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ORIGINAL ARTICLE

Nutritional status among teachers of the state education network of Minas Gerais and its associated factors

Estado nutricional entre professores da rede de ensino estadual de Minas Gerais e seus fatores associados

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ABSTRACT

Objective: To analyze the nutritional status among teachers of the state school system of Minas Gerais and its associated factors. **Methods:** This was a cross-sectional study among elementary and high schoolteachers from Minas Gerais from October to December 2021. An online survey was made available to all participants through the Google Forms platform. The dependent variable verified the conditions of the nutritional status of the teachers: eutrophic ≤ 24.9kg/m^2, overweight 25 to 29.9kg/m^2 and obesity ≥ 30kg/m^2. For the analysis, sociodemographic variables, working conditions and lifestyle were evaluated. **Results:** The participants were 1,907 teachers, 34.7% classified as eutrophic, 40.2% overweight and 25.1% obese. There was a higher chance of obesity among men (OR=1.64; 95%CI: 1.21;2.22), among teachers aged 30 to 59 years (OR=3.64; 95%CI: 1.88;7.05) and 60 years or older (OR=3.46; 95%CI: 1.50; (OR=1.46; 95%CI: 1.13;1.89), with working hours of 40 or more hours per week (OR=1.36; 95%CI: 1.04;1.77), where diet required modification (OR=1.54; 95%CI: 1.17;2.02) and was inadequate (OR=1.76; 1.76%; 1.95%; 1.67 (OR=1.60; 95%CI: 1.13;2.27), and among teachers in the phases of action (OR=1.60; 95%CI: 1.13;2.27), preparation (OR=2.24; 95%CI: 1.55;3.23) and contemplation (OR=1.46; 95%CI: 1.02;2.10) of a behavior change for physical activity. **Conclusion:** The results of this study show an increase in obesity with age and the persistence of unhealthy behaviors.

Keywords: Obesity; Overweight; Teachers; Nutritional status; Quality of life.

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RESUMO

Objetivo: Analisar o estado nutricional entre professores da rede de ensino estadual de Minas Gerais e seus fatores associados. **Métodos:** Este foi um estudo transversal entre professores do ensino fundamental e médio de Minas Gerais no período de outubro a dezembro de 2021. Um questionário online foi disponibilizado a todos os participantes através da plataforma Google Forms. A variável dependente verificou as condições do estado nutricional dos professores: eutrófico ≤24,9kg/m^2, sobrepeso de 25 a 29,9kg/m^2 e obesidade ≥30kg/m^2. Para a análise, foram avaliadas variáveis sociodemográficas, condições de trabalho e estilo de vida. **Resultados:** Participaram 1.907 professores, sendo 34,7% classificados como eutróficos, 40,2% com sobrepeso e 25,1% com obesidade. Houve maior chance de obesidade, em relação aos professores eutróficos, entre os homens (OR=1,64; IC95%: 1,21;2,22), entre professores com idade de 30 a 59 anos (OR=3,64; IC95%: 1,88;7,05) e de 60 anos ou mais (OR=3,46; IC95%: 1,50;8,01), entre os professores contratados/designados (OR=1,46; IC95%: 1,13;1,89), com jornada de trabalho de 40 ou mais horas semanais (OR=1,36; IC95%: 1,04;1,77), que a alimentação necessitava de modificação (OR=1,54; IC95%: 1,17;2,02) e estava inadequada (OR=1,76; IC95%: 1,16;2,67) e entre os professores que estavam nas fases de ação (OR=1,60; IC95%: 1,13;2,27), preparação (OR=2,24; IC95%: 1,55;3,23) e contemplação (OR=1,46; IC95%: 1,02;2,10) da mudança de comportamento para a prática de atividade física. **Conclusão:** Os resultados deste estudo mostram um aumento da obesidade com a idade e a persistência de comportamentos pouco saudáveis.

Palavras-chave: Obesidade; Sobrepeso; Docentes; Estado nutricional; Qualidade de vida.

