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The Possible Association of Burnout and Neuropathic Low Back Pain Among Hungarian Postal Workers: A Cross-Sectional Study

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Objective: Burnout is an increasingly prevalent phenomenon, which can be associated with a wide range of mental and physical illnesses. There is also a possible connection between burnout and neuropathic low back pain, but the association is poorly studied.

Methods: The aim of our cross-sectional study was to analyze the prevalence and risk factors of chronic neuropathic low back pain taking many co-variates into account, such as burnout and its main determinants among postal workers. Demographic data, risk factors and concomitant diseases were recorded. Burnout was measured with the Mini Oldenburg Questionnaire (MOLBI), neuropathic low back pain was assessed by the painDETECT questionnaire, insomnia was detected by the Athen's Insomnia Scale and depression was measured by the Beck Depression Inventory.

Results: Three hundred sixty-eight males (35.6%) and six hundred sixty-six females (64.4%) participated in our study. Low back pain occured in 182 workers (17.6%), among them 36 workers (19.4%) had neuropathic low back pain, 56 (30.9%) had mixed pain and 90 (49.7%) workers had nociceptive low back pain. In a hierarchical regression analysis strong predictors of neuropathic low back pain included having secondary employment, depression, sleep disturbance and emotional exhaustion (main component of burnout).

Conclusion: This is among the first studies showing a possible association between burnout and neuropathic low back pain, highlighting the importance of adequate burnout screening and the implementation of interventions to avoid significant disabilities.

Keywords: burnout, neuropathic pain, low back pain, epidemiology, questionnaire, cross-sectional study

Introduction

By the beginning of the 21st century, rapid changes had occurred in the modern working environment mainly triggered by globalization, privatization and liberalization.[1] There has been an increasing demand for acquiring new skills due to the high performance expectations resulting in significant mental burden manifesting in burnout or depression.[1,2]

Burnout consists of a cluster of symptoms including emotional exhaustion, depersonalization and loss of productivity, which have been extensively studied in the scientific literature.[3] The phenomenon most likely affects people whose work requires empathy and strong interpersonal contacts (such as healthcare or social workers and teachers), but it also can be developed among those who were not initially considered at risk such as "blue collar" (manual) workers.[4] A recent study showed that the prevalence of burnout rate of postal workers can be comparable to healthcare professionals who are amongst the most vulnerable ones.[4] So burnout can occur in any professions and parental burnout also exists.[5] Work (or parental – see above) overload resulting from internal motivation or external factors, increased stress, work addiction (being 'workaholic') are the most important risk factors in the development of the syndrome, especially among those who are exposed to these factors for longer periods, or whose work requires concentration and emotional involvement or active intervention.[6,7] Apart from workplace stressors/risk factors, individual and social factors also play a crucial role in

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the development of burnout, such as family background, private life problems, psychological stress, self-esteem, religious and political beliefs, role and status in society etc.[8–12]

According to the current nomenclature, burnout is classified as an occupational phenomenon and not as a medical condition despite its strong association with mental issues such as depression and anxiety, as well as with a wide range of conventional diseases, namely, hypertension, diabetes and cardiovascular syndromes.[13,14] Furthermore, the diagnostic criteria for burnout are not entirely established in the absence of prospective studies. Several questionnaires have been designed so far, and although it is the Maslach Burnout Inventory that has been considered as the gold standard measure for the detection of burnout, it has attracted criticism lately.[3,15] A recent analysis raised the possibility of replacing this questionnaire with the Copenhagen Burnout Inventory or with the Oldenburg Questionnaire, which seemed to be more sensitive in the detection of the phenomena; however, clinical guidelines are still lacking.[15]

There seems to be a strong correlation between burnout and chronic pain syndromes, which are amongst the leading causes of disability.[16] Musculoskeletal disorders (including low back pain) have been shown to be significantly associated with burnout. In follow-up studies, increased levels of burnout during were associated with an increased risk of developing musculoskeletal pain and being hospitalized for this condition.[14,17,18] Neurobiological research carried out in the last three decades has shown that a significant number of chronic pain patients also suffer from neuropathic pain including those with chronic low back pain or hip and knee arthritis, which were originally considered as diseases causing only somatic pain.[19–21] Neuropathic pain results from damage or dysfunction of the peripheral or central nervous system and is usually underdiagnosed and untreated or undertreated.[19–21]

