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Nutritional profile, working conditions, and musculoskeletal pain among workers in Food and Nutrition Units in Pelotas (RS)

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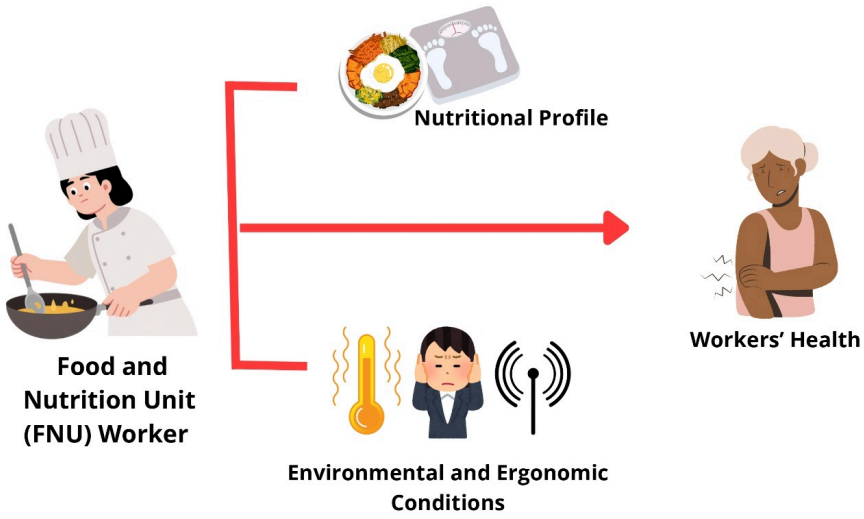
Graphical Abstract



Highlights

- *The physical and organizational environment influences physical discomfort among Food and Nutrition Unit workers.*
- *There are positive differences between Food and Nutrition Units regarding dietary habits and physical activity.*
- *Inadequate ergonomic conditions, with no impact on the nutritional profile of Food and Nutrition Unit workers.*

Abstract

Food and Nutrition Units are characterized by demanding and physically strenuous work, involving repetitive movements, manual handling of loads, and limited conditions of lighting, temperature, and excessive noise. It is important to assess whether these conditions influence workers' health. Accordingly, this study aimed to analyze dietary intake, nutritional status, and working conditions related to ergonomic aspects among workers from three Food and Nutrition Units in the city of Pelotas, Brazil. This was a cross-sectional, quantitative study using questionnaires to assess dietary intake and environmental conditions, as well as anthropometric measurements (body weight, height, and waist circumference) for nutritional classification based on body mass index (BMI). In Unit A, a higher prevalence of overweight was observed, exceeding the number of eutrophic individuals. Most participants presented altered waist circumference, indicating risk for metabolic syndrome. A total of 19 employees participated; more than half reported engaging in physical activity, with Unit C showing the highest proportion. Regarding the consumption of fresh or minimally processed foods, all workers from Unit B reported daily intake, whereas Unit C showed the lowest consumption. Only in Unit A was there a report of water intake exceeding two liters per day. Concerning working conditions, workers from all three units reported pain or bodily discomfort in the previous seven days and over the past 12 months. In Unit B, three employees required sick leave due to low back pain. Occupational activity may cause physical discomfort, as well as unfavorable ergonomic conditions, and may indirectly influence workers' nutritional profile.

Keywords: Food and Nutrition Units. Nutritional Status. Dietary Intake. Working Conditions. Ergonomics.

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INTRODUCTION

Food and Nutrition Units (FNUs) are responsible for the production and distribution of meals for healthy or ill populations. It is essential that meals are balanced and comply with dietary and sanitary, hygienic standards, meeting the nutritional requirements of consumers in order to provide healthy and adequate meals, thereby contributing to the maintenance, improvement, or recovery of health[1].

For this responsibility to be adequately fulfilled, it is important to have an appropriate workforce, taking into account both the quality and the quantity of staff[2]. In addition, working conditions must be adequate so that workers feel comfortable while performing their tasks.

