

Prevalence of dyslipidemia among employees of a pulp and paper company

Prevalência de dislipidemia em trabalhadores de uma empresa do setor papelero

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ABSTRACT | Background: The forestry sector employs a large number of workers worldwide. **Objective:** To establish the prevalence of dyslipidemia among forestry workers in a pulp and paper company. **Method:** Cross-sectional and descriptive study with quantitative approach conducted with a sample of 155 forestry machine operators who underwent periodic health examinations in 2013. **Results:** 45.1% of the participants exhibited sedentary behavior, 18.7% obesity, 52.2% overweight and 36.7% waist circumference within the high-risk range. About 46.5% exhibited HDL <40 mg/dL; 6.5% LDL >160 mg/dL (hypercholesterolemia alone); 38.7% triglycerides >150 mg/dL (hypertriglyceridemia alone); and 3.2% mixed hyperlipidemia. Based on the results we suggest a strategic action plan to revert the status of dyslipidemia and continuously improve the quality of life of this population of workers. **Conclusion:** Health promotion strategies are needed to improve the quality of life of workers, including orientation on healthy lifestyles and incentives to balanced nutrition and physical activity.

Keywords | dyslipidemias; quality of life; health promotion.

RESUMO | Introdução: O trabalho florestal é um setor da economia que emprega grande número de trabalhadores em todo o mundo. **Objetivo:** Conhecer a prevalência de dislipidemia em trabalhadores da área florestal de uma empresa papelero. **Método:** Trata-se de um estudo descritivo, do tipo transversal, de abordagem quantitativa, com uma amostra de 155 operadores de máquinas florestais que realizaram o exame periódico em 2013. **Resultados:** As análises apontaram que 45,1% dos colaboradores eram sedentários; 18,7% apresentavam obesidade; 52,2% tinham sobrepeso no momento da pesquisa; e 36,7% apresentavam circunferência abdominal de risco. Um total de 46,5% dos trabalhadores apresentavam HDL < 40 mg/dL; na hipercolesterolemia isolada, 6,5% exibiam LDL > 160 mg/dL; na hipertrigliceridemia, 38,7% possuíam triglicérides > 150 mg/dL; e na hiperlipidemia mista, 3,2% apresentavam a doença. Com base nos resultados foi proposto um plano de ação estratégico em saúde para reverter o quadro de dislipidemia e auxiliar na melhoria contínua da qualidade de vida desses indivíduos. **Conclusões:** Há necessidade de elaboração de estratégias de promoção de saúde, por meio de orientações sobre hábitos de vida saudáveis, como incentivo à alimentação balanceada e atividade física, para assim promover, continuamente, qualidade de vida ao trabalhador.

Palavras-chave | dislipidemias; qualidade de vida; promoção da saúde.

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INTRODUCTION

Dyslipidemia is characterized by an abnormal concentration of one or more of the blood lipids/lipoproteins (triglycerides [TG], cholesterol, high- [HDL] and low- [LDL] density lipoproteins)¹. It is associated with variable clinical manifestations as a function of the lipid involved. For instance, individuals with high LDL might develop xanthelasma and tendon xanthomas².

The 2017 update of the Brazilian Dyslipidemia and Atherosclerosis Prevention Guideline introduced changes in the laboratory-based classification of dyslipidemias and their reference values; therapeutic targets are defined based on the individual cardiovascular risk and nutritional status. As a function of the lipid involved, dyslipidemias are categorized as:

- Low HDL: reduced HDL (women: <50 mg/dL, men: <40 mg/dL) alone or combined with high LDL or TG;
- Hypercholesterolemia alone: increased LDL (≥ 160 mg/dL) alone;
- Hypertriglyceridemia alone: increased TG (≥ 150 mg/dL or ≥ 175 mg/mL postprandial) alone;
- Mixed hyperlipidemia: increased LDL (≥ 160 mg/dL) and TG (≥ 150 mg/dL or ≥ 175 mg/mL postprandial). The Friedewald equation is inadequate to calculate LDL when TG ≥ 400 mg/dL; mixed hyperlipidemia is then defined by non-HDL cholesterol ≥ 190 mg/dL³.

Dyslipidemia might cause countless harms to the health of workers in any occupational category including the forestry sector, which employs hundreds of thousands of people, most of whom are unaware of the risks of sedentary behavior, alcohol consumption and inadequate diet⁴.

Facing this scenario, collecting information on the prevalence of dyslipidemia among forestry workers in the pulp and paper industry is relevant to contribute to the knowledge in this field and bring new data to help managers and workers formulate together strategies for health promotion, disease prevention and improving their quality of work life.

Therefore, the aim of the present study was to establish the rates of dyslipidemia among forestry workers in a pulp and paper company.

