http://www.periodicos.uem.br/ojs/index.php/CiencCuidSaude
ISSN on-line1984-7513
DOI: 10.4025/cienccuidsaude.v20i0.51054

ORIGINAL ARTICLE

TOBACCO DEPENDENCE AND CARBON MONOXIDE LEVEL IN OUTSOURCED WORKERS[1]

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ABSTRACT

Objective: to analyze the physical dependence to tobacco and carbon monoxide levels in the exhaled air (smoking status) in outsourced workers at a public university. **Method:** descriptive-analytical, cross-sectional, quantitative study developed with 316 outsourced workers from a public university. Data were collected using an instrument for characterization of the participants, the Fagerström Test for Nicotine Dependence, and measurements with a monoximeter. **Results:** of the 316 outsourced workers, only 41 reported the use of tobacco or tobacco products and 39% of them had a high/very high degree of physical dependence to tobacco. The majority (90.2%) had smoking status considered of smokers. The variables physical dependence to tobacco and level of carbon monoxide in exhaled air showed a statistical association (p= 0.038). **Conclusion:** some workers had physical dependence to tobacco; therefore, the creation and adoption of public policies aimed at this type of population and the presence of nurses in companies are important to promote the health of workers.

Keywords: Worker's Health. Outsourced Services. Smoking. Carbon Monoxide. Nursing.

INTRODUCTION

The world of work has undergone several modifications in its forms of contracts. Contracts through outsourcing are gaining increasing prominence in the labor market. This work practice has become frequent in Brazil and worldwide as a way to increase productivity and the quality of services, and reduce labor costs[1-2].

Outsourcing emerged due to the needs of companies for efficient and accelerated production. Some authors argue that the reason for outsourcing is greater specialization and productivity at work, while others claim that outsourcing is justified by cost reduction, a fact that favors job insecurity[3].

The outsourcing process started in Brazil around the 1970s, as a productive arrangement after the third industrial revolution. This process has led to numerous changes in the way work is organized and in the relationships between companies[4].

However, outsourced workers can perform activities of low occupational qualification and little appreciation, of manual nature, arduous physical effort. In view of this, this type of service is seen as precarious, and may have consequences for the well-being and health of these professionals[2], culminating in the emergence of occupational diseases, psychological changes, and abuse of various psychoactive substances[5].

Drug abuse has several negative consequences for individuals, which can involve social problems such as physical and psychological disorders. Alcohol and tobacco

[1]Article extracted from the master's dissertation "Evaluation of self-esteem, alcohol, tobacco and other substances in outsourced workers at a public university", presented to the Federal University of Alfenas, Nursing school, Alfenas, MG, Brazil.

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are public health problems that have caused several health consequences. Among the substances most used by workers, including outsourced workers, tobacco stands out, which is among the main risk factors for the occurrence of various diseases. The use of tobacco has had several consequences for the health of individuals, for their work and for their interpersonal relationships, which may interfere with their quality of life[6-7].

Smoking is now considered a worldwide pandemic, with approximately 1.3 billion users and 6 million deaths per year. The projection of tobacco-related deaths, if no containment measures are adopted by government agencies, is 8 million for 2030 worldwide[7].

In this context, outsourced workers are among the most vulnerable to the use of tobacco products. This vulnerability is often influenced by their low education and low economic income. Thus, these workers may be exposed to working conditions that require greater physical effort. Thus, they are also exposed to changes in their life, health and work conditions and, from that, they can use tobacco as a form to relieve stressors present in the work and life environment, causing other consequences for their health[2,8-9].

Some studies have already shown that the greatest use of tobacco products is among those workers with less education or study time, and also among low-income people who perform jobs with greater manual effort, such as outsourced workers[9 -10]. There is also a relationship between characteristics/work conditions and tobacco consumption, in which those workers subject to responsible activities and under time pressure, are more vulnerable to tobacco consumption[8].

In view of this, the multidisciplinary health team, including the participation of nurses, has an important role in the diagnosis of smokers and the necessary guidance on the negative consequences of tobacco use. In this team, attention is drawn to nurses, who must perform the active search for these users, develop educational actions and minimize the risks of complications arising from use of tobacco among workers[11].