Work carried out in FNUs is characterized by high production demands within short periods of time, and working conditions are often unfavorable for employees, including excessive noise and temperatures, insufficient lighting, repetitive movements, manual handling of loads, and inadequate postures, as well as time pressure to ensure meal preparation. These factors affect workers' performance, physical and mental health, and consequently productivity and meal quality, which are directly dependent on workforce performance[3,4].

Studies indicate that a large proportion of FNU workers are overweight or obese. Excess body weight is associated with impaired physical performance, reduced mobility, and difficulties in performing work-related activities, in addition to increasing the risk of noncommunicable chronic diseases (NCDs) such as diabetes mellitus, systemic arterial hypertension, and various types of cancer[5], and may also lead to musculoskeletal problems[6]. Furthermore, it results in comorbidities that affect quality of life and work pace, negatively influencing absenteeism[7].

The Dietary Guidelines for the Brazilian Population state that adequate and healthy eating is a right of all individuals and should be aligned with their biological, cultural, and social needs[8]. Changes in dietary patterns among Brazilians have been observed, with increased consumption of ultra-processed foods, generally rich in saturated or trans fats, simple sugars, and sodium, and decreased intake of fruits and vegetables, which are considered protective against NCDs due to their high content of nutrients and dietary fiber[9].

According to Dourado and Lima[10], the productivity of FNUs depends on employees' performance, highlighting the importance of applying ergonomics in this sector. Ergonomics seeks to adapt work to the worker, ensuring comfort and preventing harm during task performance[10]. Due to concerns regarding the consequences of work on workers' health, studies have emerged analyzing ergonomic conditions and Repetitive Strain Injuries (RSI) and Work-Related Musculoskeletal Disorders (WMSDs), with the aim of minimizing these negative effects and promoting better quality of life[11].

The relationship between ergonomics and the nutritional status of FNU workers is highly relevant and warrants discussion, as the conditions to which these workers are exposed directly compromise their health. The nature of the work requires considerable physical and mental effort, affecting dietary choices and the nutritional status of employees. In light of the above, the objective of this study was to analyze dietary intake, nutritional status, and working conditions in relation to ergonomic aspects among workers from three Food and Nutrition Units in the city of Pelotas, RS, Brazil.

MATERIALS AND METHODS

This was a cross-sectional, quantitative study conducted in three Food and Nutrition Units (FNUs) in Pelotas, RS, a city with approximately 325,000 inhabitants[12]. A total of 19 workers involved in food handling participated in the study; nutritionists and other employees not performing this function were excluded.

Data collection was carried out in two stages: first, the administration of a questionnaire on dietary intake and lifestyle habits, followed by anthropometric measurements; and, at a later stage, the assessment of ergonomic aspects. The dietary questionnaire, developed based on the Dietary Guidelines for the Brazilian Population[8], investigated the frequency of food consumption according to the degree of processing, as well as habits such as physical activity and smoking.

Anthropometric assessment included body weight, height, waist circumference, and BMI calculation, classified according to World Health Organization (WHO) criteria[13]. Ergonomic conditions were analyzed using the Nordic Musculoskeletal Questionnaire, which comprises dichotomous questions (yes/no) regarding musculoskeletal symptoms. The

questionnaire is divided into items addressing the frequency of problems experienced in specific body regions, namely: (1) neck, (2) shoulders, (3) elbows, (4) wrists and hands, (5) thoracic spine, (6) lumbar spine, (7) hips or thighs, (8) knees, and (9) ankles and feet, as well as a question on whether participants had to stop working on any day due to these problems. Additionally, for the analysis of ergonomic conditions, a scale of bodily and environmental perceptions at work was used[14], in which employees were asked to rate their sensations in relation to the work environment on that day. The scale ranges from one (1) to seven (7) and is divided into two extremes (e.g., very cold = 1 to 3/inadequate; very hot = 5 to 7/inadequate; 4 = adequate), with higher scores indicating greater intensity of the sensation or perception.