METHODS

The present cross-sectional and descriptive study with quantitative approach, conducted from January through March 2013, was based on data collected in periodic health examinations. In cross-sectional studies, data are collected at a definite period of time and outcomes and exposures are measured together⁵.

The present study was performed in a municipality in Campos Gerais, Parana, Brazil, with forestry workers in a pulp and paper company (machine operators). The total number of employees was 446 men and 31 women, 477 of whom underwent periodic health examinations. We selected the category with the largest number of employees, namely machine operators (n=155). These employees underwent periodic examinations in 2013 according to the schedule indicated by the occupational medicine department as having protective effects for the employees at work, as well as in the terms of permanence in the job.

Another reason to select this group was that this population of workers demands special attention from the occupational health department as a function of their dietary habits, existing or developing diseases, sedentary behavior, smoking and alcohol consumption patterns — as indicated by the data collected from their records — since all these factors contribute to the occurrence of dyslipidemia.

The inclusion criteria were: machine operators allocated to forestry operations who performed periodic examination. Employees on leave or with less than one year in the job were excluded. The lipid profile was obtained based on the results of laboratory tests performed as a part of periodic examinations and registered in the employees records.

The laboratory tests complied with the requirements formulated by the National Quality Control Program. The results corresponding to 2013 were tabulated on an electronic spreadsheet and categorized per lipid type and presence or not of abnormalities according to the reference values in vigor.

The present study was approved by the research ethics committee of Pontifical Catholic University of Parana, ruling no. 319,303, in compliance with the National Health Council/Ministry of Health Resolution no. 466, from 12 December 2012, which regulates research involving human beings⁶.

RESULTS

Machine operators harvest pine and eucalyptus trees. They take their meals at on-site facilities provided by the employer, which consist of packed lunches delivered by local restaurants. As a rule, these meals are not nutritionally balanced.

The findings in the periodic health examinations allowed establishing that this population of workers consume a fat-rich diet, do not use vegetable oils at home and eat a considerable amount of red meat, all of which represents a high trans and saturated fat intake; the rest of their diet is composed of sugars, pasta and eggs. These workers do not have adequate knowledge of the recommended carbohydrate, protein and vitamin daily intake. Most participants reported to consume alcohol daily or sporadically. It should be noticed that this population's culture contributes to higher rates of poor nutrition, sedentary behavior, smoking and alcohol consumption. In consequence, orientation by occupational health professionals is highly relevant.

Machine operators have a sedentary lifestyle, as they spend their working time sitting at the control board and work in fixed shifts of six days alternating with two rest days. This exhausting work schedule hinders them from practicing sports, working out at gyms, walking or performing any other type of physical activity. The participants reported they prefer to spend their leisure time visiting their families, who live at a considerable distance from the company facilities.

The main health disorders found among the participants included low HDL, hypercholesterolemia alone, hypertriglyceridemia alone and mixed hyperlipidemia.

About 37.4% of the participants were aged 20 to 30 years old, the largest proportion 30 to 40 (38.8%) and the smallest proportion (23.8%) was older than 40.

Regular practice of physical activity was reported by 12.9% of the participants (n=20), 41.93% (n=65) exercised only sporadically and 45.17% exhibited sedentary behavior (n=70).

About 18.7% of the sample exhibited obesity (n=29), 52.25% overweight (n=81) and 29.05% normal weight (n=45) at the time of the study.

The waist circumference measurement fell within the high-risk range for 36.77% of the sample (n=57) and the normal range for 63.23% (n=98).

About 47.7% of the participants exhibited HDL \geq 40 mg/dL and 46.5% the pathological condition (HDL <40 mg/dL); data were missing for 5.8%. LDL was normal for 87.7% of the sample, while 6.5% exhibited the pathological condition – hypercholesterolemia alone (LDL \geq 160 mg/dL); data were missing for 5.8%. TG was normal for 61.3% of the participants, while 38.7% exhibited the pathological condition (TG \geq 150 mg/dL).

TG >400 mg/dL impairs the analysis of LDL and HDL and under such circumstances, the laboratory does not report the results. For this reason, abbreviation “n.m.” (not measured) appears in some graphics. The lipid profile data were collected at a laboratory that complies with the National Quality Control Program⁷, were tabulated on an electronic spreadsheet and categorized per lipid type and presence or not of abnormalities according to the reference values in vigor.

DISCUSSION

The analyzed company is categorized as with risk grade 3 and CNAE (National Classification of Economic Activities) code 1721400. It complies with the recommendations formulated by the Occupational Health Medical Control Program (Programa de Controle Médico de Saúde Ocupacional – PCMSO) which according to the law should be implemented in the shortest possible time to eliminate and/or neutralize risks to the health of workers⁸.

