ORIGINAL ARTICLE

Received: 04/26/2018
Accepted: 03/25/2019
Funding: none

Prevalence and factors associated with respiratory symptoms among civil construction workers: an occupational health surveillance proposal

Prevalência e fatores associados a sintomas respiratórios em trabalhadores da construção civil: uma proposta de vigilância em saúde do trabalhador

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ABSTRACT | Background: The civil construction industry is associated with the some of the highest morbidity and mortality rates in Brazil. Despite their epidemiological relevance, occupational health surveillance actions within the primary care setting still exhibit weaknesses. Objective: To analyze the prevalence of and factors associated with respiratory symptoms among civil construction workers in Cuiaba, Mato Grosso, Brazil. Methods: Cross-sectional analytic study conducted with 545 civil construction workers to analyze occupational health surveillance actions. Presence of respiratory symptoms was investigated by means of the British Medical Research Council questionnaire on respiratory symptoms. The Mantel-Haenszel χ^2 test was used for bivariate analysis and Poisson regression for multivariate analysis. The significance level was set to 5%. Results: Most participants were young adults and almost half exhibited respiratory symptoms. The odds to develop cough were higher for the participants exposed to chemicals (PR=1.70; 95%CI 1.22–2.37). The odds to develop wheezing were higher for the participants who had not undergone pre-employment spirometry (PR=1.57; 95%CI 1.17–2.10). Conclusion: Biological monitoring of civil construction workers might be useful to improve occupational health surveillance actions within the primary care setting.

Keywords | occupational diseases; respiratory tract diseases; surveillance of the workers health; construction industry; occupational health.

RESUMO | Introdução: O setor da construção civil é um dos que mais adoecem e matam trabalhadores no Brasil. Apesar da relevância epidemiológica, ainda são frágeis as ações de vigilância em saúde do trabalhador na Atenção Básica. **Objetivo:** Analisar a prevalência e os fatores associados a sintomas respiratórios em trabalhadores da construção civil de Cuiabá, Mato Grosso. **Métodos:** Trata-se de um estudo transversal, analítico, realizado com 545 trabalhadores da construção civil, de modo a qualificar as ações de vigilância em saúde do trabalhador. A presença de sintomas respiratórios foi determinada através do instrumento *British Medical Research Council*. Realizou-se o teste do χ^2 de Mantel Haenszel na análise bivariada e regressão de Poisson na análise multivariada. O nível de significância adotado foi de 5%. **Resultados:** A maioria dos participantes é de adultos jovens. Quase metade dos participantes foram classificados como sintomático-respiratórios. Trabalhadores expostos a substâncias químicas apresentaram maiores chances para a ocorrência de tosse (RP=1,70; IC95% 1,22–2,37) e expectoração (RP=1,63; IC95% 1,14–2,23). Trabalhadores que não realizaram os testes espirométricos nos exames admissionais obtiveram maiores chances de apresentar sibilos (RP=1,57; IC95% 1,17–2,10). **Conclusão:** O monitoramento biológico dos trabalhadores da construção civil pode servir como uma importante ferramenta para a qualificação das ações de vigilância em saúde do trabalhador na Atenção Básica.

Palavras-chave | doenças profissionais; doenças respiratórias; vigilância em saúde do trabalhador; indústria da construção; saúde do trabalhador.

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DOI: 10.5327/Z1679443520190263

INTRODUCTION

The construction industry is one of the main sources of jobs worldwide and has paramount importance for the global economy. However, it is also one of the most dangerous activities. According to the International Labor Organization (ILO), about 108,000 workers die every year in construction sites across the world, corresponding to 30% of all fatal work accidents[1,2].

Work-related diseases among construction workers are a serious public health problem. Exposure to various occupational hazards, such as dusts and other contaminants, contributes to the occurrence of illness among different occupational groups. According to some estimates, 10% to 30% of cancer cases worldwide have occupational origins[3].