In view of the above, and added to the reduced number of studies addressing this issue related to this type of worker, it is important to investigate the physical dependence to tobacco and its relationship with the level of carbon monoxide in workers. Thus, this study has the objective to subsidize information for the promotion of the health of these individuals and, consequently, improvements in the quality of life at work. It aims also to promote knowledge so that nurses have subsidies for their professional performance at all levels of health care.

Thus, the study aims to answer the following guiding question: what is the level of carbon monoxide in the exhaled air and the physical dependence to tobacco in outsourced workers? The study analyzed the physical dependence to tobacco and the level of carbon monoxide in the exhaled air (smoking status) of outsourced workers at a public university.

METHODOLOGY

This is a descriptive-analytical, cross-sectional study with a quantitative approach, developed at a public university in a municipality in the south of Minas Gerais.

The study population consisted of outsourced workers who provided services to this university, totaling 343 workers, who performed their functions in several areas. They were: laboratory assistant, administrative assistant, clerk, janitor, vigilant, assistant of general services, gatekeeper, driver, electrician, dental assistant, plumber, locksmith, hardware technician, waitress, gardener, cabinetmaker, event planner, bricklayer, audio and video technician, night watchman, sample analyst, mechanic assistant, foreman, cleaning services head, vehicle washer, painter, construction supervisor, refrigeration technician, and work safety technician.

The inclusion criteria established for inclusion of participants were: being 18 years of age or older, having at least three months of service in the company, not being on any type of leave such as sick leave, maternity leave, or vacation. Thus, the sample consisted of 316 workers, since 23 did not accept to participate in the study, three were on sick leave, and one was on maternity leave. All were invited to participate in the research in order to obtain the largest number of volunteers who used tobacco.

Data collection was carried out from December 2016 to February 2017 at the workplace, so that this procedure did not

interfere with the service dynamics. The research proposal was presented to the workers and they were invited for voluntary collaboration by signing the Informed Consent Form (ICF).

After their agreement to participate, they were given an envelope containing two self-applicable instruments: an instrument for characterization of the participants, and the Fagerström Test for Nicotine Dependence. The latter was filled out only by the participants who were smokers (n = 41) in order to assess the physical dependence to tobacco. The level of carbon monoxide in exhaled air (COex) was also measured using a carbon monoxide meter so as to classify the smoking workers according to their smoking status.

In the case of participants who had a low level of education or difficulty to fill the questionnaire, the instruments were applied in the form of an interview, with no interference of the researchers in the responses.

The instrument for characterization of the participants was to a semi-structured questionnaire created by the researchers to evaluate data on the characterization, lifestyle, chronic illnesses, and work activities of the outsourced workers, containing the following variables: sex, age, marital status, religious belief, schooling, number of children, monthly family income, type of housing, physical activity, use of tobacco, chronic illness, continuous/daily use of medications, profession, length of service in outsourced companies and in the current company, workload, period/shift in the current company, and other job/employment bonds.

It is noteworthy that this instrument was submitted to a refinement process, through the evaluation of five judges and, subsequently, a pilot test was carried out, to verify effectiveness and applicability.

The Fagerström Test for Nicotine Dependence (FTND) was validated in Brazil in 2002 and aims to measure the degree of physical dependence to tobacco, which can be classified according to the total sum of points into very low, low, moderate, high, and very high. This instrument consists of six questions that address information regarding the difficulty of abstaining from smoking in a prohibited place and when bedridden by illness; if the first cigarette in the morning is the most satisfying; and if the individual smokes more in early hours of the morning than the rest of the day; the number of cigarettes consumed; and the time after waking up when the first cigarette is smoked[12].

COex was measured using a carbon monoxide meter which measures the concentration of COex using an electrochemical sensor, expressing it in parts per million (ppm)[13]. For the assessment of COex, the worker was asked to inhale until total lung capacity (ambient air); then, take an inspiratory pause of 15 seconds, with the objective that the carbon monoxide (CO) in the blood would come into balance with the alveolar air so as to allow the device to more accurately determine the concentration of CO in the blood from the COex. After this pause, the respondents were instructed to exhale air from the lungs slowly and completely through the disposable mouthpiece of the device. Based on the result, the worker was classified according to the smoking status of a smoker or a non-smoker, in which values above six ppm of COex are considered smokers.