One of the goals of the Regulatory Standard (RS) 7, via PCMSO, is to achieve individual monitoring of workers exposed to the chemical, physical and biological agents described in RS 4 to thus promote and preserve their health. It also seeks to protect workers from all possible health risks in the workplace or inherent to their work process; control potential risks to the health of workers; contribute to the physical and mental adaptation of workers, adjustment of work to the workers and make better profit of them as a function of their skills; standardize actions centered on medical control and prevention; maintain a satisfactory prevention-centered culture adequate to the social responsibility of institutions, primarily based on

educational and persuasion actions; reduce the rates of work-related accidents and occupational diseases; and to ensure compliance with the labor and civil legislation on occupational health⁹. Within this context, reducing the occurrence of dyslipidemia and other diseases among workers is crucial.

All employees enrolled in PCMSO must mandatorily undergo health examinations, which include occupational interview, general physical examination and diagnostic tests as per the job profile and specific situation. The data collected in such examinations — including clinical evaluation and diagnostic tests, conclusions and measures applied — are registered in individual medical records identifiable through an ID number and the employee's name, which are filed by the PCMSO physician with full warranty of confidentiality. Employees must be communicated the results of tests and delivered a copy, while the original is filed in their medical records which are kept by the employer.

The occupational physician might request any of the diagnostic tests included in PCMSO as a function of the workers' symptoms, clinical condition and when work-related accidents occur; these tests are indispensable for the prevention of occupational risks. However, it is worth calling the attention to the need for simultaneous orientation on healthy habits and behaviors favorable to health promotion. For this purpose, meetings might be scheduled every fortnight, for instance, to discuss various topics including practical examples of behaviors related to the workers' routine.

We found that the periodic examinations included tests targeting health promotion and prevention of occupational risks, which was not the main focus of the present study. Our aim was to establish the rate of dyslipidemia based on the main four main lipid parameters: total cholesterol, HDL, LDL and TG. Risk factors for cardiovascular disease (CVD) include: smoking, high blood pressure, low HDL (<40 mg/dL) and family history of CVD for men >45 years old and women >55 years old when HDL is >60 mg/dL. We did not consider other risk factors relevant for the stratification and control of cardiovascular risk.

Dyslipidemia is associated with variable clinical manifestations as a function of the lipid involved. Individuals with high LDL might exhibit xanthelasma and tendon xanthomas. Eruptive xanthoma is common among cases

of severe hypertriglyceridemia and lipemia retinalis among individuals with hyperchylomicronemia. In our study, 61.3% of the sample exhibited normal TG and 38.7% hypertriglyceridemia (TG \geq 150 mg/dL).

About 23.8% of the participants were aged over 40, while most were within age range 20 to 40 years old. Age is a risk factor, as also are antecedents such as a high-fat diet over a long period of time.

The participants' diet was rated inadequate and likely to contribute to the occurrence of chronic diseases. As is known, globalization significantly contributed to increase the number of cases of chronic diseases through advertising seeking to enhance the consumption of processed and industrialized foods. Another relevant factor is lack of proper time for meals, which compels people to adopt increasingly unbalanced diets rich in calories from unhealthy sources, which associated with habits such as sedentary behavior might contribute to the occurrence of obesity and illness¹⁰.

In Brazil, inadequate dietary habits are more prevalent among the low-income population, possibly in association with their degree of knowledge and health care practices. In addition, obesity is increasing among the lower socioeconomic classes, since they have less access to a high-quality, adequate and healthy diet¹¹.

As is known, people who consume refined carbohydrates, like sugar and saturated fats (fried food), but little fiber-rich foods, such as wholesome grains and fruit, over a long period of time exhibit higher predisposition to metabolic syndrome¹².

Insufficient physical activity is a risk factor for dyslipidemia and atherosclerosis. Some authors found a relationship between continuous exercising along life and dyslipidemia in adulthood, with a prevalence of 12.2%. Within such context, the rates of dyslipidemia were higher for women and obese individuals, but lower for those who performed physical activity in childhood and adolescence. The odds of dyslipidemia were 65% for adults who were physically active in all stages of life¹.

Some authors¹ assert that insufficient physical activity is a risk factor for dyslipidemia and atherosclerosis. Lipids are a considerable substrate of energy during physical activity.

In addition to the negative consequences of dyslipidemia for the health of workers, we call the attention to its cost for employers, as it often increases as a function absenteeism and

eventually also early functional disability. For this reason, implementing permanent worksite programs to enhance healthy habits and early detection of risk factors and actions to minimize risks are crucial.

Diet is a preponderant risk factor for dyslipidemia. Employers are responsible for the diet of employees, which should be monitored by a duly qualified professional to make the necessary adjustments. For instance, workers with jobs requiring considerable physical strength need a carbohydrate-rich diet. However, one should not lose sight of the fact that also non-work-related habits interfere with the status of health and disease.