Chronic low back pain (CLBP) is a common disease affecting both the individual and the society. Nowadays, it is considered as a mixed pain syndrome, containing both nociceptive and neuropathic elements, the rate of neuropathic pain fluctuates between 16% and 55%.[22] Emotional components have a great impact on both neuropathic pain syndromes and burnout such as impaired private and work-life interactions and certain personality traits.[22,23] Furthermore, alcohol consumption and smoking can be related to neuropathic low back pain as well as depression, anxiety and pain intensity, which are also strongly associated with burnout.[24,25]

The Hungarian Post (Magyar Posta) is Hungary's largest state-owned company, with approximately 40,000 employees. According to their official website, they have to face increased turnover, the rate was nearly 24 % in 2022.Various staff retention programs have been launched in the recent years to retain employees with very modest results.[26] In this population chronic musculoskeletal pain (most likely CLBP) is the most common cause of changing the workplace or disability, consequently, prevention and appropriate treatment are essential in order to ensure and maintain the well-being of the workforce and musculoskeletal pain can be strongly associated with burnout based on our previous results.[4,26]

Despite strong association of burnout and different pain syndromes, the effect of burnout on the occurrence of chronic neuropathic low back pain is rarely studied. Based on our knowledge and literature search, our previous study was the first focusing on the association of burnout and neuropathic low back pain.[27] They appeared to share risk factors and to have similar consequences the possibility of a similar pathophysiology has been raised.[27] However, our previous results were acquired from mixed populations, and the applied Maslach Burnout Inventory has been proven to have significant psychometric and conceptual limitations.[28]

Therefore, we aimed to carry out a cross-sectional prospective, questionnaire-based study among postal employees (delivery workers) to ensure a homogenous population. We applied the short version of the Oldenburg Questionnaire, which is validated in Hungarian language and one of the two questionnaires with robust psychometric properties in the medical research of occupational burnout based on a recent systematic review and analysis.[15,28]

The aims of our research were to detect the prevalence and risk factors of neuropathic low back pain taking many co-variates into account such as demographic data, risk factors and medical history and psychometric questionnaires including burnout. We set up a hierarchical linear regression analysis to assess the role of various risk factors in the development of neuropathic CLBP.

Materials and Methods

This study was carried out between 05/2021 and 01/2022 in five counties in Southern-West Hungary among delivery workers of the Hungarian Post. The study was approved by the general and local management of the Hungarian Post Office as well as confirmed by the Ethics Committee of the University of Pécs (reference number: PTE/96773-2/2018).

Our research was an online cross-sectional study questionnaire-based study in nature using a non-probability sampling method. The recruitment process was carried out by the HR Department of the Hungarian Post through the internal mail network. An online link containing our self-completed questionnaire was established between 05/2021 and 12/2021 and was sent within their own mail network reaching all postal workers. Participation was anonymous and voluntary; only workers with previously signed online consent forms, aged >18 years, were allowed to participate in the survey.

Demographic parameters taken into account were age, gender, marital status, number of children, years spent with work, number of workplaces and whether or not the participant had secondary employment. Risk factors included in this analysis were smoking, more or less regular alcohol and drug intake. Regarding medical history the following diseases were taken into consideration: taking any medication regularly, diabetes, hypertension, ischemic heart disease, cerebrovascular disease, peripheral arterial disease, generalized pain (pain involving more than one area of the body), history of depression, and taking medication regularly.

Low back pain was assessed by the painDETECT questionnaire, developed by Freynhagen et al as part of a cooperation with the German Research Network on Neuropathic Pain. This is a patient-based, easy-to-use screening questionnaire, which can determine the prevalence of neuropathic pain components in individual low back pain patients and as well as in heterogeneous cohorts of such patients.[29] This questionnaire is also available in Hungarian language (Cronbach's $\alpha = 0.8$).[30] Cut-off values were (as originally suggested by developers): 0–12 somatic pain (very low probability of neuropathic pain), 13–18 mixed pain or probable neuropathic pain, 19–38 neuropathic pain is very likely.

