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ORIGINAL ARTICLE

Mindfulness-Based Intervention Performed During Hemodialysis: an Experience Report

Intervenção baseada em Mindfulness realizada durante a hemodiálise: Um relato de experiência.

Intervención basada en la atención plena realizada durante la hemodiálisis: un informe de experiencia.

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Abstract
The increasing prevalence of people with chronic kidney disease (CKD) undergoing hemodialysis is considered a serious worldwide problem. This population has severe functional, psychological, and social limitations, causing suffering for the patient and high costs for the health system. Studies on Mindfulness-Based Interventions (MBIs) have shown positive effects for various mental and physical disorders. Evidence of the effects of MBIs for people with CKD is emerging and programs carried out during hemodialysis sessions are almost nonexistent. The present experience report aims to describe the Hemomindful Program, an MBI for managing stress and promoting quality of life for people with CKD undergoing hemodialysis. It was an 8-week MBI, performed individually, during the hemodialysis sessions. A total of 15 adults undergoing hemodialysis treatment, 7 women and 8 men, with a mean age of 54 years (SD = 14.9) participated in this study. This report aims to describe the theoretical and practical basis of the Hemomindful Program and how it can contribute to managing stress and promoting quality of life. The participants referred to positive benefits of the practice, such as greater awareness of body sensations, emotions, and thoughts, less reactivity to deal with stressful situations, greater acceptance of experiences, feelings of well-being, changes in eating and fluid consumption habits, improved family relationships, and better self-care.

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Resumo

O aumento da prevalência de pessoas com doença renal crônica (DRC) que realizam hemodiálise é crescente, considerado um problema grave a nível mundial. Essa população apresenta muitas limitações funcionais, psicológicas e sociais, gerando sofrimento e custos elevados ao sistema de saúde. Estudos sobre as Intervenções Baseadas em Mindfulness (IBM) apresentam efeitos positivos para de transtornos mentais e físicos. Evidências sobre os efeitos de IBM com pessoas com DRC são incipientes e programas realizados durante as sessões de hemodiálise quase inexistentes. O presente relato de experiência visa descrever o Programa *Hemomindful*, uma IBM para manejo do estresse e promoção de qualidade de vida de pessoas com DRC em hemodiálise. Trata-se de uma IBM com duração de oito semanas, realizada de forma individual, durante as sessões de hemodiálise. Participaram deste estudo 15 adultos em tratamento de hemodiálise, sendo 7 mulheres e 8 homens, com idade média de 54 anos (DP= 14,9). Este relato procura descrever a base teórica e prática do Programa *Hemomindful* e como pode contribuir no manejo do estresse e promoção de qualidade de vida. Participantes referem benefícios positivos da prática como: maior consciência de sensações corporais, emoções e pensamentos; menor reatividade para lidar com situações de estresse, maior aceitação das experiências, sensação de bem-estar, mudanças de hábitos alimentares e no consumo de líquidos, melhor relacionamento familiar e autocuidado.

Resumen

El aumento de la prevalencia de personas con enfermedad renal crónica (ERC) que realizan hemodiálisis es creciente y está siendo considerado un problema grave en el ámbito mundial. Esa población presenta graves limitaciones funcionales, sicológicas y sociales, lo que genera sufrimiento y elevados costos en el sistema de salud. Estudios sobre Intervenciones Basadas en Mindfulness (IBM) presentan efectos positivos para trastornos mentales y físicos. Evidencias sobre los efectos de IBM en personas con ERC son incipientes y programas realizados durante las sesiones de hemodiálisis son casi inexistentes. Este relato de experiencia tuvo por objetivo describir el Programa Hemomindful, una IBM para manejo del estrés y promoción de la calidad de vida de personas con ERC experimentando hemodiálisis. Se trata de una IBM con duración de ocho semanas, realizado de forma individual, durante las sesiones de hemodiálisis. Participaron de este estudio 15 adultos en tratamiento de hemodiálisis, siendo 7 mujeres y 8 hombres, con edad media de 54 años (DE= 14,9). Este relato trata de describir la base teórica y práctica del Programa Hemomindful y cómo puede contribuir para la administración del estrés y promoción de la calidad de vida. Los participantes refirieron beneficios positivos de la práctica, como: mayor consciencia de sensaciones corporales, emociones y pensamientos; menor reactividad para lidiar con situaciones de estrés; mayor aceptación de las experiencias; sensación de bienestar; cambios de hábitos alimenticios y no consumo de líquidos; y, mejor relacionamiento familiar y autocuidado.

Keywords Mindfulness · Chronic kidney disease · Hemodialysis · Stress · Quality of life

Palavras chave *Mindfulness* · doença renal crônica · hemodiálise · estresse · qualidade de vida.

Palabras clave Mindfulness · enfermedad renal crónica · hemodiálisis · estrés · calidad de vida

Introduction

Chronic kidney disease (CKD) is considered a global public health problem, which affects approximately 10% of the world population (Barreto et al. 2016). Due to partial or total loss of kidney function, the patient needs renal replacement therapy, with hemodialysis (HD) being the therapy most used, having a prevalence of up to 93.1% in Brazil (Thomé et al. 2019). The restrictions imposed by CKD and the treatment of prolonged HD negatively affect health, increasing stress and decreasing the quality of life (QoL) (Bello et al. 2017; García-Llana et al. 2014; Sohn et al. 2018). Hemodialysis is a procedure to support kidney function that consists of removing toxic substances and excess fluid from the blood with the help of a machine; this procedure is usually performed 3 times a week, lasting for 3 to 4 h per session (Daugirdas et al. 2015).