The situation of civil construction is no different. The work process in this industry is dynamic and complex and comprises a wide scope of activities and tasks. Work is characterized by direct and indirect contact with countless agents deleterious to health, among which non-ionizing radiation, dusts, vapors, gases and welding fumes stand out. Further aspects include a workforce with low educational level, demands and pressure for productivity and high turnover rates. All these factors contribute to the occurrence of musculoskeletal disorders, dermatitis, gastrointestinal and respiratory diseases[4].

In regard to the latter, several studies reported significant pulmonary function impairment among civil construction workers[5-7]. In a study conducted with 800 brick kiln workers in Nepal, 55% of the sample exhibited cough, wheezing and chronic phlegm[8]. Another study in Ghana found that the prevalence of chest pain and dyspnea was significantly higher among workers daily exposed to cement compared to non-exposed occupational groups[9]. In a study with 128 workers in India, 66% of the participants exhibited poorer respiratory parameters than what expected for their age, gender and height[10].

Among civil construction workers, the amount and length of exposure to a wide variety of contaminants causes clinical manifestations which might be classified as acute or chronic. Acute manifestations usually include upper airway obstruction, cough, wheezing and dyspnea. The pathophysiology of chronic exposure, in turn, might lead to chronic obstructive pulmonary disease (COPD), pneumonia, lung fibrosis and cancer, among others[11].

As an attempt to reduce the incidence of occupational respiratory diseases, several developed countries, such as the one belonging to the European Union and the United States, passed rigorous legislation that sets limits to the exposure to dusts and other inhaled particles (occupational exposure limit, OEL). While such limits vary among countries, inspection and regulatory procedures ensure adequate control of workplaces, particularly in the civil construction industry[11].

Despite Regulatory Standard 18, which describes the due working conditions and environment for the construction industry[12], the government's mechanisms for inspection and health and safety at work surveillance are still weak in Brazil[5]. In addition, health professionals frequently fail to establish early correlations between respiratory signs and symptoms of workers and their present or past occupational exposures[13].

This failure to establish causal links is a serious problem that evidences the weaknesses of occupational health surveillance (Vigilância em Saúde do Trabalhador — VISAT) especially within the primary care setting. When performed at all, VISAT actions at this level are narrow scoped, fragmented and often unrelated to the healthcare network, the map of production and the local epidemiological profile[14].

This scenario directly leads to underreporting, diagnostic imprecision, mistakes in the clinical management of patients, difficult access to social security benefits and poor efficacy of primary care relative to work-related health problems[15].

Cuiaba, the capital of the state of Mato Grosso, Brazil, was selected a few years ago as one of the locations for the soccer World Cup, which resulted in a large number of new civil construction jobs in association with the development of road infrastructure, arenas and urban mobility. However, these developments were attended by higher exposure to several environmental contaminants[16]. In such cases, the healthcare sector, VISAT in particular, should rise to the challenge posed by early detection of clinical signs and symptoms predictive of future respiratory illnesses among civil construction workers occupationally exposed to environmental contaminants[7]. The aim of the present study was to analyze the prevalence of and factors associated with respiratory symptoms among civil construction workers in Cuiaba to analyze VISAT actions.

METHODS

STUDY POPULATION AND SAMPLE

The present cross-sectional and analytic study was conducted from August through November 2014 with unionized civil construction workers in Cuiaba.

The number of potential participants and workplace locations were obtained from the Civil Construction Industry Workers' Trade Union of Cuiaba. The sample size was calculated following the procedures recommended for finite populations[17], considering 5,000 registered workers, error of 5%, prevalence of respiratory symptoms of 50% and design effect of 1.5. On these grounds, the sample had to comprise 428 participants. Further 15% was added to enable association analysis between the outcome and independent variables, which increased the sample size to 492. An additional 10% was considered to compensate for eventual losses and refusal to participation, to a total of 545 participants. The construction sites were then selected by simple sampling among the 23 registered companies, leading to the selection of five which promptly agreed to participate. The participants were randomly selected according to the order they arrived to work and were interviewed at the construction site cafeteria.

INSTRUMENTS AND VARIABLES

Data collection was performed by means of a semi-structured questionnaire, which was administered by the investigators at the selected construction sites. All the investigators received previous training from the study coordinators to familiarize with the instrument used.