Conflicts of Interests:
None.

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Introduction

Excess weight and obesity are considered a global epidemic of multifactorial character encompassing biological, social, cultural, behavioral and political dimensions. It is a public health problem, since it is associated with a loss of quality of life, functional limitations and is responsible for a substantial percentage of premature deaths[1,2].

In recent years, there has been a worrying increase in the prevalence of excess weight and obesity worldwide, with an especially important increase in low- and middle-income countries[3]. Excess weight affects people of all ages, races, sexes and socioeconomic levels. Thus, knowing what elements lead to social disparities is a step to reduce unfair inequalities in undesirable health outcomes[4].

There are several factors that can contribute to the development of excess weight and obesity, such as a sedentary lifestyle, unhealthy eating habits and underlying medical conditions. The excessive consumption of processed foods, rich in sugars and saturated fats, and a lack of physical activity are often cited as behaviors associated with excess weight and obesity[5]. In addition, psychological factors such as stress, depression and anxiety may also contribute to weight gain and obesity[6].

An increase in mental and physical effort, as a result of long working hours, is associated with a higher risk of excess weight and, consequently, chronic non-communicable diseases (CNCDs)[7]. In occupations where the workload is excessive, there is a higher prevalence of obesity among workers, since the intense demand for physical effort can cause mental exhaustion, physical fatigue, a decrease in the practice of physical activity and consequently a sedentary lifestyle, resulting in weight gain. Excess weight is becoming a limiting factor for various types of work, due to the impact on the reduction of skills and therefore negatively affects performance[8].

The teaching profession can compromise the body's balance due to the stress load faced by teachers on a daily basis[9]. Factors related to the organization, content and working conditions, although little explored, are recognized

in the literature as influential on the mental and physical health of these professionals[10]. Teaching time is associated with an increase in the Body Mass Index (BMI), suggesting that the more hours a teacher works daily, the greater the nutritional, metabolic, endocrine risks, and other related diseases[7].

With the increasing incidence of excess weight and obesity, it becomes increasingly relevant to evaluate the effects of these aspects on the quality of life of teachers. It is believed that social distancing, resulting from the COVID-19 pandemic, in the face of an altered daily routine, affected life habits, which can influence the health of teachers. Thus, the objective of this study was to analyze the nutritional status of teachers of the state school system of Minas Gerais and evaluate the factors associated with health conditions.

Methods

This is an epidemiological, cross-sectional and analytical study of the websurveys type. The study was conducted with a population of approximately 90,000 teachers working in state schools of public basic education in the state of Minas Gerais, Brazil (given by the State Department of Education of Minas Gerais – SEE/MG), distributed in about 3,500 schools. The state of Minas Gerais consists of 853 cities, with a population of 20,539,989 inhabitants according to the 2022 census[11].

Although the websurvey does not allow researchers to maintain control over the size of the sample investigated, sample calculation was performed to obtain knowledge about the minimum number of participants needed to adequately represent the target population. To calculate the sample size, a formula based on the prevalence of disease or event was used, considering an infinite population. The prevalence was 50%, 3% error and 20% increase to compensate possible losses[12]. Therefore, the need to collect data from at least 1,282 teachers was estimated to ensure their representativeness for the state of Minas Gerais.

Initially, authorizations and partnership with SEE/MG were obtained. After authorization, data collection took place from October 26 to December 31, 2021, through an online form available to teachers by Google Forms platform. The link of the collection form was disclosed by SEE/MG, an invitation was published on its official page (https://www.educacao.mg.gov.br/) and emails were sent to the 45 Regional Superintendences of Education (SREs) of Minas Gerais, requesting the SREs to forward the invitation through the teachers' institutional emails. The form link was sent in two phases, on the first day of collection and approximately thirty days after collection began.

According to data from the pilot study conducted with 16 teachers from different cities of Minas Gerais, filling out the data collection form took approximately 40 minutes. To avoid the automatic filling of the research form, a reCAPTCHA was used, which presented image tests, making it difficult to fill out the form by robotic systems.