Hemodialysis supports life and relieves a series of symptoms; however, it imposes many limitations. Social, financial, and family stressors are numerous when dealing with the symptoms of the disease, restrictions, and treatment prescriptions (Rojas 2017). The patients present reduced functional capacity, compromising self-care, leisure, work, and social activities (Fassbinder et al. 2015). The rates of non-adherence to the diet, fluid consumption restrictions, and medication use are around 30 to 60% in this population (Sohn et al. 2018). Patients commonly feel less in control of their lives, with depressed mood and anxiety (García-Llana et al. 2014; Sohn et al. 2018). Approximately 50% of the people that undergo HD present symptoms of depression and anxiety (Sohn et al. 2018), associated with low QoL, low adherence to treatment, and increased mortality (García-Llana et al. 2014; Sohn et al. 2018).

Research shows positive results from Mindfulness-Based Interventions (MBIs) in reducing symptoms of different chronic diseases and mental and physical disorders such as depression, anxiety (Chiodelli et al. 2020; Murphy 2016), hypertension (Solano López 2018), irritable bowel syndrome, cancer, chronic pain, cardiovascular diseases (Carlson 2012), insomnia (Garland et al. 2014; Ong et al. 2014), addictive behaviors (Bowen et al. 2014), and kidney disease (Bennett et al. 2018; Thomas et al. 2017), and in improving medication adherence (Salmoirago-Blotcher and Carey 2018).

Mindfulness is defined as a process in which the attention is focused on the present moment, being aware of what is going on in the body, mind, and emotions, with a curious, gentle, and non-judgmental attitude (Kabat-Zinn 1990). The first MBI protocol was developed in 1979 by Jon Kabat-Zinn, called Mindfulness-Based Stress Reduction (MBSR), developed with the aim of facilitating adaptation to the stressors of living with chronic diseases (Kabat-Zinn 1990). Mindfulness-Based Interventions integrate cognitive and behavioral skills and Mindfulness meditation practices (Vandenberghe and de Sousa 2006).

Studies show that Mindfulness training can lead to structural and functional changes in the practitioners' brain, affecting specific cerebral regions that act on improving the perception of symptoms and reducing emotional arousal, and facilitating the involvement in health promotion behaviors (Hölzel et al. 2011; Hubbling et al. 2014; Tang et al. 2015). Traditional MBI protocols, such as MBSR (Kabat-Zinn 1990) and

Mindfulness-Based Cognitive Therapy (MBCT) (Segal et al. 2002) are normally offered in groups for 8 weeks, with sessions ranging from 2 to 2.5 h. The majority of the formal practices, performed in a sitting posture or lying down, last for 10 to 30 min each and the formal practice of Mindfulness for 45 min daily is encouraged. Many people are unable to adhere to these models, due to personal characteristics or specific health problems, such as people with chronic pain (Cusens et al. 2010), cancer (Glynn et al. 2020), cognitive problems (Russell and Arcuri 2015), addictive disorders (Bowen et al. 2014), and those with CKD that perform HD (Bennett et al. 2018; Gross et al. 2017; Thomas et al. 2017).

Some researchers have tested the viability of MBIs adapted for people with CKD undergoing HD (Bennett et al. 2018; Gross et al. 2017; Thomas et al. 2017). A randomized clinical trial (RCT) verified the feasibility and effectiveness of an MBSR intervention in reducing symptoms of stress and improving QoL, adapted to a workshop and teleconference format, for patients who were waiting for a kidney or pancreas transplants. The results showed a reduction in symptoms related to stress and that heavy treatment regimens, multiple comorbidities, impaired mobility, time, and travel requirements constituted barriers for adherence to the program (Gross et al. 2017). The participants suggested that Mindfulness meditation practice could alleviate anxiety and pain, which often accompany HD sessions (Gross et al. 2017). Another RCT assessed the feasibility of a brief MBI, with Mindfulness practices of 10 to 15 min durations, during HD sessions to reduce symptoms of depression and anxiety (Thomas et al. 2017). The participants appreciated the intervention and reported subjective improvements such as increased hope, self-confidence, and courage. The intervention format was found to be viable and offered a strategy to provide an MBI in this context, although the efficacy of the intervention for the symptoms of anxiety and depression was not evaluated due to the low sample power (Thomas et al. 2017).

This is an incipient field of research at the international level and almost nonexistent in Brazil. Evidence indicates the need for MBIs to be performed during HD sessions, adapted to the context, to facilitate patient compliance, contribute to the management of the discomfort generated during HD and promote health (Gross et al. 2010, 2017; Thomas et al. 2017; Williams et al. 2015).

The aim of this article is to present the Hemomindful Program, an MBI for managing stress and promoting QoL applied with CKD patients during HD sessions, as well as the theoretical and practical basis of the process of developing Mindfulness skills, based on an experience report.

Methodology

Participants

Participants were recruited from the Hemodialysis Unit of the Nephrology Service of the Clinical Hospital of Porto Alegre (HCPA), in southern Brazil. Inclusion criteria were being 18 years of age or over; receiving HD treatment for at least 3 months; being literate; and having an interest in participating in the study. The exclusion criteria were having a serious psychiatric disorder diagnosed by the HCPA medical team (current psychosis or acute suicidal ideation with intention); severe symptoms of depression or

anxiety; significant cognitive impairment; and having systematically practiced meditation previously.

Instruments

To assess the sociodemographic profile, a questionnaire structured by the research group with questions covering sex, skin color, age, education, housing, and current occupation was used.

The Mini-Mental State Examination (MMSE) was used to screen for cognitive impairments (Bertolucci et al. 1994). The MMSE is composed of questions that correlate in five dimensions: concentration, language/praxis, orientation, memory, and attention, with a maximum score of 30 points. The 23/24 cut-off point is most commonly used, presenting high sensitivity and specificity for detecting cognitive impairment and dementia.

