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Article

Healthcare Employees Working in a Dialysis Center Have More Severe Burnout Syndrome than Those Working in a Satellite Dialysis Unit

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Abstract

Background: Healthcare professionals working with chronic patients for a long time are at risk of compassion fatigue and burnout (BO). Our study aims to compare the levels of BO and the workplace-influencing factors of health care employees working in a dialysis center or satellite unit. **Methods:** We conducted the present study in two types of dialysis units: a centre and a satellite. The patient’s physical status and comorbidities were quantified by Karnofsky Performance Scale (KPS) and Charlson Comorbidity Index (CCI) and compared between these units. The research was conducted with 39 healthcare employees (30 nurses, 4 doctors and 5 other medical staff). Participants were enrolled using a convenience sampling technique at the dialysis outpatient services in Pécs, Hungary. Personal information forms, the Maslach Burnout Inventory (MBI), the Mini Oldenburg Burnout Inventory (MOLBI), the Dysfunctional Attitude Scale (DAS-SFI), and Beck’s Depression Inventory (BDI) questionnaires were used. **Results:** There was a significant difference in the patients’ KPS (67.9 vs. 85.7, $p < 0.001$) and CCI (6.62 vs. 5.55, $p = 0.003$) treated in center and in satellite unit. Our MBI analysis comparing the dialysis workplaces (center vs. satellite unit) revealed that health care employees report significantly higher and more severe BO working in the dialysis center compared to the satellite unit. Multiple stepwise linear regression analyses showed a strong prediction of the center workplace ($p = 0.022$) for BO syndrome. There was a positive correlation between MOLBI of the employees and CCI of the patients ($p = 0.028$, $r = 0.426$). **Conclusions:** This study confirmed that the condition of the treated patients plays an important role in the development of the BO syndrome among dialysis health care professionals. There was more severe BO employees working in the center compared to those working in the satellite unit. Our results indicate that measures to prevent BO should be implemented in dialysis units.

Keywords: burnout syndrome; hemodialysis; center; satellite; dialysis employees; patient clinical status

1. Introduction

Dialysis nurses spend a lot of time with patients as members of the healthcare team. They form intimate bonds with patients and their families, provide long-term care, and witness the anguish and suffering of their patients just like oncology nurses [1]. Cancer nurses are thought to be the most susceptible to burnout (BO) and compassion fatigue (CF) [2]. Dialysis nurses also have to cope with the difficult conditions and emotions that chronic disease and treatment bring to the patients and

their families in addition to providing care for the same patient for extended periods of time, with dialysis treatments typically lasting four hours per day, three times per week [3].

These nurses may experience emotional exhaustion because they frequently engage in challenging talks, break unpleasant news, and witness patient suffering and deaths [4]. Medical personnel treating patients with chronic renal illness are at high risk of developing BO. Stressors of BO are tied to the work environment and workload. Traumatic stress is linked to direct exposure to traumatic circumstances, despite having similar symptomologies, they frequently co-occur [5].

Research indicates that dialysis health care employees are at higher risk of developing BO due to their prolonged and intense interactions with patients who require specialised technological care [6]. According to a recent multicenter study conducted in China, there was a high level of BO among hemodialysis nurses. Working conditions, working at night, relationships with coworkers, the number of children, marital status, and specialised nursing training were all linked to BO according to the results of this study [7].

Our study aimed to compare the levels of BO in nurses, doctors and other medical staff (cleaners and patient transporters) working in different types of dialysis units: in-center vs. satellite. Our aim was also to determine the predictors of the different stages of BO syndrome.

In our city we have two dialysis units: a center and a satellite unit. In the center patients needing more medical assistance and having more comorbidities are treated. In the satellite unit we treat patients who are in better general condition and physical status.