The electronic address (e-mail) and the civil servant registration number with check digit (MASP) were collected in order to verify the eligibility of the participants and prevent the duplicate completion of the form. To guarantee the confidentiality of the data, protection measures were adopted, and all the tabulation, systematization and analysis procedures were carried out exclusively based on the codes assigned to each form, without direct association with the personal information of the respondents.

The study included teachers in activity in the year of data collection, who worked in elementary and/or high school, who had a contract in one of the state schools of Minas Gerais and those who accepted participating in the research. As exclusion criteria, teachers without a teaching function (such as directors), retirees and those who did not accept participation in the study.

The dependent variable verified the conditions of the nutritional status of the teachers, being considered through the evaluation of the BMI "weight (kg)/height (m)^2", calculated through the weight and height self-reported by teachers and classified with cut-off points established by WHO[13], being categorized as: eutrophic ≤24.9 kg/m^2, overweight 25 to 29.9 kg/m^2 and obesity ≥30kg/m^2. For greater accuracy of results, teachers who reported being pregnant at the time of collection were excluded from the analysis.

The independent variables applied were: sex (female; male), age (less than 30 years; 30 to 59 years; 60 years or more), relationship with school (registered/employed; hired/assigned), weekly working hours (less than 40 hours; 40 hours or more), eating (healthy; needs modification; inadequate)[14] and behavior change for physical activity practice (maintenance; action; preparation; contemplation; pre-contemplation)[15].

The food assessment scale is a validated instrument containing 24 questions that aims to measure healthy eating practices. The questions include the dimensions of planning, domestic organization, ways of eating and food choices. Answer choices are presented on a four-point Likert scale. The total score is obtained from the sum of the items (1 to 24), being categorized into: inadequate diet (up to 31 points), requires modification (between 31 and 41 points) and healthy eating (above 41 points)[14].

The behavior change for physical activity practice is divided into 5 stages: maintenance (behavior changes were made and maintained for 6 months or more); action (behavior change made in the last 6 months); preparation (there is an intention of change in the immediate future – 30 days); contemplation (there is some intention of change in the next 60 days); pre-contemplation (there is no intention of change in behavior in the near future – next 6 months)[15].

The data collection results were organized, audited and analyzed with the help of the Statistical Package for the Social Sciences (SPSS®) version 22.0. Initially, descriptive (simple and relative frequency) and bivariate (using Pearson's chi-square test) analyses were performed. In sequence, the variables that presented a descriptive level less than or

equal to 20% ($p \leq 0.20$) were initially selected to compose the multiple model. In the multiple model, multinomial logistic regression was adopted, considering teachers classified as "eutrophic" as the reference category. The model was manually adjusted. All variables that presented $p \leq 0.20$ entered the model together and only variables with a descriptive level below 5% ($p<0.05$) were kept in the final model. For the final multiple model, adjusted analyses were presented, estimated by the Odds Ratio (OR), the 95% confidence interval (95%CI) and descriptive level ($p<0.05$). The quality of the model adjustments was evaluated by the coefficient of determination (Pseudo R^2).

The project was analyzed and approved by the Research Ethics Committee of the State University of Montes Claros (Unimontes), Decision No. 4.200.389/2020. All professors who participated in the research received the Free and Informed Consent Form (TCLE) and agreed to participate by checking the "yes" option. It is important to note that, as this is an electronic form prepared on the Google Platform, the system automatically sends it to the participant's email, which allows the document to be issued to the participant and ensures compliance with the ethical requirement. The research fully followed Resolution No. 466/12 of the National Health Council/Ministry of Health, which establishes the guidelines for conducting research involving human beings.

Results

The study included 1,907 teachers from approximately 354 cities in Minas Gerais. Of the total number of teachers, 77.2% were female, 89.8% were 30 to 59 years old, 57.5% were registered/employed, 34.3% worked 40 or more hours a week, 38.7% reported that their eating habits need modification and 34,4% of teachers made behavioral changes to the practice of physical activity, maintained for 6 months or more (maintenance phase) (Table 1). Regarding BMI, 34.7% of teachers were classified as eutrophic, 40.2% were overweight and 25.1% were obese.