The Depression Anxiety Stress Scale-DASS-21 was used to measure the negative emotional states of depression, anxiety, and stress. It is a self-report scale that contains three subscales scored on a four-point Likert-type response scale, in ascending order of severity and frequency of symptoms. The scale provides three scores, one per subscale, with a minimum of "0" and a maximum of "21." The highest scores in each scale correspond to more negative emotional states (Vignola and Tucci 2014). All the instruments applied were validated for the Brazilian context and presented adequate psychometric properties, with good levels of internal reliability.

The field notes of the research assistants that participated in all the interventions were used, which included information about the environment (e.g., sound or care team interference during the intervention and/or other factors observed) and the motivation and engagement of the participant. The reports regarding the participants' experience, such as bodily sensations, emotions, and thoughts perceived during the practice and exercises, were audio recorded during the sessions, with authorization from the participants.

Procedures

Construction Process of the MBI: Hemomindful Program

For the development of the Hemomindful Program, meetings were held with researchers and professionals that had expertise in the different MBI models. Three professionals also had specialized clinical and field experience in assisting CKD patients undergoing HD. An MBI was performed with nurses and nursing technicians from the unit, who, after participating in the program, collaborated in the study logistics and protocol, making suggestions for its performance during the HD sessions. Meetings, conference calls, and e-mails were used for team communications and alignment of the first version of the Hemomindful Program MBI.

Between April and June 2019, a pilot study was carried out and qualitative evaluations of the process indicated good acceptance and adherence to the Mindfulness practices. The challenges encountered, regarding the intervention context and needs

perceived by the participants, were considered for the design of the Hemomindful Program, presented in this article.

The program was conducted by the researcher that conceived this intervention, who has consolidated meditation practice, 5 years of experience in conducting Mindfulness groups based on Mindfulness-based relapse prevention (MBRP) models for compulsive and reactive behaviors (Bowen et al. 2014) and the "Body-in-Mind Training—BMT neurocognitive framework (Russell 2015). She is qualified in these protocols and received training in Mindfulness reference centers from the teachers that created the programs mentioned above. She has over 15 years of work experience in the health field. For the previous 2 years, she has worked with the multidisciplinary team caring for people with CKD undergoing HD. The performance of the interventions was supervised by other instructors of the referred programs, with greater or equal experience, with special emphasis on Professor Tamara Russell (creator of the BMT program).

Data Collection

The study was presented to the potential participants and those that agreed to participate signed the consent form. Subsequently, an evaluation of the participants was carried out in relation to sociodemographic data, length of HD treatment, cognitive function, and negative emotional states. Those that fulfilled the inclusion criteria were randomized into the control and intervention groups, with the intervention group being the focus of this study.

Qualitative data were collected through field notes and the audio recording of all the Hemomindful Program sessions.

Data Analysis

To characterize the sample, descriptive analyses were performed, with mean and standard deviation values. To analyze the prevalence of negative emotional states, individuals were grouped according to the severity of symptoms of depression, anxiety, and stress, using the cut-off points proposed by the author of the original scale (Lovibond and Lovibond 1995).

In order to facilitate the understanding of the Hemomindful Program process based on the theoretical assumptions of MBIs, the experience of the sessions was reported where mindfulness skills of observation, description of internal and external experiences, acting with awareness, non-reactivity, and non-judgment can be evoked through different techniques. Some statements of the participants were highlighted to exemplify the experiential and learning process throughout the program.

Hemomindful Program

This is an integrative mind-body program, which is based on the MBRP (Bowen et al. 2014) and BMT (Russell 2015) protocols. It is a structured intervention based on Mindfulness meditation practice and integrates knowledge from cognitive, behavioral, and neuroscience psychology. The duration of the program is 8 weeks (2 months), with

a weekly individual session of up to 60 min facilitated by an instructor, at the bedside during the HD session. The program aims to develop awareness of bodily sensations, emotions and thoughts, situations that trigger habitual patterns and automatic reactions that permeate the stress process (Kabat-Zinn 1990). From the awareness of these phenomena and processes, the subjects have the possibility of making choices towards their self-care.

The eight meetings address specific topics in each session: (1) being present; (2) inhabiting the body; (3) mindfulness in daily life; (4) welcoming the pain and discomfort; (5) acceptance and skillful action; (6) thoughts are not facts; (7) self-care and balanced lifestyle; (8) social support and continued practice. The principles of Mindfulness practice proposed by the BMT model make up part of the development of these themes, these being check-in, intention, attention, mental habits, compassion, and recognition of the systems of emotional regulation—threat, reward, and calm (Russell 2015). In the meetings, concepts of the practice of Mindfulness are approached through the investigation and encouragement of the instructor so that the participant can explore the experience of practicing Mindfulness and other guided exercises.

During the sessions, formal and informal Mindfulness practices are worked on. The formal practices refer to the use of meditation as a tool to deepen the person's experience. Four main techniques of formal Mindfulness meditation are worked on mindful breathing, body scan, conscious movements, and the practice of loving-kindness or compassion. The informal practices refer to the application of skills developed in everyday contexts. Two examples of informal practices are mindful walking and eating. Table 1 briefly describes the topics, objectives, and main practices and exercises of the Hemomindful Program.

Each session has an agenda composed of different moments: checking (how the participant is at that moment), practicing Mindfulness, investigating the experience, psychoeducation on the subject, and tasks to be carried out at home, and closing checks. During each session, the participant receives illustrative material with relevant information on the topic, the exercises performed in the session and a weekly diary to better explore their practices. At the end of the program, all materials that the participant receives weekly are compiled in a practical manual of the program.