As there is no consensus on the measurement of burnout, we applied the modified Oldenburg Questionnaire (Mini-OLBI), compiled by Demerouti et al in cooperation with the Karolinska Institute; measure tool with robust psychometric properties.[15,28,31] The questionnaire contains 10 items and has two subscales, exhaustion (five items) and disappointment (five items). This questionnaire is validated and available in Hungarian language (Cronbach's $\alpha > 0.7$).[28] The questionnaire measures burnout along two dimensions: exhaustion and disillusionment. Exhaustion subscale detects physical, and cognitive strain of work (work-related fatigue). Disillusionment scale measures depersonalization, loss of interest possible cynicism, and loss of commitment. Answers are scored on a four-point Likert-type scale, but it should be kept in mind that half of the them are reversed.[20] Mean scores ≥ 2.1 on disappointment and ≥ 2.25 on exhaustion considered to be high and burnout can be diagnosed fulfilling both criteria.[15,28,31]

Depression was measured by the short version of the Beck Depression Inventory (BDI-SF), which is also available and validated in Hungarian language (Cronbach's alpha 0.92).[32,33] This easy-to-use questionnaire contains 9 questions to evaluate the severity of mood disorder and has previously been shown to have good internal consistency in Hungarian samples.[32,33] The following symptoms are measured: indecision, excessive anxiety about physical symptoms, fatigue, social withdrawal, incapacity for work sleep disturbance, self-blame, dissatisfaction, pessimism and lack of joy. Items are scored from 1 to 4 points. Scoring between 0 and 9 points means that depression is unlikely, further categories distinguish mild (10–18 points) moderate (19–25 points) and severe depression.[32,33]

Sleep disturbance was detected with the Athens Insomnia Scale (AIS).[34] This questionnaire has a valid Hungarian translation (Cronbach's alpha 0.878).[35] The questionnaire contains eight questions about nocturnal symptoms such as early awakening or difficulty falling asleep, and there are three more items about daytime problems. Scoring more than six points means that insomnia is very likely, while having more than ten points indicates clinically significant sleep disturbance (severe insomnia).[34,35]

Statistical Analysis

Data were evaluated as means ± SD (standard deviation), frequencies, and percentages. The chi-square test, the Pearson's Rank-Order Correlation, distribution ratios and Analysis of variance (ANOVA) were conducted to evaluate differences between study subgroups. To evaluate the effect of independent variables (demographic data, risk factors, concomitant

diseases, burnout, depression and insomnia) on dependent variable (neuropathic low back pain), we conducted a hierarchical linear regression analysis.[36] Statistical analyses were performed using the statistical package of SPSS 11.0 (SPSS, Chicago, IL, USA).

Results

Demographic Data

From a total of 1300 recruited workers, 1.034 questionnaires were returned and were completely filled out (response rate: 79.5%). Three hundred and sixty-eight males (35.6%) and 666 females (64.4%) participated in our study. Most of the examined workers (43.9%) were between 46 and 55 years of age. Seven hundred and sixty-four people (73.89%) were married or lived in a relationship. The number of childless workers was 236 (22.8%). Fifty-eight participants (5.6%) had secondary employment. The vast majority (45.5%) of our study population had been working for 21–40 years. Baseline data are presented in Table 1.

Risk Factors and Previous Diseases

Four hundred and forty-five (43.0%) study participants were taking any medication regularly, 299 (28.9%) were smokers, 91 (8.8%) were consuming alcohol and 34 (3.3%) were taking drugs more or less regularly. Three hundred and five (29.5%) participants had hypertension, 185 (17.9%) had musculoskeletal pain. Ischemic heart disease was detected in 124 (12.0%) workers. Sixty-two (6.0%) participants had diabetes (Table 2).

Table 1 Characteristics of the Study Population

	%
Whole population	100 (1034)
Gender	
Female	64.4 (666)
Male	35.6 (368)
Age	
18–25 years	4.0 (41)
26–35 years	13.3 (138)
36–45 years	23.5 (243)
46–55 years	43.9 (454)
56–62 years	13.7 (142)
More than 62 years	1.6 (16)
Marital status	
Single	12.9 (133)
Relationship	17.1 (177)
Married	56.8 (587)
Divorced/widow	13.2 (136)

(*Continued*)

Table 1 (Continued).

