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Behavior of health indicators of rural workers after health education actions

Comportamento de indicadores de saúde de trabalhadores rurais após ações de educação em saúde

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ABSTRACT:

INTRODUCTION: In Brazil, 16 of 90 million workers perform their work activities in rural areas, which is the country's economy closely associated with rural production. However, health care provided to rural areas is less than that offered to the urban population. The diseases that affect these populations are similar, but, there is higher mortality in the rural environment. PURPOSE: This study aimed to identify the behavior of the metabolic, morphologic, and physical fitness parameters of rural workers after health education. METHODS: Metabolic, morphologic, and physical fitness parameters of seventeen rural workers were assessed. After health education, the subjects returned to the laboratory three years later and repeated the assessments. RESULTS: Reductions in metabolic variables: total cholesterol (-8.0%; p = 0.031), LDL-c (-19.1%; p = 0.005), and triglycerides (-19.1%; p = 0.044); while increases in HDL-c (18.1%; p = 0.001), resting heart rate (9.5%; p = 0.046), and body fat (14.5%; p = 0.001) also has been founded. FINAL CONSIDERATIONS: Health education promotes positive changes in the lipid profile, but not in the morphologic and physical fitness parameters of the rural workers. It is suggested that less frequent education actions can minimize health risks, contributing to improving the health of rural workers.

KEYWORDS: Agricultural Workers' Diseases; Cardiovascular Diseases; Farmer; Occupational Health; Risk Factors.

RESUMO:

INTRODUÇÃO: No Brasil, 16 de 90 milhões de trabalhadores realizam suas atividades laborais na zona rural. Entretanto, a assistência em saúde fornecida ao meio rural é menor do que a oferecida para a população urbana. As doenças que afetam essas populações são semelhantes, mas, há maior prevalência de mortalidade no ambiente rural. OBJETIVO: Este estudo buscou identificar o comportamento do perfil bioquímico, antropométrico e cardiorrespiratório de trabalhadores rurais após educação em saúde. MÉTODOS: Foram avaliados parâmetros bioquímicos, antropométricos e cardiorrespiratórios de 17 trabalhadores rurais. Após ações de educação em saúde, os participantes voltaram ao laboratório três anos após e repetiram as avaliações. RESULTADOS: Reduções em variáveis metabólicas: colesterol total (-8,0%; p = 0,031), LDL-c (-19,1%; p = 0,005), e triglicerídeos (-19,1%; p = 0,044); enquanto aumentos no HDL-c (18,1%; p = 0,001), frequência cardíaca de repouso (9,5%; p = 0,046), e percentual de gordura corporal (14,5%; p = 0,001) também foram encontrados. CONSIDERAÇÕES FINAIS: Ações de educação em saúde promovem mudanças positivas no perfil lipídico, mas não no perfil antropométrico e cardiorrespiratório de trabalhadores rurais. Sugere-se que ações educativas menos frequentes podem minimizar os riscos à saúde, contribuindo para a melhora da saúde dos trabalhadores rurais.

PALAVRAS-CHAVE: Doenças dos Trabalhadores na Agricultura; Doenças Cardiovasculares; Agricultor; Saúde Ocupacional; Fatores de Risco.

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INTRODUCTION

The interest in investigating working conditions and the impacts referring to the worker's health state is increasing[1]. In Brazil, of the 90 million workers, approximately 16 million perform their work activities in rural areas[2], which is the country's economy closely associated with agribusiness. Thus, the rural worker has a large quota in economic development[3]. However, health care provided to rural areas still has certain frailties, as the care received is less than that offered to the urban population[1,3]. In rural areas, health systems may be more vulnerable, which can limit access to health services, and delay the identification and early treatment of illnesses[3].