Outcomes were analyzed based on the British Medical Research Council questionnaire on respiratory symptoms[18]. This instrument comprises several groups of questions relative to respiratory symptoms and was cross-culturally adapted and validated for the Brazilian Portuguese language[19]. First cough (yes/no), phlegm (yes/no) and wheezing (yes/no) were analyzed separately and considered as exclusive response variables. All the participants who reported any of these three symptoms were categorized as symptomatic (yes/no).

Independent variables were sociodemographic characteristics, including age range, sex, marital status, educational level and per capita family income. We also collected information on smoking (smoker, nonsmoker, ex-smoker) which was then categorized as smokers (current and former) and non-smokers. Further variables corresponded to occupational aspects (occupation, working hours, length of exposure and employment relationship), pre-employment tests (spirometry and chest radiographs) and environmental exposures in the workplace (cold, heat, dampness and dusts).

DATA ANALYSIS

The data were entered twice in software Epi-Info® version 7 to ensure their internal consistency. Analysis was performed with Stata® version 13.0.

The data were subjected to descriptive, bivariate and multivariate analysis. On bivariate analysis we investigated associations between the independent and response variables with the Mantel-Haenszel χ^2 or Fisher's exact test as per need. The significance level for association analysis was set to 0.05 (a=5%).

Multivariate analysis was performed by means of Poisson regression adjusted for confounding variables. All the variables with $p<0.20$ were included in the model. Categorical variables were included in analysis as ordinal variables when the results of the χ^2 test for linear trend were significant.

To establish the joint effect of occupations with highest risk for occupational diseases and low income, we included their interaction in the multiple Poisson regression model following analysis of homogeneity between strata by means of stratified analysis (data not shown).

ETHICAL ISSUES

The present study is part of a larger research project to analyze occupational risks, reported morbidity and precarious work among civil and heavy construction workers in the state of Mato Grosso, Brazil. This project was approved by the research ethics committee, ruling no. 242,732, from 10 April 2013. All the participants read and signed an informed consent form.

RESULTS

Most of the 545 participants were male (91.7%) and the largest proportion was within age range 20 to 29 years old (mean: 32±12.2 years old). Almost half of the participants (45.1%) had not completed elementary school. About 13.5% of the sample earned up to half the minimum wage. Most participants were married or lived with a partner 959.4%). Smokers represented less than one third of the sample (21.6%) (Table 1).

About 49.9% of the occupational groups corresponded to hodmen, bricklayers, plasterers and electricians. Almost two thirds of the participants had worked less than four years in civil construction and almost three fourths had formal employment relationship. In regard to pre-employment tests, 46.2% of the sample had undergone spirometry and 54.5% chest radiographs (Table 2).

The prevalence of participants with respiratory symptoms was 44.4%. Cough was reported by 24.2% participants, phlegm by 22.5% and wheezing by 25.5% (Table 2).

Table 3 describes the prevalence and prevalence ratio (PR) of respiratory symptoms according to sociodemographic characteristics and pre-employment tests.

The variables associated with cough were: smoking (PR=2.93, 95% confidence interval–95%CI 1.44–2.59), exposure to cold (PR=1.82; 95%CI 1.36–2.43), exposure to dampness (PR=1.82; 95%CI 1.33–2.48), exposure to fumes (PR=1.65; 95%CI 1.03–2.65) and exposure to other chemicals (PR=1.70; 95%CI 1.22–2.37). Phlegm exhibited statistically significant association with smoking (PR=2.16; 95%CI 1.59–2.92), exposure to cold (PR=1.39; 95%CI 1.02–1.91) and exposure to other chemicals (PR=1.63; 95%CI 1.14–2.23). Wheezing was associated with smoking only (PR=1.41; 95%CI 1.03–1.92) (Table 4).