2. Methods

Employees participated in the study voluntarily. Written Informed consent was obtained before completing the questionnaire. Participants were assured confidentiality and anonymity. The study was carried out using a descriptive and correlational research design. Our research was conducted with 39 health care employees, 30 nurses, 4 doctors and 5 other medical staff (medical clerks, cleaners and patient transporters). Participants were enrolled using a convenience sampling technique at the dialysis outpatient services in Pécs, Hungary. Personal information forms, the Maslach Burnout Inventory (MBI), the Mini Oldenburg Burnout Inventory (MOLBI), the Dysfunctional Attitude Scale (DAS-SFI), Beck's Depression Inventory (BDI), and effort-reward imbalance questionnaires were used.

The Maslach Burnout Inventory (MBI), widely used among BO testing methods, analyses the three dimensions of BO: emotional exhaustion, depersonalization, and decreased personal performance, in a short, easy-to-fill test consisting of 22 statements. The Burnout Inventory focuses on defining the BO syndrome in the workplace context [8]. It uses a 7-point Likert scale (0–6). The degree of BO can be determined by dividing the total score per subscale by thirds, and by dividing the scores of the subscales by thirds, as low (between 0–33%, total score 0–44), medium (34–66%, total score 45–88), and high (67–100%, 89–132 total score). We also used the abbreviated version of the MOLBI. This is a 10-item scale, which measures the two aspects of the BO. Its first aspect is exhaustion, which is physical and emotional tiredness connected to work. The second aspect is disengagement, which contains a lack of motivation in work and intensive depersonalization. Five items belong to each scale, and two of them are reversed. Responses are rated on a 4-point Likert scale, ranging from 1 ('totally disagree') to 4 ('totally agree'). The higher score indicates more severe BO symptoms.

The DAS-SFI is a shortened, validated version of the 17-item scale developed by Weismann et al. With a total of nine statements, it measures how typical the given phenomenon is for the respondent, between the extreme values of not at all typical and very typical. It measures the need for external recognition, likability, performance, perfectionism, the need for omnipotence, and external control, as well as legitimate but unrealistic expectations [9].

BDI examines the severity of depression with the help of nine questions. It asks about the following symptoms: social withdrawal, inability to make decisions, sleep disorders, fatigue, excessive worry about physical symptoms, inability to work, pessimism, dissatisfaction, lack of joy,

and self-blame. Scoring is from 1 point to 4 points. When evaluating the scale, the assigned scores can be used to separate severe, moderately severe, mild depression or a state without depression [10].

The effort-balance-reward (EBR) questionnaire, the workplace stress questionnaire developed by Siegrist et al., consists of the three main dimensions of workplace efforts: rewards and overcommitment [11,12]. In 15 questions it analyses how typical the statements are for the respondents on a four- or five-point Likert scale. The Hungarian adaptation of Caldwell et al.'s Social Support Questionnaire [13] (Support Dimension Scale, SDS), examines workplace psychosocial risk factors along 28 scales and 7 dimensions [14].

The last part of the survey was aimed at assessing the health status of the target group, with a total of 10 (mainly to be decided) closed questions focused on the symptoms observed during BO.

The dialysed patient's physical status and comorbidities were quantified by Karnofsky Performance Scale (KPS) and Charlson Comorbidity Index (CCI) and compared between the units.

2.1. Ethical Considerations

Research committee ethical approval was received from the University of Pécs Local Ethical Board (No: 9938-PTE 2024). Institutional permissions and the verbal and written informed consent of the participants were obtained before the study.

2.2. Statistical Analysis

Study population data were analysed as means ± SD (standard deviation) using the chi-square test and distribution ratios. Data were evaluated using of descriptive statistics, analysis of variance, correlation ratios, and logistic regression analysis. Chi-square test was used to compare the prevalence of BO (no BO, disappointment, exhaustion, and BO groups) among different demographic groups. Analysis of variance was used to evaluate the BO score, sociodemographic factors, prevalence of health problems, comorbidity, and social support. The association between BO and depression was explored using Pearson's correlation coefficients. A stepwise regression (without the impact of the other not-significant predictors based on the result of the analysis of variance) was also employed to identify the impact of predictor variables. A confidence interval (CI) of 95% was set up in our study for all odds ratios. Potential predictors were analysed using univariate analysis. Multiple step-wise linear regression analyses was conducted to reveal the outcome variables. Statistical analysis, including the above-mentioned methods, was carried out with the use of the statistical package SPSS 11.0 (SPSS, Chicago, IL, USA).