Data were organized in a spreadsheet, analyzed descriptively, and presented in comparative tables among the FNUs. Each participant received individual feedback with guidance on healthy eating, as well as information on nutritional services available in the municipality.

The study complied with Resolution No. 466/2012 of the National Research Ethics Commission (CONEP) and was approved by the Research Ethics Committee (protocol No. 6,460,015).

RESULTS

The study was conducted with workers from three (3) FNUs. Two (2) of these units provide meals to students (FNUs B and C), and the remaining unit (FNU A) is a popular restaurant. Workers directly involved in meal production who signed the Informed Consent Form were included; those working in general services and nutritionists were excluded. In FNU A, the staff consisted of eight (8) workers, of whom seven (7) (88%) participated, as one (1) worker was on vacation. In FNU B, there were also eight (8) workers, but only six (6) (75%) agreed to participate in the study. FNU C had nine (9) employees; seven (7) signed the Informed Consent Form, but one (1) participant had to be absent from work for health reasons and was therefore unable to participate. Thus, a total of six (6) workers (67%) from this unit took part in the study. Overall, the analyzed sample consisted of 19 workers, of whom 13 (68%) were female and six (32%) were male. The overall mean age was 41 years.

Regarding the anthropometric profile (mean body weight of 80.81 kg), BMI analysis across the three FNUs showed that FNU A had the highest proportion of participants classified as overweight (57%), compared with 17% in FNU B and 33% in FNU C. With respect to obesity class II, FNU C stood out as the unit with an intermediate percentage of overweight (33%); notably, this was the only unit in which obesity class III was identified. Concerning lifestyle characteristics, among the 19 participants, only five were smokers, all of whom belonged to FNU C (26%). More than half of the participants reported engaging in physical activity, with FNU C showing the highest proportion of physically active workers (83%). In addition, a large proportion of participants from FNU B (83%) presented a substantially increased risk according to waist circumference classification; it should be emphasized that all participants in this unit were female.

Table 1 presents the results related to the frequency of consumption according to the level of food processing and reported water intake. Regarding the consumption of fresh or minimally processed foods, 57% of workers in FNU A reported daily intake of foods from these groups. In FNU B, all participants (100%) reported daily consumption, whereas FNU C showed the lowest proportion, with 50% reporting daily intake of these foods. Concerning daily consumption of processed foods, the following proportions were observed: 57% in FNU A, 100% in FNU B, and 17% in FNU C. For ultra-processed food consumption, in FNU A, 29% reported consumption once a week and 14% reported daily consumption. In FNU B, 50% reported consuming ultra-processed foods once a week. In FNU C, 33% did not know how to respond or did not consume these foods, and 17% reported daily consumption. Regarding the most frequently used culinary ingredient, oils were highlighted in all three units (47%), followed by salt (21%) and sugar (11%). However, in FNU A, 29% reported combined consumption of oils/fats/salt/sugar, and 14% reported fats/salt/sugar. With respect to water intake, in FNU A, only 14% reported consuming 2–3 L per day. In FNU B, 50% of participants reported consuming less than 1 L per day, whereas in FNU C, 83% reported consuming 1–2 L per day and 17% reported consuming 2–3 L per day.

Teble 1 - Frequency of consumption according to the level of food processing and reported water intake among workers from three Food and Nutrition Units. Pelotas, RS, 2025.