	%
Number of children	
Have no child	22.8 (236)
1 child	26.0 (269)
2 children	37.2 (385)
More than 3 children	13.9 (144)
Years spent with work	
1–12 months	4.5 (45)
1–5 years	20.3 (210)
6–10 years	10.3 (107)
11–20 years	17.5 (181)
21–30 years	25.6 (265)
31–40 years	19.9 (206)
More than 40 years	1.9 (20)
Secondary employment	
No	94.4 (976)
Yes	5.6 (58)

Table 2 Risk Factors and Comorbidities in the Study Population

Risk Factors and Comorbidities	**(%)**
Whole population	100 (1034)
On regular medication	43.0 (445)
Smoker	28.9 (299)
Taking alcohol	8.8 (91)
Taking drugs	3.3 (34)
Diabetes	6.0 (62)
Hypertension	29.5 (305)
Ischemic heart disease	12.0 (124)
Generalized pain	17.9 (185)
Cerebrovascular disease	1.7 (18)
Peripheral artery disease	5.6 (58)
History of depression	4.9 (51)

Psychometric Questionnaires

Chronic low back pain occurred in 182 workers (8.9%), 90 (49.7%) workers had nociceptive low back pain, 56 workers (30.9%) suffered from mixed pain and 36 (19.4%) had definite neuropathic low back pain. The overall prevalence of burnout was 50.8% (525/1034) in the study population (mean score 2.74 ± 0.33). The rate of emotional exhaustion was 52.8% (546/1034) (mean exhaustion score 2.3 ± 0.52), and 816 workers (78.9%) were disappointed (mean score was 2.5 ± 0.58). Three hundred and seventy five (36.2%) participants had no depression, 585 (56.6%) suffered from mild, 64 (6.2%) from moderate, and 10 (1.0%) from severe depression. The prevalence of sleep disturbance (insomnia) was 17.9% (185/1034), 4.6% (48/1034) suffered from severe sleep disturbance (Table 3).

Univariate Analysis

Chi-squire test showed that with regard to demographic data, neuropathic low back pain was associated with being 36–45 years old ($p = 0.007$), working in the second workplace ($p = 0.024$), working for 11–20 years and ($p = 0.036$) and having a secondary employment ($p = 0.003$) (Table 4). Consuming alcohol more or less regularly was significantly higher among study participants with neuropathic low back pain ($p = 0.023$) as well as the rate of diabetes ($p = 0.028$) and peripheral artery disease ($p = 0.005$) (Table 5). Analysis of the psychometric questionnaires showed that neuropathic low back pain was also associated with moderate ($p = 0.013$) or severe depression ($p = 0.035$) and severe insomnia ($p = 0.006$). Burnout was also significantly associated with this condition ($p = 0.044$), mainly due to emotional exhaustion ($p = 0.005$) (Table 6). There was a significant association between the neuropathic low back pain and emotional exhaustion (69.4%

Table 3 Prevalence of Neuropathic Low Back Pain, Burnout, Depression and Insomnia in the Study Population

(n=1034)	**%**
Chronic low back pain	8.9 (182/1034)
Nociceptive	49.7 (90/182)
Unclear pain	30.9 (56/182)
Neuropathic pain	19.4 (36/182)
Depression	
Normal	36.2 (375/1034)
Mild	56.6 (585/1034)
Moderate	6.2 (64/1034)
Severe	1.0 (10/1034)
Burnout	
Overall	50.8 (525/1034)
Emotional exhaustion	52.8 (546/1034
Disappointment	78.9 (816/1034)
Sleep disturbance	
No	77.5 (801/1034)
Present (overall)	17.9 (185/1034)
Present (severe)	4.6 (48/1034)

Table 4 Association of Demographic Data and Neuropathic Low Back Pain (*p < 0.05)

(Data %, N=36)	Neuropathic Pain (%)	p value
Age (X^2 (4)=2.024)		
18–25 years	8.3 (3)	0.731
26–35 years	5.6 (2)	0.732
36–45 years	27.8 (10)	0.007*
46–55 years	47.2 (17)	0.335
56–62 years	11.1 (4)	0.744
Number of workplace (X^2 (4)=5.250)		
1st	38.9 (14)	0.263
2nd	27.8 (10)	0.024*
3rd	8.3 (3)	0.252
4th	8.3 (3)	0.516
≥ 5th	16.7 (6)	0.808
Years spent with work (X^2 (6)=7.035)		
1–5 years	27.8 (10)	0.318
6–10 years	11.1 (4)	0.258
11–20 years	30.6 (11)	0.036*
21–30 years	19.4 (7)	0.077
31–40 years	2.8 (1)	0.604
≥ 40 years	8.3 (3)	0.992
Secondary employment (X^2 (1)=0.011)		
No	86.1 (31)	0.916
Yes	13.9 (5)	0.003*