3. Results

Hemodialysed patients treated in our center and satellite unit were compared By KPS and CCI. The KPS of the patients treated in the center was significantly lower compared to the satellite dialysis unit's patients (67.9 vs.85.7; p<0.001). CCI of the patients treated in the center was significantly higher CCI compared to the patients treated in the satellite unit (6.62 vs. 5.55, p = 0.003; Figure 1).

Among the employees overall 40 questionnaires were successfully delivered and 39 responses received (a response rate of 97.5%). Eight male (20.5%) and 31 female employees (79.5%) participated in our study. The age of the participants was between 46 and 62 years in 66.4% (22/39), average 48.7 year. Thirty people (76.9%) were married or living in a relationship. Fourteen (35.9%) participants had two children. The vast majority (74.4%) of the participants graduated from high school. There were 30 nurses (76.9%), 4 doctors (10.3%) and 5 (12.8%) members of other medical staff (2 medical clerks, 2 cleaners and 1 patient transporter). Seventeen (43.6%) participants have been working for 21–40 years. Socioeconomic data and the questionnaire findings are presented in Table 1 and in supplementary material, Table 1.

Table 1. Participants socioeconomic data.

n=39	n	%
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Workplace	Satellite	25	64.1
	Center	14	35.9
Gender	Male	8	20.5
	Female	31	79.5
Age	18-25	0	0.0
	26-35	7	18.0
	36-45	5	12.8
	46-55	14	35.9
	56-62	8	20.5
	62-	5	12.8
Marital status	single	3	7.7
	relationship	10	25.6
	married	20	51.3
	divorced/widow	6	15.4
Number of children	no child	11	28.2
	1 child	9	23.1
	2 children	14	35.9
	3 or more than 3	5	12.8
Education	primary school	2	5.1
	high school	29	74.4
	college, university	8	20.5
Type of work	medical clerk	2	5.1
	nurse	30	76.9
	doctor	4	10.3
	other heathcare worker (cleaner)	2	5.1
	other heathcare worker (patient transporter)	1	2.5
Years spent in healthcare	0-1	3	7.7
	1-5	5	12.8
	6-10	7	17.9
	11-20	6	15.4
	21-30	9	23.1
	31-40	8	20.5
	40-	1	2.6
Work schedule	one shift	24	61.6
	two shifts	7	17.9
	continuous	8	20.5
Workflow	inpatient care	2	5.1
	chronic care	12	30.8
	outpatient care	25	64.1
Secondary employment	no	34	87.2
	yes	5	12.8

More than 74% of the participants had a good or excellent health status: 1.78 days was the average absence due to illness over one year. On the other hand, 48.7% were taking medications regularly, 25.6% were smokers, and nobody was drinking alcohol regularly. Hypertension occurred in 28,2% of the participants, 20.5% had musculoskeletal pain, 38.5% reported having emotional stress, 23.1% had mood swings, 25.6% felt sweating, 28.2% had a headache, 48.7% had neck or back pain, and 20.5% had sleep disturbance.

Most of the health care workers (66.7%) reported to have a good relationship with their colleagues, 71.8% also with their superior and 92.3% had a happy private life. Most of the participants (61.5%) were satisfied with their work, 33.3% felt professional appreciation, 51.3% felt human respect,

but 41.0% reported being willing to change their career. Most of the health care employees (74.4%) reported that they would be willing to participate in some kind of stress relief program.