The sessions were planned to progress from previous materials and practices, being divided into phases: weeks 1 to 3 being dedicated to recognizing the tendency towards "autopilot" and to developing self-awareness—especially awareness of bodily sensations during the formal practices of Mindfulness and in the day to day. These first weeks are mainly dedicated to helping the practitioner to recognize bodily sensations, providing a reliable way to focus the attention on the present moment and emotions and thoughts that arise in situations of pain, discomfort, and stress. In weeks 4 to 6, participants learn to explore what has been learned so far and experience being in painful and difficult situations without being absorbed by them, developing acceptance and tolerance skills, gradually reducing the stress through practice. In weeks 7 and 8, self-awareness practices expand to an awareness of shared humanity, which allows practitioners greater empathy and compassion with themselves and with others, maintaining a lifestyle that supports the practice of Mindfulness.

The practices have a gradual progression to work with emotional discomfort, observation of thoughts as objects of conscience, with encouragement towards greater

Table 1 Brief description of the themes, aims and main practices and exercises of the Hemomindful Program sessions

Session	Aims	Practices and exercises
1. Being present "Pause"	- To introduce autopilot and to contrast it with mindfulness; - To present the *Hemomindful* basis and practices; - Principles of mindfulness: intention, attention, and attitude; - To present mindfulness as a way to recognize mental patterns; - To present the check-in as a way to slow down and bring about body awareness.	- Raisin; - Self-care check-in. Task - Self-care check-in; - Mindful eating.
2. Inhabiting the body "Intention"	- To present the body scan and conscious movement practices; - To draw attention to the triggers of the physical, cognitive, and emotional reactions; - To introduce the emotional regulation systems: threat, drive, and soothing; - To illustrate how these reactions lead us to automatic behaviors and take our attention away from what is really happening; - To present conscious movements as a form of self-care in this automatic process.	- Body scan - Recognizing the emotional regulation systems; - Conscious movements. Task - Daily activity with mindfulness.
3. Mindfulness in the daily life "Attention"	- To present the practices of the STOP sounds and attentive walking as possibilities to integrate mindfulness into the daily life; - Breathing awareness as an anchor always present in the experience; - To increase awareness of using Stop to create a space for responding instead of reacting on a daily basis.	- Awareness of listening - Breathing - STOP Task - STOP 3x a day; - Change of habit: walking with mindfulness.
4. Welcoming pain and discomfort "Attention"	-To increase awareness of bodily sensations, thoughts, and emotions that tend to arise in difficult and stressful situations; - To explore from experience primary and secondary reactions; - To practice staying in and opening oneself to challenging situations such as experiencing pain discomfort without avoiding or evading it; - To learn skills that help to stay present and not automatically give in to pressure and behave dysfunctionally; - To explore the discovery of needs and self-care activities performed; - To introduce the check-in with a self-compassion action as a practice of welcoming and compassionate conscience, especially in difficult situations.	- Surfing in difficulties; - STOP in difficult situations; - Self-compassion check-in. Task - STOP in difficult situations; - Subtle change of habit.

Table 1 (continued)

Session	Aims	Practices and exercises
5. Skillful acceptance and action "Compassion"	- To cultivate an attitude of curiosity, kindness, and non-judgment with pleasant, unpleasant, or neutral experiences that arise; - To discuss the role of acceptance in the process of change, especially in relation to stress and pain; - To promote the experience of qualities of presence, rooting, dignity, strength, impermanence through metaphors; - To explore skillful self-care behaviors directed towards life values.	- Sitting meditation: sounds, thoughts, sensations, breathing, emotions (poem "The guest house"); - Mountain meditation; Task - Subtle change of habit.
6. Thoughts are not facts "Mental habits"	- To reduce the degree of identification with our thoughts, recognizing that we do not have to comply with or control them; - To discuss the cycle of relapse of reactive behaviors and understand the role of thoughts in this process; - To explore the practice of attentive movements as an anchor for the presence in moments of accelerated mental flow.	- Thoughts; - Conscious movements. Task - STOP and watch the "mental monkeys."
7. Self-care and balanced lifestyle "Compassion"	- To discuss the importance of a balanced lifestyle and taking care of oneself to reduce the vulnerability to relapse of reactive behaviors - To introduce the practice of loving-kindness as another practice of conscience and compassionate attitude towards oneself and others; - To discuss regular mindfulness as a way to maintain balance.	- Loving-kindness; - Worksheet of exhausting, neutral, and energizing activities. Task - Energizing activity.
8. Social support and continued practice "Compassion"	- To highlight the importance of support networks and the importance of balance in the lifestyle, taking care of oneself to reduce stress; - To discuss the use of the regular practice of mindfulness as a way to maintain balance; - To reflect on what was learned in the course, reasons, and strategies for continuing the practice.	- Body scan; - Reflections regarding the program; - Concluding meditation.

kindness and acceptance of the experiences throughout the program. All Mindfulness practice audios have elements for the active cultivation of loving-kindness and self-compassion, attitudes that are reinforced in the final sessions.

Participants are invited and encouraged to practice Mindfulness using audios made available during the other HD sessions they undergo during the week, in addition to daily home practice. They are also encouraged to record their practices, perceptions, and challenges in the weekly practice diary, which aims to facilitate

the process of including the practice of Mindfulness in their daily lives. All participants receive an audio CD or the material in digital format (sent via the internet) containing guided practices.

