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Pain assessment, management and impact among Hemodialysis patients: a study from Tunisia

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Abstract

Introduction Pain is a common complication in patients with end-stage chronic kidney disease, impacting their quality of life. However, the pain experienced by dialysis patients is often overlooked in favor of other issues related to chronic kidney disease and dialysis itself. The study aimed to assess the prevalence, intensity, location, and impact of pain on daily activities in a cohort of chronic hemodialysis patients.

Materials and Methods We conducted a cross-sectional study during November and December 2023. Patients aged 18 years and older, undergoing hemodialysis for at least 6 months, completed an anonymous questionnaire. Socio-demographic and clinical characteristics of the patients were recorded initially, and pain aspects were evaluated using the Brief Pain Inventory.

Results Among the 100 patients surveyed, 78% reported suffering from chronic pain, considered moderate by 57.7% of them. Pain occurred in 89.7% of cases after hemodialysis sessions, was osteoarticular in 71.8% of cases, predominantly in the lower limbs in 94.9% of cases, of mixed type in 71.8% of cases, and caused partial functional impairment in 53.8% of cases. Paracetamol was the most commonly used analgesic (75% of cases).

Conclusion This research confirms the high prevalence of pain among chronic hemodialysis patients and its negative impact on them. Healthcare providers should consistently evaluate pain in dialysis patients. Pain management should be a research priority because pain is a valid and considerable health concern in the increasing chronic kidney disease patient population.

Keywords Chronic pain, Hemodialysis, Symptom assessment

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Introduction

Chronic kidney disease (CKD) represents a major public health concern globally and in Tunisia [1, 2] due to its significant mortality rate, high treatment costs, and significantly reduced quality of life [3, 4]. Hemodialysis (HD) remains the most commonly used technique among the replacement therapies for end-stage CKD [5]. In 2022, Tunisia had 12,000 patients undergoing chronic HD treatment [6].

While this treatment is effective, many complications can occur in HD patients. These may include low blood pressure, muscle cramps, nausea, vomiting, heart arrhythmias, bleeding or bruising at the vascular access site (fistula or catheter), and post-dialysis fatigue [7].

Pain is a common complication in patients with end-stage CKD, affecting their quality of life [8]. A 2016 systematic review of 52 studies involving 6917 participants found that the prevalence of acute and chronic pain in chronic HD patients was 82% and 92%, respectively [9].

However, the pain in dialysis patients is often overlooked in favor of other issues such as various complications of end-stage CKD and dialysis itself. In fact, healthcare professionnels often focus on other HD complications and neglect this real problem.

Given the lack of data on pain in HD patients, we undertook this study to assess the prevalence, intensity, localisation and impact of pain on daily activities in a cohort of Tunisian chronic HD patients.

Materials and methods

Study design

A cross-sectional study was conducted at the university hemodialysis center of Sousse. The study was approved by the Ethics Committee of the Faculty of Medicine of Sousse under the reference number CEFMS 251/2023.

Inclusion and exclusion criteria

Patients included were 18 years old and above. They had been on HD for at least 6 months and had consented to participate in the study. Patients who were absent during data collection and those presenting any kind of disability that could interfere with data collection were not included in the study such as neurological diseases and cancers.

Data collection was conducted during November and December 2023. We included exhaustively all HD patients at the center during the data collection period who met the inclusion and exclusion criteria. The patients anonymously responded to the questionnaire on the day of dialysis.

The data collection method

Our research used a questionnaire comprising two sections.The first section included socio-demographic data of the patients, informations related to the nephropathy and to dialysis and informations concerning the pain if expressed (type, timing, frequency, relationship with dialysis sessions and diet and impact on daily life). The second section contained an Arabic version of the Brief Pain Inventory (BPI) questionnaire. The BPI [10] assesses pain localization (head, trunk, upper and lower limbs) using a diagram representing the human body, the intensity of current and past 24-hour pain, types of pain, management treatments used, evaluation of pain relief from these treatments, and the functional interference of pain in daily activities.

The first four items of the BPI are used to assess the intensity of pain on a numeric scale from 0 to 10. The number 0 represents "no pain" and the number 10 represents "the worst pain imaginable". Pain intensity is defined as follows: 0 = No pain, ≤ 3 = Mild pain, 4–6 = Moderate pain and 7–10 = Severe pain. A single item is used to indicate the percentage of improvement achieved after using a treatment or medication for pain. 0% corresponds to "no improvement" and 100% corresponds to "complete improvement". The other seven items measure the interference of pain with seven daily activities, including general activity, walking, work, mood, enjoyment of life, relations with others, and sleep, using numbered scales from 0 to 10 similar to the scales mentioned earlier. However, in this case, the number 0 corresponds to "no interference" and the number 10 corresponds to "completely interferes" [11].