Table 5 Comparison of Risk Factors and Comorbidities in the Study Subgroups (*p < 0.05)

(Data %, N=36)	Neuropathic Pain (%)	p value
On regular medication X^2 (1) =0.001	69.4 (25)	0.587
Smoker X^2 (1)= 0.096	30.6 (11)	0.468
Taking alcohol X^2 (1)=1.578	8.3 (3)	0.023*
Taking drugs X^2 (1)= 0.034	5.6 (2)	0.672
Diabetes X^2 (1)=2.159	27.8 (10)	0.028*

(*Continued*)

Table 5 (Continued).

(Data %, N=36)	Neuropathic Pain (%)	p value
Hypertension X^2 (1)=0.072	47.2 (17)	0.519
Ischemic heart disease X^2 (1)=0.130	11.1 (4)	0.465
Stroke X^2 (1)=0.115	8.3 (3)	0.624
Peripheral artery disease X^2 (1) =1.762	25.0 (9)	0.005*
History of depression X^2 (1)=0.151	11.1 (4)	0.480

Table 6 Association of Neuropathic Low Back Pain with Burnout, Depression, Insomnia (*p < 0.05 in All Cases)

(Data %, N=36)	Neuropathic Pain	p value
Depression (X^2 (3)=28.150)		
Normal	33.3 (12)	0.081
Mild	33.3 (12)	0.305
Moderate	19.5 (7)	0.013*
Severe	13.9 (5)	0.035*
Burnout (X^2 (2)=30.635)		
Overall burnout	72.2 (26)	0.044*
Emotional exhaustion	69.4 (25)	0.005*
Disappointment	55.6 (20)	0.508
Sleep disturbance (X^2 (2)=20.649)		
No	36.1 (13)	0.276
Present (overall)	33.3 (12)	0.481
Present (severe)	30.6 (11)	0.006*

vs 55.4%, p = 0.024, r^2 = 0.077, r = 0.070) and sleep disturbance (2.0% vs 30.6%, p = 0.000, r^2 = 0.090, r = 0.301) and depression (0.6% vs 13.9% p = 0.001, r = 0.212, r^2 = 0.045) (not shown).

Multivariate Analysis

In hierarchical linear regression analysis, variables added in the first block were age, time spent with work and having secondary employment. Mental health symptoms (burnout, sleep disturbance, depression) were added in the second block and the risk factors and comorbidity variables (alcohol consumption, hypertension, diabetes, peripheral vascular disease) were added in the third block. The first block analysis explained 15% of the variance of symptoms, the second block explained 17.8% and the third block explained 12.1%. The strong predictors of neuropathic low back pain were secondary employment (p = 0.010), depression (p = 0.037), sleep disturbance (p = 0.008) and emotional exhaustion (p = 0.007) (Table 7).

Table 7 Hierarchical Linear Regression Analysis Focusing on the Potential Predictors of Neuropathic Low Back Pain (*p < 0.05 in All Cases)

	Model I			Model II			Model III		
	B	SE B	β	B	SE B	β	B	SE B	β
Age	0.748	0.149	0.291	0.783	0.279	0.381	0.776	0.302	0.254
Time spent with work	1.096	0.068	0.092*	1.095	0.170	0.098*	0.471	0.691	0.075
Secondary employment	1.143	0.013	0.070*	1.928	0.010	0.075*	1.220	0.790	0.045*
Burnout				1.543	0.487	0.433*	0.636	0.064	0.505
Emotional exhaustion				1.578	0.637	0.456*	3.027	0.648	0.421*
Depression				1.016	0.044	0.132*	1.078	0.054	0.738*
Sleep disturbance				1.073	0.049	0.070*	1.023	0.046	0.242*
On regular medication							0.459	0.603	0.580
Alcohol consumption							0.748	0.871	0.738
Hypertension							0.951	0.059	0.007
Diabetes							0.244	0.035	0.085
Peripheral artery disease							0.674	0.262	0.770
R^2	0.020			0.058			0.089		
F	1.323			5.340			8.423		

Discussion

Burnout is a progressively developing individual response to chronic (work) stress causes damage at an emotional, cognitive and attitudinal level, which translates into negative behavior towards peers, users, work and the professional role itself.[37] Although it is a rapidly increasing condition and despite a strong association with mental and physical illnesses it is still labelled as an occupational phenomenon, which should be reconsidered.[14] This phenomenon is most likely to occur among those working in human services fields, but any type of employee can be affected; it is important to stress that school burnout and parental burnout do also exist.[38,39]