Ethical Procedures

The present study is part of a larger project called "Efeitos de uma intervenção baseada em mindfulness para redução de estressores, perfil de dor e qualidade de vida de pessoas com doença renal crônica em hemodiálise." The study protocol was approved by the HCPA Research Ethics Committee (CAAE: 40658214.6.0000.5336 GPPG/HCPA). This project consists of an RCT, with a follow-up of up to 6 months, in which participants were allocated to two different groups: the Control Group (Usual Treatment of the HD Unit) and the Intervention Group (Hemomindful Program). This report is focused on the experience of the Intervention Group: Hemomindful Program.

Results

Selection of Participants

A total of 15 participants were allocated to carry out the Hemomindful Program (intervention group), 7 women (46.7%) and 8 men (53.3%), with a mean age of 54.3 years (Min.24; Max.76; SD = 14.9). Seven participants declared themselves to be white (46.7%), 2 mixed race (13.3%), and 8 black (40.0%). Considering education, 53.3% had completed elementary education ($n = 8$), with 6.7% of them having higher education ($n = 1$). In the MMSE, the sample presented a mean score of 27.3 points (Min. 24; Max. 30; SD = 1.88). The majority lived with family members ($n = 13$, 86.7%) and had no paid work activity ($n = 14$, 93.3%). Of the sample, 80.0% received social welfare benefits due to CKD or their age ($n = 12$). The mean length of HD treatment in the sample was 5.6 years (SD = 5.37), with a minimum of 3 months and a maximum of 15.25 years of treatment.

Regarding the prevalence of negative emotional states and severity of symptoms, 46.7% ($n = 7$) presented symptoms of depression (26.6% severe or extremely severe), 53.3% ($n = 8$) symptoms of anxiety (26.6% severe or extremely severe), and 33.3% ($n = 3$) symptoms of stress (20.0% severe or extremely severe).

A total of 80.0% of the participants completed the 8-week MBI program ($n = 12$), with 03 losses throughout the process. One participant canceled their participation due to the need to change the treatment location. Another participant reported "feeling too sick" and "lack of interest" and left the program after session four and one participant died in the final week prior to ending the protocol due to cardiopulmonary problems. Among those that completed the program ($n = 12$), the majority reported performing formal Mindfulness meditation practices at home, using the audio material, at a frequency of 2 to 3 times a week. All the participants considered the program accessible because it was performed during the HD sessions.

Experience Report

The intervention was carried out with one participant at a time, each performed eight individual face-to-face sessions (60 min) for 8 weeks (2 months), in one of the weekly HD sessions. The day of the week and time of the sessions were previously defined with each participant, avoiding interventions in the first and last hour of the dialysis treatment due to possible physiological changes in the HD process and the work dynamics of the unit. During the sessions, the participant remained seated or lying in a chair performing the HD; the instructor and the research assistant sat in chairs beside the bed. Before starting the sessions of the Hemomindful Program, the participant's nursing professional of reference was told that if it was necessary to perform any procedure with the participant, they could interrupt us. In addition, to increase privacy, we chose to close the curtains around the bed, considering that the treatment environment is shared and many patients undergo HD at the same time.

Before starting and at the end of the session, the vital signs (blood pressure and heart rate) were checked and recorded, but not analyzed in this article. The vital signs are measured by the machine that the participant is attached to while undergoing hemodialysis. Measuring vital signs before and after activities performed during the HD session is part of the routine and work process in the care with this population and context. Next, we held a brief practice of check-in to share the experience at that moment; we investigated with the participant their posture in the chair, making possible adjustments to find greater comfort and move forward in the session schedule.

There were different sounds in the room, machine alarms, conversations between staff and patients and sounds from the televisions, for example. In order to carry out the majority of the formal practices of the program, the participants were provided with headphones with acoustic protection. The participant and instructor performed the practices together, with the support of a headset adapter that allows the audio of the recorded Mindfulness meditation practice to be listened to simultaneously. In the first sessions of the program, the sounds of the environment were mentioned by the participants as frequent factors of dispersion. These sounds were used at different times as objects of observation and for the investigation of the experience after the practice. As the sessions passed, we noticed that the moments of dispersion with the sounds were decreasing, and the participants were less reactive to these situations.

In each session of the program, one or two formal Mindfulness practices were performed using audios lasting between 5 and 15 min and one or two informal practices such as eating, seeing, listening, or breathing consciously. Longer practices, with audios of up to 24 min, were made available as auxiliary material to perform at other times.

The sessions were interactive, with exchange of experiences, using the educational material related to the session to assist in the psychoeducation process. The participants kept this material. Both the instructor and the research assistant shared their experiences (sensations, thoughts, emotions, and impulses), allowing the participant to observe different reactions and responses to the same practice or stimulus.

For the majority of the participants, the experience of having people sitting next to them in the HD session, once a week for an hour, was new. Many participants felt the need to talk about their life stories, illnesses, or memories and stories that emerged from the practice. The instructor's investigation of the experience was essential to lead the

participants to the present moment, the direct (primary) experience, and to understand what was produced from it (secondary). The process of investigating the experience, known as "inquiry," makes it possible to observe the mind's tendency to deviate towards stories, judgments, and the practice of bringing the focus back to the present moment (Bowen et al. 2015).

The meditation bell was used in the initial and final short practices of the session to mark the practice time. All the participants seemed to appreciate the sound; many tried to ring the bell and showed curiosity and happiness when doing this. The sound was quiet and the use of this resource did not seem to cause any inconvenience to the other patients who were undergoing hemodialysis at the same time or in the work process at the HD unit. The sound of the bell was also used in the audios of the formal Mindfulness practices and, as the practitioners used headphones, only they heard the sound. Another resource used was the WhatsApp application to send text messages with incentives for practice and audios worked on in the session. For the participants that did not have this resource, the practice audios were made available on CD.