Food groups by degree of processing	UAN A (n=7) (n) %	UAN B (n=6) (n) %	UAN C (n=6) (n) %	AVERAGE %
Fresh or minimally processed foods				
Once a week	(1) 28.57	(0) 0	(1) 16.66	15.78
2–3 times per week	(0) 0	(0) 0	(1) 16.66	5.26
4 or more times per week	(1) 14.28	(0) 0	(1) 16.66	10.52
Every day	(4) 57.14	(6) 100	(3) 50.00	68.42
Does not know / No response	(0) 0	(0) 0	(0) 0	0
Processed foods				
Once a week	(1) 14.28	(6) 100	(1) 33.33	47.36
2–3 times per week	(1) 14.28	(0) 0	(2) 33.33	15.78
4 or more times per week	(1) 14.28	(0) 0	(1) 16.66	10.52
Every day	(4) 57.14	(0) 0	(1) 16.66	26.31
Does not know / No response	(0) 0	(0) 0	(0) 0	0
Ultra-processed foods				
Once a week	(1) 28.57	(3) 50.00	(1) 16.66	31.57
2–3 times per week	(2) 28.57	(2) 33.33	(1) 16.66	26.31
4 or more times per week	(2) 28.57	(0) 0	(1) 16.66	15.78
Every day	(1) 14.28	(1) 16.66	(1) 16.66	15.78
Does not know / No response	(0) 0	(0) 0	(2) 33.33	10.52
Culinary ingredients				
Oils	(2) 28.57	(3) 50.00	(4) 66.66	47.36
Fats	(0) 0	(0) 0	(0) 0	0
Salt	(2) 28.57	(0) 0	(1) 16.66	21.05
Sugar	(0) 0	(2) 33.33	(1) 16.66	10.52
No response	(0) 0	(1) 16.66	(0) 0	5.26
Water intake				
Less than 1 L	(2) 28.57	(3) 50.00	(0) 0	26.31
1–2 L	(3) 42.85	(1) 16.66	(5) 83.33	47.36
2–3 L	(1) 14.28	(2) 33.33	(1) 16.66	21.05
≥ 3 L	(1) 14.28	(0) 0	(0) 0	5.26
No response	(0) 0	(0) 0	(0) 0	0

With regard to reports of musculoskeletal symptoms over the previous seven (7) days and the preceding twelve (12) months, only participants from FNU B reported neck problems in the last 7 days, representing 11% of the studied sample. Over the last 12 months, neck problems were reported in FNU A and FNU B (16%), and only 17% reported having to stop working due to these complaints. Regarding the shoulders, data from the three FNUs over the last seven (7) days indicated that 26% experienced problems in the right shoulder and 21% in both shoulders; over the last 12 months, 32% reported problems in the right shoulder and 21% in both shoulders. However, these complaints did not prevent workers from continuing to perform their daily activities in the FNUs. No reports of pain or discomfort in the elbows were recorded in any of the three FNUs; however, 16% reported problems in the right wrist/hand and 11% in both wrists/hands, and this pattern was also observed over the last 12 months. Concerning the thoracic spine, 47% reported problems in the last 7 days, with the same proportion reported over the last 12 months. More than half of the participants (58%) reported discomfort in the lumbar spine both in the last 7 days and over the last 12 months. In FNU B, one worker (5%) required temporary leave from work due to complaints of low back pain. With respect to the hips and thighs, 37% reported discomfort in the last 7 days and 26% over the last 12 months. Knee problems were reported by 32% of participants in the last 7 days and by 26% over the last 12 months. Regarding the ankles or feet, 21% reported problems in the last 7 days, and the same proportion was reported over the last 12 months.

Regarding ergonomic aspects and classification according to perceived sensation on the day of assessment (Table 2), temperature was rated as 7 by

42% of the sample, indicating inadequacy due to excessive heat. In contrast, for lighting (48%), humidity (53%), noise (42%), air flow (42%), air quality (42%), and fatigue (37%), the intermediate value predominated. Nasal condition was classified as normal by 47% of participants, as were throat condition (74%), mouth condition (79%), lip condition (74%), skin condition (42%), and eye condition (74%). Nevertheless, 74% of the sample reported no eye irritation, 63% reported no headache, and 90% reported no dizziness. Overall sensation at the moment was rated as 7 by 84% of the studied sample, indicating a feeling of fatigue. However, 58% reported being concentrated, 58% reported being in a good mood, and 53% reported feeling willing or motivated.