The BPI was used in this study given its validation in CKD patients [12]. A pre-test was conducted with ten randomly selected participants. These ten patients easily answered the questionnaire, allowing us to retain it without any modifications.

Statistical analysis

Statistical analysis was performed using SPSS 17.0 software. Descriptive statistics were calculated, including frequencies and percentages for categorical variables.

Results

We gathered 100 chronically HD patients who agreed and responded to our questionnaire.

The average age of the patients was 52.13 years old with a predominant age group between 31 and 60 years old. The female to male ratio was 1.22.

Of the 100 patients, 84 were followed for CKD, half for more than 10 years. The remaining 16 patients were diagnosed with end-stage CKD at baseline. Diabetes and hypertension were the most frequent comorbidities, and diabetic nephropathy was the most frequent initial nephropathy. Only one patient had ever received a kidney transplant.

Table 1 Comorbidities, initial nephropathy and dialysis vintage of the patients (*N* = 100)

	Number and %
Comorbidities	HTN (40), diabetes mellitus (30), arthrosis (16), hyperparathyroidism (11), anemia(17), stroke (3), asthma (5).
Surgical history	parathyroidectomy (9), nephrectomy (6), appendicectomy (9), cesarian Sect. (12), kidney transplant (1), lower limb amputation (1)
Initial nephropathy	Diabetic (25), hereditaty (11), glomerular (7), vascular (15), interstitial (12), lupus (1), undetermined (29)
Dialysis vintage	1–5 years (45), 5–10 years (49), > 10 years (6)

HTN: hypertension

Table 2 Relationship with dialysis and diet, nature, timing, frequency and impact of pain in HD patients (*N* = 78)

Variable	Effective (*N*)	Percentage (%)
Relationship with dialysis and diet	31	39.7
During puncture of the AVF	11	14.1
During the dialysis session	70	89.7
After the dialysis session	44	56.4
After a high potassium diet		
Pain nature	56	71.8
Osteo-articular	30	38.5
Intermittent claudication of the lower limbs	35	44.9
Gastrointestinal pain	45	65.4
Headache	6	7.6
Peripheral neuropathy		
Pain timing	51	65.38
Day	17	21.79
Night	10	12.82
Mixed		
Pain frequency	20	25.64
Daily	9	11.53
Constant	41	52.56
Intermittent	8	10.25
Rare		
Impact of pain on daily life	8	10.25
Pain leads to disability	40	51.28
Pain causes partial functional impotence	10	12.82
Pain causes total functional impotence	20	25.64
Pain has no significant impact on daily life		

AVF: arterioveinous fistula

Table 1 provides an overview of the comorbidities, initial nephropathy and dialysis vintage of the patients.

Presence, relationship with dialysis and diet, type, Timing, frequency and impact of pain

Among the 100 patients in the study population, 78 reported experiencing chronic pain. As shown in Table 2, pain in dialysis patients was mainly (89.7%) felt after the end of the dialysis session and was of osteoarticular nature in the majority of cases (71.8%). Half of the patients described the pain as intermittent, with 51 experiencing it during the day. It caused partial functional impairment in half of the patients, while it had no significant impact on daily life for 25% of them.

Table 3 Frequency of analgesic use in HD patients experiencing pain (*N* = 60)

Frequency of analgesic use	Effective(*N*)	Percentage (%)
Seldom	19	31,7
Frequently (> 4 times/week)	29	48,3
Daily	12	20,0
Total	60	100,0

Pain managment

Medication use for pain was identified in 60 patients experiencing pain (76%). Paracetamol, taken by patients without a prescription, was the most commonly used analgesic (75% of cases), the remaining patients were taking tramadol as prescribed by a doctor. As shown in Table 3, half of the 60 patients frequently took analgesics.

Brief Pain Inventory (BPI) - pain questionnaire

This questionnaire revealed that patients experiencing pain rated their pain from moderate to intense in 71% of cases. At the time of the questionnaire, which was on the day of dialysis, half of the patients had pain ranging from mild to intense, with the most intense pain located in the lower limbs. Painkillers have only resulted in a significant improvement in pain for 23% of the patients experiencing pain (see Table 4). Patients reported greater pain relief with tramadol than with paracetamol.

