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Prevalence and factors associated with back pain among education workers in Brazil: a longitudinal study

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This study aimed to longitudinally assess the prevalence of back pain and associated factors in education workers of the Federal Network for Professional and Technological Education in Brazil. This longitudinal epidemiological study was conducted in two stages, with data collected in 2022 and again in 2023, for a sample population of education workers from 38 Brazilian federal institutes. Sociodemographic data as well as data of the back pain assessment performed using the Back Pain and Body Posture Evaluation Instrument questionnaire were collected. Data on the assessment of quality of life and mental health, obtained using the World Health Organization Quality of Life-Bref and Depression Anxiety Stress Scale-21 instruments, respectively, were also collected. Generalized estimating equations were used in a Poisson regression model. Overall, 600 employees from all regions of Brazil were assessed. In 2022, the prevalence of back pain was 80.8%, and it dropped to 78.2% in 2023. The factors associated with a major risk of pain were mainly female sex (relative risk [RR], 1.15; 95% confidence interval [CI], 1.07–1.24), lack of regular physical activity (RR, 1.10; 95% CI, 1.04–1.17), and low quality of life, especially in the psychological domain (RR, 1.13; 95% CI, 1.02–1.27). The results indicate a high prevalence of back pain in education workers of the Federal Network for Professional and Technological Education in Brazil. A survey of associated factors can support a biopsychosocial approach to the problem, with the possibility of preventive actions aimed at reducing the development of pain in education workers, as well as improving their quality of life and occupational health.

Keywords Dorsalgia, Teacher, Administrative technician in education, Occupational health, Mental health

Back pain is the most prevalent musculoskeletal disorder in adults; it is estimated that approximately 80% of the world's population has experienced at least one episode of back pain in their lifetime[1,2]. According to the World Health Organization, back pain is the leading cause of disability in 160 countries[3,4]. Thus, it is a significant health problem worldwide, affecting approximately 568 million people, and its impact is expected to increase in the coming decades, especially in low- and middle-income countries[2,4].

Chronic back pain is one of the major causes of limitations and work-related disability and affects quality of life (QoL), social interactions, activities of daily living, and mental health[5,6]. One of the main challenges in identification with chronic pain is that it is often non-specific and multicausal, making it difficult to identify a single cause[7,8]. Therefore, may be associated with a combination of socioeconomic, physical, behavioral, and psychological factors[4,9].

Socioeconomic factors such as the level of education, occupation, sex, age, and ethnicity, and housing and behavioral factors such as lifestyle habits, physical activity, screen time, and sleep affect access to information and healthcare, which leads to vulnerability and can be associated with the development of back pain[10,11]. A scoping review identified the following factors associated with the development back pain: prolonged sitting, poor posture, and static posture[12]. The psychological risk factors associated with back pain include depression, anxiety, post-traumatic stress disorder, poor social support, low self-esteem, and substance use disorders[6].

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In the educational environment, professionals are exposed to technological and psychosocial risks and stressors that can markedly affect their QoL[10]. Factors such as prolonged sitting, poor posture, anxiety levels, high workloads/demands, low support from colleagues, and a poor mental state contribute to the development of back pain among education workers such as teachers and administrative technicians[13,14]. In the case of workers from the Federal Education Network in Brazil (RFEPCT), established in 2010 to provide professional and technological training with the verticalization of education[15] long working hours, sedentary behavior, inadequate posture, prolonged screen time, and biological factors (such as advanced age and obesity), as well as psychological factors (such as depressive symptoms), and social conditions contribute to the development of back pain[16].

Research on pain development, QoL, and mental health among public servants in the education sector is ongoing; however, there is a scarcity of related studies in developing countries. Most investigations adopt descriptive and cross-sectional designs, while longitudinal studies are needed to assess the persistence of habits considered risk factors for low back pain. Therefore, our study contributes to the adoption of organizational strategies that promote employee health and well-being, providing guidance on individual habits and self-care, as well as the development of policies and practices that prioritize more efficient and humanized management[17]. No longitudinal studies have determined the prevalence of back pain among education workers of RFEPCT and factors associated with it. Given the gaps in scientific research on this topic, we conducted this longitudinal study to assess the prevalence of back pain and the factors associated with its development among education workers of RFEPCT.

Methods

Study design

This longitudinal epidemiological study was conducted in 2022 (baseline) with follow-up investigations performed in 2023 (follow-up) as part of a project entitled "Quality of Life in Education in Brazil - QoLE-Bra"[18]. The study included education workers of RFEPCT, which comprises 38 federal institutes, two federal centers for technological education, 22 technical Schools, the Federal Technological University of Paraná, and the Pedro II College, distributed across the country's 27 states, with a total of 661 campuses in North, Northeast, Midwest, Southeast, and South Brazil. It was submitted to and approved by the Research Ethics Committee of the Instituto Federal Goiano (approval no. 5.270.596, registered protocol no. 52353621.3.0000.0036)[18].