In the final multiple model (Table 2), the odds of being overweight, in relation to eutrophic teachers, were higher among men (OR=1.60; 95%CI: 1.23;2.10), among those aged 30 to 59 years (OR=2.42; 95%CI: 1.46;4.01) and 60 years or older (OR=2.71; 95%CI: 1.39;5.26), diet requiring modification (OR=1.33; 95%CI: 1.05;1.67) and in teachers who were in the preparation phase (OR=1.63; 95%CI: 1.17;2.26) of the behavior change for the practice of physical activity.

There was a higher chance of obesity, in relation to eutrophic teachers, among men (OR=1.64; 95%CI: 1.21;2.22), among those aged 30 to 59 years (OR=3.64; 95%CI: 1.88;7.05) and 60 years or more (OR=3.46; 95%CI: 1.50; (OR=1.46; 95%CI: 1.13;1.89), with working hours of 40 or more hours per week (OR=1.36; 95%CI: 1.04;1.77), diet requiring modification (OR=1.54; 95%CI: 1.17;2.02) and was inadequate (OR=1.76; 95%CI: 1.1.6;2.67), and among teachers in the phases of action (OR=1.60; 95%CI: 1.13;2.27), preparation (OR=2.24; 95%CI: 1.55;3.23) and contemplation (OR=1.46; 95%CI: 1.02;2.10) of behavior change for physical activity. The adjusted final model explained 5.4% of the variability of the dependent variable (Table 2).

Table 1. Descriptive and bivariate analysis of the body mass index of public basic education teachers. Minas Gerais, 2021 (n=1,907).

VARIABLES	Body Mass Index				
	Total	Eutrophic	Overweight	Obesity	
	n (%)	n (%)	n (%)	n (%)	*p*-value[β]
Sex					0.003
Female	1,473 (77.2)	526 (36.8)	553 (38.7)	351 (24.5)	
Male	434 (22.8)	119 (27.9)	193 (45.2)	115 (26.9)	
Age*					0.001
< 30 years	88 (4.6)	48 (55.8)	26 (30.2)	12 (14.0)	
30 - 59 years	1,712 (89.8)	562 (33.7)	674 (40.5)	430 (25.8)	
≥ 60 years	106 (5.6)	34 (32.7)	46 (44.2)	24 (23.1)	
Link to the school					0.076
Registered/Employed	1,096 (57.5)	370 (34.7)	448 (42.0)	249 (23.3)	
Hired/Assigned	811 (42.5)	275 (34.8)	298 (37.7)	217 (27.5)	
Weekly working hours					0.023
< 40 hours	1,253 (65.7)	448 (36.8)	482 (39.6)	288 (23.6)	
≥ 40 hours	654 (34.3)	197 (30.8)	264 (41.3)	178 (27.9)	

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VARIABLES	Body Mass Index				
	Total	Eutrophic	Overweight	Obesity	
	n (%)	n (%)	n (%)	n (%)	*p*-value[β]
Eating					<0.001
Healthy	971 (50.9)	371 (39.0)	376 (39.5)	205 (21.5)	
Needs changes	738 (38.7)	214 (30.1)	301 (42.3)	197 (27.7)	
Inadequate	198 (10.4)	60 (31.1)	69 (35.8)	64 (33.2)	
Behavior change for the practice of physical activity					0.002
Maintenance	656 (34.4)	260 (40.1)	259 (40.0)	129 (19.9)	
Action	386 (20.2)	123 (33.0)	153 (41.0)	97 (26.0)	
Preparation	338 (17.7)	88 (26.9)	139 (42.5)	100 (30.6)	
Contemplation	350 (18.4)	113 (33.3)	131 (38.6)	95 (28.1)	
Pre-contemplation	177 (9.3)	61 (35.9)	64 (37.6)	45 (26.5)	

Caption: [β] = Pearson's Chi-square test; *Variation in n due to loss of information.