In the final model, the variables associated with cough were: more than 8 working hours/day (PR=1.34; 95%CI 1.01–1.79), exposure to cold (PR=1.55; 95% CI1.15–2.08), exposure to dampness (PR=1.47; 95%CI 1.07–2.01) and smoking (PR=1.76; 95%CI 1.31–2.37). Phlegm was associated with exposure to cold (PR=1.40; 95%CI 1.17–1.69) and the occupation-income interaction (PR=1.44; 95%CI 1.17–1.77). Smoking (PR=1.06; 95%CI 1.01–1.12) and pre-employment spirometry (PR=1.06; 95%CI 1.01–1.11) exhibited statistically significant association with wheezing. In the final model, the variables associated with presence of general respiratory symptoms were: smoking (PR=1.52; 95%CI 1.26–1.84), exposure to fumes (PR=1.41; 95%CI 1.26–1.84), age under 30 (PR=0.78; 95%CI 0.65–0.94) and the occupation-income interaction (PR=1.79; 95%CI 1.07–3.01) (Table 5).

Table 1. Sociodemographic characteristics of civil construction workers, Cuiaba, 2015 (n=545).

Sociodemographic characteristics	n	%
Sex		
Male	500	91.74
Female	45	8.26
Age range (years)		
<20	25	4.5
20 to 29	201	36.8
30 to 39	155	28.4
40 to 49	78	14.3
50 to 59	62	11.3
>60	24	4.4
Educational level		
Illiterate	10	1.8
Incomplete elementary school	246	45.1
Complete elementary/incomplete secondary school	134	24.5
Complete secondary school	138	25.3
Higher and graduate education	17	3.1
Per capita family income*		
Up to half the minimum wage	74	13.5
More than half the minimum wage	471	86.4
Marital status		
Married/stable union	324	59.4
Single	195	35.7
Separated	22	4.0
Widowed	4	0.7
Smoking		
Yes	118	21.6
No	427	78.4

*The minimum wage was BRL 724.00 in 2015.

Table 2. Workplace characteristics, pre-employment tests and respiratory symptoms among civil construction workers, Cuiaba, 2015 (n=545).

Workplace characteristics	n	%
Occupation*		
Hodmen/bricklayers/plasterers/electricians	272	49.9
Other	273	50.0
Working hours		
Up to 8	383	70.2
>8	162	29.7
Length of exposure		
Up to 4 years	223	71.2
>4 years	90	28.7
Employment relationship		
LLC	393	72.1
Other	152	27.8
Pre-employment tests		
Spirometry		
Yes	252	46.2
No	293	53.7
Chest radiographs		
Yes	297	54.5
No	248	45.5
Respiratory symptoms		
Cough		
Yes	132	24.2
No	413	75.7
Phlegm		
Yes	123	22.5
No	422	77.4
Wheezing		
Yes	139	25.5
No	406	74.5
General respiratory symptoms		
Asymptomatic	303	55.6
Symptomatic	242	44.4

*According to the Brazilian Classification of Occupations; LLC: Labor Laws Consolidation.

DISCUSSION

Almost half of the participants in the present study were categorized as with respiratory symptoms. This finding is even more relevant because this was a rather young population, the largest proportion of participants being 20 to 29 years old.

Similar findings were reported in a study conducted with road construction workers in India. Almost 70% of the participants exhibited some work-related respiratory sign or symptom and almost all (92%) were under age 30 years. Cases were of both acute and chronic disorders[10].

Another aspect deserving of notice is the low educational level of the participants in the present study; almost half had not completed elementary school. A low educational level makes workers even more vulnerable to precarious working conditions, reduce their opportunities to receive training in health and safety at work and impairs their access to healthcare. As a result, they are more likely to develop health problems[20].

Cough and wheezing were the most prevalent self-reported symptoms. These findings corroborate those of a study with 572 civil construction workers in the United States. More than half of the participants complained of cough (53.8%), dyspnea (60.6%) and wheezing (50.2%)[4].

Civil construction workers are often exposed to several occupational hazards, resulting in multiple exposures to harmful agents. Chemicals such as paint and hydrocarbon solvents might contribute to trigger cough and phlegm as a function of their known ability to irritate the upper airways[21].