Teble 2 - Classification of perceived sensations in relation to the work environment in three Food and Nutrition Units. Pelotas, RS, 2025.

Ergonomic aspects	Classification according to perceived sensation on the day (1 to 7)							Ergonomic aspectss
	1	2	3	4	5	6	7	
	Inadequate			Adequate		Inadequate		
(n=19)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Very cold	0 (0)	0 (0)	0 (0)	5 (26.31)	3 (15.78)	3 (15.78)	8 (42.10)	Very hot
Very humid	1 (5.26)	3 (15.78)	2 (10.52)	10 (52.63)	0 (0)	1 (5.26)	2 (10.52)	Very dry
Very dark	1 (5.26)	1 (5.26)	1 (5.26)	9 (47.63)	0 (0)	5 (26.31)	2 (10.52)	Very bright
Very quiet	0 (0)	1 (5.26)	2 (10.52)	8 (42.10)	4 (21.05)	2 (10.52)	2 (10.52)	Very noisy
Stagnant air	0 (0)	1 (5.26)	1 (5.26)	6 (31.57)	3 (15.78)	2 (10.52)	6 (31.57)	Pleasant airflow
Stale air	0 (0)	1 (5.26)	1 (5.26)	8 (42.10)	1 (5.26)	2 (10.52)	5 (26.31)	Good air quality
	Inadequado			Adequado		Inadequado		
Runny nose	1 (5.26)	0 (0)	3 (15.78)	5 (26.31)	0 (0)	1 (5.26)	9 (47.36)	Dry nose
Dry throat	0 (0)	0 (0)	0 (0)	1 (5.26)	2 (10.52)	2 (10.52)	14 (73.68)	Normal throat
Dry mouth	0 (0)	0 (0)	0 (0)	2 (10.52)	1 (5.26)	1 (5.26)	15 (78.94)	Normal mouth
Dry lips	0 (0)	0 (0)	1 (5.26)	1 (5.26)	2 (10.52)	1 (5.26)	14 (73.68)	Normal lips
Dry skin	0 (0)	2 (10.52)	0 (0)	6 (32.57)	0 (0)	1 (5.26)	8 (42.10)	Normal skin
Dry eyes	0 (0)	0 (0)	0 (0)	3 (15.78)	0 (0)	2 (10.52)	14 (73.68)	Normal eyes
Irritated eyes	1 (5.26)	1 (5.26)	0 (0)	1 (5.26)	0 (0)	2 (10.52)	14 (73.68)	No eye irritation
Headache	2 (10.52)	0 (0)	2 (10.52)	3 (15.78)	0 (0)	1 (5.26)	12 (63.15)	No headache
Dizziness	0 (0)	0 (0)	0 (0)	1 (5.26)	0 (0)	1 (5.26)	17 (89.47)	No dizziness
Feeling well	0 (0)	0 (0)	0 (0)	1 (5.26)	1 (5.26)	1 (5.26)	16 (84.21)	Feeling unwell
Tired	2 (10.52)	2 (10.52)	1 (5.26)	7 (36.84)	1 (5.26)	1 (5.26)	5 (26.31)	Rested
Lack of concentration	0 (0)	1 (5.26)	0 (0)	3 (15.78)	2 (10.52)	2 (10.52)	11 (57.89)	Normal concentration
Bad mood	0 (0)	1 (5.26)	0 (0)	6 (31.57)	0 (0)	1 (5.26)	11 (57.89)	Good mood
0% willingness	0 (0)	0 (0)	1 (5.26)	2 (10.52)	3 (15.78)	3 (15.78)	10 (52.63)	100% willingness

DISCUSSION

Although ergonomics has gained increasing attention, studies addressing the infrastructure of Food and Nutrition Units (FNUs) and its relationship with employees' nutritional status remain scarce. The work environment in these units is often unhealthy, characterized by excessive noise, heat, and inadequate lighting, which favor exhaustion and occupational diseases. Understanding how these conditions influence weight gain and workers' well-being is essential to clarify the causes of excess body weight and its impacts on occupational health.