Table 2. Adjusted analysis of Multinomial Logistic Regression with eutrophic teachers as the reference category. Minas Gerais, 2021 (n=1,907).

VARIABLES	Overweight		Obesity	
	Adjusted OR (95%CI)	*p*-value	Adjusted OR (95%CI)	*p*-value
Sex				
Female	1.00		1.00	
Male	1.60 (1.23;2.10)	<0.001	1.64 (1.21;2.22)	0.001
Age				
< 30 years	1.00		1.00	
30 - 59 years	2.42 (1.46;4.01)	0.001	3.64 (1.88;7.05)	<0.001
≥ 60 years	2.71 (1.39;5.26)	0.003	3.46 (1.50;8.01)	0.004
Link to the school				
Registered/Employed	1.00		1.00	
Hired/Assigned	1.03 (0.82;1.29)	0.812	1.46 (1.13;1.89)	0.004
Weekly working hours				
< 40 hours	1.00		1.00	
≥ 40 hours	1.18 (0.93;1.49)	0.165	1.36 (1.04;1.77)	0.022
Eating				
Healthy	1.00		1.00	
Needs changes	1.33 (1.05;1.67)	0.019	1.54 (1.17;2.02)	0.002
Inadequate	1.07 (0.72;1.58)	0.738	1.76 (1.16;2.67)	0.008
Behavior change for the practice of physical activity				
Maintenance	1.00		1.00	
Action	1.31 (0.97;1.78)	0.074	1.60 (1.13;2.27)	0.008
Preparation	1.63 (1.17;2.26)	0.003	2.24 (1.55;3.23)	<0.001
Contemplation	1.12 (0.81;1.54)	0.493	1.46 (1.02;2.10)	0.039
Pre-contemplation	1.02 (0.68;1.53)	0.924	1.29 (0.81;2.04)	0.286
Pseudo R2=5.4%				

Caption: OR = *Odds Ratio;* 95%CI = 95% Confidence Interval.

Discussion

Data from the present study showed that more than half of the teachers evaluated were overweight/obese. These results are similar to those presented by the WHO, which, in recent global estimates, found that on average 52% of the world's adult population were overweight and/or obese[16]. In a study conducted by the Ministry of Health, in which a set of 27 cities were evaluated, the frequency of excess weight and/or obesity was approximately 75%[17]. Another study conducted with teachers from the municipal network of basic education in a city in northern Minas Gerais showed a total prevalence of excess weight and/or obesity of 52.7%[18]. The presence of excess weight and/or obesity increases the risk of several types of chronic non-communicable diseases, which can be widely preventable[16].

The present study found that males are more likely to develop obesity. This same result was observed in a survey conducted with teachers in the city of Jequié, Bahia[19]. A study conducted with professors from the University of Viçosa demonstrated that, although the prevalence of excess weight and obesity was high in men, there was no correlation between BMI and glycemic levels. This may occur because blood glucose is not directly related to the amount of body fat, and may also include lean muscle mass, which may have directly influenced the results of male participants[20]. Based on this information, it is important to implement public policies and services to promote men's health, aiming at significant improvements[21].

Regarding the age group, teachers between 30 and 59 years and over 60 years had a higher prevalence of obesity. This finding is consistent with a study conducted in Mexico which investigated the prevalence and trend of obesity in adults and mentioned that the highest rates are observed during the fourth decade of life[22]. A previous survey, conducted with basic education teachers in Brazil, also confirmed unfavorable results in relation to the health of teachers over 40 years[23]. As age increases, there is a decrease in lean mass and an increase in fat mass, resulting in an increase in the percentage of fat[24].

Hired teachers working with a temporary contract had a greater chance of suffering from obesity. A survey conducted with teachers of the state network of Minas Gerais (REE/MG) found that the designated teachers had a more severe disease condition , since the leave time for health reasons was higher compared to effective teachers[25]. A possible explanation may be the fact that these teachers face insecurity due to the employment relationship, which usually results in a delay in seeking health treatments when they are sick[25]. This lack of concern of teachers with their health has a clear negative impact on related results.