The study population comprised 83,517 employees of the Federal Education Network, including teachers and administrative staff. The questionnaire was made available to the entire population, and a total of 1,563 civil servants returned complete responses in the 2022 baseline survey. Of the 1,563 civil servants who completed the questionnaire in 2022, 600 were included in the 2023 follow-up survey and were considered in the longitudinal study (Fig. 1). A non-probabilistic convenience sampling strategy was adopted, with participants representing all regions of the country.

Eligible participants were teachers and technical-administrative professionals in the education sector who were aged ≥ 18 years, actively employed within the RFEPCT in Brazil in 2022, and who consented to participate in the 2022 and 2023 analyses. Individuals who did not complete the questionnaire were excluded. The guidelines and norms established by Resolution 466 of December 2012 of the National Health Council, which regulates research involving human beings in Brazil, were followed. All the participants provided written informed consent[19].

Data collection

Data were collected through online questionnaires by using the Google Forms digital platform. The questionnaires were structured and shared through this platform and links were sent to the participants' emails after they signed an informed consent form. Sociodemographic data such as sex, age group, level of education, marital status, region in Brazil, living environment, position held, and length of service at the REFPCT were collected. Regarding lifestyle habits, the following were assessed: hours per day on the computer, hours per day sitting watching television, duration of sleep per night in hours, satisfaction with sleep, reading and/or studying in bed, preferred sleeping position, and regular physical activity[18].

Quality of life was investigated using the World Health Organization Quality of Life-Bref version validated for Portuguese, which has 26 questions and has high reliability with a Cronbach's alpha of 0.91[20,21]. The instrument assessed QoL in four domains[21]. The physical domain assesses health-related issues, such as pain, discomfort, energy, fatigue, sleep, rest, and mobility. The psychological domain includes positive and negative feelings, self-esteem, perceived QoL, and spirituality. The social domain considers interpersonal relationships, family support, and social and emotional support. The environmental domain encompasses aspects such as physical safety, financial resources, access to health and social care, leisure, and transportation[18,21].

Mental health was assessed using the Depression Anxiety Stress Scale-21. The instrument was developed by the University of New South Wales in 1995 and is used to assess symptoms of depression, anxiety, and stress through an interactive and guided process[18]. Its 21 questions are scored on a 4-point Likert scale, with the scores reflecting the intensity of the symptoms experienced in the previous week. The final results are obtained from the sum of the individual scores and categorized into three subscales, each with seven questions corresponding to depression, anxiety, and stress[22]. The instrument has shown psychometric robustness in diverse contexts, with evidence of high reliability and consistent structural validation in a population of teachers[23].

The Back Pain and Body Posture Evaluation Instrument questionnaire, which contains 21 questions, was used to assess the development of back pain[24]. The instrument was designed to identify the presence of back pain in the 3 months before its application and to assess behavioral risk factors such as television and computer times, lifestyle habits such as regular physical activity, and postural habits associated with the development of