The practices of conscious movement were adapted to the possibilities of mobility in the chair or bed, avoiding movements in the arm of the vascular access of the machine. The movements were illustrated in the practical manual, containing postures adapted for different situations (standing, sitting on the chair or reclining on the bed, lying on the bed or floor), possible adjustments, support materials (e.g., cushion, pillow), and other suggestions for practice in motion, like the traditional practice of conscious walking.

In the first 3 weeks, the focus of the program was on experiencing, through Mindfulness practices, how it is customary to react automatically, unconsciously, and to observe how this inattention happens on a daily basis. The first practice of the program was the "Raisin," in which, through the senses (touch, sight, smell, hearing, and taste), they explored bodily sensations, thoughts, and emotions that arise and how the body and mind react automatically to this process. One of the participants M. (45 years), after the practice said he felt relaxed and said that when he had his eyes closed, he imagined that the raisin was a stone or a seed, he said: "It was nothing like what I thought." When exploring the touch of the raisin on his lips with his eyes closed, he says he was curious, thinking "is it something to eat?" He reported sensing little smell and when he put it in his mouth, he sensed the sweet taste after chewing. He realized that he put the raisin on the side that he always chews, "instinctively" and said "we have to have a lot of self-control to eat like this."

In the practice of the body scan, participant A (44 years) reported that when she paid attention to her face, her cheeks felt heavy, making her feel fat. Participant E (76 years), on the other hand, reported paying attention to shoulder pain and that he did not perceive other sensations in the body. When performing the practice of mindful attention to sounds, participant L (64 years) mentioned how the practice brought her happy memories and said: "my heart beats faster with joy."

Also, in the first weeks, we performed short practices such as the self-care check-in and STOP to breathe. All the participants chose routine activities to try to perform mindfully during the week or to change some habit. Among the activities chosen by the participants were eating one piece of fruit per day, standing with bare feet and feeling the grass, decreasing the consumption of liquids, playing with their child, and walking around the neighborhood. These practices were recounted in the sharing of the following sessions.

In weeks 4 to 6, we explored the application of the skills learned in situations that they considered difficult in their daily lives, where they observed a tendency to react automatically. In the session that worked on the theme: Welcoming the pain and discomfort, different situations considered stressful for the participants, such as: the relationship with their body; dealing with food and liquid restrictions; having to undergo hemodialysis; social limitations of the treatment; bodily pain; anxiety; insomnia; desire to leave during the hemodialysis; transplant; cold; drop in blood pressure; and gastritis were among the situations mentioned.

Participant H. (46 years) talked about how limiting his liquid consumption interfered with his life, saying that he measured, in bottles of water, the amount he could drink in order to try to control himself, but that when he passed this amount, he felt guilty; however, he did not managed to avoid drinking. Participant F. (26 years) mentioned that whenever she was hospitalized for some reason, it was difficult to deal with negative thoughts, she kept thinking that she could die and worrying about who would take care of her daughter if that happened, which caused her a lot of suffering. Some participants demonstrated emotions from their facial expressions or cried at times, others wanted to and were ashamed to cry; others perceived body rigidity, or judgments about the experience. In some sharing sessions, the instructor and research assistant were also moved and we observed that a closer relationship, bonding, and a space of trust to observe and share what was really present arose from this vulnerability.

Practices such as Surfing in difficulties and Stopping in difficult situations allowed the experience of observing bodily sensations, emotions, and thoughts that arise without being absorbed in them (Bowen et al. 2014). Practices such as Mountain Meditation (Bowen et al. 2014) and Self-Compassionate Check-In (Russell 2015) expanded the experience of attitudes of openness, kindness, curiosity, non-judgment, and self-compassion in any experience.

From the practice of Observation of the thoughts (Bowen et al. 2014) using the metaphor of mental monkeys (Russell 2015), the participants worked on the ability to observe thoughts as mental phenomena, as well as a body sensation, emotion, and not the truth of things. This process can be seen in the statement of participant L. (64 years): "Now every time I start thinking bad things and I get agitated I remember: it's the monkeys, the thoughts."

When performing conscious movement practices, many participants noticed changes in the flow of thoughts. When asked: "Where was your mind while you moved?"; common statements were: "It was empty," "I didn't think about anything," or "in the movement." When starting the practices, some participants mentioned automatic thoughts such as "I can't move," "if I move I will feel more pain." Through the experience, all the participants reported a feeling of well-being when moving, even with the presence of discomfort in some regions of the body.

When developing the theme of acceptance and skillful action, the exercises included the investigation of activities that could be useful to deal with stressful situations on a daily basis, stimulating the participants' self-care. Being with family members (partner, children, and grandchildren), friends or pets; listening to music; cooking; take a hot shower; doing stretches; and going for walks were among the skillful actions mentioned by the participants.

The final two sessions were focused on the importance of a support network and the continuity of the mindfulness practice to cultivate this mode of attention. In the practice

of Loving-kindness, the participants were able to investigate what arises in the experience by offering and receiving good wishes from loved ones, as well as offering good wishes to themselves. Participant F. (24 years) said she felt a sense of well-being in her chest when thinking about her daughter. Participant J. (43 years) remembered the difficulties he had raising his son and was emotionally moved. When asked about the experience of offering good wishes for himself, he said that he "felt strange." Talking about the practice, this same participant mentioned realizing how much good the program was doing him and that he wanted to take it to other people.

Participant H. (46 years) when talking about the experience of receiving good wishes said "Feeling that someone likes us is very good." And when talking about offering himself good wishes, he said: "I think it's great, maybe I have a degree of self-centeredness, my limits are very limited," and laughed at his statement, after a few seconds, he said: "I am in a very unique moment of my life, I am feeling happy."