Functional impairment in walking ability due to the pain was significant in our patients, at 4.69/10. In terms of social and family repercussions, pain had little impact on relationships with others, with an average of 3.73/10. Taste for life was the psychological impact most reported by our patients, reaching an average of 4.71/10.Pain interferences, as measured by the BPI, are shown in Table 5.

Discussion

Pain in HD is poorly recognized and an under-reported problem. In the current study, we focused on examining the prevalence, localization, intensity, and functional interference of pain on the daily activities of a cohort of Tunisian patients with chronic HD.

Our study's high prevalence results of pain are consistent with other studies evaluating HD patients with CKD [13–19]. These studies report a pain prevalence ranging from 38% [17] to 95.6% [19].

Pain is widely accepted as a complex, multidimensional, subjective phenomenon, characterized by significant

Table 4 Brief pain inventory, characteristics of pain in HD patients (*N* = 78)

Variable	Effective (*N*)	Percentage (%)
Pain Intensity	24	30.76
Mild	46	58.97
Moderate	8	10.25
Severe		
Most intense pain experienced in the past 24 h	5	6.41
No pain	11	14.10
Mild pain	35	44.87
Moderate pain	27	34.61
Severe pain		
Least pain experienced in the past 24 h	12	15.38
No pain	47	60.25
Mild pain	14	17.94
Moderate pain	5	6.41
Severe pain		
Pain at the time of data collection	37	47.43
No pain	19	24.35
Mild pain	14	17.94
Moderate pain	8	10.25
Severe pain		
Location of most intense pain	63	79
Lower limb	24	30
Abdomen	45	56
Head	29	36
Shoulders	25	31
Upper limb	23	29
Back	8	10
Neck		
Improvement achieved following treatments this week	7	10.25
	21	33.33
No improvement	33	42.2
Slight improvement	17	21.79
Moderate improvement		
Significate improvement		

Table 5 Pain interferences in Hemodialysis patients experiencing pain (*N* = 78)

	Sub- dimensions and items	Average	Standard Deviation	Min-Max
Pain interference	**Functional disability**			
	A-General activity	4.41	2.17	0–8
	C-Walking	4.69	2.46	0–8
	D-work	5.09	2.77	0–9
	Social and familial impact			
	E-Interactions with others	3.77	2.41	0–8
	Level of psychological distress			
	B-Mood	2.37	1.86	1–9
	F-Sleep	4.16	2.38	0–10
	G-Enjoyment of life	4.71	2.32	0–8

variability in individuals' reactions and tolerance levels, both from one person to another and within the same person depending on circumstances and contexts [10, 20, 21]. Our findings confirm this complexity, showing a significant variability in how participants experience pain in relation to dialysis.

Participants experienced pain after dialysis in 89.7%, while only 14.1% reported feeling pain during the session. These pains are directly related to dialysis such as headaches and cramps, which occur during or after the session and may be linked to an electrolyte imbalance occurring during dialysis [22], reverse urea effect, and exaggerated cerebral vasodilation due to autoregulation or hormonal abnormalities in response to reduced oxygen during dialysis [23]. These pains related to dialysis could be prevented by a good estimation of dry weight, a minimization of ultrafiltration, an increase in dialysate sodium, a reduction in HD session time, a reduction in blood flow and by supplemental oxygen during the dialysis session [23].

Among our patients, 56.4% reported experiencing pain when they did not adhere to their low-potassium diet, which is consistent with Can and Arda's findings. In their study, dialysis and inadequate diet were found to exacerbate pain in 44.8% and 23% of cases, respectively [24].

Only 39.7% of participants reported feeling pain during the arteriovenous fistula puncture. This pain, often attributed to repeated punctures with large-gauge needles, can vary in intensity depending on the patients and the healthcare provider performing the procedure [22]. Pain would be more common in patients who have had arteriovenous fistulas for less than a year [25].

Physiologically, the body's bone tissue is constantly being replaced, allowing the bones to remain strong and dense. The kidneys convert vitamin D into its active form (calcitriol), which helps regulate the amount of calcium in the blood and the amount used to produce bone tissue. In individuals with kidney insufficiency, the kidneys are no longer able to convert enough vitamin D into its active form, leading to an increase in parathyroid hormone levels. Elevated levels of parathyroid hormone can weaken bones by reducing their density [26]. This would explain osteoarticular pain in 65.4% of our patients. Similarly, Al Harraqui et al.,reported that low back pain had an osteoarticular origin in 68.1% of their patients, respectively [27].