Eleven (28.2%) participants had no depression, 27 (69.2%) suffered from mild depression, and 1 (2.6%) suffered from moderate depression. The employee's 84.6% (33/39) had mild, and 10.3% (4/39) had moderate dysfunctional attitudes.

According to the results of the MBI questionnaire, the prevalence of BO was 89.7% (35/39) CI 95% 82.8% to 96.6% in this study population (95% CI estimated by bootstrap technique; mean score 2.56 ± 0.64 CI 95% 2.15 to 2.96). There was a significant association between the patients' health care status and BO ($p < 0.001$). There was a significantly higher incidence of severe BO in employees working in the center with MBI (7/14 (50%) vs. 3/25 (12%), $p = 0.004$; Figure 2).

Our analysis showed that 76.9% suffered from emotional exhaustion (30/39, mean score 2.75 ± 0.86), 41.0% felt depersonalization (16/39, mean score was 2.07 ± 0.09), and 82.1% (32/39, mean score was 2.67 ± 0.63) felt personal accomplishment (Figure 3).

According to the results of the MOLBI questionnaire the prevalence of BO was 71.8% (28/39) in this study population. Subgroup analysis showed that 2.5% suffered from exhaustion (1/39), 25.6% felt disappointed (10/39) (Supplementary material, Table 1).

More severe BO was associated with the center compared to the satellite dialysis unit (50.0 vs. 12.0%, $p = 0.011$). BO was also associated with single marital status ($p = 0.012$), having no child or one child ($p = 0.014$, $p = 0.031$), continuous work schedule ($p = 0.042$), moderate or severe dysfunctional attitudes ($p = 0.020$, $p = 0.010$), and moderate or severe depression ($p = 0.30$, $p = 0.013$; Supplementary material, Table 2).

Table 2. BO and health status, risk factors and diseases of the personell.

Burnout (N=39)	mild		moderate		severe		p
	N=4	10.3%	N=25	64.1%	N=10	25.6%	
Health status							
excellent	0	0.0%	4	80.0%	1	20.0%	0.640
good	2	8.3%	16	66.7%	6	25.0%	0.729
bearable	2	20.0%	5	50.0%	3	30.0%	0.700
Healthcare use frequently							
no	0	0.0%	3	100.0%	0	0.0%	0.773
regularly	1	14.3%	4	57.1%	2	28.6%	0.697
once	1	11.1%	6	66.7%	2	22.2%	0.690
several times a year	2	22.2%	4	44.4%	3	33.3%	0.338
once a month	0	0.0%	8	80.0%	2	20.0%	0.269
several times a month	0	0.0%	0	0.0%	1	100.0%	0.120
Absence due to illness	2	20.0%	6	60.0%	2	20.0%	0.203
Voluntary screening test	4	11.8%	22	64.7%	8	23.5%	0.118
Risk factors							
taking medication	2	10.5%	12	63.2%	5	26.3%	0.225
smoking	2	20.0%	4	40.0%	4	40.0%	0.777
taking drugs	0	0.0%	1	100.0%	0	0.0%	0.785
Diseases							
diabetes	0	0.0%	1	50.0%	1	50.0%	0.010*
hypertension	1	9.1%	7	63.6%	3	27.3%	0.773
cardiovascular disease	1	25.0%	2	50.0%	1	25.0%	0.578
musculosceletal pain	2	25.0%	2	25.0%	4	50.0%	0.046*
history of cancer	0	0.0%	0	0.0%	1	100.0%	0.230
psychiatric disease	2	66.7%	0	0.0%	1	33.3%	0.654
Symptoms							
irascibility	1	12.5%	3	37.5%	4	50.0%	0.031*