The statements demonstrated the diversity of bodily sensations, emotions, and thoughts that arise in this practice. For many participants, it was the first time that they tried to offer themselves good wishes and to know what arises from doing so. Words such as "happiness," "well-being," "love," "gratitude," "tranquility," and "peace" were more present in the participants' sharing sessions.

In the final meeting, we took the time to investigate the changes perceived by the participants over the 8 weeks. Benefits such as "dealing with the stress," "learning new things," "calmness," "taking care of me," "willpower," "energy," "animation," "self-knowledge," "self-control," and "better way of thinking and acting" were cited.

We perceived the development of the Mindfulness skills of observation and description of bodily sensations, emotions, and thoughts present; non-reactivity and non-judgment of internal or external experiences; and acting with greater awareness. Some statements reveal some of these changes: Participant A (42 years): "It was a novelty for me to know, you know... to feel, feel my body, discover myself. And it was very good... that now I see that I am doing a good thing with my life." Participant C (37 years): "What was most valuable was the perception, getting to know myself more, getting to know some things, the reasons that I got more agitated and now less anxiety. I learned to know myself a lot more." Participant E (70 years): "The experience of the practices of being able to understand what is a benefit to me. I learned to pay more attention to something like, how can I say, to practice my thinking and my will to live more, understand?" Participant J. (43 years): "Because it helped me a lot. Generally, it gave me more encouragement, it gave me more incentive, that I can do things, that I'm not so limited. There are limitations, but if I try a little, I see that there is a way to not be so limited."

Discussion

The Hemomindful Program appears to be a beneficial intervention for managing stress and promoting QoL in people with CKD undergoing HD. The participants considered the intervention format to be satisfactory and accessible for people receiving intensive hospital treatment.

The profile of the sample is similar to that of other studies regarding gender, age, and education (Gross et al. 2017; Sohn et al. 2018; Thomas et al. 2017), as well as the

prevalence of negative emotional states, where approximately 50% of this population presented symptoms of depression and anxiety (García-Llana et al. 2014; Sohn et al. 2018).

The adherence rate for the program was 80.0%, with all these participants completing the 8 sessions of the program. The result was positive when compared to the results found in other studies with the same target population and similar MBI proposals (Gross et al. 2017; Sohn et al. 2018; Thomas et al. 2017). In one RCT that investigated the viability and effectiveness of an MBI for reducing symptoms of depression and anxiety, 71.0% of the participants completed the study (Thomas et al. 2017). Another RCT that assessed the feasibility of an MBI adapted from the MBSR program for patients that were waiting for a transplant reported that 75.0% of participants perform at least 5 of the 8 sessions of the program (Gross et al. 2017). In our study, of the 15 the participants that started the intervention, 13 had the opportunity to carry out the entire program, and among these, only one participant gave up referring to "feeling very sick" and "unmotivated." This justification was also reported by participants that abandoned the intervention in previous studies (Gross et al. 2017; Thomas et al. 2017).

The program being carried out at the bedside, during the HD sessions, with the presence of the instructor, seems to be a positive factor. All participants reported that they liked participating in the program during the HD. The majority reported that, if the project was performed outside of hemodialysis hours, they would probably not have participated, as they would have had to stay longer in the hospital or come on another day, which would entail financial expenses and long travel time, with the need to take care of their homes, family, and or work on days that they did not perform HD. Previous studies have indicated that performing practices in a treatment environment is important for adherence to interventions in this population (Gross et al. 2017; Sohn et al. 2018; Thomas et al. 2017; Williams et al. 2015) and that the presence of the instructor was a motivational factor (Gross et al. 2017).

The context presented some challenges for the implementation of the program, such as interruptions by the care team, sounds of machine alarms, and the limited physical space for chairs beside the bed. These challenges have also been described in other studies carried out in the context of HD (Gross et al. 2017; Sohn et al. 2018; Thomas et al. 2017). Fatigue and excessive sleepiness, severe body pain, nausea, and problems in the HD process were situations that hindered or prevented the practice at some moments. The same situations were mentioned in previous studies (Gross et al. 2017; Sohn et al. 2018; Thomas et al. 2017). Due to hemodynamic changes resulting from the extracorporeal circulation process and the removal of a large volume of fluids in a very short period of time, complications such as hypotension, hypertensive peak, cramps, nausea and vomiting, headache, chest pain, lower back pain, pruritus, fever, and chills are common during HD (de Souza Terra et al. 2010; Gomes and Nascimento 2018). Over the sessions, we observed less reactivity and greater awareness and acceptance of the experience.

These situations are typical of a context of HD treatment and the environment can be considered challenging for the practice of Mindfulness. However, this is the reality of the participants who need to be in this context three times a week, for 4 h a day. Therefore, we consider it important to practice Mindfulness in the treatment environment, as it contributes to the process of desensitization of this experience. Individuals learn mindfulness techniques, such as breathing awareness (focusing on breathing and

observing thoughts without being absorbed by them) and body scan (promoting awareness and acceptance of sensations in different parts of the body), to help them understand that painful sensations and negative emotions do not need to be fought or suppressed and need not prevent them from living meaningful lives (Kabat-Zinn 2003). Mindfulness-Based Interventions are potentially beneficial for people with long-term physical complications, mainly for improving psychological well-being (Long et al. 2017).