In 44.9% of our surveyed patients, the pain was gastrointestinal. This percentage exceeds that observed by Al Harraqui et al. [27] where digestive pain was present in only 9% of patients.

In our series, 65.38% of the patients reported experiencing pain during the day, while 21.79% mentioned episodes of nocturnal pain. According to Gamondi et al.'s findings, 36% of their cohort reported being awakened several times a week due to the pain [13].

Among our patients, 52.56% described the pain as intermittent, while 25% classified it as daily, 10.25% as rare, and only 11.53% as constant. These findings bear

similarities to those of El Harraqui et al. (27), where the pain was intermittent in 48.4% of participants, daily in 25.64%, rare in 10.25%, and constant in 11.53%.

Regarding the impact of pain on daily life, we found that it resulted in partial functional impairment in half of our patients. In the study by El Harraqui et al. [27], a limitation in general activity was observed in 65.1%, which aligns with our findings.

Pain management in renal patients is challenging due to the narrow margin between pain relief and toxicity [28].

Our findings highlight this challenge, as a significant proportion of patients (76.9%) receiving HD who were experiencing pain were using medications to alleviate it. According to previous studies [29], fewer than half of HD patients were on medication to combat pain. In our study, we noticed that 75% of our patients primarily used paracetamol as an analgesic. This percentage aligns closely with the findings of Marzouq et al. [30], where 56.3% of participants used paracetamol.

Around half of the participants took painkillers frequently (4 times a week), 20% took them daily, and 31.7% rarely, correlating with similar findings in the study El Harraqui et al.in which, the frequency of usage was reported at 44% for frequent intake, 28% for daily intake, and 28% for rare intake [27].

In our study, 42.2% of surveyed patients reported partial effectiveness of analgesics. The pain level remained unchanged for 50% of patients in the study by El harraqui et al. [27]. This observation can be explained by a lack of precise understanding of how chronic pain works, which hinders the correct prescription of analgesics for patients undergoing HD [21].

Interestingly, a significant difference in the perceived effects of analgesics was observed between our study and that of Marzouq et al. In their study, only 3% of patients reported a 50% pain relief with analgesics [30]. However, in our sample, 21.79% experienced a significant pain relief with the analgesic. This variability in analgesic response among HD patients emphasizes the importance of individualized pain management approaches.

This challenge of prescribing analgesics in HD patients could be addressed by using a combination of treatments. Indeed, pain is rarely managed with only one type of therapy. This approach is called « multimodal » pain management. This may include the use of medications, injection therapies, massage, physical therapy, acupuncture and more [31].

In our study, it was observed that pain was particularly intense in the lower limbs for the majority of participants, with a percentage of 94.9%, while it was also frequently reported in the head by 71.8% of the respondents. In the study conducted by Yeşil et al. on HD patients, complaints of pain were mainly associated with headaches (58.5%), lower limb pain (39.6%), and pain induced by cramp-like contractions (52.8%) [32].

Similarly, in the Can and Arda series, it was observed that patients experienced higher levels of pain in the lower limbs in 36.8% of cases, in the head in 29.9% of cases, and in the upper limbs in 11.5% of cases [24]. The greater intensity of pain in the lower limbs of patients in our study may be explained by the high frequency of peripheral neuropathy and arteripathy in these predominantly diabetic patients, and also by the cramps in the lower limbs that occur after HD sessions.

Regarding the intensity of the pain, most patients had moderate pain, accounting for 58.97%, this rate is close to that found in the study conducted by Dreiher J et al., where the proportion of patients experiencing moderate pain was 43.3% [33].

Approximately half of the surveyed population, 47.43%, stated that they did not experience any pain during the data collection, which coincided with their dialysis session. In the study conducted by Gamondi et al., the majority of the participants, 68%, reported not feeling any pain at the time of the questionnaire [13].

Recognizing that pain has a negative impact on patients' quality of life and psychoemotional state is essential [17]. As part of our study, the use of the Brief Pain Inventory interference scales revealed an average of 4.41 out of 10 for functional disability in regular work among patients. This indicates that most patients reported a moderate inability to effectively perform their tasks. In addition, we observed that an average score of 4.69/10 for functional disability in walking capacity among patients indicates a moderate to high level of impact on their ability to walk due to chronic pain. In the study by Boukhira et al., chronic pain caused complete discomfort in usual work for 71.7% and complete hindrance in walking for 68.8% of cases [34].