The participants exposed to chemicals exhibited 70% higher odds to report cough (PR=1.70; 95%CI 1.22–2.37) and 63% higher odds of phlegm (PR=1.63; 95%CI 1.15–2.23). These results agree with those reported by Rafeemanesh et al.[6], in whose study with cement industry workers in Iran cough and phlegm were the most prevalent symptoms. Following adjustment for confounding factors, those authors found that the odds to develop respiratory diseases were 7.6 times higher for the participants exposed to dusts and other chemicals compared to non-exposed occupational groups[6].

Respiratory complaints are also reported for other occupational groups in Brazil. A study performed with 183 ceramic industry workers in Cuiaba and Varzea Grande, Mato Grosso, detected respiratory symptoms in almost

Table 3. Prevalence, prevalence ratio and confidence interval for variables associated with cough, phlegm, wheezing and respiratory symptoms according to sociodemographic and occupational health characteristics of civil construction workers, Cuiaba, 2015 (n=545).

Variables	Cough PR (95%CI)	Phlegm PR (95%CI)	Wheezing PR (95%CI)	General respiratory symptoms PR (95%CI)
Sex				
Male	1.00	1.00	1.00	1.00
Female	0.65 (0.42-1.00)	0.76 (0.46-1.23)	0.95 (0.57-1.58)	0.81 (0.61-1.09)
Age range (years)				
17 to 29	1.00	1.00	1.00	1.00
≥30	0.64 (0.48-0.86)	0.80 (0.64-1.19)	0.99 (0.73-1.32)	1.27 (1.06-1.53)
Educational level				
Incomplete elementary school	1.00	1.00	1.00	1.00
Other	0.95 (0.70-1.28)	0.98 (0.71-1.34)	0.84 (0.63-1.13)	0.90 (0.75-1.09)
Per capita family income*				
Up to half the minimum wage	1.00	1.00	1.00	1.00
More than half the minimum wage	1.13 (0.71-1.80)	1.45 (0.84-2.50)	0.65 (0.46-0.91)	0.96 (0.73-1.28)
Marital status				
Married/stable union	1.00	1.00	1.00	1.00
Other	1.25 (0.93-1.69)	1.26 (0.92-1.72)	0.88 (0.65-1.18)	1.07 (0.88-1.29)
Occupation				
Other	1.00	1.00	1.00	1.00
Hodmen/bricklayers/ plasterers	1.13 (0.84-1.52)	1.15 (0.84-1.57)	1.15 (0.84-1.57)	1.00 (0.83-1.22)
Pre-employment spirometry				
Yes	1.00	1.00	1.00	1.00
No	0.91 (0.67-1.22)	0.82 (0.60-1.13)	1.57 (1.17-2.10)	
Chest radiographs				
Yes	1.00	1.00	1.00	1.00
No	0.80 (0.59-1.08)	1.10 (0.80-1.50)	1.25 (0.93-1.66)	0.96 (0.79-1.16)

PR: prevalence ratio; 95%CI: 95% confidence interval; *the minimum wage was BRL 724.00 in 2015.

half of the participants. One third of the sample exhibited cough, phlegm, dyspnea and wheezing. Exposure to several chemicals and extreme temperatures is one of the probable explanations for these findings. In turn, civil construction work is characterized by unhealthy and dangerous working conditions, which contribute to the occurrence of several diseases, especially involving the respiratory system[20,22].

The main variables associated with cough, wheezing and general symptoms were smoking (PR=1.52; 95%CI 1.26–1.84) and exposure to fumes (PR=1.41;

Table 4. Prevalence, prevalence ratio and confidence interval for variables associated with cough, phlegm, wheezing and respiratory symptoms according to lifestyle and exposure to physical and chemical hazards relative to civil construction workers, Cuiaba, 2015 (n=545).