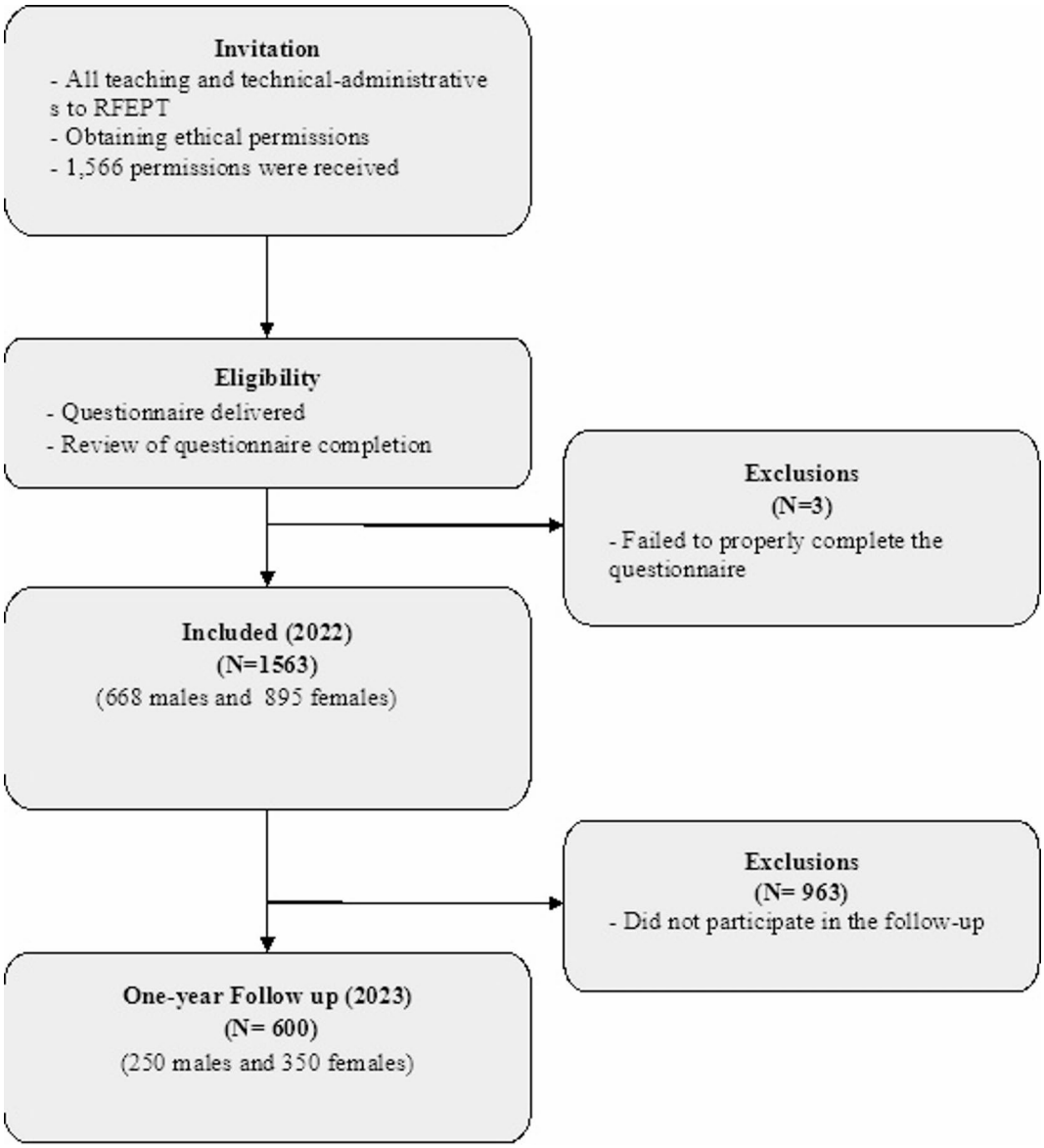

Fig. 1. Flowchart of the study's data collection.Source: Developed by the authors (2025).

back pain[24,25]. It has been reported to have Kappa values ranging from good to very good (0.6 to 0.8) and an intraclass correlation coefficient of 0.937[25].

Statistical analyses

The answers obtained from the questionnaires were imported and organized into a database by using Microsoft Excel. Statistical analyses were performed and graphs were generated using the Statistical Package for the Social Sciences (SPSS version 26). The dependent variable was the development of back pain in the 3 months preceding the survey, and the independent variables were demographics, socioeconomic factors, behavioral factors, QoL (physical, psychological, environmental, and social domains), and mental health (stress, anxiety, and depression)[21,22,24]. Descriptive data are presented as absolute numbers (n) and relative frequencies (%), and relative risk (RR) and 95% confidence interval (CI) were used. For the longitudinal analysis, generalized estimating equations (GEE) were used to develop a Poisson regression model. Statistical significance was established using the Wald test with a cutoff value of $p < 0.05$. Exposure variables with a p-value of < 0.20 in the bivariate analysis were included in the multiple Poisson regression analysis[26,27].

Results

Overall, 600 individuals who participated in the survey in 2022 and 2023 were studied; there was a predominance of female employees (58.3%) in the study population. Education administrative technicians and teachers accounted for 59.8% and 40.2% of the participants. Table 1 provides information on the sociodemographic and socioeconomic characteristics of the participants.

	n	%
Sex		
Female	350	58,3%
Male	250	41,7%
Age group		
≤ 33	43	7,2%
33–37	126	21,0%
38–42	151	25,2%
43–47	102	17,0%
48–52	71	11,8%
≥ 53	107	17,8%
Education level		
Secondary, higher, and/or technical vocational	34	5,7%
Specialization	164	27,3%
Masters degree	260	43,3%
Doctorate and/or post-doctorate	142	23,7%
Region		
North and northeast	172	29,5%
Midwest	168	24,3%
South	94	18%
Southeast	166	28,2%
Marital status		
Single	153	25,8%
Married	378	63,0%
Divorced or widowed	68	11,2%
Position		
Education administrative technicians	359	59,8%
Teacher	241	40,2%
Percentage values (%) have been rounded one decimal place.		

Table 1. Sample characterization, demographic and socioeconomic data of RFEPCT civil servants at baseline (2022) ($N = 600$).