The diseases that affect this rural population do not differ from that affect the urban area, but, there is a higher prevalence of mortality in the rural environment[4]. Several factors, such as lifestyle, socioeconomic aspects, the geographic extension of the rural territory, limited access to information, drugs, transport, and health services, can contribute to late diagnoses and the increased incidence of cardiometabolic dysfunctions[1,5]. Diseases such as hypertension, diabetes mellitus, dyslipidemia, obesity, and inappropriate habits (e.g. improper eating, alcohol abuse, physical inactivity) are risk factors for cardiovascular diseases[6]. Previous studies have investigated risk factors for the development of cardiovascular diseases on rural workers through metabolic, morphologic, and physical fitness parameters[6-8]. It has been reported risk factors such as high level of blood glucose and total cholesterol (TC)[6], high body mass index (BMI)[7,8], greater waist circumference (WC)[8], and increased systolic blood pressure (SBP)[7].

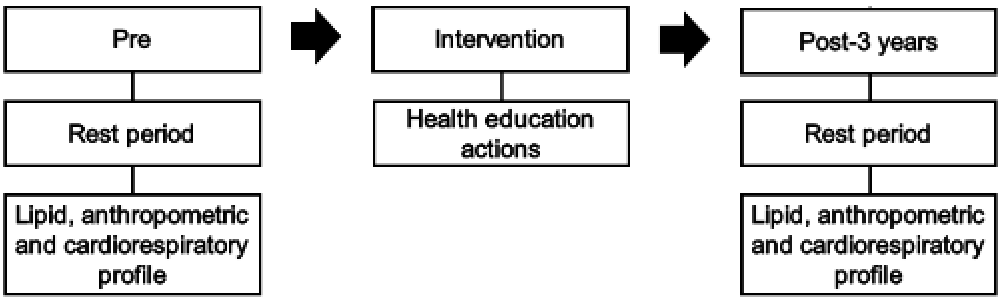
Previously, it was reported in the literature[9] that health promotion actions developed in the rural area showed improvements in the rural communities' health indicators. Therefore, health education can contribute to the improvement of elements related to the cardiometabolic diseases' risk factors, and can be an important tool for raising awareness among the rural population, able to address aspects related to promote health care[9]. In addition to approach the rural community closer to health professionals, the health actions enable the recognition of individual health necessity and enable greater access to primary care services[3].

Accordingly, due to the lack of establishing the health levels of the rural population, there is a need to identify the modifiable risk factors for cardiovascular diseases to minimize the health risk of this population. Thus, the purpose of this study was to identify the behavior of the metabolic, morphologic, and physical fitness parameters of rural workers after health education actions.

METHODS

This is an experimental study, in which the subjects were evaluated at two different times between an interval of three years (2013-2016), before and after health education actions. The sample consisted of 17 rural workers from cities (Candelária, Passo do Sobrado and Vale Verde) of the southern micro-region of the Regional Development Council of Vale do Rio Pardo (COREDE/VRP), in Rio Grande do Sul, Brazil. This study was approved by the institutional Research Ethics Committee under CAAE number 43252721.1.0000.5343. The evaluations are composed of basic information questionnaires, and identification of the metabolic, morphologic, and physical fitness aspects, with all the tests performed in a laboratory setting. After the first evaluations, the subjects participated in seminars, in which they received the individual results of the aspects that were evaluated, information and guidance related to basic health care, and participated in educational activities and discussions related to health promotion. Three years later, the subjects returned to the laboratory and repeated the same evaluations, allowing the monitoring of the parameters evaluated in the long-term (Figure 1).

Figure 1: Timeline and content of the experimental design and measurements.



Seventeen rural workers (men = 7; women = 10) participated in this study, aged of 25 and 63 years old, and with an average age of 46.76 ± 10.75 years. To participate in the study, the subjects should meet the following inclusion criteria: a) rural worker; b) age equal or older than 18 years; c) present the necessary physical conditions to perform the proposed tests. The following exclusion criteria were considered: a) presented any pathology that could make it impossible to perform the tests; b) unable to complete all stages of the evaluations. All participants met the inclusion criteria, were informed about the study, and gave written consent to participate. There was no sample loss between evaluations.