In the present study, assessment of nutritional status showed that the mean body weight across units was 80.81 kg, with a higher prevalence of excess weight than eutrophy. Lifestyle habits were considered positive, as most participants engaged in physical activity, were non-smokers, consumed fresh or minimally processed foods (68%), and reported low consumption of ultra-processed foods (16%), all of which are protective factors against noncommunicable chronic diseases (NCDs). However, when working conditions and the presence of musculoskeletal pain were evaluated, few workers had been absent from work due to pain or discomfort in any body region during the previous seven days and/or the past 12 months, and ergonomic aspects were classified as adequate by the majority

of participants.

In FNUs, the workforce is predominantly composed of women. Nevertheless, in the present study, a considerable proportion of male workers (32%) was observed, although still lower than that of females, differing from the study by Paiva and Cruz[6], in which all workers were women. Regarding nutritional status, eutrophy was low (21%), whereas excess weight predominated (47% obesity; 32% overweight), corroborating the findings of Macedo *et al.*[15] and Simon *et al.*[7]. This scenario reflects the national trend of increasing obesity reported by Scarparo, Amaro, and Oliveira[16]; compared with the 22% obesity prevalence reported by those authors, the present study showed an increase of 15%, confirming the worsening of this condition among FNU workers.

The increase in overweight and obesity is of concern due to the predisposition to conditions such as metabolic syndrome, a cluster of risk factors that contribute to cardiovascular diseases and type II diabetes *mellitus*[13]. Abdominal obesity (android pattern) is a key risk factor for these syndromes, as excess adipose tissue releases substances that potentiate this condition[9].

Regarding waist circumference measurements, 58% of participants presented increased risk (>94 cm for men and >80 cm for women), particularly among women, whereas 42% did not present this risk. These findings were higher than those obtained using body mass index (BMI), in which 21% of participants were classified as eutrophic, indicating that some individuals may be eutrophic according to BMI but present abdominal obesity when waist circumference is considered. This result is similar to that reported by Simon *et al.*[7], who found a high prevalence of abdominal obesity, even higher than excess weight prevalence, but differs from Castro, Anjos, and Lourenço[17], who observed lower indices, with 20% presenting waist circumference values above 94 cm and only 4.6% above 102 cm. The present findings also diverge from those reported by Paula and Dias[18], in which the highest risk was observed among men.

Regarding dietary habits, the predominance of consumption of fresh foods is consistent with the Dietary Guidelines for the Brazilian Population[8]. However, frequent use of oils may increase the risk of NCDs when consumed in excess[19]. Concerning smoking, 74% of participants were non-smokers, a positive finding in light of the national decline in tobacco consumption reported by Vigitel[5] and similar to the results of Batista *et al.*[20]. Physical activity was reported by 58% of participants, a proportion higher than that observed by Macedo *et al.*[15], confirming the benefits highlighted by Souza and Nogueira[21], Reis *et al.*[22], and Szwarcwald *et al.*[23].

Beyond food consumption, adequate hydration is essential. Although water has no caloric value, it is indispensable for maintaining life, accounting for approximately 40–70% of body mass. In addition, it participates in biochemical and physiological processes, facilitates toxin elimination, helps alleviate headaches, and may prevent certain diseases.

Hydration in FNUs is a critical factor; however, the present data indicate insufficient intake, with most individuals consuming less than one liter per day. Intense physical effort and continuous exposure to high temperatures — intrinsic to the FNU environment — result in water loss exceeding replacement. This imbalance favors dehydration, directly compromising workers' health, safety, and productivity[24]. Therefore, monitoring and preventive strategies are essential to mitigate these risks and ensure workforce operational capacity.

Regarding work-related pain, despite reports of discomfort, only two workers (10.52%) had to stop working due to neck and low back pain. This differs from the findings of Paiva and Cruz[6], who reported higher absenteeism due to pain in a study of four FNUs.