	Female *n* (%)		**Male *n* (%)**		**otal *n* (%)**	
	2022	**2023**	**2022**	**2023**	**2022**	**2023**
Experienced back pain in the last 3 months?						
No	41 (11,7%)	55 (15,7%)	68 (27,2%)	67 (26,8%)	109 (18,2%)	122 (20,3%)
Couldn't answer	5 (1,4%)	5 (1,4%)	1 (0,4%)	4 (1,6%)	6 (1,0%)	9 (1,5%)
If you've had back pain in the last 3 months, how often?						
Once only	21 (6,0%)	15 (4,3%)	15 (6,0%)	13 (5,2%)	36 (6,0%)	28 (4,7%)
1 time per month	39 (11,1%)	46 (13,1%)	38 (15,2%)	42 (16,8%)	77 (12,8%)	88 (14,7%)
1 time a week	58 (16,6%)	55 (15,7%)	33 (13,2%)	26 (10,4%)	91 (15,2%)	81 (13,5%)
2 to 3 times a week	67 (19,1%)	66 (18,9%)	28 (11,2%)	35 (14,0%)	95 (15,8%)	101 (16,8%)
4 or more times a week	80 (22,9%)	77 (22,0%)	45 (18,0%)	41 (16,4%)	125 (20,8%)	118 (19,7%)
Couldn't answer	39 (11,1%)	31 (8,9%)	22 (8,8%)	22 (8,8%)	61 (10,2%)	53 (8,8%)
If you've had back pain in the last 3 months, has it limited your activities?						
Yes	63 (18,0%)	53 (15,1%)	40 (16,0%)	39 (15,6%)	103 (17,2%)	92 (15,3%)
No	227 (64,9%)	231 (66,0%)	137 (54,8%)	135 (54,0%)	364 (60,7%)	366 (61,0%)
Couldn't answer	14 (4,0%)	6 (1,7%)	4 (1,6%)	5 (2,0%)	18 (3%)	11 (1,8%)

Table 2. Prevalence of back pain according to sex of RFEPCT civil servants at baseline (2022) and one-year follow-up (2023) ($N = 600$). Percentage values (%) have been rounded one decimal place.

The prevalence rates of back pain in the 3 months preceding the survey in 2022 and 2023 were 80.8% ($n = 485$) and 78.2% ($n = 469$), respectively (Table 2). Back pain frequency of four or more times a week was reported by 20.8% of those surveyed in 2022 and by 19.7% in 2023. In 2022, pain did not limit activities in 60.7% of cases, and it continued to not influence activities in 61% in 2023. In 2022, 16% and 18% of the male and female participants,

respectively, reported that pain limited their activities; the corresponding percentages for 2023 were 15.6% and 15.1% (Table 2).

The bivariate analysis revealed a significant association of back pain with female sex (RR, 1.18; 95% CI, 1.10–1.28); dissatisfaction with sleep (RR, 1.14; 95% CI, 1.01–1.29); lack of regular physical activity (RR, 1.13; 95% CI, 1.07-1.07. 20); and low perception of QoL including the physical (RR, 1.14; 95% CI, 1.05–1.22), social (RR, 1.14; 95% CI, 1.07–1.23), environmental (RR, 1.17; 95% CI, 1.08–1.26; $p < 0.001$), psychological (RR, 1.25; 95% CI, 1.15–1.36), and total (RR, 1.19; 95% CI, 1.10–1.28) domains. In addition, back pain was significantly associated with mental health indicators, including depression (RR, 1.14; 95% CI, 1.06–1.22), anxiety (RR, 1.13; 95% CI, 1.05–1.22), and stress (RR, 1.16; 95% CI, 1.08–1.25) (Table 3).

In the multivariate analysis, female sex (RR, 1.18; 95% CI, 1.10–1.28), lack of regular physical activity (RR, 1.10; 95% CI, 1.04–1.17), and the psychological domain (RR, 1.14; 95% CI, 1.02–1.28) were maintained as risk factors for back pain in individuals who reported pain in the previous 3 months. However, no associations were found between back pain and depression, anxiety, or stress (Table 3).

Discussion

We conducted this longitudinal study to assess the prevalence of back pain and the factors associated with its development among education workers of RFEPCT. We found a high prevalence of back pain among education professionals at both the time points analyzed and that the factors associated with back pain mainly included female sex, lack of regular physical activity, and low QoL, especially in the psychological domain. This study assessed low back pain in the 3 months prior to the survey in 2022 and 2023, and found the occurrence rate to be 80.8% and 78.2%, respectively.