Variables	Cough PR (95%CI)	Phlegm PR (95%CI)	Wheezing PR (95%CI)	General respiratory symptoms PR (95%CI)
Smoking				
No	1.00	1.00	1.00	1.00
Yes	1.93 (1.44-2.59)	2.16 (1.59-2.92)	1.41 (1.03-1.92)	1.50 (1.24-1.81)
Exposure to cold				
No	1.00	1.00	1.00	1.00
Yes	1.82(1.36-2.43)	1.39 (1.02-1.91)	0.85 (0.61-1.17)	1.18 (0.97-1.43)
Exposure to heat				
No	1.00	1.00	1.00	1.00
Yes	1.26 (0.93-1.70)	1.13 (0.82-1.55)	1.00 (0.74-1.35)	1.04 (0.86-1.26)
Exposure to dampness				
No	1.00	1.00	1.00	1.00
Yes	1.82 (1.33-2.48)	1.37 (0.96-1.97)	1.17 (0.83-1.67)	1.21 (0.97-1.51)
Exposure to dusts				
No	1.00	1.00	1.00	1.00
Yes	1.34 (0.97-1.86)	1.17 (0.84-1.63)	1.04 (0.77-1.41)	1.04 (0.85-1.27)
Exposure to welding fumes				
No	1.00	1.00	1.00	
Yes	0.88 (0.31-2.43)	1.60 (0.78-3.30)	0.83 (0.30-2.30)	1.12 (0.66-1.92)
Exposure to fumes				
No	1.00	1.00	1.00	1.00
Yes	1.65 (1.03-2.65)	1.30 (0.73-2.32)	1.01 (0.54-1.87)	1.33 (0.97-1.82)
Exposure to other chemicals				
No	1.00	1.00	1.00	1.00
Yes	1.70 (1.22-2.37)	1.63 (1.14-2.23)	0.86 (0.55-1.33)	1.22 (0.96-1.54)

PR: prevalence ratio; 95%CI: 95% confidence interval.

95%CI 1.26–1.84). According to the scientific literature, smoking is a considerable risk factor for several pulmonary diseases, such as COPD, asthma and chronic bronchitis[5,23]. In turn, a systematic review found that 15 to 20% of confirmed COPD cases were associated with occupational exposures[11]. According to a study performed in North America, 20 to 30% of COPD cases derive from occupational exposures[4].

Exposure to cold (PR=1.55; 95%CI 1.15–2.08) and dampness (PR=1.47; 95%CI 1.07–2.01) was associated with cough and phlegm. A survey conducted in four European countries detected higher prevalence of wheezing, cough and asthma among workers exposed to excessive dampness[24]. Dampness favors fungi proliferation, which might trigger several allergies[25]. Another possible explanatory hypothesis is that civil construction involves mostly outdoor work, which exposes workers to climatic and environmental changes. In turn, work indoors in climatized environments with low humidity and high concentration of dusts and other substances might also potentiate the occurrence of respiratory symptoms among workers[26]. However, studies which associate dampness and respiratory symptoms among civil construction workers are still rare in Brazil[27].

The participants exposed to fumes exhibited the highest prevalence of cough. The precarious quality of the air inside buildings together with diesel fumes increase the frequency of cough and other respiratory symptoms[28].

Longer working hours was associated with cough. Long working hours might have negative impact on the health of workers, resulting in occupational diseases and absenteeism[23]. In addition, the length of exposure to harmful substances in the workplace increases under such conditions[29,30].

The odds of wheezing were 57% higher for the participants who had not undergone pre-employment spirometry (PR=1.57; 95%CI 1.17–2.10). The aim of spirometry is to assess the pulmonary function, and thus it is used for diagnosis of respiratory disorders[31]. Serial peak flow measurements are recommended in cases of suspected work-related asthma or for workers with respiratory complaints. Impaired ventilatory capacity might be an accurate biological marker for VISAT actions, as it is indicative of early functional disorders, especially in the case of COPD, which is still prevalent among workers and although incurable, is entirely preventable[32].

Healthcare providers in general, and especially those at primary care facilities, still have difficulty to establish a causal link between respiratory symptoms and the patient's occupation. This shortcoming represents a considerable loss of opportunities for VISAT actions.

Table 5. Final Poisson regression model with variables associated with cough, phlegm, wheezing and respiratory symptoms among civil construction workers, Cuiaba, 2015 (n=545).