Our study is among the first to focus on a possible link between burnout (a phenomenon) and neuropathic low back pain, which is a devastating syndrome caused by the damage or the dysfunction of the pain processing pathways to facilitate the medical approach of burnout. We have previously showed the possible association between burnout and neuropathic low back pain in a mixed population of healthcare workers, social workers and teachers who are amongst the most vulnerable populations.[27] However, our former study struggled with limitations such as heterogenous population, so we formed a homogenous group of workers with the inclusion of delivery employees of the Hungarian Post Office (traditional postmen) to avoid the confounding effect of different types of work. Low back pain is considerably more common in this population, mainly attributed to lifting and handling.[40] Secondly, the previously applied Maslach Burnout Inventory has certain limitations, such as low internal consistency of the depersonalization scale, especially when translated from English.[41] In addition, the meaning of some items can be ambiguous, and the individual subscales do not contain the same amount of positive and negative items, which can significantly affect the internal consistency of the questionnaire.[42] Furthermore, the independence of different subscales, especially emotional exhaustion and depersonalization is also questionable in Hungarian versions.[43] On the other hand, the Copenhagen Burnout Inventory (CBI) and the Oldenburg Burnout Inventory (OLBI) seem to be the most sensitive measures of burnout based on a recent systematic analysis.[15] We applied the short version of the OLBI as it was validated into Hungarian and has showed construct validity and reliability in the measurement of burnout.

About 10% of this population suffered from chronic low back pain, which is higher than the 7.5% point prevalence extracted from the Global Burden of Disease (GBD) study, which highlights the importance of this condition among postal delivery workers.[44] Low back pain is one of the most common diseases occurring with neuropathic pain.[24,25] Low back pain originating from neuropathic etiology often transforms into an intractable chronic pain syndrome with recurrent attacks. Therapies traditionally used in the treatment of low back pain (eg NSAIDs and muscle relaxants) are usually ineffective and can cause severe side effects worsening the patient's condition. This condition is usually complicated by mental issues such as insomnia, depression and anxiety imposing a great burden to patients, families, healthcare system and society.[24,25] Given the prevalence of chronic low back pain worldwide, the medical expense of neuropathic low back pain can account for a significant part of the overall cost as its management is still a challenge for physicians. So the early set-up of the diagnosis is important for further effective targeted therapy.[24,25,45,46] Our study showed that about one-fifth of CLBP patients suffered from neuropathic pain and the rate of mixed pain (having nociceptive and neuropathic components) was about 30%, which is comparable to previous findings and to the results of our earlier study.[16,27]

Neuropathic low back pain was associated with age (being middle-aged) and working for 11–20 years. These results are not surprising as the occurrence of low back pain (as well as the prevalence of neuropathic low back pain) has a 2.5-fold increase among the working population (years lived with disability peaked at middle-age).[24,44,47] High physical demands, twisting, bending, pulling and lifting objects are the most common occupational factors of low back pain syndromes, which are common tasks of postal work and can also be related to the cumulative effect of workload.[48] It was also supported by the 4-decades follow-up study of Burgdof et al, who showed the association of falling out of work due to low back pain and physical load.[24]

Secondary employment was also strongly associated with this chronic neuropathic low back pain and being the only epidemiological factor which remained significant in a hierarchical linear regression analysis. In a Canadian study targeting patients with neuropathic pain, this condition was associated with low income, and this is also in accordance with the results of previous studies suggesting the role of low socioeconomic status (possibly also reflected in having several workplaces) as disabling low back pain is usually considerably more common in this population.[27,49,50] This suggests potential deprivation-related factors in the development of chronic neuropathic low back pain.