In Austria, a survey of educators identified the main musculoskeletal disorders prevalent and showed a high prevalence of back pain. However, it used the perception of pain in the 12 months prior to the study, and found pain occurrence in both the neck (85.9%) and the lumbar region (73.9%)[28]. Women had a major risk of developing back pain compared to men. This finding is attributable to various factors and interactions between physiological, psychosocial, and cultural factors[3]. From a physiological perspective, women have less efficient endogenous pain inhibition systems and female sex hormones influence pain sensitivity[2], whereas in men, testosterone has an antinociceptive effect. Women are also more susceptible to musculoskeletal disorders in general[29].

Psychological states, particularly anxiety, and hormonal fluctuations can influence sensitivity, leading to sex differences in pain perception[30,31]. In addition, cognitive and emotional processes such as attention and pain interpretation are also associated, because women can focus more on pain and interpret it differently[32]. Sociocultural factors play an important role in this perception, with women often reporting greater pain intensity because of the burden of a triple workload, social expectations, and gender role reversal[29,30,33]. These findings emphasize the importance of targeted actions for the prevention and management of back pain in female individuals.

Physical activity has been shown to be a factor associated with the non-occurrence of back pain. The incidence of back pain was major in individuals who reported not being physically active on a regular basis[34,35] reaching more than 80% of pain at both times analysed. In a study on workers, active participants were 33% less likely to experience back pain than those who were insufficiently active (odds ratio [OR]: 0.67; 95% CI: 0.46–0.98)[35,36]. Physical activity strengthens muscles and ligaments, which helps maintain proper posture, prevent injuries, and increase resistance and tolerance to pain[37].

Regarding levels of physical activity, medium levels of activity, compared with low levels, contribute as protective factors against back pain (OR: 0.93; 95% CI: 0.65–1.32)[32]. A meta-analysis of cross-sectional studies showed 23% and 15% reductions in the risk of low back pain associated with medium and high levels of physical activity, respectively[37]. Therefore, regular physical exercise, particularly muscle strengthening and stretching, significantly reduces the development of low back pain by improving muscle strength, flexibility, and spinal stability[38,39].

In both periods analyzed, more than 60% of the participants reported that their pain did not limit their daily activities. According to Uhl, up to 80% of people experience back pain at some point in their lives; however, most back pain episodes are acute and resolve with or without treatment[40]. This suggests that although pain is common, in many cases, it is manageable and does not cause severe disability, which has also been observed in other studies in active populations[3,4]. However, back pain markedly affects daily activities, with approximately 40% of individuals experiencing substantial limitations in workplace and community activities[41]. Workers with back pain had an average of 6.2 more days of absenteeism compared with those having other medical conditions, resulting in a high indirect cost to society[42]. Effective management strategies, including physical activity and educational programs, can help alleviate these limitations and improve QoL[41].

The association between pain and limitations in daily activities is reciprocal and bidirectional, since discomfort or functional impairment can reduce the willingness or ability to engage in physical exercise[5]. Lack of physical activity or inadequate exercise contributes to the worsening or persistence of back pain due to the loss of muscle strength, flexibility, and overall conditioning. It is crucial to identify these individuals early to prevent the progression of their back pain to chronic conditions, because the risk of back pain increases with age[41], further intensifying its impact on work disability[5,42].

Although not statistically significant, a trend of pain development was observed among younger public servants, with the rate being 84.4% in 2022 and 81.2% in 2023 among those younger than 39 years of age. This finding partially contradicts the trend observed in the general population, where the prevalence of low back pain tends to increase with age[41,43]. This discrepancy may be related to the occupational profile of younger public servants who may be exposed to physical strain, prolonged improper posture, or stress at the beginning of their careers[44]. This finding underscores the importance of ergonomic guidance, workplace adaptations,