Collected data were entered into an Excel version 2017spreadsheet for the preparation of the database. Later, double typing was performed to avoid transcription errors. The Statistical Package for the Social Sciences version 20.0 was used for descriptive and inferential statistics.

The Fisher's exact test was used to verify whether there was an association between physical dependence to tobacco and COex level (smoking status). The level of statistical significance was set at 5%, that is, data were statistically significant at $P < 0.05$.

This study was approved by the Research Ethics Committee, in accordance with Opinion 1,623,102. It should be noted that the companies providing outsourced services signed authorizations to carry out the research and that all ethical precepts involving research with human beings were respected, according to Resolution 466/2012.

RESULTS

This study found that, of the 316 outsourced workers, the majority were female (54.4%), aged between 30 and 39 years (31.3%, average of 38.7 years), married or living with partners (58.2%), Catholics (70.3%), with one or two

children (47.0%), with monthly family income between R$ 1,501 to R $ 3,000 (51.6%, average of R $ 2,642.71, corresponding to approximately 1.5 to 3.5 minimum wages), with own house (58.5%), and with complete high school (37.0%).

It was found that most part of the workers did not practice any physical activity (42.7%), had some chronic disease (30.1%) in which the most prevalent was systemic arterial hypertension (SAH) (48.4%). It was also observed that 38.6% of outsourced workers used made continuous or daily use of some medication, with antihypertensive drugs having a higher percentage (57.4%), followed by contraceptives (22.9%).

With regard to labor characteristics, it was found that part of the workers were laboratory assistants (17.7%), administrative assistant, clerk, and janitor (respectively, 17.4%, 16.0% and 13.0%). Most workers had up to 10 years of professional experience in outsourced services (81.3%), with a workload at the institution of 44 hours per week (84.4%, average of 43.6 hours), performed their duties in the morning and afternoon (85.8%), and had another job (18.4%), with a workload of up to 20 hours per week (65.5%).

Of the 316 workers who composed the sample, 41 (13.0%) said they used tobacco products on a daily basis.

Table 1. Distribution of outsourced workers who used tobacco products daily according to the questions of the Fagerström instrument. Alfenas, MG, 2016/2017. (n = 41)

Questions	Answers	f	%
1. After waking up, how long is it before you smoke your first cigarette?	More than 60 minutes	11	26.8
	Between 31 and 60 minutes	8	19.6
	Between 6 and 30 minutes	6	14.6
	Less than 6 minutes	16	39.0
2. Do you find it difficult not to smoke in areas where smoking is prohibited?	No	23	56.1
	Yes	18	43.9
3. Is the first cigarette in the morning what brings you the most satisfaction?	No	12	29.3
	Yes	29	70.7
4. Do you smoke more in the early hours of the morning than the rest of the day?	No	26	63.4
	Yes	15	36.6
5. Do you smoke even when you are bedridden due to illness?	No	23	56.1
	Yes	18	43.9
6. How many cigarettes do you smoke per day?	Less than 11	17	41.5
	11 to 20	16	39.0
	From 21 to 30	6	14.6
	More than 30	2	4.9

Source: Authors' elaboration

There was a higher percentage of workers who smoke their first cigarette of the day in less than 6 minutes after waking up (39.0%) and find it difficult not to smoke in prohibited places (43.9%). The majority reported that the first cigarette in the morning is the one that brings the most satisfaction (70.7%) and that they did not smoke more in the early morning hours (63.4%). When asked whether they smoked even when bedridden due to illness, the majority of workers reported that they did so (43.9%) and stated that they smoked less than 11 cigarettes a day (41.5%). However, it should be noted that a considerable number of workers, corresponding to 39.0%, smoked 11 to 20 cigarettes per day (Table 1).