The metabolic profile variables were obtained by blood tests performed at biochemical laboratory settings. Workers were previously requested to maintain a 12-hour fast until the time of blood collection, and moments before the blood collection, participants maintained five minutes of rest. The blood collection was performed in the brachial vein using two vacutainers, which one of them containing fluoride/oxalate (to obtain plasma) and another without additive (to obtain serum). Blood samples were deposited in vacutainer without anticoagulants and were incubated at 37°C for 15 minutes and centrifuged at 2500 rpm for five minutes to collect serum[6]. The plasma samples were used to the determination of the resting blood glucose, and the serum samples submitted to the determination of the lipid profile [TC, high-density lipoprotein (HDL-c), low-density lipoprotein (LDL-c), and triglycerides] it was identified on the Miura 200 equipment (I.S.E., Rome, Italy), using commercial kits from Kovalent (Kovalent, Brazil).

Morphologic characteristics were identified by the anthropometric assessment. Total body mass, height, WC, and skinfolds were measured. The body mass and height were assessed using a beam scale (Welmy SA, Santa Bárbara do Oeste, SP, Brazil). The data served to obtain the BMI calculated through the equation: BMI=body mass/height². The WC was obtained below the last floating rib or at the narrowest circumference of the torso[10]. Skinfold measurements were performed considering the folds: pectoral, triciptal, subscapular, suprailiac, middle axillary, abdominal, and thigh. The skinfolds were measured using a Lange Skinfold Caliper (Beta Technology INC, Santa Cruz, CA, USA) and applied to the Jackson and Pollock equation, in which the summation of the referred skinfolds is adopted (∑7 skinfolds), and Siri's equation for after identification of body fat percentage[10]. The tests were performed by the same investigators, with experience in anthropometric assessment. After the anthropometric assessment, the participants received a standardized light meal for breakfast.

Physical fitness was been measured by the cardiorespiratory assessment, which was performed from a resting state in a sitting position, maintained for five minutes. Initially, the monitoring of resting heart rate (HR) was assessed using the Polar Vantage NV frequency meter and a Polar Electro Oy (Polar, Kempele, Finland) transmitter. The resting blood pressure (BP) was obtained with a sphygmomanometer and stethoscope, with workers maintaining the same resting position. After basic instructions, an ergoespirometric test was performed on Inbramed Super ATL (Inbramed Ltda., Porto Alegre, RS, Brazil) treadmill. Ergoespirometry test was performed using the Bruce Modified effort protocol, which consisted of the initial phase without inclination and with a progressive increase in speed, and after the first three-minute stage, the inclination and speed of the treadmill increased with each new stage. Respiratory gases were measured every 20 seconds by a gas analyzer (VO2000, Aerosport, Medgraphics, St. Paul, Minnesota, USA), which was calibrated before the start of each test within a temperature-controlled environment (20-22ºC), and data collections were performed in the morning, maintaining the same evaluation times. The data of maximum oxygen uptake (VO_2max) being extracted directly. To determine cardiorespiratory fitness, the highest VO_2 values were considered during the tests, which are normalized relative to the participant's total body mass ($ml \cdot kg^{-1} \cdot min^{-1}$).

The subjects participated in seminars provided by the research group and other health professionals, in which they received the individual results of the aspects that were evaluated, information and guidance related to basic health care, and participated in educational activities (e.g., lectures and conversation circle) and discussions related to health promotion. The main topics covered were issues related to the importance of a healthy diet and the practice of regular physical activity, sleepiness, and lifestyle to promote healthy habits and wellness. Further to the guidelines, the participants answered their doubts, and when necessary, the subjects were conducted to the reference health service to receive medical care. After receiving the guidance, individual care became the responsibility of each participant after the intervention until the second evaluation.