	Baseline (2022)		Follow-up (2023)					
	n (%)	Back pain *n* (%)	*n* (%)	Back pain *n* (%)	RR[1] Bivariate (IC[2] 95%)	*P*[3]	RR[1] Multivariate (IC[2] 95%)	*p*[3]
Demographics								
Sex						< 0.001*		< 0.000*
Male	250 (41,7%)	181 (72,7%)	250 (41,7%)	179 (72,8%)	1		1	
Female	350 (58,3%)	304 (88,1%)	350 (58,3%)	290 (84,1%)	**1.18 (1.10–1.28)**		**1.15 (1.07–1.24)**	
Age group						0.067		0.266
≤39	257 (43,3%)	217 (84,4%)	225 (38,1%)	184 (81,8%)	1		1	
40–59	309 (52,0%)	248 (80,3%)	334 (56,5%)	264 (79,0%)	0.95 (0.89–1.01)		0.97 (0.91–1.03)	
≥60	28 (4,7%)	20 (71,4%)	32 (5,4%)	21 (65,6%)	0.81 (0.66–1.00.66.00)		0.85 (0.70–1.04)	
Marital status						0.137		0.117
Single	374 (63,0%)	310 (82,9%)	374 (63,3%)	304 (81,3%)	1		1	
Married	153 (25,8%)	124 (81,0%)	149 (24,2%)	116 (77,9%)	0.97 (0.90–1.05)		0.95 (0.88–1.02)	
Divorced or widowed	67 (11,3%)	51 (76,1%)	68 (11,5%)	49 (72,1%)	0.88 (0.78–1.00.78.00)		0.91 (0.81–1.01)	
Region						0.311		-
Midwest	144 (24,2%)	122 (84,7%)	166 (28,1%)	137 (82,5%)	1.08 (0.98–1.19)		-	
North and Northeast	175 (29,5%)	137 (83,4%)	168 (28,4%)	130 (77,4%)	1.04 (0.94–1.15)		-	
Southeast	169 (28,5%)	137 (81,1%)	163 (27,6%)	125 (76,7%)	1.01 (0.91–1.12)		-	
South	106 (17,8%)	80 (75,5%)	94 (15,9%)	77 (81,9%)	1		-	
Housing						0.100		0.252
Rural environment	28 (4,7%)	25 (89,3%)	22 (3,7%)	16 (72,7%)	1		1	
Urban environment	566 (95,3%)	460 (81,3%)	569 (96,3%)	453 (79,6%)	1.09 (0.98–1.20)		1.06 (0.96–1.17)	
Socioeconomic								
Position						0.778		
Administrative techinicians in education	354 (59,6%)	293 (82,8%)	353 (59,7%)	279 (79,0%)	1.01 (0.94–1.08)			
Teacher	240 (40,4%)	192 (80,0%)	238 (40,3%)	190 (79,8%)	1			
Education level						0.396		-
Secondary, higher, and/or technical vocational	43 (7,2%)	33 (76,7%)	34 (5,8%)	24 (70,6%)	1		-	
Specialization	182 (30,6%)	156 (85,7%)	161 (27,2%)	131 (81,4%)	1.11 (0.95–1.29)		-	
Masters degree	237 (39,9%)	192 (81,0%)	255 (43,1%)	204 (80,0%)	1.08 (0.92–1.26)		-	
Doctorate and/or post-doctorate	132 (22,2%)	104 (78,8%)	141 (23,9%)	110 (78,0%)	1.04 (0.88–1.22)		-	
Time of service in Education						0.918		-
Until 10 years	371 (62,5%)	301 (81,1%)	324 (54,8%)	255 (78,7%)	1.12 (0.70–1.79)		-	
11 to 20 years	193 (32,5%)	159 (82,4%)	236 (39,9%)	191 (80,9%)	1.13 (0.70–1.81)		-	
21 to 30 years	24 (4,0%)	20 (83,3%)	24 (4,1%)	18 (75,0%)	1.17 (0.70–1.95)		-	
31 years or more	6 (1,0%)	5 (83,3%)	7 (1,2%)	5 (71,4%)	1		-	
Hours per day on the computer						0.255		
≤2 h per day	24 (4%)	16 (66,7%)	33 (5,5%)	22 (66,7%)	1			
3 to 4 h per day	86 (14,3%)	68 (79,1%)	90 (15,5%)	68 (79,1%)	1.14 (0.95–1.38)			
> 5 h per day	474 (79%)	386 (82,5%)	457 (76,5%)	363 (80,1%)	1.18 (0.98–1.41)			
Couldn"t answer depending of the day	16 (2,7%)	15 (93,8%)	20 (3,3%)	16 (84,2%)	1.23 (1.00–1.51.00.51)			
Satisfied with sleep?						< 0.001*		0.467
Very dissatisfied or dissatisfied	166 (27,7%)	140 (84,8%)	178 (29,7%)	157 (89,2%)	**1.26 (1.12–1.42)**		1.11 (0.97–1.28)	
Neither satisfied nor dissatisfied	151 (25,2%)	132 (89,2%)	163 (27,9%)	133 (83,1%)	**1.23 (1.09–1.40)**		1.11 (0.97–1.27)	
Satisfied	193 (32,2%)	149 (77,6%)	196 (32,7%)	146 (75,6%)	**1.14 (1.01–1.29)**		1.09 (0.96–1.24)	
Very satisfied	90 (15%)	64 (71,9%)	63 (10,5%)	33 (53,2%)	1		1	
Reads and/or studies in bed						0.064		0.178
No	261 (43,5%)	190 (73,6%)	241 (36%)	185 (79,1%)	1		1	
Sometimes	168 (28,0%)	142 (85,5%)	165 (27,5%)	130 (79,3%)	1.07 (1.00–1.15.00.15)		1.06 (0.98–1.13)	
Yes	171 (28,5%)	153 (90%)	194 (32,3%)	154 (79,8%0	1.08 (1.01–1.16)		1.07 (0.99–1.14)	
Regular physical activity						< 0.001*		0.001*
Yes	341 (56,8%)	259 (77,1%)	380 (64%)	286 (75,3%)	1		1	
No	259 (43,2%)	226 (87,6%)	211 (36%)	183 (86,7%)	**1.13 (1.07–1.20)**		**1.10 (1.04–1.16)**	
Quality of life (WHOQOL-bref)								
Physical domain						0.004*		0.487
First tertile (lowest QoL)	172 (29,0%)	157 (91,3%)	252 (42,6%,)	211 (83,7%)	**1.13 (1.05–1.22)**		0.98 (0.88–1.09)	
Continued								

