (27.1%) but in those without IBS were 3 (7.3%) it is known that gastrointestinal symptoms are known to be more common in patients with DM than in the normal population (Quan *et al*., 2008) [30] Hypertension was significantly higher in patients with IBS than those without, HTN in IBS patients was 34 (57.6%) but in those without IBS were 14 (34.1%).

As regard to DM, In the same line of our study, the study by (Gök, *et al*, 2017) [14] and (Cano *et al*., 2007) [2] showed that DM was higher in IBS patients on hemodialysis. And regarding to hypertension, (Yılmaz, *et al*. 2021) [39] showed the same results, that hypertension was significantly higher in IBS group.

(Afsar, B. *et al*., 2010) [1] The results of our research showed a substantial increase in the prevalence of diabetes mellitus and hypertension among people without IBS compared to those with IBS. The mean value of DM in patients with IBS was 11, but in patients without IBS it was 33. Similarly, the mean value of HTN in patients with IBS was 40, whereas in patients without IBS it was 103. The cause of the higher occurrence of chronic illnesses such as DM and HTN in our patients with IBS is still unknown. However, research has shown that IBS patients may be more susceptible to psychosocial stress and seek medical advice more often for any symptom or physical conditions.

In our research, individuals with IBS exhibited notably elevated sadness and anxiety levels compared to those without IBS (p<0.001 and p<0.029, respectively).The research used the Hamilton Depression Rating Scale and Hamilton Anxiety Rating Scale to assess patients with IBS. The prevalence of depression was found to be 79% among patients with IBS and 41% among persons without IBS. Anxiety symptoms are prevalent in 72% of patients with IBS and in 47% of persons without IBS. In comparison with which had studied gastrointestinal syndromes of IBS in hemodialysis patients, it found that the differences appeared to be unrelated to anxiety or depression.

We could not found a relationship between any laboratory parameter and IBS, except CRP. CRP was significantly

higher in patient with IBS than those without in our patients. Our result agreed with (Poullis *et al*. 2002) [29], it had the same result, there was statistical significant relationship between IBS and CRP.

It can be explained by understanding the role of increased gut inflammation in IBS patients, which is supported by the elevated number of mast cells and T cells found in the gut wall, as well as evidence of immune activation. This can be shown by an elevation in CRP levels (Ringel, *et al*. 2013) [31].

No statistically significant correlation between hemodialysis duration and incidence of irritable bowel syndrome was seen in our research. There was no correlation between the length of time a patient spent on dialysis and the frequency of irritable bowel syndrome (IBS), according to a study of dialysis patients (Drossman *et al*., 2002) [6]. Patients who received dialysis for an extended period of time were more likely to get irritable bowel syndrome, according to our research. Additionally, we discovered that a lengthy hemodialysis duration is a distinct risk factor for IBS in our logistic regression study.

Our result showed no statistical significant between the studied groups regarding to PTH or TSH with non-significant p value (0.766, 0.879) respectively. Our result was agreed with **(**Yılmaz, *et al*. 2021) [39] showed the same results, that showed no statistical significant between the studied groups regarding to PTH or TSH with non-significant p value (0.826, 0.679) respectively

It can have explained as the main function of PTH is to increase the concentration of serum calcium and decrease the concentration of serum phosphorus by impacting its primary target organs of bone and kidney, so because our patients had CKD, and they usually under regular supplementation of Vit-D and calcium might help improve the symptoms of IBS patients (Levine, *et al*., 2014) [25]

In our research, we found that more than 80% of individuals with IBS who undergo regular hemodialysis also indicate that dairy, gluten, and fried meals are dietary triggers for their symptoms. It is worth noting that dietary fibers have an association with the development of irritable bowel syndrome symptoms because they influence nutritional absorption, intestinal motility, and stool consistency. Soluble fibers enhance stool pattern, but insoluble fibers may worsen irritable bowel syndrome symptoms because they are poorly absorbed in the stomach.

Our result was in agreement with **(**Spiller, *et al*., 2021) [35] revealed diet type and pattern were affected in IBS symptoms in patients who received regular hemodialysis.

Conclusion

Patients undergoing hemodialysis were more likely to have IBS, according to our research. A greater prevalence of depression and anxiety was observed as well in the hemodialysis group when contrasted with the non-hemodialysis CKD group.

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