In the present study, working hours were associated with obesity in teachers. The high workload of teachers can lead to an imbalance in food and negatively impact nutritional status[26]. Previous studies have shown that a high workload is associated with a number of health problems, including stress, fatigue, lack of adequate sleep and an impaired work-life balance. These factors can directly influence the eating habits of these professionals, leading to less healthy choices and nutritional imbalances[27]. The preparation of healthy meals requires time and planning, which can be difficult to reconcile with an intense workload[28].

In addition, high workload can lead to chronic stress and consequently trigger changes in appetite and eating patterns[29]. Some people tend to overeat in stressful situations, consuming foods high in fats and sugars as a strategy to achieve emotional comfort. This practice is associated with weight gain and the development of health problems related to diet, such as diabetes, hypertension and cardiovascular diseases[30].

In the present study, a higher chance of obesity was observed in teachers who require dietary modification. Studies with Spanish workers associate working conditions with workers' nutrition, as is the case of teachers whose high turnover of working hours and stress level were associated with the increased consumption of processed foods and reduced consumption of fruits[31]. Initiatives to promote healthy eating in schools located in Recife showed a relevant correlation with a lower prevalence of excess weight and obesity[32], highlighting that the school environment plays an important role for changes in the health pattern. As influential figures in school, teachers are role models for their students and can influence in the adoption of healthy living habits[33]. The adoption of food education and regular physical exercise practice are important to address the modifiable factors that cause obesity in this class of workers[33].

Among teachers, there was a greater chance of obesity among those who were in the stages of action, preparation and contemplation of behavior change for physical activity. A study was conducted with women from a multiprofessional obesity treatment program, in which the results showed a significant reduction in the body weight of the participants in the intervention group, and progress in the behavioral stage for the practice of physical exercise[34].

A cross-sectional study involving Brazilian adults living in Cambé, Paraná, conducted to analyze the stages of change to leisure-time physical activity over 4 years, observed the maintenance of the same stage in relation to the initial evaluation in 40% of respondents. Moreover, 31.6% of the participants relapsed. These data are in agreement with the result of this study, since in the phases of preparation and contemplation there is no practice of physical activity which leads to the persistence of obesity[35]. The results of this study corroborate the idea that, in addition to the interest in starting the practice of physical activity, motivation is necessary, which can be increased with the advice of a professional, since teachers who had a higher chance of obesity recognize the problem and are willing to overcome it[36].

It is recommended that future research in this area include a more comprehensive set of variables related to the context of Workers' Health. Although the variables analyzed in this study are pertinent, it is recognized that other relevant aspects — such as organizational conditions, psychosocial risks, institutional environment and work management

policies — could have been incorporated, expanding the understanding of the phenomenon investigated.

There are limitations in this study that should be mentioned. The use of self-reported questionnaires to assess nutritional status reflects on the reliability of data (weight and height) informed by teachers and also by questions about diet and physical activity. The body mass index, although useful, does not encompass the full complexity of the nutritional status. Furthermore, important variables related to work conditions and organization were not included, which could enrich the analysis of results. The need for Internet access affects selection bias, but also enables remote data collection. Thus, it was possible to have a more comprehensive sample of the state of Minas Gerais, including teachers working in rural areas. Other advantages of the study are the methodological accuracy and support from SEE-MG.

Conclusion

The nutritional status of teachers is related to sociodemographic variables, linked to school, working hours and lifestyle. The results of this study show an increase in obesity with age and the persistence of unhealthy behaviors. The teachers hired as temps have more unstable health conditions. There is a need to implement public policies on healthy habits to improve the quality of life of teachers and thus provide better performance.

Authors' Contributions

We describe contributions to the papers using the taxanomy (CRediT) provided above: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: KCM Pereira; TL Dourado; NSS Silva; DS Haikal; L Pinho.

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