	Baseline (2022)		Follow-up (2023)					
	n (%)	Back pain *n* (%)	*n* (%)	Back pain *n* (%)	RR[1] Bivariate (IC[2] 95%)	*P*[3]	RR[1] Multivariate (IC[2] 95%)	*p*[3]
Second tertile	194 (32,7%)	165 (85,1%)	266 (45,0%)	210 (78,9%)	**1.10 (1.03–1.18)**		1.02 (0.94–1.11)	
Third tertile (highest QoL)	228 (38,4%)	163 (71,5%)	73 (12,4%)	48 (65,8%)	1		1	
Social domain						< 0.001*		0.181
First tertile (lowest QoL)	220 (37,0%)	190 (86,4%)	232 (39,3%)	201 (86,6%)	**1.14 (1.07–1.23)**		1.07 (0.99–1.16)	
Second tertile	174 (29,3%)	143 (82,2%)	187 (31,6%)	143 (76,5%)	1.06 (0.98–1.14)		1.01 (0.94–1.09)	
Third tertile (highest QoL)	200 (33,7%)	152 (76,0%)	172 (29,1%)	125 (72,7%)	1		1	
Environmental domain						< 0.001*		0.354
First tertile (lowest QoL)	225 (37,9%)	198 (88,0%)	241 (40,8%)	208 (86,3%)	**1.17 (1.08–1.26)**		1.05 (0.95–1.16)	
Second tertile	193 (32,5%)	155 (80,3%)	183 (31,0%)	150 (82,0%)	**1.11 (1.03–1.20)**		1.06 (0.98–1.16)	
Third tertile (highest QoL)	176 (29,6%)	132 (75,0%)	167 (28,3%)	111 (66,5%)	1		1	
Psychological domain						< 0.001*		0.023*
First tertile (lowest QoL)	234 (39,4%)	207 (88,5%)	233 (39,4%)	203 (87,1%)	**1.25 (1.15–1.36)**		**1.13 (1.02–1.27)**	
Second tertile	166 (27,9%)	142 (85,5%)	223 (37,7%)	181 (81,2%)	**1.19 (1.10–1.29)**		**1.12 (1.02–1.25)**	
Third tertile (highest QoL)	194 (32,7%)	136 (70,1%)	135 (22,8%)	85 (63,0%)	1		1	
Total						< 0.001*		0.619
First tertile (lowest QoL)	184 (31,0%)	165 (89,7%)	211 (35,7%)	184 (87,2%)	**1.19 (1.10–1.28)**		0.92 (0.79–1.08)	
Second tertile	181 (30,5%)	153 (84,5%)	216 (36,5%)	175 (81,0%)	**1.12 (1.04–1.20)**		0.96 (0.86–1.07)	
Third tertile (highest QoL)	229 (38,6%)	167 (72,9%)	164 (27,7%)	110 (67,1%)	1		1	
Mental health								
(DASS-21)								
Depression						< 0.001*		0.744
First tertile (lowest)	214 (36,0%)	152 (71,0%)	219 (37,1%)	157 (71,7%)	1		1	
Second tertile	221 (37,2%)	190 (86,0%)	192 (32,5%)	156 (81,3%)	**1.14 (1.06–1.22)**		1.02 (0.94–1.11)	
Third tertile (highest)	159 (26,8%)	143 (89,9%)	180 (30,5%)	156 (86,7%)	**1.19 (1.11–1.28)**		1.04 (0.95–1.15)	
Anxiety						< 0.001*		0.170
First tertile (lowest)	216 (36,4%)	156 (72,2%)	220 (37,2%)	154 (70,0%)	1		1	
Second tertile	193 (32,5%)	161 (83,4%)	178 (30,1%)	145 (81,5%)	**1.13 (1.05–1.22)**		1.04 (0.96–1.13)	
Third tertile (highest)	185 (31,1%)	168 (90,8%)	193 (32,7%)	170 (88,1%)	**1.21 (1.13–1.30)**		1.08 (0.99–1.19)	
Stress						< 0.001*		0.116
First tertile (lowest)	224 (37,7%)	161 (71,9%)	199 (33,7%)	135 (67,8%)	1		1	
Second tertile	191 (32,2%)	165 (86,4%)	195 (33,0%)	165 (84,6%)	**1.16 (1.08–1.25)**		1.06 (0.98–1.15)	
Third tertile (highest)	179 (30,1%)	159 (88,8%)	197 (33,3%)	169 (85,8%)	**1.18 (1.10–1.27)**		0.99 (0.90–1.09)	