Table 2. Distribution of outsourced workers who used tobacco products daily according to the classification of physical dependence to tobacco according to the cutoff points of the Fagerstrom instrument. Alfenas, MG, 2016/2017. (n = 41)

Physical addiction to tobacco	F	%
Very low	12	29.3
Low	7	17.1
Medium	6	14.6
High	11	26.8
Very high	5	12.2
Total	41	100.0

Source: Authors' elaboration

When assessing the distribution of outsourced workers according to the classification of the Fagerström instrument, according to the cut off points, it was possible to verify that the highest percentage of the surveyed workers had a very low degree of physical dependence to tobacco (29.3%). However, it is worth mentioning that a considerable number of workers had a high degree of dependence (26.8%) (Table 2).

Table 3. Distribution of outsourced workers who used tobacco products daily according to the level of carbon monoxide in the exhaled air and the smoking status. Alfenas, MG, 2016/2017. (n = 41)

Variables	f	%
Carbon monoxide in exhaled air (in ppm)		
6 or less	4	9.8
7 to 15	13	31.5
16 to 25	15	36.6
More than 25	9	22.0
Total	41	100.0
Smoking status *		
Smoker	37	90.2
Non-smoker	4	9.8
Total	41	100.0

Source: Authors' elaboration
*People with Coex value above 6 ppm are considered smokers

In the assessment of Coex levels in the exhaled air, the majority of workers had Coex levels in the range from 16 to 25 ppm (36.6%). It is worth mentioning that all workers who had Coex above 6 ppm had smoking status as a smoker. In this sense, 90.2% of workers had smoking status considered as smokers (Table 3).

Table 4. Univariate analysis of physical dependence to tobacco and smoking status in outsourced workers who used tobacco products daily. Alfenas, MG, 2016/2017. (n = 41)

Variables	Smoking status		p-value*
	Non-smoker	Smoker	
Physical dependence to tobacco			
Very low to low	4 (21.1%)	15 (78.9%)	**0.038**
Medium to very high	0 (0.0%)	22 (100.0%)	

Source: Authors' elaboration
*Fisher's exact test

The variables physical dependence to tobacco and level of carbon monoxide in the exhaled air (smoking status) showed a statistical association (p = 0.038), that is, workers who had medium to very high physical dependence to tobacco had smoking status classified as smoker (Table 4).

DISCUSSION

It was found in this study that less than half of the sample used tobacco daily. These findings corroborate an investigation conducted with 4025 workers from four companies in Taiwan, which showed that 22.3% of them smoked daily. In addition, it was observed that smoking was associated with increased blood pressure, abdominal obesity and metabolic syndrome, especially in men[14]. Such data reaffirm the harm caused in people's lives, which are provided by the frequent consumption of tobacco products.

It is noteworthy that nicotine is the main component of tobacco, capable of causing dependence due to its stimulating effect on the central and peripheral nervous system, in which the release of catecholamines occurs, causing damage to the cardiovascular system[15].

In the assessment of daily consumption of tobacco products, it was shown that most workers smoked their first cigarette of the day

less than 6 minutes after waking up, had difficulty staying without smoking in prohibited places, the first cigarette in the morning was what brought more satisfaction and they did not smoke anymore in the early hours of the morning. Still, it was observed that some of them smoked even when they were bedridden due to illness. In addition, part of the outsourced workers reported that they smoked less than 11 cigarettes a day.

These results are similar to those of another investigation carried out with non-teaching staff at a public university in the countryside of São Paulo, which showed that most workers smoked their first cigarette up to 60 minutes after waking up; who found it difficult to go without smoking in prohibited places; that the first cigarette in the morning brought the most satisfaction; who smoked even when bedridden by illness; and, who smoked up to 10 cigarettes a day[16].

A survey conducted with 284 physicians and nurses at a Regional General Hospital in Tijuana in Mexico using the same instrument presented some divergent results in relation to the data of the present study. It was found that most professionals did not have difficulties to go without smoking in prohibited places, that they did not smoke more in the early hours of the morning, and did not smoke when bedridden by illnesses[17].

As for the classification of physical dependence to tobacco, in the present study, the majority of smokers had medium to very high dependence. Such results are in line with findings from other studies[13]. In view of the above, the health team, especially nurses, have an important role, especially in identifying the best approach to deal with smokers, as well as, with their concerns, to assist them in adhering to the treatment for nicotine addiction[18].