concentration disorder	0	0.0%	5	83.3%	1	16.7%	0.518
anxiety	1	33.3%	1	33.3%	1	33.3%	0.220
emotional stress	3	20.0%	7	46.7%	5	33.3%	0.162
fatigue	0	0.0%	3	42.9%	4	57.1%	0.047*
mood swings	1	11.1%	4	44.4%	4	44.4%	0.322
teeth grinding	0	0.0%	2	100.0%	0	0.0%	0.734
sweating	0	0.0%	9	90.0%	1	10.0%	0.690
urge to urinate	0	0.0%	2	66.7%	1	33.3%	0.145
headache	2	18.2%	3	27.3%	6	54.5%	0.164
neck, back pain	3	15.8%	12	63.2%	4	21.1%	0.085
sleep disturbance	1	12.5%	6	75.0%	1	12.5%	0.597
digestive disorder	0	0.0%	0	0.0%	3	100.0%	0.012*
appetite disorder	0	0.0%	0	0.0%	1	100.0%	0.117
sexual disorder	0	0.0%	1	100.0%	0	0.0%	0.713
skin symptom	0	0.0%	5	71.4%	2	28.6%	0.937
increased smoking	0	0.0%	1	4.0%	0	0.0%	0.912

*p<0.05 in all cases.

MBI analysis showed significantly higher points in employees working in the dialysis center in the emotional exhaustion (EE; p = 0.002) and depersonalization (DP; p = 0.041), but not in personal accomplishment (Figure 3).

The total average points of MBI were significantly higher in center dialysis workers compared to satellite unit workers (62.8 vs. 52.8, p = 0.015; Figure 4).

There was a significant positive correlation between BO and moderate dysfunctional attitudes (p=0.001, r=0.566, r²=0.321, β=0.457) and moderate depression (p=0.009, r=0.499, r²=0.249, β=0.424). We found also a significant positive correlation between the total number of the participants’ MOLBI results and dialysed patients’ CCI scores (p=0.028, r=0.426, r²=0.181, β=2.322), by Pearson’s correlation.

We also compared the EBR and SDS questionnaire scores of employees working in the center and satellite unit. BO was associated with emotional exhaustion (66.7% vs. 0.0%, p = 0.048), mental exhaustion (60.0% vs. 0.0%, p = 0.023), self-esteem improvement (60.0% vs. 25.0%, p = 0.037), and doing nothing to reduce exhaustion (60.0% vs. 25.0%, p = 0.015). Both were higher in workers of the center (Supplementary material, Table 3).

Table 3. Stepwise regression analysis predicting burnout in different models.

	Model I.				Model II.				Model III.			
	B	SE B	β	p	B	SE B	β	p	B	SE B	β	p
Workplace*	1.030	0.953	1.357	0.025*	2.464	1.441	2.923	0.01*	1.804	0.590	2.454	0.013*
Marital status*	1.574	0.651	1.563	0.02*	1.151	0.133	1.258	0.047*	1.590	0.454	1.872	0.028*
Number of children	0.090	0.048	0.091	0.089	0.688	0.184	0.982	0.76	1.092	0.556	1.366	0.87
Work shedule*	1.546	0.521	1.726	0.048*	1.608	1.732	2.238	0.021*	1.856	0.051	1.959	0.023*
Dysfunctional attitudes					0.916	0.374	0.997	0.98	0.476	0.256	0.762	0.79
Depression*					1.176	0.859	2.272	0.028*	1.729	0.038	1.991	0.02*
Emotional exhaustion*					1.611	1.396	1.771	0.03*	1.444	0.197	1.601	0.04*
Mental exhaustion*					2.054	1.238	2.753	0.02*	1.402	0.223	1.952	0.03*

Action to reduce of exhaustion		0.968	0.730	0.758	0.76	0.691	0.477	0.998	0.87
Fatigue						0.916	0.374	0.997	0.91
Muscoskeletal pain*						1.860	0.402	1.972	0.02*
Digestive disorders*						1.674	0.135	1.709	0.038*
R ²	0.213		0.698			0,566			
F	8.363		3.516			2.628			

*p<0.05 in all cases.