All statistical analyzes were performed using the *Statistical Package for the Social Sciences* (SPSS) version 23.0

(IBM, Armonk, NY, USA). Descriptive analyzes of mean and standard deviation (SD) were performed, while normality of data was tested using the Shapiro-Wilk test. The Wilcoxon non-parametric test for two or more related samples was used to compare the moments, considering the significance level of $\alpha = 0.05$. The graphs were made using *Prism 5 for Windows version 5.0* (GraphPad, San Diego, CA, USA).

RESULTS

Table 1 shows the basic information of the sample, related to working hours, and regular physical activity in the two moments.

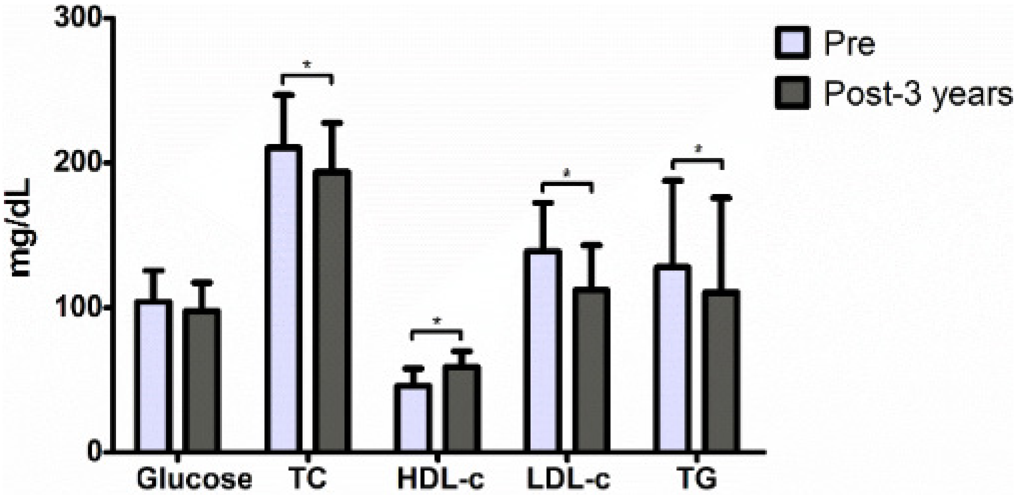
Table 1: Basic sample characteristics before and three years after health education actions.

	Pre		Post-3 years	
	n (17)	%	n (17)	%
Sex				
Male	7	41.2	7	41.2
Female	10	58.8	10	58.8
Age group				
<40 years	4	23.5	3	17.6
40-49 years	5	29.4	6	35.3
50-59 years	6	35.3	3	17.6
≥60 years	2	11.8	5	29.4
BMI				
Recommended range	4	23.5	5	29.4
Overweight	8	47.1	9	52.9
Obesity	5	29.4	3	17.6
Work hours				
<4h	-	-	-	-
4-8h	6	35.3	6	35.3
9-12h	8	47.1	10	58.8
>12	2	11.8	1	5.9
Regular physical activity				
Nothing	14	82.4	17	100.0
Once a week	2	11.8	0	0
Twice a week	1	5.9	0	0

Values expressed by frequency measures. BMI: body mass index; n: sample size.

Changes in the lipid profile between pre and post times can be observed in the figure 2. An increase in HDL-c (18.1%; $p = 0.001$) and a reduction in metabolic variables: TC (-8.0%; $p = 0.031$), LDL-c (-19.1%; $p = 0.005$), and triglycerides (-19.1%; $p = 0.044$) were observed.

Figure 2: Changes between pre and post intervention on the lipid profile.



TC = total cholesterol; HDL-c = high-density lipoprotein; LDL-c = low-densitiy lipoprotein;
TG: triglycerides. *significance level of p ≤ 0.05.

Table 2 shows the data (mean and SD) in the metabolic, anthropometric, and cardiorespiratory profile of rural workers in the two moments. The changes in biochemical variables can be observed (p ≤ 0.05). There was an increase in resting HR (9.5%; p = 0.046), and the body fat percentage (14.5%; p = 0.001), three years after health education actions. On the other hand, the other variables did not change (p > 0.05).