On a psychological level, the enjoyment of life was the most frequently affected among our patients, with an average score of 4.71/10, indicating a moderate to high level of influence on their emotional state due to chronic pain. These findings align with existing literature showing a link between chronic pain and depressive symptoms in hemodialysis patients, as described in the study by Caravaca et al. [17]. The rates of depression in previous studies were also significant. Indeed, in the study by Kusztal et al., 30.2% of patients exhibted symptoms of anxiety/depression, exceeding a score of 8 on the Hospital Anxiety and Depression Scale (HADS) [35] and the average HADS score was 6 in the study by Shimizu et al. [36].

Sleep problems are prevalent in hemodialysis patients and can affect their quality of life and ability to deal with the illness [37]. In our study, patients averaged a score of 5.04 out of 10, indicating that pain affected their sleep quality to some extent, though not significantly disruptive

on the whole. Nonetheless, Boukhira et al. found complete sleep disruptions in 38.01% of the cases [35].

At the end of this study, we believe that it is essential to adopt a multidimensional and holistic approach to managing pain in chronic hemodialysis patients, considering the physiological, psychological, and social aspects of pain.

In this context, we propose the following recommendations:

In the field of practice:

- Use validated tools specifically adapted to chronic hemodialysis patients to regularly assess the intensity and characteristics of pain in this population.
- Integrate non-pharmacological interventions acupuncture, cognitive behavioral therapy, relaxation techniques, virtual reality, and alternative methods such as transcutaneous electrical nerve stimulation, music therapy, and aromatherapy, to manage pain and improve the quality of life of chronic HD patients.
- Take comorbidities in HD patients into account, as they may contribute to pain. By identifying and effectively treating these comorbidities, the recurrence of pain can be reduced.
- Regularly evaluate the effectiveness of interventions implemented to relieve pain in HD patients.
- Integrate psychological support sessions and social assistance alongside dialysis sessions for HD patients. This approach significantly improves overall care by providing emotional support and practical advice.
- Educate patients on pain management, self-care techniques, and signs that require medical intervention to enhance their autonomy in managing their pain and encourage proactive communication with the medical team.
- Communicate with patients to foster a climate of trust and a better understanding of their pain management needs, encouraging patients to openly express their concerns and pain experiences without judgment.

In the field of training:

- Establish training programs for nurses working in HD units, including the use of validated assessment tools, understanding the specifics of pain in these patients, and the appropriate interventions for this pain.
- Train nurses in empathic communication techniques to improve their interactions with patients, particularly when assessing and discussing pain.

Conclusion

Chronic pain in hemodialysis patients is a topic of significant importance in the healthcare field, yet it is often underestimated and poorly managed. Due to its intensity and significant impact on the daily lives of these patients, this reality poses a major challenge.

Our study has highlighted the importance of assessing pain in chronic HD patients and its repercussions. The findings reveal that the majority of respondents experience pain, primarily felt after dialysis sessions. Furthermore, our research has shown that chronic hemodialysis patients suffer from osteoarticular pain, persistent throughout the day and even at night. Over half of our patients use pain relief medications, especially commonly used paracetamol. Pain had a moderate functional impact, and psychological distress was moderate in terms of mood influence. However, the social and familial repercussions of pain were mild.

Pain in hemodialysis patients thus requires particular attention from healthcare professionals, especially nurses, as they are closest to the patients and play an essential role in enhancing their comfort and well-being. It is crucial to raise awareness among healthcare professionals about this issue, incorporate pain assessment into standard hemodialysis care, and establish management strategies to ensure a good quality of life for this population. Nevertheless, further studies, particularly longitudinal studies are essential to to assess the long-term impact of pain management strategies.

Limitations of the study

- The results of this study cannot be generalized because of the small sample size (100 patients); in fact, this study is the first step of a multicenter study involving HD patients in university and private centers in central Tunisia, the results of which will be available soon.
- It is possible that patients do not communicate their pain accurately, which could influence the results of our study.

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All authors have contributed to the manuscript in significant ways, reviewed, and agreed upon the manuscript. S.M. and S.A. were major contributors in writing the manuscript. R.C. analyzed data, and interpreted the results.

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Data availability
All data for this article are available from the corresponding author and can be provided upon request.

Declarations

Ethics approval and consent to participate

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Consent to publish

The consent to publish from the patient is not applicable.

Competing interests

The authors declare no competing interests.

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