Model I.: workplace, marital status, number of children, work shedule, dysfunctional attitudes.
Model II.: workplace, marital status, number of children, work shedule, dysfunctional attitudes, depression, emotional exhaustion, mental exhaustion, mental exhaustion, action to reduce of exhaustion.

Model III.: workplace, marital status, number of children, work shedule, dysfunctional attitudes, depression, emotional exhaustion, mental exhaustion, mental exhaustion, action to reduce of exhaustion, fatigue, muscoskeletal pain, digestive disorders.

There was a positive association between BO and diabetes (50.0% vs. 0.0%, p = 0.010), musculoskeletal pain (50.0% vs. 25.0%, p = 0.046), irascibility (50.0% vs. 12.5%, p = 0.031), fatigue (57.1% vs. 0.0%, p = 0.047), and digestive disorders (100.0% vs. 0.0%, p = 0.012) determined by univariate regression analysis (Table 2).

In multivariate regression analysis including all factors (demographic criteria, depression, comorbidities, and social support), the predictors of BO were: working in center dialysis workplace (OR = 4.299, p = 0.048), single marital status (OR = 3.990, p = 0.042), having no child or one child (OR = 1.461, p < 0.001, OR = 1.467, p = 0.003), and continuous work schedule (OR = 5.727, p = 0.015). Moderate dysfunctional attitudes (OR=3.039, p=0.022), moderate depression (OR=3.238, p=0.004), feeling emotional exhaustion (OR=1.917, p=0.018) and mental exhaustion (OR=2.879, p=0.001), doing nothing to reduce exhaustion (OR=1.394, p=0.005), muscoskeletal pain (OR=1.239, p=0.007), fatigue (OR=4.443, p=0.012), and digestive problems (OR=1.655, p=0.031) were also associated with BO.

In stepwise regression analysis's first block, added variables were workplace, marital status, number of children and work schedule. The social support and mental health symptoms (depression, dysfunctional attitudes, emotional and mental exhaustion, and action to reduce exhaustion) were added to the second block. Comorbidities (musculoskeletal pain, fatigue, and digestive disorders) were added in the third block. The first block analysis explained 71.4% of the variance of symptoms; the second block explained 92.0%; and the third block explained 81.2%. The strong predictors of BO were continuous work schedule (p < 0.001), single marital status (p = 0.027), working in center dialysis unit (p = 0.022), moderate depression (p = 0.0016), emotional exhaustion (p = 0.018), mental exhaustion (p = 0.001), muscoskeletal pain (p = 0.023), and digestive disorder (p = 0.004; Table).

4. Discussion

Previous studies have examined levels of BO in different wards, also in dialysis units [15]. According to our knowledge this is the first study that considered department-specific (in center versus satellite dialysis unit) comparisons in addition to the impact of sociodemographic and work environment factors in dialysis employees.

We examined the levels of BO and its associated factors among employees working in two different dialysis units: a center and a satellite unit. Patients treated in the center had more comorbidities and needed more medical assistance. Patients treated in the satellite unit were more capable of self-care. Accordingly, patients treated in the center had worse KPS and higher CCI scores.

We found significantly more severe BO among the health care workers of the center compared to the satellite dialysis unit. There were no differences between the employees of the two sites in mild and moderate BO syndrome according to the results of the MBI and MOLBI tests.

As our results confirmed, the workplace itself is an important factor in the development and extent of BO, as well as whether the effort made by the employee at work and the reward, remuneration, and recognition received for it are consistent with each other based on individual evaluation [16]. If the employee perceives a discrepancy between the quantity and quality of work performed and the material and moral recognition received for it, it may lead to the development of workplace stress.

Saribudak et al.[14] compared oncology-hematology nurses to hemodialysis nurses and found significantly higher risk of compassion fatigue in dialysis nurses, but did not find significant difference in BO between these groups. In our study, in line with the results of the above paper we found that the emotional and mental exhaustion were associated with BO.