Table 2: Rural workers' metabolic, morphologic, and physical fitness parameters before and three years after health education actions.

	Pre	Post-3 years	Δ%	p
Blood glucose (mg/dl)	103.94 (±21.77)	97.76 (±19.71)	-6.0	0.227
TC (mg/dl)	210.23 (±36.42)	193.41 (±34.14)	-8.0	0.031*
HDL-c (mg/dl)	45.94 (±12.09)	59.01 (±10.86)	18.1	0.001*
LDL-c (mg/dl)	138.76 (±33.45)	112.23 (±30.74)	-19.1	0.005*
Triglycerides (mg/dl)	127.94 (±59.57)	110.62 (±65.10)	-13.5	0.044*
BMI (kg/m²)	27.32 (±3.91)	27.07 (±3.72)	-0.9	0.435
WC (cm)	86.73 (±8.51)	87.45 (±8.94)	0.8	0.979
Body fat (%)	24.48 (±7.33)	28.04 (±9.25)	14.5	0.001*
HR (bpm)	72.82 (±14.48)	79.76 (±12.08)	9.5	0.046*
SBP (mmHg)	126.94 (±13.70)	129.53 (±12.57)	2.0	0.285
DBP (mmHg)	78.88 (±8.88)	80.88 (±11.07)	2.5	0.309
VO_2max (ml·kg-1·min-1)	33.59 (±11.99)	35.04 (±13.50)	4.3	0.586

TC = total cholesterol; HDL-c = high-density lipoprotein; LDL-c = low-densitiy lipoprotein; BMI = body mass index; WC = waist circumference; HR = resting heart rate; SBP = resting systolic blood pressure; DBP = resting diastolic blood pressure; VO2max = maximum oxygen uptake; Δ% = percentual changes. Values expressed as mean and standard deviation. *significance level of p ≤ 0.05.

DISCUSSION

This study aimed to verify the behavior of the metabolic, morphologic, and physical fitness parameters of the rural workers after health education actions. Based on the results founded, it was possible to observe better results for some lipid variables in the second evaluation. There were positive changes for TC, HDL-c, LDL-c, and triglycerides (Figure 2), suggesting that the information related to health care provided during the research contributed to these changes. This information allows self-knowledge by individuals regarding their metabolic profile, and from this knowledge, it allows changes or the maintenance of good habits to improve results[11].

The improvement of metabolic variables reduces the risk of cardiovascular complications, once the combination of at least three components (central obesity, high blood pressure levels, high blood glucose concentration, increased triglycerides, and low HDL-c levels) define metabolic syndrome, a chronic disease that increases the early risk of cardiovascular events[12,13], and that is associated with a low rate of physical fitness[14]. In the present study, no differences were observed in blood glucose between the two moments. However, a reduction in the values of the risk components (TC, LDL-c, and triglycerides) for metabolic syndrome was identified, as well as an increase in HDL-c. This may be an indication that the health education actions were sufficient to promote positive changes in the individual's lipid profile, suggesting that the quality of the food or eating may have improved in this time interval. For Beck, Lopes & Pitanga[15] these aspects are important risk factors for the development of cardiovascular diseases, and the changes in these results may be associated with eating habits and the practice of physical activities.

Regular physical activity is considered essential in the prevention of metabolic syndrome, is the practice of physical exercises associated with the reduction of TC, LDL-c, and triglycerides[16]. Also, it can promote anthropometric indicators to levels considered ideal, increase cardiorespiratory capacity, and muscle strength[14, 17-19]. It is observed that the individuals in this study did not adhere to any regular physical activity program (Table 1), because, despite the results showing improvements in the lipid profile, the anthropometric and cardiorespiratory variables did not show positive changes.