The tasks of the forestry machine operators analyzed in the present study include mechanical cutting, pulling and processing wood by means of machines specifically adequate for all the procedures in each stage of the harvest and transport process. Therefore, their job does not involve significant physical strength, which contributes to the occurrence of obesity. Physical inactivity should be combatted and employers play a major role in raising awareness and promoting actions to enhance physical activity among workers, since it helps in the prevention of silent noncommunicable diseases¹³.

These workers are also charged of checking the status of machines with checklists and of performing small maintenance repairs with the help of a mechanic. They employ adequate tools under proper safety conditions to solve electrical, mechanical and hydraulic problems. They are requested to fill forms and production reports, including the number of effective work and lost hours, number of plots and operators. They orient other operators and communicate with each other to improve the performance of operations while complying with safety regulations and quality requirements. They further comply with the sustainability policy and the procedures and requirements of the company integrated management system for environment, quality, safety and occupational health, with knowledge of and through assessment of environmental aspects and impacts in their area. These activities expose them to several occupational hazards.

We emphasize the relevance of physical activity given its cardioprotective effect through changes in the chemical composition of LDL and evidenced by increase of the

free cholesterol, cholesterol esters, phospholipids, and the lipid-to-protein ratio¹⁴.

Physical activity was shown to be efficacious to increase HDL¹⁵. A study¹⁶ found that aerobic exercise increased HDL by 11% among adults, which confirms the relevance of physical activity in regard to the metabolic syndrome and to reduce the cardiovascular risk. Physical activity also reduces the plasma TG levels¹⁷. A review study found reduction of the TG concentration among individuals who exercise¹⁸.

Continuous aerobic exercising contributes to the control of dyslipidemia by reducing the serum TG and increasing HDL. While not inducing significant changes in the LDL level, aerobic exercise might contribute to increase the size of molecules, thus impairing their ability to penetrate the vascular subendothelial space, being oxidized and causing atherosclerosis. For physical activity to have beneficial effects it should be practiced regularly and according to adequate methods¹³.

We suggest stratifying cardiovascular risk for the purpose of prevention and treatment. Ideally, the individual conditions of each worker should be considered, including pre-existing diseases, age, sex, family and social history. In regard to the non-pharmacological treatment of dyslipidemia, nutritional therapy is recommended, comprising partial replacement of saturated by mono and polyunsaturated fatty acids, exclusion of trans fat, weight control, reducing the consumption of alcohol, sugar and carbohydrates, including omega-3 fatty acids, phytosterols, soy protein and probiotics, lifestyle changes, regular physical activity and smoking cessation³.

The present study reflects the need for tools to improve the quality of work life, with better balance between the personal and professional lives, to contribute to the satisfaction of workers, reduce absenteeism and prevent early functional disability¹⁹.

We emphasize that quality of life is increasingly being taken into account by organizations and quality of life programs have paramount importance for personal, professional and organizational development. Programs targeting personal satisfaction, such as healthy eating, might contribute to reduce the occurrence of CVD through a focus on the monitoring of the workers' lifestyle to thus preserve their social, physical and cultural integrity, and on stimulating changes in their dietary

habits to minimize the prevalence of dyslipidemia-related diseases, obesity, diabetes, hypertension and coronary artery disease. More in particular, employers should pay attention to physical activity and contribute to enhance it through incentives, improved access, establishing fitness centers and contests to promote a healthy environmental culture.

To summarize, our suggestion is to promote healthy eating, including nutritionists and restaurant audits to ensure the provision of high-quality meals, in addition to lectures and nutritional orientation, including the preparation of individualized menus. Finally, we also suggest implementing adequate follow-up by means periodic medical evaluations and integrated monitoring of the state of health of workers. The results of such initiatives will contribute to the planning and development of future actions for health promotion and prevention of chronic diseases among the analyzed population of workers.

The present study has some limitations, as we analyzed one single occupational category. Yet we believe that its results will contribute to the planning and development of future actions by managers and workers together for health promotion and disease prevention among machine

operators at the analyzed company, also likely improve their quality of life.

CONCLUSION

The present study established the prevalence of dyslipidemia among employees of a pulp and paper company in Campos Gerais, Parana, Brazil. Its aim was to survey the rate of dyslipidemia in a sample of 155 forestry machine operators. The results evidenced sedentary behavior, excess weight and high waist circumference values — i.e., relevant risk factors — among the analyzed population, which should thus receive special attention from the occupational health manager.

The patent HDL and TG abnormalities found point to an alarming situation, while the due actions cannot be expected to be exclusively implemented by national authorities. An opening to organizational development needs to be found with focus on healthcare in the workplace. The data reported here have paramount importance as a tool for the implementation of programs targeting prevention, incentives, follow-up and continuous improvement of the health of workers.

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