In the assessment of Coex levels, the majority of the workers studied were in the range of 16 to 25 ppm; still, most were classified as having the smoking status of smokers. An intervention study with 35 workers from a public university in Minas Gerais showed that workers in the treated group (n = 24) had an average COex of 18.4 ppm and in the control group (n = 11) of 16.4ppm[13].

In this context, it is worth noting that nicotine, a substance that causes dependence to tobacco, has receptors in the brain, the so-called nicotinic cholinergic receptors. When nicotine binds to these receptors, it prevents the occurrence of physiological chemical reactions and promotes the release of dopamine. Thus, it provides a feeling of euphoria and pleasure when used that, in addition to inactivating the monoamine oxidase enzyme, responsible for the degradation of dopamine, promotes nicotine dependence when consumed in a prolonged and exacerbated manner[19].

The lack of nicotine in the body can cause some discomfort in the person, such as anxiety. This impels the individual to repeat the consumption of tobacco in an attempt to seek again the sensation of comfort and pleasure provided by this substance[20].

Thus, it is noted that several factors prevent the individual from quitting smoking, incuding anxiety, nervousness and family problems. In addition, high consumption of tobacco is known to cause several harms and losses in the smoker's life, namely, damage to oral health, increased pain intensity, cough, dyspnea, premature aging of the skin, heart and pulmonary diseases, perinatal problems, lung cancer, and other types of cancer[4,21].

Some strategies that can be used by nurses and other health professionals to help smoking cessation are individual counseling, motivational strategies, auricular therapy, psychotherapy and association with drug therapies[13]. Therefore, it is important to expand the knowledge and training of health workers, to help control smoking among workers and the general population[13,22].

The variables physical dependence to tobacco and carbon monoxide level in the exhaled air (smoking status) showed a statistical association; the outsourced workers who had medium to very high physical dependence to tobacco presented the smoking status of smokers.

Corroborating such data, findings in the international literature also showed a relationship between the number of cigarettes smoked and COex levels in people, in which the greater the number of cigarettes smoked, the greater the COex level[21]. Another international study showed a positive correlation between physical dependence to tobacco and COex level[23].

COex is a highly toxic gas, formed by the incomplete burning of carbon in cigarettes. This

substance has the ability to bind red blood cell hemoglobin more easily when compared to oxygen. Thus, this connection causes a reduction in the amount of oxygen in the blood, which can cause moderate hypoxemia to ischemic events[24].

The damages caused by tobacco are varied and most smokers know them. For this reason, many of them resort to smoking cessation programs. A study carried out in a smoking cessation program in Hong Kong showed some important factors for success in smoking cessation, such as age, mental health, cigarette consumption, score on this scale, reasons for cessation, confidence in the abandonment, the person's depressed mood, and self-efficacy, counseling sessions in medical office, telephone counseling, and drug treatment[25]. Another study pointed out that smokers can present psychological disorders such as anxiety, depression, mood disorders, among others, when they try to quit smoking. Therefore, smoking cessation must be programmed[26].

In view of the above, the need for multiprofessional work in smoking cessation is emphasized, with intense nurses' performance, through a holistic approach to the management of smoking cessation and to improve self-efficacy and motivation. In addition, it is important to promote surveillance programs for workers' health, through policies for smoking cessation among workers[25-27].

In this context, there is a need for bodies present in outsourced companies to pay attention to the factors that may cause the predisposition for the use of tobacco, and adopt measures that promote quality of life at work. In addition, the importance of creating and adopting public policies that serve this type of population is fundamental to promote the health of these workers.

It is noteworthy that the presence of nurses in companies is indispensable for health promotion and the prevention of injuries resulting from the work environment, since they can perform their duties using motivational strategies to combat factors that may cause predisposition to use and addiction to tobacco.

Some factors were limiting in this study, including its cross-sectional design, which did not allow verifying cause-effect relationships in the results. However, it allowed characterizing and associating variables, observing the situation of the workers at that moment. The difficulty in locating the workers due to the different activities performed at the university was another limitation. However, this factor did not affect the sample size and the results found. Another limitation was the statistical analysis, which did not allow a better understanding of the association of the variables due to the small number of workers who were smokers. However, it was possible to verify the situation of outsourced workers who used tobacco at that time.