There were no changes in the variables BMI and WC. Although, the normative values of BMI indicated that most individuals were overweight in both moments (Table 1). This is in agreement with other studies developed in other regions of Brazil with this population[20, 21], indicating the prevalence of overweight in rural populations. Previously, our research group[6] analyzed the cardiovascular risk of rural workers and observed that 88.4% were overweight, with intermediate or high risks for coronary events. In the study developed by Finco, Finco & Graeve[20] women had higher BMI values than men, suggesting that the BMI values founded by the present study may have been influenced by the sample being composed mostly of women.

On the other hand, in our study, the body fat percentage increased (14.5%), which may be associated with changes in the body composition due to advancing age, such as the loss of muscle mass and the accumulation of fat[22]. According to the average age of the participants (Table 1), this occurrence may have been caused by the sarcopenia natural process, in which from the age of 25 there is a loss of muscle mass of 3-10% per decade of life, also leading to a reduction in the functional capacity of 1-2% per year from 50 years, and until 3% after 60 years old[23,24]. Another possible explanation for this increase in the body fat percentage is the use of pesticides, which are related to genetic polymorphisms, and the use of pesticides can cause anthropometric changes[25].

Regarding the physical fitness, an increase in resting HR was observed, and even though the VO2max was similar between the two moments, the levels of these predictive variables suggest low physical fitness. These aspects reinforce the idea mentioned above that regular practice of physical activity was not adopted by the participants. The increase in resting HR can be justified by factors such as a) physical fitness reduction; b) advancing age; c) gender. The relationship between low physical fitness and increased risk of mortality is well documented in the literature[26,27], as well the relation of elevated resting HR with the risk of developing cardiovascular diseases such as hypertension, coronary heart disease, and myocardial infarction[26]. This is due to the loss of efficiency of the cardiovascular system[28], in which the biological mechanism involved in the increase in resting HR is related to the increase in sympathetic activity, which can cause myocardial hypertrophy and vascular endothelial dysfunction[26].

Considering the second factor, resting HR increases with advancing age through natural mechanisms of the aging process[29], as changes in the autonomic nervous system[28]. It is assumed that cardiovascular and cardiorespiratory changes resulting from aging are related to progressive loss of baroreflex efficiency, an increase in peripheral resistance during rest, increased sympathetic tone, progressive increase in left ventricular thickness and vascular stiffness, among other mechanisms[29]. Thus, these changes may justify the increase in resting HR founded in our study. Therefore, it is suggested to implement the practice of regular physical activity in the routine of these workers to delay these changes, promote an increase in physical fitness, and reduce the risk of cardiovascular diseases[30].

Our study has some limitations. The difficulty in attracting the voluntary participation of this population is evident and can be attributed to the extensive workload of these workers. In addition, a day off from work can compromise the economic situation of these individuals. The mobility difficulties due to the distance, also appear as a barrier for participation in projects with this population. Another factor to be considered would be the variety of tasks and functions performed by these workers, as well as the volume and intensity of tasks during the working day, which can be traditionally different between men and women. Therefore, energy and functional demands can be different among workers and could contribute positively or negatively to the health status of each individual. At the same time, this research project provided rural workers with free access to exams and evaluations, as well as health guidelines. These populations in rural and remote areas are most vulnerable due to difficulties in accessing health services[3]. Among the rural population, more than 50% of the evaluated sample reported having at least one morbidity, usually accentuated by their work activities, however, most of these workers do not seek, or seek at most once a year for primary health care services, citing the long work journey as the greatest difficulty for searching. Above all, this study made it possible to identify long-term improvements in the health of rural workers, demonstrating that less frequent health education actions can minimize health risks, contributing to improving the health of the studied population. Health education programs with a shorter time interval than the one offered in this study can demonstrate improvements in the health indicators of this population even greater than those found at the moment[9].

FINAL CONSIDERATIONS

Health education actions can impact positive behavior in the rural workers' lipid profile (i.e., cholesterol and triglycerides), but not in their morphologic and physical fitness parameters. This suggests that such behavior may be mainly related to eating habits, and less frequent education actions can minimize health risk factors, contributing to improving the rural workers' health in the long-term, based on guidelines and basics health care.

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