Wang et al. [17] revealed that hemodialysis nurses working in a public hospital compared to the private care nurses were more likely to develop compassion fatigue. An important associated factor with compassion fatigue was the type of employment.

We have found that in our dialysis unit employees working in the center had higher levels of BO syndrome than those working in the satellite unit. BO incidence among employees caring for chronic patients was 38-42% according to literature data [18]. In the study by Karkar et al. [18], 32 percent of dialysis nurses had high levels of BO, but 59.8% had low levels of emotional BO in another study [19]. We found that 89.7% of our employees had BO according to the MBI test. However, the BO prevalence was reported as 71.8% by MOLBI. Severe BO occurrence was 50% among center workers and 12% among satellite unit workers. Both results were considerably higher than the BO incidence reported in the literature [18].

According to a review by Kotzabassaki et al., dialysis nurses regularly assigned to care for the same patients or for difficult patients had an unusually high risk of BO [20]. We could also confirm this in our dialysis center unit employees. Dialysis patients prefer to be treated by the same nurse every time, because they trust the nurse and they have a bond with them [21]. They would choose to see the same nurse always on the other hand, but for the caretaker this can be challenging.

The greater the chance of developing BO syndrome in employees increase with the time spent working in dialysis. In our study more than 45% of the dialysis health care workers had over 20 years of working experience. There was no significant difference between the two dialysis units in the employees working experience of over 20 years (50 vs. 44%). More than 61% of the dialysis unit health care employees worked for more than ten years in health care. In Karakoc's study [22] 67.6% of the nurses worked in dialysis for more than ten years, while in Hayes et al.'s study [23] 47% of the nurses worked over ten years and 25% over 15 years in dialysis. The participants of our study worked in dialysis for longer time, 23.1% for 21-30 years and 20.5% for 31-40 years.

Yu et al. looked at factors influencing BO in oncology nurses, having similar risk of BO as dialysis nurses. They found that social support—particularly institutional support—was crucial in lowering BO in the medical community [24,25]. Factors determining BO were identified as inadequate social support, inadequate support from upper management, inadequate transportation support (particularly for early morning dialysis sessions), limitations on career planning, the ownership of 63.58% of the nation's dialysis practices by the private sector, and inadequate support, particularly in child care [26,27]. Similarly, in our study strong predictors of BO were the following: continuous work schedule, single marital status, in-center dialysis unit workplace, moderate depression, emotional exhaustion, mental exhaustion, musculoskeletal pain, and digestive disorder. Based on our data, important predictors of severe BO were single marital status and childlessness, which supports the idea that a supportive family environment may have a protective role in the development of BO syndrome.

In a meta-analysis published by Cavanagh et al. the prevalence of compassion fatigue and related variables among medical employees was analysed. They noted that the precise

sociodemographic traits linked to compassion fatigue remained unknown [28]. According to the literature, BO can be decreased in oncology nurses in a supportive work environment with social support [29–31]. In a similar way, Flynn et al. reported that BO rates were more than four times higher in dialysis nurses who regarded their practice environments as least supportive than in registered nurses who rated them as very supportive [32]. In our study, there was no significant difference between the two dialysis units employees' social support, as it was similar in both places, so this did not influence the BO of the workers.

According to Vahey et al. [33], elements of the work environment, including support services, nurse-physician connections and administrative assistance were linked to BO and job unhappiness. According to the literature, dialysis nurses' high level of BO was their extended working hours [18]. Our study's findings are consistent with this, in our employees continuous working schedule was a significant influencing factor of severe BO.

According to Karakoc et al., 40% of nurses did choose to work in the dialysis unit voluntarily, while approximately 30% did so according to managerial orders. Those who did not choose to work as dialysis nurses had higher depersonalization scores, which indicates a BO dimension related to motivation and interpersonal distancing [22]. In our study there was no voluntarily worker, but our findings showed that employees working in the center experienced more emotional exhaustion, depersonalization than those working in the satellite unit, but there were no differences between the personal accomplishment.