It is well known that regular alcohol intake is associated with neuropathy via thiamine deficiency and a recent study has also revealed the role of this addiction as a significant predictor.[51,52] Furthermore, alcohol-related neuropathologies can be due to the increased expression of various clusters of inflammatory molecules in the central nervous system, which can be the predecessor of developing neuropathic pain; however, these results are more likely to have been speculative rather than based on scientific evidence.[52,53] However, in our study alcohol intake only found to be associated with burnout in an univariate analysis and could not be confirmed by the multivariate analysis, which is in concordance with the findings of the meta-analysis of the observational studies, which showed that it appears to be associated with CLBP only and in people with alcohol consumption dependence.[51]

Diabetes and peripheral artery disease were also associated with neuropathic low back pain in our study in an univariate analysis. Chronic neuropathic low back pain can be associated with increased blood pressure (due to the pain itself) as well as can lead to sedentary lifestyle, physical inactivity and lack of regular exercise resulting in weight gain, thereby creating or exaggerating comorbidities like diabetes mellitus and vascular diseases.[54–56] On the other hand, the role of diabetes is well known in the development of neuropathic pain as well as different manifestations of vascular diseases including peripheral arterial disease and atherosclerosis of the lumbar vessels, which can be an underlying mechanism of (neuropathic) low back pain.[54,55,57,58] However, our study, similar to our previous findings, could not confirm their role as potential contributors in a multi-variate analysis.[27]

We found a surprisingly high rate of burnout among our study participants: postal delivery workers. Although postal workers have not been in the focus of burnout research to date, their burnout rate is comparable to that of medical personnel, who are amongst the most vulnerable ones.[59,60] Interestingly, somewhat contrary to our previous study, although the phenomenon of burnout itself was related to neuropathic low back pain; however, only its emotional component proved to be independently associated with it, emphasizing the role of emotional factors in the development of various pain syndromes.[27,60] The pain itself could also be a significant contributor of fatigue/emotional exhaustion,

leading to further reduction of functional capacity in patients suffering from neuropathic CLBP. Co-occurrence of fatigue/emotional exhaustion and chronic neuropathic low back pain can contribute to a greater loss of function and increased risk for sick leave.[27,61]

We have no clear explanation for the association of emotional exhaustion (main component of burnout) and neuropathic low back pain. Based on literature data the association can be bidirectional. It is well known that burnout is mainly due to work overload and chronic occupational stress leading to the activation of the autonomic nervous system (ANS) and the hypothalamic-pituitary-adrenal (HPA) axis. This activation results in over activation of vital functions (such as increased heart rate and elevated blood pressure) and also leads to blood coagulation abnormalities, increased rate of with low-grade inflammation, deprivation of the immune system, insomnia and increased risk of poor health behaviors (absence of physical activity, being overweight, tobacco and alcohol use)[27,59,60] This pathways and changes also have been documented in the development of neuropathic pain.[27] Second, imaging studies have shown significant alteration in the pain perception pathways of the central nervous system (both under and over activation of different areas as well as brain atrophy) due to neuropathic pain, which may play a role in sympathetic overload leading to the above mentioned findings as well as vascular diseases and mental complications such as burnout.[27,59–61] However, this explanation is rather speculative than scientific at the moment.

Conclusions

In summary, our study is amongst the first studies analyzing the possible association between burnout and neuropathic low back pain among "blue collar" workers. Significant proportion of CLBP patients suffer from neuropathic pain, which is still a challenge for the clinicians and requires better understanding and improved diagnosis and treatment. Although both conditions have similarities with regard to their risk factors, the phenomenon of burnout itself was not strongly associated with neuropathic pain. On the other hand, emotional exhaustion, which can be the key element of burnout was also a significant predictor of neuropathic low back pain, which highlights the importance of emotional components in its development. Improving the recognition and understanding of CLBP of neuropathic origin can help in the development of mechanism-based strategies. We suppose that neuroinflammation plays a role as a common pathway.

Finally, our article has several limitations. First of all, it was a cross-sectional and not a representative study, so our results should be given careful consideration as causality cannot be clarified. It was an online epidemiological survey; therefore, there was no physical examination, or detailed medical history with regards to the duration of symptoms and previous patient records were also not available, which may have significantly influenced our findings. Employees' duties and employment status were also not analyzed, which may significantly affect our results. Although our study involved more than 1000 postal workers, only a minority suffered from neuropathic low back pain, and the sample is not representative and we cannot generalize our findings, and our conclusions are limited to the population included in this study.

Institutional Review Board Statement

The study protocol applies the ethical guidelines of the 1975 Declaration of Helsinki. This study was also approved by the Regional Ethical Committee at the University of Pécs, Pécs, Hungary as seen above.

Data Sharing Statement

Study data are available on request to the corresponding author.

Informed Consent Statement

Informed consent was read and signed by participants prior to entering the study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflict of interest.

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