The proposal of the Hemomindful Program is to provide the possibility to learn, through the practice of mindfulness, to relate in a different way to these stimuli, to reduce reactivity, and to manage stress in these situations, where this ability can be amplified for other day-to-day situations. During the intervention, the participants presented and/or reported reactive behaviors, aversive to the restrictions imposed by the treatment and the body sensations, emotions, and thoughts that they experienced and they realized that they repeated these behaviors. The Hemomindful Program is intentionally based on two approaches: MBRP and Body-in-Mind Training (BMT). The first has an emphasis on changing habits and patterns and addictive behaviors. However, the focus is not on "curing" a disease or "fixing" something that is damaged, but on promoting greater connection with the present moment, with acceptance and kindness (Bowen et al. 2014). The second approach, BMT, uses body movements and the neuroscience basis of the practice of Mindfulness as the main tool for developing the Mindfulness skill to serve the needs of the target population, which can be integrated with other protocols (Russell 2015). The attentive movement practices can provoke numerous neural connections that act directly on emotional regulation (Clark 2015; Russell 2015). The treatment of HD, over time, causes deterioration of cognitive, physical, and social processes (de Souza Terra et al. 2010; García-Llana et al. 2014). The participants with greater cognitive difficulties adhered more to the practices of conscious movement compared to the other traditional practices, such as the body scan. The practices of conscious movement can help populations with cognitive problems through the exploration of body sensations (Clark 2015; Russell and Arcuri 2015).

People undergoing HD remain in the same posture for long periods, reporting muscle tension, pain, and physical and emotional discomfort (Williams et al. 2015). These and other challenges for the practice of Mindfulness during HD, such as excessive sleepiness, fatigue, and ruminating thoughts at many moments, could be managed with the practices of conscious movement. Conscious movements seem to contribute to the increase in the repertoire of bodily sensations, the description and perception of moments of reaction and the choice in the way of moving, of posture, and of rhythm, discovering what is presented when moving, as feelings of discomfort, pleasure, or absence of sensation. This process allows the practitioners to gradually reflect on their movement in life and take them to other areas of life, such as the involvement in treatment, eating habits, relationship with family members, self-care, and improving their quality of life. Participation in desirable behaviors such as care with food and liquid consumption, physical activity, and strengthening of the support network were mentioned by the participants. These behaviors are fundamental in the prevention, treatment, and management of symptoms of chronic diseases and MBIs can contribute in this direction (Williams et al. 2015).

The results demonstrate the positive psychological states of the participants, especially in the final sessions, and we believe that practices with a deepening of the

compassionate attitude, such as Loving-kindness and the Self-compassionate Check-In, were fundamental in this process. Self-compassion is associated with lower levels of stress induced by inflammatory processes after unknown psychosocial stress. Efforts to help people deal more effectively with acute stress and reduce the risk of chronic illnesses must not only assess and alleviate negative emotions, but also promote positive emotional states, such as self-pity (Breines et al. 2014).

Some factors seem to have contributed to the participants' adherence such as performing the MBI during hemodialysis sessions. From evidence from similar studies and reports of the people undergoing hemodialysis regarding what could encourage participation in the program, it was almost unanimous that it needs: "to be performed during the hemodialysis sessions," which was confirmed in the data analysis.

Closing the curtains around the bed seems to have helped to increase privacy during the intervention process and sharing headphones with the instructor during the formal mindfulness practices, listening to the audios at the same time, allowed for quality investigation of the experience of the practitioner. These strategies may perhaps modify the experience in some way; however, these adaptations did not prevent the participants from realizing how their minds work and daydream, so much so that in the first sessions, this fact was reported most frequently. The development of the mindfulness skill happens throughout the session, through formal practices, with or without audios, and through informal practices, such as hearing, seeing, feeling the body through conscious movements, speaking, and listening.

The presence of the research assistant made it possible to promote greater interaction and exchange of experiences with another person. In addition, the moment of investigation of the experience was not exclusively focused on the participant, who could be intimidated by the instructor's investigation of the experience, especially in the first sessions where it is common for many judgments to arise because they do not understand the practice. Mindfulness-Based Interventions are usually carried out in groups, which generates the recognition of different reactions or responses to the same events (Bowen et al. 2014).

The practitioner's manual was very useful for conducting the session and for the learning of the participants. People with CKD undergoing HD are on average ≥ 50 years of age, with a high prevalence of visual and cognitive problems (de Matos and Lugon 2014; Oliveira et al. 2016). Brief explanations and exercises described in large letter format and the use of colors and images related to the contents of the program and context allowed greater accessibility and motivation to use the material. Some participants reported using the material at home to remember themes and practices, as well as to share knowledge with their families.

The WhatsApp group, in addition to encouraging practice during the 8 weeks, became an opportunity to recognize other HD colleagues who were also performing the MBI. The use of mobile applications in the MBI has been shown to be viable and positive in other studies (Gross et al. 2017; Howells et al. 2016).

The fact that the intervention instructor is part of the multiprofessional team of the HD unit where the research was carried out could have contributed to the participants' adherence. Studies have highlighted that MBIs developed by trained and certified care team professionals usually have better participant adherence results (Williams et al. 2015).

In addition, in the protocols used for the basis of this program, the learning of mindfulness is progressive, considering the needs of the participants and context, with

these adjustments in the Hemomindful Program proving to be relevant to the process of developing the participants' mindful ability.

It is believed that these results may contribute to future research projects and interventions with Mindfulness in the context of HD. The viability and effectiveness data of the RCT to investigate the impact of the Hemomindful Program will be accessed in future studies. This represents an investment that can increase responses to health, promote QoL, and decrease costs in the areas of prevention, treatment, and management of symptoms of CKD, as well as in other populations with high demand for multidisciplinary hospital care.

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Data Availability The authors declare that all other data supporting the findings of this study are available within the article (and its supplementary information files).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Bioethics Committee of the Hospital de Clínicas de Porto Alegre (HCPA) (No. 7493319700005327).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent to Publish Patients signed informed consent regarding publishing their data.

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