Nurse BO was shown in the literature to be higher among those with at least 6 to 10 years of work experience [34]. This was not supported by our research, which showed that among hemodialysis providers with comparable levels of expertise, those with moderate BO had the greatest rates experience. Furthermore, the worst BO levels were detected in our study in personnel having less than a year of experience in the dialysis field. The research conducted by Borkalaki et al. demonstrated that nurses have elevated stress levels when working in hemodialysis and peritoneal dialysis units, even though the stressors associated with these units vary [35]. According to our results, more severe BO occurred in those working in the center, where peritoneal dialysis was also performed. We assume that this was caused by caring for seriously ill, helpless and sometimes hopeless patients.

Pawlowitz et al. showed in a nationwide Polish study that nephrologist doctors working mostly in dialysis settings might be at increased risk of reduced personal accomplishment and BO syndrome [36]. We could also confirm this in our study, although the most employees in our study were nurses.

The primary drivers of BO most commonly identified in a study by Nair included the number of working hours per week, electronic medical record requirements, the lack of time with family and friends of clinic workload is contributing to the development of BO [37]. This was consistent with our results: continuous working schedule was associated with severe BO.

According to the results of our study, factors that significantly influenced severe BO syndrome, were the employees' comorbidities: diabetes (2/39, 5.1%; $p=0.01$) and musculoskeletal pain (8/39, 20.5%, $p=0.046$). Mild or moderate dysfunctional attitudes and mild or moderate depression were associated with the severity of BO. It should be considered that dialysis center workers are also human beings and they may also have diseases and problems that can have a significant impact on their lifestyle and attitude.

We suggest that more emphasis should be placed on screening for BO and on facilitating the acquisition of coping mechanisms among the staff of the dialysis unit.

In the ideal future, as Shanafelt states, "we are not victims, nor are we heroes. We are humans; we are vulnerable; we thrive most when we find meaning and purpose in our work" [38]. According to Washburne, the antidote to feelings of low personal accomplishment is to find meaning in work, and a growing body of literature supports [39] the idea that drawing attention to the most meaningful aspects of work is associated with reduced burnout [40].

It is not easy to accomplish these tasks in a chronic dialysis unit.

The results of our study suggests that it is important to change the dialysis unit employees' workplace periodically to prevent BO syndrome complaints. It is also important for patients' safety and care to prevent these dialysis healthcare professional workers from BO.

5. Limitations of the Study

There are some limitations to this research. Firstly, the collected study data are based solely on the employees' self-reporting. Secondly, we used a convenience sample of hospitals and employees, which may not adequately represent the population because it is a nonprobability sampling method. Moreover, a small portion of the variance in each model was explained by the determined predictors, indicating that other factors remain to be explored. Finally, the cross-sectional study did not assess the changes in the respondents' professional quality of life over time.

6. Conclusion

Our study confirmed that among the workplace factors, the condition of the dialysed patients plays an important role in the development of BO syndrome in dialysis unit employees. BO syndrome should be prevented in dialysis employees for their own well being and also to maintain patient's safety.

Authors' contributions: All authors have read and approved the manuscript. Balázs Sági and Botond Csiky conceived and designed the study, the collection of clinical data, and the drafting of the manuscript. Éva Fejes and Éva Polics Ságiné performed the data base and statistical calculations and compiled the tables and prepared the figures. Nóra Szigeti and Borbála Csiky collected the patient's clinical data and performed the Karnofsky and Charlson indices. Botond Csiky: Identified the study plot and contributed to the interpretation of the drafting and for the preparing the manuscript.

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Availability of data and materials: The data underlying this article cannot be shared publicly due to Hungarian regulations and the privacy of individuals who participated in the study. The data could be shared on reasonable request with the corresponding author if accepted by the Regional Committee for Medical and Health Research Ethics and the local Data Protection Official.

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