Thus, longitudinal investigations, mainly of the intervention type, addressing the theme analyzed in this study in a way that demonstrates the causal nexus and the cause-effect of the use of tobacco products in outsourced workers, as well as, in larger samples for more consistent statistical analysis are recommended.

CONCLUSION

With the present results, it can be concluded that part of the outsourced workers had a very low degree of physical dependence to tobacco and most of them had smoking status of smokers. In addition, it was found that workers who had medium to very high physical dependence to tobacco had smoking status classified as that of smokers.

The present study can contribute to the advancement of scientific knowledge because studies addressing outsourced workers are few. Thus, these studies may contribute so that nurses who work in companies have subsidies to act in their professional practice, so that they act with greater commitment in the preventive, curative and educational actions for outsourced workers, providing them with greater satisfaction, greater productivity to companies, and also the reduction of absenteeism due to mental illness and substance use.

DEPENDÊNCIA DO TABACO E NÍVEL DE MONÓXIDO DE CARBONO EM TRABALHADORES TERCEIRIZADOS

RESUMO

Objetivo: analisar a dependência física do tabaco e o nível de monóxido de carbono no ar exalado (*status* tabágico) em trabalhadores terceirizados de uma universidade pública. **Método:** estudo descritivo-analítico, transversal, quantitativo, desenvolvido com 316 trabalhadores terceirizados de uma universidade pública. Os dados foram coletados por meio do instrumento de caracterização dos participantes, do *Fagerström Test for Nicotine Dependence* e do aparelho monoxímetro. **Resultados**: dos 316 trabalhadores terceirizados, apenas 41 relataram o uso de tabaco ou derivados e 39% destes possuíam grau de dependência física do tabaco elevado/muito elevado. A maioria (90,2%) deles possuía *status* tabágico considerados fumantes. As variáveis dependência física do tabaco e nível de monóxido de carbono no ar exalado apresentaram associação estatística (p=0,038). **Conclusão**: alguns trabalhadores possuíam dependência física ao tabaco; por isso, torna-se importante a criação e adoção de políticas públicas que atendam a este tipo de população, assim como, a presença de um enfermeiro nas empresas, com vistas para a promoção da saúde dos trabalhadores.

Palavras-chave: Saúde do trabalhador. Serviços terceirizados. Tabagismo. Monóxido de carbono. Enfermagem.

DEPENDENCIA DEL TABACO Y NIVEL DE MONÓXIDO DE CARBONO ENEMPLEADOS TERCERIZADOS

RESUMEN

Objetivo: analizar la dependencia física del tabaco yel nivel de monóxido de carbono en el aire exhalado (*status* de tabaquismo) enempleados tercerizados de una universidad pública. **Método:** estudio descriptivo-analítico, transversal, cuantitativo, desarrollado con 316 empleados tercerizados de una universidad pública. Los datos fueronrecolectados por medio del instrumento de caracterización de los participantes, del*Fagerström Test forNicotineDependence*y delmonitor de monóxido de carbono. **Resultados**: de los 316 empleados tercerizados, solo 41 relataron el uso de tabaco o derivados yel 39% de estos poseía grado de dependencia física del tabaco elevado/muy elevado. La mayor partede ellos (90,2%) poseía *status*de tabaquismo considerados fumadores. Las variables dependencia física del tabaco y nivel de monóxido de carbono en el aire exhalado presentaron asociación estadística (p=0,038). **Conclusión**: algunos empleados poseían dependencia física al tabaco; por ello, es importante la creacióny adopción de políticas públicas que respondan a este tipo de población, así como la presencia de un enfermero en las empresas, a fin de promover la salud de los empleados.

Palabras clave: Salud delempleado. Servicios tercerizados. Tabaquismo. Monóxido de carbono. Enfermería.

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Submitted: 21/02/2020
Accepted: 08/12/2020

FINANCIAL SUPPORT

Coordination for the Improvement of Higher Education Personnel (CAPES), Brazil. Financing Code 001.