Table 3. Relative risk with bivariate analysis and multivariate analysis of the association between pain and demographic, socioeconomic, behavioral, quality of life, and mental health variables of RFEPCT employees. Generalized Estimating Equations (GEE) analysis, WHOQOL-bref: World Health Organization Quality of Life-BREF version, QoL: Quality of Life, DASS-21: Depression Anxiety Stress Scale-21, [1]: Relative Risk, [2]: Confidence interval, [3]: p-values were obtained using the Wald test for coefficient significance, $^{*}p < 0{,}05$.

regular breaks during the workday, and physical activity, particularly among public servants whose routines often involve sedentary work[44].

Excessive use of technology and electronic devices among younger individuals, combined with prolonged improper body posture also contributes to musculoskeletal complaints[45,46]. Screen time on computers and portable mobile devices showed a linear relationship with back pain in a meta-analysis, where the risk of pain increased by 8.2% for every additional hour of daily computer use[47]. Yue Suri et al. (2018) demonstrated that prolonged sitting (> 6 h) triggered episodes of back pain, stress, and depression[12]. However, in the present study, screen time was not associated with back pain. A low perception of QoL in the psychological domain was associated with the development of back pain. Hoppe et al.[28] also identified low emotional arousal as a predictor for the onset of back pain, along with height and occupational engagement, underscoring the need to assess psychosocial factors to manage and prevent the impact of back pain on daily activities[12,14].

Brazil, with its vast territorial expanse and immense climatic, cultural, economic, and geographical diversity, exhibits significant variation across its macro-regions. However, even after considering these differences, we did not find a clear association between these variables and the development of back pain. This suggests that regardless of regional characteristics, back pain is an inherent condition associated with the role of education workers. The participation of RFEPCT employees from different regions of Brazil, particularly from various occupational roles such as faculty members and technical-administrative in education, and the scarcity of longitudinal studies tracking pain occurrence in this population, are considered the key strengths of this study. These factors provide a national overview of the prevalence of back pain among public servants.

One limitation of this study is that the questionnaires were administered online and responses were self-reported, which made it impossible to perform ergonomic assessments and analyze the work environment, given that this environment can affect the development of back pain[18,48]. Therefore, it may have been difficult to identify the other factors associated with back pain in this study population. Future research should not only analyze the work environment, screen time, and prolonged postures of this population in association with the development of pain but also explore the mediating role of psychosocial factors, coping strategies, and organizational policies.

Conclusion

We found a high prevalence of back pain among education employees in Brazil at both study points, and the factors associated with pain development were mainly female sex, lack of regular physical activity, and perception of QoL in the psychological domain. The low perception related to the psychological domain is significantly associated with the occurrence of back pain and emphasizes the necessity of a biopsychosocial approach to its management. Preventive measures that also address mental health are important for improving the QoL of this population. Therefore, there is a need for labor policies that protect workers' health.

Data availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Received: 6 June 2025; Accepted: 25 September 2025
Published online: 20 November 2025

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Acknowledgements

The authors express their gratitude to the Instituto Federal Goiano, Fundação de Amparo a Pesquisa do Estado de Goiás (FAPEG), National Council for Scientific and Technological Development (CNPq) and the Research Group on Child and Adolescent Health (GPSACA) for their support and collaboration.

Author contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Suelen Marçal Nogueira, Luis Fernando Monteiro e Isabela Fernanda Rodrigues de Olivera. The first draft of the manuscript was written by Suelen Marçal Nogueira, Carolina Rodrigues Mendonça, Anelise Sonza, Manuel Monfort-Pañego and Priscilla Rayane e Silva; e Matias Noll. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding

The authors declare that they received no funding for the conduct of this study.

Declarations

Competing interests

The authors declare no competing interests.

Ethical approval

This study was submitted to and approved by the Research Ethics Committee of the Instituto Federal Goiano, approved under no. 5.270.596, registered protocol no. 52353621.3.0000.0036. The guidelines and norms established by Resolution 466 of December 2012 of the National Health Council, which regulates research

involving human beings in Brazil, were followed. All the participants provided written informed consent.

Additional information

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