Variable	Cough PR (95%CI)	Phlegm PR (95%CI)	Wheezing PR (95%CI)	General respiratory symptoms PR (95%CI)
More than 8 working hours/day	1.34 (1.01–1.79)	-	-	-
Exposure to cold	1.55 (1.15–2.08)	1.40 (1.17–1.69)	-	-
Exposure to dampness	1.47 (1.07–2.01)	-	-	-
Exposure to chemicals	1.55(1.12–2.13)	-	-	-
Smoking	1.76 (1.31–2.37)	-	1.06 (1.01–1.12)	1.52 (1.26–1.84)
Pre-employment spirometry	-	-	1.06 (1.01–1.11)	-
Exposure to fumes	-	-	-	1.41 (1.26–1.84)
Age ≥30 years old	-	-	-	0.78 (0.65–0.94)
Occupation-income interaction	-	1.44 (1.17–1.77)	-	1.79 (1.07–3.01)

PR: prevalence ratio; 95%CI: 95% confidence interval.

Monitoring the respiratory capacity of workers occupationally exposed to contaminants which impair the pulmonary function might be included in the primary care routine. Indeed, it is a relevant part of VISAT and should be part of the everyday practice of healthcare providers, especially in the primary care level.

Biological monitoring of workers has potential to enhance VISAT actions in the primary care setting, which are often restricted to narrow scoped or generic health educational actions or mapping production process in their area of coverage. Although these are relevant VISAT components, they should be understood as the point of departure for more ambitious actions considering the characteristics of production processes, occupational hazards, possible pathophysiological interactions between hazards and the workers' bodies and the morbidity and mortality profile of the target population.

We are moving toward an effectively preventive approach aligned to the occupational hazards effectively present in civil construction worksites in Brazil. The purpose in this case is to increase the engagement of the Unified Health System network, from laboratory tests to visiting worksites together with other agencies and sectors involved in occupational health. Such scenario contributes to achieve better recognition of the main risk factors associated with the various occupations and their repercussion on the health of workers. Within such framework, healthcare providers are better guided in their clinical investigation, by considering the corresponding set of variables in their diagnostic hypotheses. In addition, this approach challenges healthcare providers to think (over) their practice within the context of other health surveillance actions designed according to the complexity and identification of occupational hazards inherent to each production process.

VISAT still has much to evolve, particularly within the primary care setting. More effective, better planned and executed VISAT actions, in agreement with the specificities of the various production processes in their area of coverage, will reduce the rate of underreported work-related diseases. To be sure, this is one of the problems at healthcare facilities we have not yet been able to solve.

The present study has some limitations. Its cross-sectional design does not allow inferring causal links between exposures and the outcomes of interest. Therefore, one might consider the results as probabilistic factors without drawing any inference or attempting to establish causal links[33]. A second limitation derives from the nature of the dependent variables, as the data were self-reported instead of having been collected in clinical interviews by physicians able to identify the participants with respiratory symptoms. Finally, the possibility of memory bias among the participants with respiratory symptoms cannot be ruled out.

CONCLUSION

While identifying production processes in their area of coverage should be understood by primary care providers as the point of departure of VISAT actions, it does not represent the full scope of its activity. Such actions should be expanded to establish correlations between the characteristics of production processes, corresponding occupational hazards and possible pathophysiological implications for the morbidity and mortality profile of the target population.

Within this context, biological monitoring of workers might be relevant for VISAT action planning. In addition, it might be useful for the formulation of more efficacious health promotion and disease prevention measures, based on early detection of signs and symptoms predictive of future disorders. Therefore, it contributes to early diagnosis, treatment and also to reduce risk factors for occupational diseases among different occupational groups, the civil construction industry in particular. It further contributes to the design of more efficacious treatment plans, by considering the influence of occupational hazards on the occurrence of illness. Finally, it affords several options for intersectoral actions including the various actors in the health and safety at work field.

ACKNOWLEDGEMENTS

We thank all the workers who actively participated in the present study, trade unions, Federal University of Mato Grosso and Occupational Health Reference Center of Mato Grosso (Centro de Referência em Saúde do Trabalhador do Mato Grosso–CEREST-MT) for their support. Finally, we thank the Labor Prosecutor Office for funding the study.

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