The scientific literature still lacks studies that deepen the association between nutritional status and work-related musculoskeletal pain. Nevertheless, musculoskeletal pain is widely recognized as one of several conditions associated with obesity, predominantly affecting weight-bearing joints such as the knees, ankles, and feet, as well as contributing to low back pain[25]. Excess body weight increases mechanical stress on tissues and joints, inducing physical limitations and bodily pain[24,26,27,28].

In the present study, evaluation of musculoskeletal symptoms across the three FNUs showed that all participants (100%) denied elbow pain in the last seven days and the past 12 months. During the same period, 42% reported no low back pain. However, a high prevalence of pain in specific regions was observed, particularly the lumbar spine (58%), followed by the right shoulder, with prevalences of 27% and 32% over the last seven days and 12 months, respectively.

Similar results were reported by Canuto *et al.*[25], who observed that 50% of workers experienced discomfort after the workday in the previous year, mainly affecting the upper and lower back, ankles, hips, and shoulders. This prevalence is likely

explained by the nature of food service activities, characterized by prolonged maintenance of an upright posture. Corroborating these findings, Shakya and Shrestha[29] reported a high prevalence (60%) of work-related musculoskeletal symptoms, with back pain (35%) being the most frequent, followed by neck (27.5%) and ankle pain (27.5%).

A positive association between musculoskeletal disorders and tasks performed in repetitive or inadequate postures was also identified by Sharma *et al.*[30] in industrial kitchens. In the FNUs analyzed, work routines alternate between predominantly standing positions and periods of sitting. Bezerra and Oliveira[31] recommend alternating standing posture with tasks that allow movement or sitting, as static postures increase fatigue by requiring prolonged muscle contraction, reducing local blood flow and leading to exhaustion and degenerative inflammatory processes in overloaded tissues.

The seated position, in turn, may negatively affect the lumbar region by imposing a non-physiological spinal curvature. Forward trunk inclination increases disc pressure, favoring injury. In this context, Mgemena *et al.*[32] emphasize that maintaining ergonomically correct posture during sitting is essential for operational efficiency and preservation of workers' health. It is noteworthy that, while Canuto *et al.*[25] reported no work absences, the present study identified that 5% of the sample required absence due to low back pain and 11% due to pain in other body regions — figures lower than those reported by Paiva and Cruz[6], who found that 56.5% had missed work due to illness, with absences ranging from one to four times, and 75% occurring within the previous year.

Regarding ergonomic perceptions, the main complaints were related to inadequate temperature (42%) and fatigue (84%). These findings are consistent with those of Canuto *et al.*[25], who reported mental effort complaints in 67% of cases, and Ansari *et al.*[33], who found that 85% of hospital kitchen operators considered their workload excessive. Moreover, Buscemi *et al.*[34] associate occupational stress with the development of arthritis and spinal disorders.

Finally, as emphasized by Pimenta *et al.*[35], factors such as inadequate staffing, repetitive movements, poor physical layout, excessive noise, and thermal stress directly compromise quality of working life. In FNUs, productivity pressure under tight deadlines, combined with unfavorable environmental conditions, results in dissatisfaction, physical exhaustion, reduced productivity, and increased risk of accidents and occupational diseases.

CONCLUSION

It can be concluded that the consumption of protective foods was favorable, as most participants reported daily intake of fresh foods and low consumption of ultra-processed products. The reported pain is likely related to the predominance of overweight or class I obesity in the sample, although without significant impact on work performance. Ergonomic aspects were considered adequate and did not appear to influence nutritional status. Overall, the environment was regarded as reasonable, and workers generally reported feeling well. Nevertheless, the repetitive and physically demanding nature of the work may contribute to pain and discomfort. Despite the positive findings, further studies with larger samples are necessary to promote improved working conditions and occupational health.

CRediT author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the workreported in this paper.

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